Co-design and implementation of common elements-based academic support in Norwegian Child Welfare Services

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Summary

Background

A range of interventions within the health and social sciences demonstrate effectiveness in research settings. Still, many evidence-based interventions are unlikely to be implemented and sustained as intended in non-research settings (Glasgow et al., 2012; Hall et al., 2016; Lau et al., 2016; Stirman et al., 2012). Several explanations have been suggested such as unsuccessful implementation strategies, unfavorable conditions for implementation in services, lack of investments, and disconnects between contextual circumstances and characteristics of interventions.

Child Welfare Services (CWSs) can benefit from implementation of interventions informed by research evidence, and they need interventions to help children academically. Studies in Norway indicate that up to 8 in 10 children in CWSs struggle in school, and the majority of these children live at home with their parents (Statistics Norway, 2016). Similar numbers are reported internationally (Jackson & Cameron, 2011). Supporting these children academically can improve their life course trajectory and benefit societies at large. However, academic needs are traditionally considered secondary to other social, psychological, and welfare needs in CWSs. Also, practitioners in CWSs must often address multiple co-occurring needs in the families they support, both within individuals in a family and between them. Reviews show that there are academic programs available for implementation (Knoph et al., 2015; Seeberg et al., 2014). However, to address the scope of needs for academic support in CWSs, practitioners need an academic intervention they can use alongside other supports within their complex practice contexts. The available academic programs do not appear to meet CWSs contextual demands, and how to design such interventions has rarely been studied.

Intervention- and implementation scientists have called for innovations to design and re-design interventions to make them more feasible to implement, sustain, and scale-up in complex practice settings. These calls are often accompanied by suggestions to engage stakeholders more purposefully in research. The concept of common elements, an idea about distilling the most likely useful content of interventions, may provide methodology to facilitate and study such efforts.

Procedure and methods

This thesis is part of the KOBA-study, an integrated knowledge translation project conducted in partnership with Norwegian CWSs. The KOBA study included developing a common elements-based academic intervention (Enhanced Academic Support) for children and families in CWSs, and a hybrid randomized pragmatic trial to evaluate aspects of implementation and the effects of Enhanced Academic Support. This thesis reports on a common elements methodology developed for the study, results from a systematic common elements-review, the co-design of Enhanced Academic Support, findings from a study of climate for implementation in Norwegian CWSs, and a mixed-methods case study exploring the implementability of Enhanced Academic Support.

The first paper is a systematic review of common elements in out-of-school-time academic (OSTA) interventions for primary school children at risk of academic failure. 11.704 records were screened for eligibility, which led to the inclusion of 36 studies of OSTA interventions. A novel common elements methodology was used to code details about interventions and studies in matrixes, and frequency-based algorithms were used to identify common elements of effective interventions.

The second paper is a peer-reviewed protocol describing the KOBA-study. The protocol also reports how knowledge from intervention- and implementation science was combined with the expertise of contextually relevant stakeholders to co-design the intervention and implementation strategies.

The third paper is a cross-sectional study of conditions for implementation in CWSs and individual-level predictors of implementation climate. Data was collected from 129 child welfare employees before implementing Enhanced Academic Support and 157 employees after implementation. Methods included translating the Implementation Climate Scale (ICS) and psychometric testing of the Norwegian version of ICS and two scales indexing job stress and job satisfaction developed for the study. Hierarchical linear regression analyses tested individual-level predictors of implementation climate. ICS scores from Norwegian CWSs was compared with scores from CWSs in the USA.

The fourth paper is a mixed-methods case study of the implementability of Enhanced Academic Support in CWSs, and how characteristics of the intervention influence practitioners' perceptions of implementability. Quantitative data collection included a sample of 24 practitioners. Qualitative data included two focus groups with seven practitioners, two individual interviews with two supervisors, and 120 free text feedback comments from a monitoring system during implementation. The quantitative analyses were descriptive, and

qualitative analyses were conducted using thematic analyses mixing inductive and deductive coding and interpretations. Mixing was done using convergence and expansion analyses.

Results

The systematic review identified 30 effective and six ineffective OSTA interventions for primary school children at risk of academic failure. Common elements methodology was used to code practice elements ($n = 62$), process elements ($n = 49$), and implementation elements ($n = 36$) in the interventions in matrices. Common elements across the interventions were identified and given frequency count values (FV), reflecting how often elements were included in effective studies compared to in ineffective. The five common practice elements with the highest FVs were homework support, training in positive parental school involvement, positive reinforcement, structured tutoring, and psychoeducation. Common combinations of practice-, process-, and implementation elements were also identified and given FVs reflecting how common practice elements were delivered and implemented when they were effective, accounted for when they were ineffective.

The results of the review informed co-design of Enhanced Academic Support, a flexible academic intervention consisting of four core elements: (1) parent training in parental involvement in school, (2) structured tutoring in reading and math, (3) guidance in home learning structure and routines, and (4) guidance in positive reinforcement.

The cross-sectional study found that job satisfaction, job stress, and length of tenure was associated with implementation climate in CWSs, and that post-graduate education and active or passive participation in implementation was not. Job satisfaction was a unique predictor with all variables accounted for and emerged as a potentially important determinant to consider in implementation. The study found acceptable psychometric properties for the Norwegian translation of the Implementation Climate Scale in Norwegian CWSs. Average total scores on implementation climate in Norwegian CWSs did not significantly differ compared to in CWSs in the USA. There were some significant differences in subscales.

The fourth paper found that three of the four core elements in EAS appear widely implementable in CWSs general practice, while the core element structured tutoring could be perceived as inappropriate for some families and divergent from some practitioner's sense of coherence at work. Flexibility and autonomy in use of EAS was important for implementability, with the opportunity to integrate core elements of EAS into other types of support as a crucial feature. The degree of flexibility in EAS also causes notable concerns for fidelity to core elements. The compatibility between EAS and practitioners' preferences, autonomy, and values generally influenced perceptions of implementability, as did

perceptions of appropriateness for children and families and CWSs responsibilities. There were indications of insufficient implementation strategies, which may have influenced implementability.

Discussion

EAS appears implementable for the majority of practitioners working as family therapists in general CWS practice, and thus has the potential to reach many children and families in need of academic support. The tutoring element likely needs refinements and differentiation in implementation to be widely appropriate and usable, which is important to ensure the academic support can alleviate knowledge gaps in basic reading and math skills.

Practitioners need EAS to have a flexible format to be sustainable in the complex general CWS practice. However, a more fixed structure during initial implementation would likely be beneficial to build proficiency. Coinciding, more intensive, ongoing, and contextually tailored implementation strategies are needed, especially to ensure processual aspects of practices that are important for academic improvements are facilitated. If the core elements produce value, a viable approach towards long term sustainment may be dissolving EAS as an intervention and instead maintain core academic elements as core competencies within regular quality assurance systems.

The general child welfare practice, which accounts for the majority of support provided by CWSs, are complex implementation contexts. They are characterized by heterogeneity, capacity constraints, challenging work climates, and are often subject to media scrutiny. Practitioners in these contexts are vulnerable to stress, change-fatigue, burnout, and secondary trauma. Implementation in such circumstances should be sensitive to contextual variations, capacity constraints, and practitioners' well-being at work, both to increase the potential value of the implementation and for ethical reasons. Job satisfaction and tenure may inform strategic priorities and role selection in implementation processes in CWSs.

The common elements methodology provided useful evidence-informed building blocks to use in co-design of EAS. The addition of process elements such as delivery forms and structural and contextual characteristics illuminated nuances to the intervention's effectiveness and provided useful options for tailoring and planned adaptations. Poor reporting of implementation strategies in included studies limited the usefulness of the addition of implementation elements. The disconnect between descriptions of interventions in studies and the actual use of the interventions in studies (i.e., dosage and fidelity data) introduces substantial biases in common elements reviews. Future reviews can address such

limitations because of increased attention to details in reporting standards and the push for data availability by funding institutions and scientific publishers.

Purposefully combining theory and knowledge from implementation science with contextual expertise helped co-design features of EAS that were beneficial to implementability. However, implementation strategies were likely sub-optimal and inadequately executed. Future efforts should do more iterative co-design of practices and implementation strategies before full implementation, and plan for ongoing improvement within the larger practice ecology in the services.

Conclusions

Enhanced Academic Support (EAS) was implementable for most family therapists in child welfare services and can potentially reach many children and families in need. We identified several aspects to improve to realize this potential.

The common elements methodology was useful in the co-design of the EAS and contributed to making EAS implementable. Recent improvements in reporting standards and increased data availability in scientific publishing can progress implications from such methodologies and improve the precision of research evidence.

Intervention development and implementation in child welfare services require meticulous sensitivity to context. Intervention and implementation should consider the services' full scope of practice and their organizational climates.

List of papers

Engell, T., Kirkøen, B., Hammerstrøm, K. T., Kornør, H., Ludvigsen, K. H., & Hagen, K. A
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1. Introduction

The gap between what is known from research in health and social sciences and what is practiced in health- and welfare services and schools is a severe obstacle for improving care, education, and well-being. Classical studies indicate it takes 17 to 20 years to translate health innovations from research into practice, and most innovations will never be practiced in non-research settings (Balas & Boren, 2000; Morris et al. 2011). Well-being and quality of life are suffering worldwide from limitations in translation and implementation of knowledge from research (NASEM, 2018). Closing implementation gaps, also known as quality chasms, has been identified as crucial to meet the United Nation's sustainable development goals (ibid.). Moreover, estimates indicate that about 80% of health research investments do not produce public health impact (Chalmers & Glasziou, 2009). Interventions with empirically established efficacy in research settings are limitedly used as intended in non-research settings (Glasgow et al., 2012; Lau et al., 2016; Stirman et al., 2012) and few are sustained over time (Hall et al., 2016; Herlitz et al., 2020). As a result, the scientific study of implementation and knowledge translation has emerged and established its significance for increasing the impact of human services research on public health and wellbeing (Albers et al., 2020; Nilsen & Birken, 2020).

Implementation science emerged from the evidence-based movement in medicine in the 1990s. Sparked by the notion that evidence-based health interventions should be widely spread to improve health and wellbeing, researchers began to recognize that disseminating evidence does not necessarily result in its use. A seminal review by Balas and Boren (2000) illuminated the extensive gap existing between evidence-based interventions and non-research practice in health, and the field of implementation science was born to mitigate this gap. Implementation science has been defined as "the scientific study of the use of strategies to adopt and integrate evidence-based health interventions into clinical and community settings" (U.S Department of Health and Human Services, 2019). Moving from its infancy into its toddler years, however, implementation science seems to be broadening its scope. In their recent Handbook on Implementation Science, Nilsen and Birken (2020) suggests redefining implementation science as the "scientific inquiry into questions concerning how to carry intentions into effect." This definition resonates well with trends in the field, seeing knowledge from implementation science as broader applicable than merely restricted to evidence-based health interventions (Bertram et al., 2021).

The terms 'implementation science' and 'translational science' are often used interchangeably. Although they overlap, they are different. While implementation science

typically concerns studying the implementation of something, traditionally an evidence-based intervention or program, translational science concerns the entire translational process from basic scientific discovery to human applications in routine practice. The term 'from bench to bedside' describes the scope of translational science where 'bench' refers to results from laboratory research, and 'bedside' refers to these laboratory-results turning into new ways of treating patients. In terms of the social sciences, translational science may refer to the scientific process from understanding manipulations of a psychosocial phenomenon to developing psychosocial interventions to manipulate that phenomenon, which are, in the end, used to intervene with the phenomenon in non-research settings to improve the wellbeing of people. Another overlapping concept, 'knowledge translation' (also known as knowledge transfer and knowledge exchange), refers to using available knowledge to guide the process from bench to bedside. It has been defined as the "effective and timely incorporation of evidence-based information into the practices of health professionals… to affect optimal health care outcomes and maximize the potential of the health system" (Sudsawad, 2007). Although there are some subtle differences, research on both implementation and knowledge translation involves studying the process or act of carrying an intention of change into effect (Theobald et al., 2018). Regardless of the definition used, increasing the impact of health- and welfare research likely includes finding ways to extend the reach and utility of research evidence to benefit larger portions of people in need. The field of implementation science and knowledge translation (from now on, 'implemention science' refers to both) has undertaken this endeavor.

Implementation Science is inherently transdisciplinary, and Child Welfare Services (CWS) are among the human service systems that can benefit from implementation science. CWSs help and support children and families with a wide range of challenges and hardships. Children in CWSs are vulnerable to marginalization, and their needs can span several social, psychological, and developmental fields of expertise. Subsequently, implementation is imperative to ensure services to help them are informed by the best available knowledge. School completion and education are important for children to prosper, especially for children experiencing marginalization or other vulnerabilities (Frønes, 2016; Johnson et al., 2010; Vinnerljung et al., 2010;). Children in CWSs tend to struggle in school and need academic support (Dæhlen, 2015; Jackson & Cameron, 2011). However, practitioners in CWSs typically do not have training in providing academic support, and doing so is traditionally considered secondary to their responsibilities and priorities (Berridge, 2007; Iversen et al.,

2010). The last decade has, however, unveiled a promising potential in providing academic support to children through CWSs, and implementation of academic support in CWSs is called for by scientific communities and policymakers (Forsman & Vinnerljung, 2012; Seeberg et al, 2014; Evans et al., 2017).

This thesis describes and studies a translational process of developing an academic intervention for implementation in CWSs. The thesis's work is part of the KOBA-study, a knowledge translation project to develop, implement, and evaluate academic support for children and families in CWSs. The thesis is written as a monograph with scientific papers integrated. The scope of the work is transdisciplinary and therefore provides background for multiple themes across related disciplines. I start by reviewing the academic needs of children in CWSs, and the organizational conditions for implementation and academic interventions for children in CWSs - the case and context for the study. Following, I provide a more in-depth description of the current state of implementation science, and its implications for translational science and intervention development. Lastly, I introduce the concepts of common elements and collaborative design of interventions as responses to issues raised thus far. I then present the objectives of the thesis and research questions. In the main body of the thesis, I first present the common elements methodology developed for the study, describe the development of Enhanced Academic Support, and present methods and results from the peer-reviewed papers. I then discuss and interpret results and suggest future directions.

2. Background

2.1. Child welfare services and the need for implementation of academic support

2.1.1 Academic achievement of children in child welfare services

Academic achievement is significant to children's prosperity. Struggling academically and not completing school are associated with an increased risk of later social exclusion, welfare dependency, and problem behaviors (Frønes, 2016). School completion predicts wellbeing in adulthood and protects against later marginalization (Johnson et al., 2010; Vinnerljung et al., 2010). Children who receive support from CWSs more often experience concurrent and prospective marginalization than peers, and academic achievement may represent an opportunity for life course improvement (Forsman, 2020). Children in CWSs who achieve academically have been found less likely to experience illness, unemployment, to use drugs, to engage in suicidal or criminal behavior, and to depend on welfare support in

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adulthood, even when controlling for socioeconomic status (Berlin et al., 2011; Brännström et al., 2015).

Unfortunately, decades of research show that children with experience from receiving child welfare support are, as a group, less likely to complete school and attain educational degrees compared to children without this experience (Cheung & Heath, 1994; Clausen & Kristoffersen, 2008; Dæhlen, 2015; Jackson & Cameron, 2011; Vinnerljung et al., 2005). In Norway, children in CWSs are more than twice as likely to drop out of school than their peers (Statistics Norway [SSB], 2020). Only two in ten children who have been involved with CWSs complete secondary school on schedule, and 35% are neither employed nor in education by the time they reach 23 years of age (ibid.). In comparison, six in ten children in the general population complete secondary school on time, and under 10% are neither employed nor in education at the age of 23 years (Bø & Vigran, 2018). Similar completion rates for young people in public care have been reported in England, Spain, Hungary, Denmark, and Sweden (Jackson & Cameron, 2011).

While the majority of research on the academic achievements of children in CWS has focused on secondary school or higher education (Bryderup & Trentel, 2012; Cheung et al., 2012; Clausen & Kristofersen, 2008; Dæhlen, 2015; McClung & Gayle, 2010; Vinnerljung et al., 2005), the antecedents of poor academic outcomes likely emerge earlier. Children experiencing hardship during childhood may develop knowledge gaps early in their academic careers (Sebba et al., 2015). Knowledge gaps in prerequisites for further learning, such as reading, spelling, and math, may be exacerbated over time and result in poor academic outcomes without timely and effective support. Following the lockdowns during the covid-19 pandemic, such knowledge gaps may have grown. Statistical models predict that learning loss due to covid-19 may have long-lasting impacts on the academic achievement and future wellbeing of children in disadvantaged groups (low socioeconomic status, ethnic minorities; Dorn et al., 2020). A nationwide study in the Netherlands found that just eight weeks of lockdown resulted in significant losses in learning for primary school students, and disadvantaged students (indicated by having less-educated parents) experienced more than twice as large learning losses compared to peers (Engzell et al., 2020). Thus, the need to provide academic support to vulnerable children is currently highly prominent.

Most studies on providing academic support to children in CWSs are with children in out-of-home care or foster care, while most children in Norwegian CWS, 82%, receive measures while living at home with their biological family (SSB, 2020). Statistics have indicated that children receiving in-home support may struggle in school similarly to children

in out-of-home care (Berger et al., 2015; Clausen & Kristofersen, 2008; SSB, 2016). Indeed, baseline results from the KOBA-study found that, on average, elementary school children who receive in-home support in Norwegian CWSs struggle significantly in reading and math compared to peers (Kirkøen et al., in review). Out-of-home care has even been found to be a protective factor against academic difficulties for children exposed to many risk factors at home (Maclean et al., 2016; Sebba et al., 2015).

Exposure to many risk factors may account for why children in CWS tend to struggle academically. In terms of the bioecological theory, these children may experience conditions in their microsystem that are unfavorable to their development (Bronfenbrenner, 1979). Parents in families receiving support from CWSs are more likely to be socioeconomically disadvantaged, sole providers, less educated, and to suffer from mental health issues and drug abuse (Berridge, 2012; Clausen & Kristoffersen. 2008; Franzén et al., 2008; Maxwell et al., 2006), all of which have been associated with academic difficulties in children (Arnold & Doctoroff, 2003; Bradley & Corwyn, 2002; Tessier et al., 2018). Also, families often receive support from CWSs due to suboptimal or neglecting parenting and care, and their children may experience insufficient developmental stimulation and support limiting early learning and development (Maxwell et al., 2006; Tessier et al., 2018).

The risk factors to which these children are exposed may also cause disruptive changes in living arrangements or schools – the mesosystems – which may further damage their academic learning environment (Jackson & Cameron, 2011; Hattie, 2009). Moreover, mental health issues and difficulties with acquiring social skills is more prevalent among children in CWS compared to peers (Goemans et al., 2016; Shin, 2005). Taken together, these risk factors and their associated unfavorable outcomes illuminate the complexities of providing support to families in CWS. The academic needs of children in CWSs coexist with other needs and may also be linked. To help children prosper, CWSs will likely need to attend to children's academic needs and their conditions for learning at home, alongside addressing other challenges in the families.

2.1.2 Child welfare services

CWSs work to ensure safety, stability, well-being, and a healthy upbringing for children. The majority of CWS in Norway is delivered by municipal agencies located across the country (SSB, 2020). The term CWS is here used as a translation of the Norwegian term 'Barnevernet,' which in some countries would be translated to Child Welfare Services and in others as Child Protection Services. In Norway, the child welfare system has the combined function of helping children and families through compensatory welfare services and

protecting children through out-of-home care placement. Thus, front-line practitioners' responsibilities span from investigating abuse and neglect, delivering family, parent, or child counseling, out-of-home care placement and support, to offering compensational measures such as parent relief and financial support (Christiansen, 2015). This combined function is a common characteristic of Nordic welfare systems, while other countries such as USA, United Kingdom, and Canada are more oriented towards child protection (Gilbert et al., 2011). Additionally, Norway has adopted a child-centric orientation where children's safety, well-being, and rights outweigh other considerations such as family preservation.

CWSs typically vary in organizational structure and capacity (Edwards & Wilderman, 2018; McCrae et al., 2014;). They also vary in the services and interventions they offer to children and families. Their services' effectiveness is often unknown, and evidence-based interventions (EBIs) are scarcely used (Christiansen, 2015; SSB, 2020). A nationwide study from CWSs in the USA found that 94% of child welfare agencies had started a new program or practice in the last five years, and 25% could be considered evidence-based (Horwit et al., 2014). Not all these interventions were implemented successfully, and the authors could not obtain data on how many children or families the interventions reached. In Norway, however, data about interventions used in CWSs are publicly available.

Table 1 shows interventions, counseling, and other forms of support delivered to children and families in Norwegian CWSs in 2019. About 22% were categorized as 'advice and counseling,' which are interventions and counseling with broad aims, low specificity, and varying content (Christiansen, 2015; SSB, 2020). About 15% are compensational measures such as ensuring children's participation in kindergarten, after-school programs, and leisure activities. The use of responsibility groups accounts for 14%, which typically are cooperative meetings between adults involved in the care and support of a child (e.g., caregivers, practitioners from CWSs, teachers, school social workers, mental health therapists) and preferably the child herself when appropriate. Financial support accounts for 12%, another 11% are parent relief and visitation homes. Two percent of interventions were more or less standardized programs, and 1.7% are considered evidence-based. Excluding the types of support that can be considered more compensational measures and not interventions or counseling (financial support, parent relief and visitation homes, child-parent centers, and responsibility groups), the percentage of evidence-based programs were 3.63%. However, the remaining interventions and counseling may sometimes contain use of elements of EBIs and other manualized programs, although the infrastructures and standard procedures are absent (Christiansen, 2015). Instead, practitioners priorly trained in high quality implemented

programs may integrate elements of programs into more eclectic practice traditions such as milieu therapy, where they "cherry-pick" elements of EBIs based on individual needs and circumstances (ibid.). Monitoring the use and quality of such unstandardized forms of practice is more challenging than monitoring standardized practice, and CWSs experience tensions between increasing demands for practicing more of the standardized interventions and having traditions of a more autonomous practice culture (Olsvik & Saus, 2020). Nevertheless, none of the interventions or counseling included in the classification system specifically targets children's academic achievement. However, some programs may include elements of academic support, such as the incredible years program (Drozd & Hansen, 2019), and some practitioners may help children academically as part of the advice and counseling and unspecified interventions.

Table 1

Interventions, Counseling, and Other Forms of Support Delivered to Children and Families in Norwegian Child Welfare Services in 2019

Type of intervention	Nr. of interventions recorded in 2019	%
Total	62729	100
Advice and counseling	13692	21,83
Other compensational measures*	9293	14,81
Responsibility groups	8815	14,05
Financial support	7840	12,5
Parent relief and visitation homes	6737	10,74
Unspecified developmental support	5123	8,17
Unspecified parent training	3235	5,16
Other networking/cooperation	2362	3,77
Home counsilor	2140	3,41
Unspecifield home-based	2144	3,41
Evidence-based programs**	1085	1,73
Other manualized programs***	90	0,14
Parent-child centers	173	0,28

* Kindergarten, after-school program, leisure activities **PMTO, FFT, MST, The Incredible Years, Marte Meo ***ICDP

Note. Out-of-home care interventions and support excluded.

The Norwegian child welfare system is under scrutiny. Demands to ensure safe, just, caring, and effective services for vulnerable children are high. Government directives, negative media attention, and accumulation of legal actions against CWSs place mounting pressure on the CWSs and their staff. Despite efforts of reform to increase use of EBIs and other evidence-based practices, the adoption of standardized EBIs appears to have decreased rather than increased according to official statistics (Christiansen, 2015;SSB, 2020). Successful implementation of evidence-based practices is challenging for most organizations (Decker et al., 2012), however, the organizational conditions and climate in CWS may make implementation processes particularly challenging (Aarons & Palinkas, 2007).

2.1.3 Implementation Climate in child welfare services

CWSs are often burdened with high caseloads, scarce resources, and high staff turnover levels (Edwards & Wilderman, 2018; Ryan et al., 2006; Strolin-Goltzman, et al., 2010). Practitioners hold demanding, stressful, and emotionally challenging jobs and are prone to negative stress, burnout, and secondary trauma (Baugerud et al., 2017; Chung & Choo, 2019; Travis et al., 2016). Such job conditions are likely unfavorable to CWSs molar organizational climate (i.e., staffs' shared perceptions of the influence of the work environment on their wellbeing at work; James et al., 2008), which has in turn been shown to affect general wellbeing and health, quality of services, and client outcomes (Glisson & Green, 2011; Griffiths et al., 2018; Lawrence et al., 2015). A challenging organizational climate, as described above, is likely harmful to CWSs ability and capacity for implementation of new practices (Aarons & Palinkas, 2007; Williams & Beidas, 2019).

Implementation Climate (IC) refers to practitioners' shared perceptions of the extent to which their organization expects, supports, and facilitates the implementation and use of evidence-based practice or specific innovations (Ehrhart et al., 2014; Klein & Sorra, 1996). These perceptions form when practitioners experience and interpret cues in their work environment through policies, procedures, practices, and communication from leaders and managers (Weiner et al., 2011). For instance, IC theory posits that an organization that hires, trains, incentivizes, advocates, and removes barriers for innovations being implemented are more likely to have a positive IC (Klein & Sorra, 1996). Considerable attention has been given to IC in implementation theory (Klein & Sorra, 1996; Moullin et al., 2019; Weiner et al., 2011), and emerging empirical work is supporting its association with successful implementation across health and welfare contexts (Kratz, et al., 2019; Powell et al., 2017 Turner et al., 2018; Williams, et al., 2018).

No study has assessed IC in Norwegian CWS. Doing so may prove valuable to understanding how and why implementation efforts succeed or fail, and inform facilitation of implementation capacity and readiness. Also, knowledge about IC may inform how interventions can be tailored to fit contextual needs and constraints, which may benefit the potential reach of interventions in CWSs specifically (Aarons et al., 2016; Christiansen, 2015), and human service settings in general (Ginsburg et al., 2020; Lyon, Brewer et al., 2020;).

2.1.4 Academic interventions in child welfare services

Although evidence shows that children in CWSs need academic support (Kirkøen et al., 2020), there has traditionally been debate about whether CWSs should provide it. In 2012, however, the Norwegian Auditor General released a critical and discouraging report on the academic situation for children in CWS and the limited academic support they recieve. Following, The Norwegian Directorate for Children, Youth and Family Affairs (Barne-, ungdoms-, og familiedirektoratet, [Bufdir]) launched a series of efforts to address the identified issues. Bufdir mandated CWSs to cooperate with schools and attend to children's academic needs in out-of-home care, and they developed and released professional guidelines for doing so. They also mandated out-of-home care institutions to designate an employee responsible for academic support and disseminated an online course for these employees. Currently, Bufdir is also piloting an academic program, *Skolelos*, for adolescents between the age of 12 and 18 in need of academic support.

The efforts above are valuable steps towards helping children in CWS academically. There are, however, several reasons why these efforts are insufficient. First, implementation science has established that disseminating guidelines and online courses have little to no influence on practice without active implementation strategies (Gagliardi & Alhabib, 2015; Shekelle et al., 2012). Second, as described above, gaps in knowledge are likely to emerge early in these children's education, and although supporting adolescents may be beneficial, earlier intervention is likely to be more effective. Intervening already in early primary school may help prevent knowledge gaps from developing and help close gaps before they grow large. Third, and perhaps most prominently, these efforts do not target the largest population of children in CWSs, which are primary school children living at home with their biological parents (SSB, 2020). This is the population for whom intervention has the most significant potential for life course improvement and positive impact. Also, these children and families are the ones who most often receive advice and counseling and unspecified interventions, both in their homes and at the offices of CWSs. Thus, there appears to be a large and

untapped potential in finding ways to integrate evidence-informed academic support into this general practice in CWSs.

Out-of-school-time academic (OSTA) interventions hold promise in promoting academic achievement for children at risk (Forsman & Vinnerljung, 2012; Knoph et al., 2015; Seeberg et al., 2013). Interventions delivered outside of school hours avoid the potential stigma associated with receiving special education in class or being removed from the classrooms. OSTA interventions also do not replace the regular classroom curriculum. Furthermore, involving parents in academic interventions at home can improve children's educational achievement (Desforges & Abouchaar 2003; Ma et al., 2016; Nye et al., 2006; Wilder 2014). While schools arguably should be primarily responsible for additional support during school hours, CWSs are well-positioned to provide complementary support after school hours, seeing as they regularly provide services to families after school and in homes.

OSTA interventions, such as Teach Your Children Well (Maloney et al., 1990) or On The Way Home (Trout et al., 2012), often consist of multiple practices, or 'elements'. Some elements directly target academic skills (e.g., tutoring), some focus on behavior (e.g., use of homework contracts and routines), and others may target motivation (e.g., positive reinforcement). Typically, these interventions are more or less standardized using manualized protocols, requiring implementation infrastructure and resources to obtain and maintain sufficient fidelity to the protocol. Many OSTA interventions share these features with the programs already used as specialized services by the CWSs. Considering the limited reach these programs currently have in CWSs, adopting a similarly formed academic program appears unlikely to have the potential for comprehensive enough adoption and reach in general child welfare practice, unless the child welfare system is significantly reformed.

The infrastructure associated with many EBIs likely contribute to their effectiveness. They are well-engineered programs. However, the strong emphasis on maintaining internal validity in research may have led traditional programs to be well designed for performance in research-like circumstances, while less designed for use in complex and constrained non-research settings (Lyon, Dopp et al., 2020) such as general child welfare practice. Practitioners in general practice contexts can rarely focus on a limited number of programs, have selected populations referred to them, and have adjusted caseloads, which is typical for many EBIs. Besides, programs and other forms of interventions are rarely designed to be combined with other interventions and counseling, which CWSs also require to address needs other than academics. Thus, CWSs may need complementary forms of evidence-informed practices that are widely implementable in their daily practice context. How to design such

interventions has rarely been studied; however, the field of implementation science may offer knowledge to inform such efforts.

2.2 The state of implementation- and translational science

2.2.1 The translational continuum

In health and welfare research, the *translational continuum* is the journey scientific knowledge undertakes from basic scientific discovery progressing into evidence-based interventions (EBIs), with its final destination being to change practice and thereby impact the health and well-being of people. This journey has traditionally been characterized by five distinct research forms and three chasms (Drolet & Lorenzi, 2011). To achieve impact, scientific knowledge needs to travel along the translational continuum and leap across the chasms. In these leaps, the knowledge has to transform from (1) basic discovery to a proposed human application (i.e., an innovation), from (2) a proposed innovation to an empirically proven innovation in controlled/laboratory settings (EBI), and (3) the last leap into routine practice use of the EBI in human services. The last chasm is what is known as the research to practice gap, and it is this gap the field of implementation science emerged to alleviate.

The translational continuum is rooted in the evidence-based medicine tradition that grew during the latter half of the 20th century with evident successes in improving the scientific basis for the practice of medicine (Djulbegovic & Guyatt, 2017). This scientific tradition became a scientific paradigm that predominantly relied on positivist perspectives on epistemology and knowledge application (i.e., there are objective truths or natural laws about the treatment of illness to be found by empirical research and applied by health services). These perspectives followed into the social sciences concerned with developing psychosocial and educational interventions and programs, with hopes of similar success in improving people's mental health and wellbeing through evidence-based interventions. Over the last 50 years, a wealth of interventions developed across the social sciences have demonstrated reliable effectiveness in research (i.e., IBIs; Weisz et al, 2019; Waddel et al., 2018). However, transferring these EBIs across the last chasm into practice proved to be challenging. First, the effects observed in highly controlled research (efficacy studies) decreased in less controlled research with a closer resemblance to non-research settings (effectiveness studies; Curtis et al., 2004; Kazdin & Blasé, 2011; Weisz et al., 2006). Second, for non-research settings to adopt EBIs, substantial implementation efforts proved necessary and complex. Implementation science emerged to understand and solve implementation issues and has rapidly grown since its birth in the late 1990s.

2.2.2 Terminology and outcomes in implementation science

Currently, knowledge from implementation science mainly evolves around factors and activities that are likely to affect the journey an EBI takes across the third translational gap - the implementation process. Factors that affect implementation processes are known as implementation determinants, or barriers and facilitators (i.e. factors that are theorized or empirically shown to influence implementation outcomes; Nilsen & Bernhardsson 2019). For instance, implementation climate is an implementation determinant. A wealth of implementation determinants has been specified in theory and identified in studies, such as organizational culture and climates (Williams & Beidas, 2018), leadership styles and staff attitudes (Farahnak et al., 2020), and the 'fit' between the intervention and the implementation context (Lau et al., 2016). Activities designed to facilitate implementation of interventions into practice are known as implementation strategies (Powell et al., 2015), and examples of frequently used implementation strategies can include didactic education, ongoing coaching, feedback systems, and incentives (Waltz et al. 2015). Implementation using one specific strategy is referred to as a *discrete strategy*, while using combinations of discrete strategies are referred to as a *blended strategy*. Proctor and colleagues (2011) identified specific outcomes for implementation processes theorized to be linked to successful implementation, also known as high implementation quality. These implementation outcomes are depicted and defined in table 2.

Table 2

Implementation Outcomes and Definitions

Outcome	Definition
Sustainability	The extent to which an innovation is maintained and institutionalized within a service or system
Adoption	Intention, decision, or action taken to take up/start using an innovation (e.g., a service deciding to implement an EBI)
Intervention fidelity	The extent to which an innovation is used as intended (e.g., with adherence to specified content and structures in protocols or models)
Implementation fidelity	The extent to which an implementation process or strategy is carried out as intended (e.g., as specified in implementation plan)
Acceptability	The extent to which an innovation is agreeable and satisfactory
Appropriateness	The perceived fit, relevance, or compatibility of an innovation in a specific context
Feasibility	The extent to which an innovation can be successfully used within a given context
Penetration	Integration of an innovation into a service setting
Reach	The amount of an innovations' target population using or receiving the innovation

2.2.3 Implementation theory and the EPIS framework

As an offspring of the evidence-based medicine tradition, early work in implementation science tended to be purely empirically driven, with little consideration to theory (Nilsen, 2020). Implementation science has not itself undergone the formative philosophical and theoretical explorations and scrutiny that other disciplines within social science have, such as psychology and sociology. Instead, implementation science adopted the principles of the evidence-based paradigm as their foothold for scientific inquiry and got to work. In the last decade, however, perspectives of postpositivism and pragmatism have become more evident in implementation science and practice, as well as in intervention science. Postpositivism refers to research pursuing objective singular truths by limiting bias in quantitative research approaches, while also acknowledging the value of alternative methods as complementary or hypothesis generating. Pragmatism refers to research emphasizing "what works," meaning that the value and consequences of knowledge are of primary importance, more so than how it came about. Coinciding with the broadening of philosophical views, the use of theory has also grown.

Implementation science is inherently an applied and transdisciplinary field of inquiry (Kislov et al., 2020). It integrates theories from across several social science disciplines such as psychology, sociology, economics, change management, and organization research to explain implementation phenomena in the social world. For instance, theory of planned behavior (Ajzen, 1991) and social cognitive theory (Bandura, 1986) have been used to explain how people can change their behavior in implementation processes and social contexts. From sociology and management research, theory on communities of practice is used to understand how knowledge is shared and adopted across groups, organizations, and human services contexts (Lave & Wenger, 1991). Research on organizational change has developed and refined theories about how specific organizational determinants (e.g., implementation climate) influence implementation processes across multiple organization levels (e.g., client-, staff-, and group level; Klein & Sorra, 1996). More recently, theories from behavioral economics have gained traction as beneficial for implementation strategies (Beidas et al., 2019). For instance, making small adjustments to practitioners' immediate work environments to prompt implementation-appropriate behavior (i.e., nudges and choice architecture), or tailor what is being implemented to afford appropriate use within conditional constraints. Related to choice architecture, the ecological theory of affordances (Gibson, 1977) have influenced my thinking

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on how perceptions of structures and entities (e.g., intervention formats) influence and nudge (i.e., *affords)* actions and habitual behavior (e.g., turning implementation intentions into sustainable actions and habits). The most influential of theory in implementation science is Everett Roger's Diffusion of Innovations theory (1962), which is evident in most implementation theories applied to this day (Nilsen, 2020). With roots in the diffusion of agricultural technology and sociology, Rogers theorized phenomena about people, groups, and the innovation itself, which influence how successfully an innovation can be spread and adopted across social systems. For instance, Rogers (2003) theorized attributes of the innovation that were likely to influence the success to which the innovation could spread, such as the experience of relative advantage and compatibility, and the innovation's complexity, trialability, and observability.

Theoretical pluralism has been widely practiced in implementation science, and pre-existing theory across different disciplines has been combined with 'implementation wisdom' and been encapsulated in mid-range implementation theories and frameworks (Kislov et al, 2020; Nilsen, 2020). These theories and frameworks structure, explain, and guide implementation processes, and there is a plethora of them available (Nilsen, 2020; Tabak, et al., 2012). A generic unspecified mid-range implementation theory can be described as follows: Based on knowledge and assessments of the implementation object (e.g. an intervention) and implementation determinants, contextually appropriate implementation strategies should target functions or mechanisms that drive proximal indicators of implementation quality (e.g., implementation fidelity) to promote that the intervention is adopted, used, and sustained as intended (i.e., intervention fidelity), which in turn will improve outcomes if the intervention is effective.

The Exploration, Preparation, Implementation and Sustainment (EPIS, Aarons et al., 2011) framework illustrated in figure 1 is a prominent and widely used implementation framework. EPIS is structured within four phases that guides the implementation process and provides theory and tools to understand it. Along the four phases, common and unique implementation determinants are conceptualized across multiple levels of implementation such as outer system and inner organizational contexts, innovation factors relating to the characteristics of the innovation being implemented, and bridging factors which denotes the dynamics across the outer and inner contexts (Moullin et al., 2019). Theory integrated in the EPIS framework has seen increasing research support, such the importance of implementation leadership and citizenship, implementation climate and attitudes towards implementation, inter-organizational alignment, and community-academic partnerships

(ibid.). In recent years, empirical research has also tested specific implementation mechanisms theorized in EPIS. For instance, Farahnak and colleagues (2020) and Williams and colleagues (2020) found staff perceptions about their implementation climate and attitudes towards the evidence-based practice to be the strongest predictors of successful implementation, highlighting individual staff as prime targets for implementation strategies and understanding local implementation conditions. Individual characteristics of staff are theorized to influence such perceptions and attitudes without being subjected to much empirical testing. In line with other prominent implementation theories, EPIS also emphasize the importance of innovation factors and that characteristics of innovations may make the implementation of them more or less likely to succeed (Damschroder et al., 2015; Cane et al., 2012; May et al., 2009; Rogers, 2003). Such characteristics have rarely been explored and may not be well understood.

Figure 1

The Exploration, Preparation, Implementation, and Sustainment (EPIS) Framework
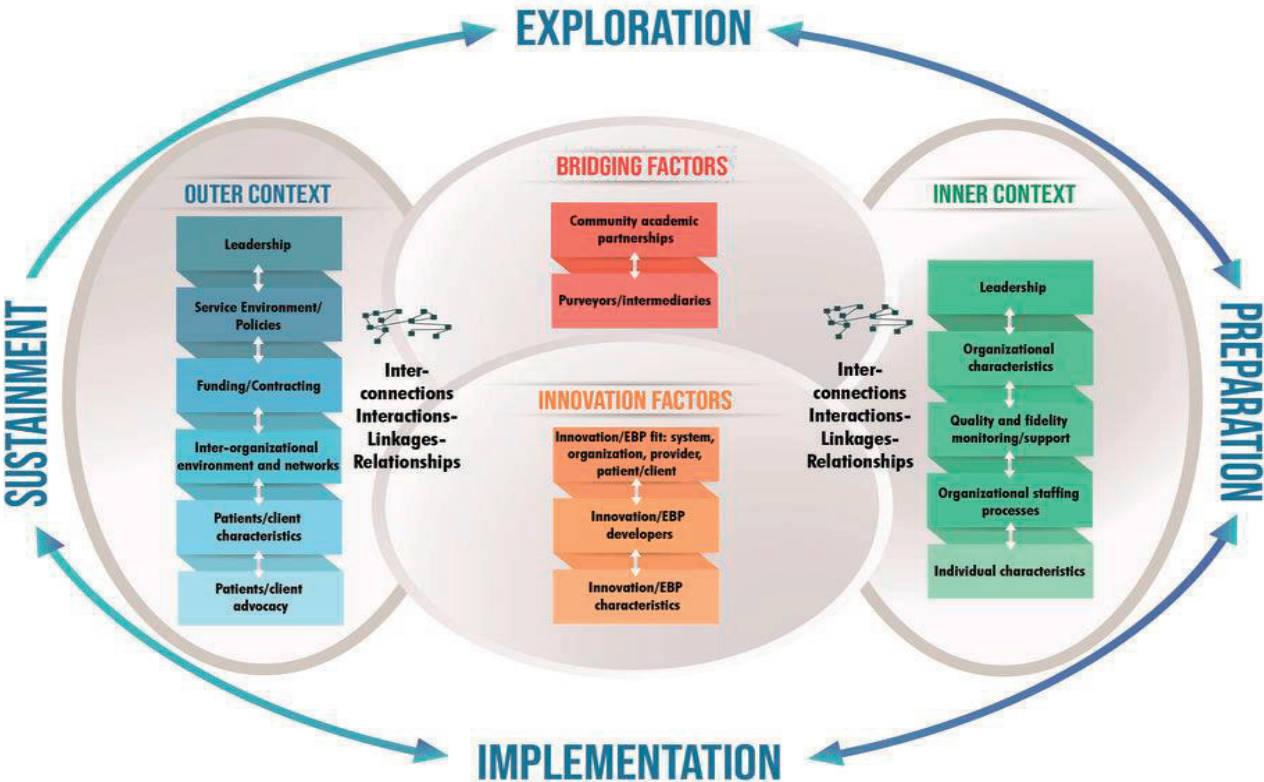
EPIS has been applied to guide processes in the KOBA-study. EPIS has specifically been used as a formative theory for the research conducted in this thesis and has informed the

development of the academic intervention, implementation strategies, research questions, measurement of implementation determinants and outcomes, and qualitative inquiries into implementation determinants. However, we rarely used EPIS explicitly as a tool or guide in the specific phases of implementation practice together with the child welfare services and other implementation stakeholders. Instead, we made pragmatic tools based on EPIS, and complementary knowledge, to make knowledge from implementation science practical for our needs. This common necessity of 'pragmatizing' implementation science has become evident by the recent realization of a complementary research-to-practice gap between implementation science and implementation practice. As described earlier, implementation science emerged to alleviate the third translational chasm - the gap between innovations being empirically proven in controlled research settings and routine use of them in practice. Now, a fourth chasm has emerged within the research to practice chasm.

2.2.4 Mitigating the fourth translational chasm

Despite the rapid advancements of implementation science, the knowledge it produces appears to have limited reach in non-research practice (Westerlund et al., 2019). The struggle with implementation in non-research practice settings persists, and curriculums in the education of health- and welfare practitioners and leaders rarely include implementations science. Practitioners and service leaders are not expected to be knowledgeable in implementation science, and governmental policies and initiatives limitedly reflect available evidence about implementation. Although implementation science has the potential to help improve care and welfare, this knowledge appears to largely remain within science and academia. As noted by Westerlund and colleagues (2019), implementation science seems to be recreating its own paradoxical research-to-practice gap parallel to the one it was meant to alleviate. There appears to be issues with the spread of implementation science knowledge to policy and non-research practice (i.e., dissemination problem), and even when it is spread, it is rarely used (i.e., implementation problem), hence, the paradox. The knowledge implementations science produces about what it takes to implement EBIs successfully, and the resources and infrastructure it demands, appears overwhelming for practice. In the words of Lyon and colleagues (2020, p. 296), its "*path is reminiscent of the one traveled by intervention science, which has led to a longstanding divide between science and practice.*" To change this reminiscent path, implementation scientists have voiced several recommendations for shifting course. For instance, using more pragmatic research design with more legitimacy towards external validity, developing more practical implementation tools

and measurements, and advancing training curriculums (Glasgow, 2013; Lyon, Comtois et al., 2020).

This fourth gap may be a natural consequence considering that implementation science is an extension of intervention science, which, to no small extent, operates within the same scientific paradigm with the same tools. The solutions suggested all appear likely to contribute to reducing the gap. There may, however, be other issues also at play. Implementation science may only be as practical as what it implements, and considering these two gaps as separate and unconnected with separate solutions, respectively, may prevent finding fundamental solutions that may mitigate them both. Implementation science may need to expand its scope beyond implementation of ready-made technologies (i.e., EBIs), and more broadly operate and set standards across the translational continuum. Recently, implementation scientists have begun to voice such arguments (Boulton et al., 2020; Rudd et al., 2020). If implementation science is producing useful knowledge about what it takes to implement in non-research settings, then leveraging that knowledge in the development of EBIs may result in EBIs that more *affords* use in non-research settings. Also, if non-research application and impact are the translational continuum's goal, theory and knowledge from, or in, non-research conditions may need to be more legitimized and informative across the whole translational process. Especially so at the conception of the technologies non-research settings will ultimately be asked to use. This may require the evidence-based paradigm to use complementary scientific and philosophical perspectives more purposefully in EBI research and practice.

To alleviate these two connected research-to-practice gaps, critical appraisals of how the translational continuum engineers its EBIs may be needed, both in terms of evidence-based interventions and evidence-based implementation strategies. Not to discredit the current ones, but to accumulate knowledge that may help refine them to improve their potential for wider non-research implementation and spark innovations that may complement them in collective efforts to improve public health and well-being. The limited reach of current EBIs in Norwegian CWSs indicates that these implementation gaps are present in those contexts, making refinement and innovation of EBIs from an implementation perspective relevant.

2.3. Evidence-based interventions from an implementation perspective

2.3.1 Complex interventions

In translational research within mental health, welfare, and education, evidence-based interventions predominantly take the form of evidence-based programs (EBPs). EBPs are so-

called complex interventions, consisting of multiple interacting elements and components (Craig et al., 2008). There are no sharp boundaries between simple and complex interventions. An intervention's complexity typically increases with the number of interacting elements and behaviors, and the difficulty associated with carrying out these behaviors (ibid.). For instance, a literacy intervention with one element (e.g., a tutor instructs a child in practicing the alphabet) is likely to be less complex than a literacy intervention with multiple elements and interactions (e.g., a tutor instructs five children in practicing the alphabet, phonemic awareness, comprehension, reading fluency, and writing, in a specific order, with difficulty tailored to individual abilities). Psychosocial and educational interventions often contain several specific behaviors or activities unified in a structured protocol. That is, the protocols typically prescribe core elements to be carried out in more or less accordance with a structured and sequenced manual. They may also describe factors and principles that are likely to affect how useful the protocol may be.

Practitioners are typically trained to deliver the protocol in specified sessions to clients, or groups of clients, through engaging them in various activities or elements. When a protocol of elements is evidence-based, it has consistently been attributed to produce positive outcomes, or alleviate negative ones, for a statistically significant portion of the population studied (i.e., causality inferred based on the probability principle). Some of these elements may target skills such as problem-solving or reading, some focus on behaviors such as avoidance or homework routines, and others may target motivation and emotions such as positive reinforcement and self-regulation. These protocols, which are often accompanied by specific material and implementation infrastructure (e.g., training procedures with certifications, consultation schedules, fidelity measurement systems), can make up branded entities known as programs. Adopting and delivering a program usually includes comprehensive implementation strategies requiring resources and capacity to obtain and maintain program fidelity.

EBPs are often meticulously engineered to prevent or alleviate problems and produce positive outcomes in research. The well-engineered infrastructure of many EBPs likely contributes to their effectiveness. It reduces variation and unwanted drift from what has been proven effective on average in research, and it provides practitioners with instructions and guides they are assured is safe and likely to be useful for a specified population. EBPs are thus also well-equipped for standardization of practice, or standards of quality, which can be beneficial for quality assurance and management. The combination of being proven effective in research and being fit for reducing practice variation through transparency and quality

assurance make EBPs successful within new public management approaches (Johansson et al., 2015). EBPs are often given precedence in evidence-based practice, and institutions try to afford their standardized use via professional guidelines, economic incentives, or funding specialized services and implementation support focused on specific EBPs (Berg, 2020). However, when implemented in natural practice settings, deviations to the standardized evidence-based forms of EBPs appear to be needed – they require persistent adaptations.

2.3.2. Adaptations to intervention protocols

Intervention adaptations can be defined as the changes made to an intervention based on deliberate considerations to increase fit with client or contextual factors at the system, organization, team, and individual practitioner level (von Tiele Schwarz et al., 2019). The popular consensus in intervention and implementation science states that adaptations to EBPs will happen in practice, and needs to happen, whether they are preferred or not (Moore et al., 2013; Stirman, et al., 2017;). Adaptations to an EBP run the risk of altering it to the extent that it is inconsistent with its empirically proven form. The persistent need for adaptations in practice may be why diminishing effects from EBPs are observed in contexts of high external validity, however, adaptations have also been found to increase the effectiveness of EBPs (Sundell et al., 2016).

Some control of adaptations can be maintained and accounted for in research, as long as they are clearly defined within a periphery. That is, within sufficient adherence to the core elements, functions, and structure that constitute the program. However, the adaptable periphery of EBPs is rarely known and articulated (i.e., which elements of the program can be modified, how, under what circumstances, and without compromising effectiveness). Recent developments in implementation science has led to more granular operationalizations of the relationship between fidelity and adaptations (e.g., MADI, Kirk et al., 2020; The FRAME, Stirman et al., 2019; The Value Equation, von Tiele Schwarz et al., 2019; Adaptome, Chambers et al., 2016). However, the number of potential 'versions' of a complex program created exponentially by adaptations makes the task of determining their effects problematic, even when using sophisticated designs such as factorial randomized controlled trials (Ornstein et al., 2020). A complementary research pathway that may be useful is applying other ontological and epistemological perspectives (e.g., realism, constructivism, dispositionalism) to study dynamic adaptations using other casual theories and scientific methods (e.g., qualitative, mixed methods, configurational comparative, realist studies, case studies). Subsequently, knowledge from such inquiry can be used to understand and inform appropriate

adaptations of EBPs and to reduce the initial misalignment between EBPs and non-research contexts in the first place.

2.3.3 EBPs in non-research settings

Despite the successes and endorsements of EBPs, widespread implementation of EBPs in their evidence-based form remains a continuous struggle for human service systems (Glasgow et al., 2012; Hall et al, 2016; Herlitz et al., 2020; Lau et al. 2015; Stirman et al., 2012). Explanations points to a combination of three issues: (1) insufficient or unsuccessful implementation strategies (Kirchner et al., 2020), (2) inadequate infrastructure, capacity, and implementation climate in services (Williams & Beidas, 2019; Scaccia et al., 2020), and (3) a mismatch between characteristics of EBPs and contextual constraints in services (Bach-Mortensen et al., 2018; Lau et al., 2016; Mitchel, 2011). In other words, there are issues with *how* we implement, *where* we implement, and *what* we implement. Implementation science has predominately dedicated its work to the first two issues, and progress is being made across the field (Albers et al., 2020; Nilsen & Birken, 2020). However, the third issue, characteristics of the innovations that are attempted implemented, has been somewhat overlooked. Even though its importance for implementation is articulated in nearly all prominent implementation theories (Aarons et al., 2012; Damschroeder et al., 2009; Fixsen & Blase, 2020; Harvey & Kitson, 2020), research into how this issue may be alleviated is lacking (Lewis et al., 2015; Lyon, Koerner et al. 2020).

2.3.4 Contextual fit and potential reach

Recent years have, however, seen a much-needed surge in attention to how characteristics of innovations influence implementation. Implementation scientists have emphasized a persistent limitation in contextual fit – a 'disconnect between the EBPs and real-world requirements and constraints' (Cabassa, 2016; Lyon, Dopp et al., 2020). Typical arguments point to a lack of contextualization in its design. That is, balancing standardization of intervention form and content with responsivity to contextual variation (Ginsburg et al., 2020; Haynes et al., 2015). Coinciding, many EBPs are critiqued for being excessively complex, inflexible, and posing unrealistic restrictions on practitioners' autonomy (Brady & Redmon, 2017; Cabassa, 2016; Hogue et al. 2017; Mitchel, 2011). Also, most EBPs typically address one or two problem domains, which means services such as CWSs would need a comprehensive list of EBPs implemented to cover their scope of needs. More critical voices question fundamental principles of the evidence-based paradigm and object to the perceived restraints EBPs pose on practitioners' autonomy and responsiveness to contextual dynamics

and unique needs (Anjum et al., 2020; Brady & Redmond, 2017; Mullen et al., 2008). Whether one considers such arguments justified or not, the persistent need to adapt EBPs in non-research contexts indicates room for improving contextual fit. Calls for such refinement, or re-design, to make EBPs easier to implement and sustain are now frequent in implementation science (Cabassa, 2016; Ginsburg et al., 2020; Lyon, Dopp et al., 2020; Shrier et al., 2020).

There are, however, more specialized non-research contexts in which many EBPs can be delivered in close proximity to their evidence-based form and produce valuable outcomes. Practitioners in such specialized services typically have adjusted caseloads, a select population referred to them, can focus on a more limited amount of practices and problem domains, and they receive ongoing professional implementation support from an intermediary organization or program developers. In short, such conditions more closely resemble the research conditions in which they were demonstrably effective. Thus, continuing to develop and spread such services and conditions are valuable contributions to human services for health and wellbeing. In Norwegian CWSs, for instance, general practitioners can refer children and families to practitioners specialized in an EBP. These services are typically external to a CWS agency, however, some CWSs are also able to finance their own teams focused on an EBP.

Such specialized services account for the 3.6% EBPs delivered in Norwegian CWSs, and they deliver high-quality evidence-based services (Drozd & Hansen, 2019; Tømmerås & Ogden, 2017). Their reach would likely grow with more political prioritization and investment, and adaptations and re-design efforts may improve their contextual fit in more complex practice settings (Lyon, Dopp et al., 2020). However, coinciding with efforts to refine and increase the use of such specialized EBPs, complementary ways of transferring evidence into practice appear needed.

Intervention scientists add to this discussion by noting that evidence-based practice in the current form of programs will not be able to address the scope of needs in human services no matter how well we implement them (Hofman & Hayes, 2019; Jones et al., 2019; Kazdin & Blasé, 2011; Mulder, et al., 2017; Shonkoff & Fisher, 2017; Weisz et al., 2019). Instead, they call for fundamentally rethinking interventions and innovating complementary forms of prevention and treatment with the potential to reach more people in need (ibid.). Although intervention and implementation science emphasize somewhat different aspects of the issue, namely contextual fit and potential reach, one avenue of scientific inquiry can help improve both; exploring ways to make interventions more implementable in natural practice settings.

2.3.5 The concept of Implementability

Implementability is a term commonly used in implementation science with inconsistency in how it is defined and operationalized. The concept has roots in the diffusion of innovation theory and Roger's (2003) articulation of innovation characteristics such as *relative advantage, compatibility,* and *complexity*. Building on Rogers and later advancements in implementation theories and outcomes (Aarons et al., 2012; Damschroeder et al., 2009; Proctor et al., 2011), implementability can be defined as the degree of ease with which an intervention or innovation can be implemented successfully in a given context. Implementability can encompass how appealing, appropriate, and fitting content of the intervention is to those who engage with it, and how this content is designed, shaped, formatted, or packaged in ways that would facilitate or inhibit successful and sustained implementation.

Proctor and colleagues (2011) articulated three constructs that influence the implementability of an intervention; (1) *feasibility*, defined as the extent to which an intervention can be successfully used or carried out in a given service or setting, (2) *acceptability*, defined as the perception among implementation stakeholders (e.g., practitioners and managers) that a given intervention is agreeable, palatable, or satisfactory, and (3) *appropriateness*, defined as the perceived fit, relevance, or compatibility of the intervention for a given practice setting, practitioner, or practice recipient. Prominent implementation theory denotes such constructs as important determinants of implementation (Aarons et al., 2012; Damschroeder et al., 2009; Fixsen & Blase, 2020; Harvey & Kitson, 2020), however, they are severely under-researched compared to other determinants of implementation (Lewis et al., 2015; Lyon, Koerner et al., 2020).

A fourth concept relevant to implementability, *intervention usability*, considers how interventions are designed to align with user needs and contextual constraints. Lyon, Koerner, and Chung (2020) refers to intervention usability as "the extent to which an intervention can be used by specified users to achieve specified goals with effectiveness, efficiency, and satisfaction". Usability as a construct is a combination of seven design goals centered around the needs of users (i.e., practitioners): (1) *learnability*; how easily and rapidly the intervention is understood and learned, (2) *efficiency*; how the design minimizes time, effort, and cost of using the intervention, (3) *memorability*; how easily the intervention is remembered and applied without added supports, (4) *error reduction*; how the design allows, and rapidly recover from, misapplication of the intervention, (5) *satisfaction/reputation*; how acceptable and valued users view the intervention, (6) *low cognitive load*; how simplicity is applied to

minimize the amount of cognitive processing required, (7) *exploit of natural constraints*; how the intervention is designed to address or be compatible with properties of a context that may limit the use of interventions.

Using these constructs as tools in the design or re-design of interventions and programs may improve contextual fit, reduce barriers to implementation, and reduce the need for adaptations. Successfully designing highly implementable interventions would likely ease the process of implementation and sustainment and subsequently increase the chances of scalable impact. Starting completely at scratch in designing interventions may be unnecessarily inefficient. There is already a vast knowledge base about complex interventions found effective in research. Perhaps only small refinements can give rise to large gains in implementability, or maybe more fundamental changes to underlying principles and delivery forms will be more beneficial. Maybe it depends on context. Regardless, all the above may be facilitated by a shift in focus from primarily conceptualizing interventions as complex programs to focusing more on the discrete practices, processes, and interactions that brings about beneficial change (i.e., mechanisms and processes of change). The concept of common elements provides theory and methodology to support such a transition.

2.4 Common elements of interventions and implementations

2.4.1 Facilitating element-level research evidence

Academic, psychosocial, and behavioral interventions within and across problem-domains are likely to share core intervention elements (Brown et al., 2017; Chorpita et al., 2009; Gardner et al., 2018; Knopf et al., 2015; Lawson et al., 2018; Lindsey et al., 2014; Sutherland et al., 2019; Van der Put, 2017) and other types of content (e.g., delivery methods and implementation strategies). Such observations have led scholars to argue that the elements found common across several effective interventions are more likely to contribute to positive outcomes than less common elements (Chorpita et al., 2005). That is, they are more likely the effective or "active" ingredients of interventions contributing to positive outcomes. This theory of common elements has taken different forms and led to a proliferation of conceptual approaches to intervention research and practice. These conceptualizations of common elements (from now referred to as element-approaches) typically include disentangling complex interventions into discrete but meaningful entities (i.e., elements) and then counting or evaluating elements frequently used across a selection of interventions. The same concept can be applied to blended implementation strategies, guiding implementation frameworks, or implementation competencies, although the concept appears not to have been applied within

implementation science thus far. The more typical applications of elements-approaches include reviewing available research to map practice elements used in EBPs, identify the practice elements (potentially) driving outcomes, use common elements directly for dissemination and implementation, and inform the design of new interventions.

These different but related element-approaches share a common goal of promoting fine-grained testing and understanding of intervention contents and mechanisms (Chorpita et al., 2011). They use various methods to distill, identify, and decide on the discrete elements that are common, active, or essential in interventions and programs. The methods are usually either based on expert opinions (e.g., Delphi methods), commonalities or frequencies (e.g., in systematic reviews or practice-based observation), statistical testing (e.g., meta-regressions), or combinations of these methods (Leijten, Weisz & Gardner, in press; Sutherland et al., 2018). The most used is the frequency approach, and the results often list elements common across a selection of interventions. To date, several studies have identified common elements across psychotherapy (Chorpita & Daleiden, 2009), family therapy (Hogue et al., 2017), parent training (Gardner et al., 2017), social-emotional learning programs (Lawson, et al., 2018), child maltreatment interventions (van der Put et al., 2018), psychosocial interventions for children affected by armed conflict (Brown et al., 2017) and socio-emotional learning in early education (McLeod et al., 2016). Less is known about common elements of academic interventions.

Such disentanglement of complex interventions into elements has been argued to be a viable step towards increasing the impact of interventions (Mulder et al., 2017; Chorpita et al., 2011). It is not necessarily the concept of common elements itself that potentially create benefits. Rather, shifting the unit of analysis and instruction from complex programs to discrete elements are also key to these benefits. For instance, increasing our understanding of effective intervention elements, and the mechanisms and processes they potentiate, could help focus EBPs on the elements most likely to contribute to positive outcomes, and discarding elements that are likely superfluous. Doing so may reduce the complexity of EBPs and increase their efficiency and effectiveness. Element-level inquiry may also establish evidence about which elements are likely most useful for whom and in what circumstances, providing evidence-based knowledge about tailoring to individual needs to improve precision. Such evidence can inform personalized approaches to care. Also, elements provide building blocks that can be reassembled and tailored into new interventions or other forms of implementation in practice. The concept of common elements is a methodological tool to aid this transition by

using existing research on complex interventions to identify the discrete contents that are likely to be the main contributors to positive outcomes.

To date, common elements-approaches have been used for intervention re-design (Hogue et al., 2017), development of modular and individually tailored interventions (Chorpita et al., 2017; Murray et al., 2018), empirical testing of singular elements (Leijten et al., 2016; Loop & Roskam, 2016), and to inform training and consultation in children's mental health services (Dorsey et al., 2016; Garland et al., 2008). Interventions that have utilized common elements in intervention design show promise across different mental health, welfare, and education settings. Studies have found increases in acceptance, use, and reach of effective practices in child welfare services and mental health services (Barth et al., 2020; Conroy et al., 2019), and efficient and positive effects across multiple problem domains (Bolton et al., 2014; Weiss et al., 2015; Weisz et al., 2012). Studying such interventions with appropriate designs are able to unpack parts of the 'black box' of effective interventions, providing element-level evidence about active ingredients and how they assert their mechanisms of change (Murray et al., 2020). Also, combining common elements methodology with individual participant data and other big data approaches can potentially illuminate the black boxes more rapidly and precisely, and such efforts are underway (Michie et al., 2017; Turner, et al., 2020).

2.4.2 Element-level evidence and implementability

By facilitating research evidence on the level of discrete elements (i.e., evidence-informed elements), common elements-approaches provide opportunities for design and re-design of interventions with characteristics that may improve their implementability in complex practice settings. For instance, discrete core elements are argued as appropriate for planned flexibility such as modular interventions or decision trees (Chorpita et al., 2005; Dorsey et al., 2016; Hogue et al., 2019;), but also spontaneous flexibility to afford practitioners being responsive to needs emerging in practice (Barth et al., 2012; Garland, 2008; Hogue et al., 2019; Mitchel, 2011). Moreover, discrete elements, compared to more complex interventions, are argued as more readily learned and retained by practitioners (Abry et al., 2015; Becker et al., 2015; Brown et al., 2017; Dorsey et al., 2016; Garland et al., 2008; Hogue et al., 2019; Shernoff et al., 2017). Related to that, knowing what elements are most likely to cause beneficial change in different circumstances affords training for, and practicing, more of what contributes and discarding what is likely unnecessary. Subsequently, the efficiency provides practitioners and services with the opportunity to cover a broader spectrum of domains with practices informed by research evidence (Barth et al., 2012; Becker

et al., 2015; Boustani et al., 2015; Brown et al., 2017; Chorpita et al., 2005; Dorsey et al., 2016; Garland et al., 2008; Hogue et al., 2019; Shernoff et al., 2017; Sutherland et al 2018; Trask et al., 2016). Also, elements are less likely to be branded or licensed, and knowledge about using them is more likely to belong to the public.

In sum, a large part of the benefits articulated about elements-approaches regards characteristics assumed to make interventions more implementable, and not necessarily more effective. Few studies have explored these characteristics in-depth. Increasing our understanding of such characteristics may inform adaptations of EBPs, or design of new interventions, to improve their implementability in complex and dynamic practice settings such as CWSs. Also, as element-level evidence about interventions accumulates, the need for knowledge on how to implement them will increase. Besides, implementation science calls for explorations of how intervention characteristics such as flexibility influence implementation mechanisms (Kirk et al., 2020), and qualitative and mixed methods approaches are called on to give rise to probable theory and hypotheses (Powell et al., 2017). Using a mix of explanatory and interpretive approaches, we can design for and explore characteristics theorized to make interventions implementable while simultaneously allowing alternative interpretations to emerge through analyses.

Lastly, and importantly, the assumed benefits of elements-approaches are not necessarily about the specific practice elements. The processes of delivering these practice elements, and the implementation making those processes happen, may be as much, or more, important aspects. Still, conceptualizations of element-approaches rarely include combinations or conjunctions of process and implementation aspects of interventions in their methodology. Advancements in the conceptualization and theory of element-approaches may be needed to prevent intervention research from reenacting its disconnect with non-research implementation and practice.

3. Aims and research questions

The thesis had three primary aims that were connected: (1) To advance the conceptualization of common elements theory and methodology, and (2) develop a common elements-based academic intervention for children and families in child welfare services (CWS) that is implementable in general child welfare practice. (3) Study child welfares services as implementation contexts. Objectives and research questions for each paper follow below.

Paper 1

Objectives

- Advance the conceptualization of common elements theory and develop common elements-methodology

- Conduct a systematic review on common elements of effective academic interventions for children in child welfare services

Research questions

1. What are common practice, process, and implementation elements of effective Out-of-School-Time Academic (OSTA) interventions for primary school children at risk?
2. What are the most common elements used in effective OSTA interventions, accounted for their inclusion in ineffective or harmful interventions?
3. What are the most frequent combinations of common practice, process, and implementation elements used in effective OSTA interventions, accounted for frequency of common combinations in ineffective interventions?

Paper 2

Objectives

- Design and protocol a translational process to develop, implement, and evaluate academic support for children in CWSs

- Combine best available evidence with expertise and experiences of stakeholders in decision making throughout the translational process

Research questions

1. How will a group of diverse stakeholders co-design an academic intervention in CWS based on common elements, knowledge from implementation science, and their contextual expertise?

2. How will a group of diverse stakeholders co-design strategies for implementing the intervention, and how will they tailor its implementation and evaluation to fit contextual needs and constraints?

Paper3

Objectives

- Psychometrically test the Norwegian translation of the Implementation Climate Scale
- Explore practitioners' perceptions of climate for implementation in Norwegian child welfare services

Research questions

1. What individual characteristics of staff is associated with perceptions of implementation climate in Norwegian CWSs?
2. How do the Norwegian translation of the implementation climate scale work psychometrically in Norwegian CWSs?
3. How do the implementation climate in Norwegian CWSs compare to that of CWSs in the USA?

Paper 4

Objectives

- Explore the implementability of Enhanced Academic Support (EAS) in CWSs
- Investigate intervention characteristics influencing the implementability of EAS

Research question

1. How implementable do practitioners perceive core elements of EAS to be in their natural practice settings?
2. What characteristics of EAS influence its implementability, and how?
3. How can the implementability of EAS be improved?

4. Advancing the conceptualization of common elements

To date, reviews and analyses of common elements of interventions have primarily focused on what is called *practice elements (*Boustani et al. 2014; Brown et al. 2017; Lawson et al. 2018; Garland et al. 2008; Mcleod et al. 2016; Sutherland et al. 2018). Practice elements, also referred to as *content elements* or *specific factors* and *techniques* in the psychotherapy literature (Mulder et al. 2017), are activities or actions used to evoke or influence a function or an outcome (e.g. parent training in positive reinforcement). However, practice elements are contingent upon processes, and a tendency to affect change may depend on how and under what circumstances something is practiced and implemented. These processes, delivery forms, and contextual factors can be referred to as *process elements* (such as home visitation or role-playing in the parent training). Practice elements appropriately combined with process elements in compatible contextual circumstances may comprise actionable properties that can cause or potentiate positive interventions (i.e., mechanisms of change).

Moreover, discrete implementation strategies, or *implementation elements,* facilitate or enable the delivery of practice- and process elements (e.g., *ongoing coaching* in providing the parent training or *tailoring* the parent training to fit contextual constraints). Implementation science indicates that implementation strategies need to be appropriately matched to implementation determinants (e.g., intervention characteristics and implementation climate) to assert their function in successful implementation (Waltz et al., 2019). That is, what is the appropriate implementation strategy or process likely depends on what practices and processes it is meant to implement, and where. Subsequently, an advancement of common elements approaches would be to identify how common practice elements are commonly combined with process- and implementation elements when they tend to work favorably.

The common elements-methodology used in this thesis aims to indicate the "what, how, and when" of effective interventions and implementation. The methodology identifies common combinations of practice-, process-, and implementation elements, rather than practice elements alone, as well as other characteristics of interventions likely to affect them (e.g., characteristics of practitioners, clients, and context). The methodology also accounts for the frequencies with which elements and combinations appear in ineffective or harmful interventions. This approach may provide additional nuance to interpreting common elements, albeit the literature available will be skewed by publication bias (Easterbrook et al., 1991). It also allows statistical testing (e.g., meta-regressions) of which elements, or combinations of

elements, that are most associated with specific outcomes and can, for instance, compare effect sizes with and without certain elements (Rith-Najarian, Boustani, & Chorpita, 2019). The logic and algorithms applied to coding combinations of elements for specific outcomes also make the methodology fit for statistical testing using coincidence analyses (CNA). CNA can test causal regularities based on combinations of elements (conjunction, disjunction, and negation) observed in complex interventions and contexts (Whitaker et al., 2020). However, both meta-regressions and CNA analyses are contingent upon sufficiently detailed reporting in primary studies.

The methodology recognizes the potentiality of discrete elements and mechanisms in interventions while also considering helpful interventions and processes as dynamic ecologies. For instance, a specific type of parent training is unlikely to cause effective outcomes alone; the particular kinds of activities clients and practitioners do together are merely potentially useful pieces of the puzzle. Positive help and change in interventions likely occur as a function of several individual-, contextual- and relational elements interacting over time (Anjum & Mumford, 2018; Duncan et al., 2010; Fonagy & Allison 2014; Shonkoff & Fisher 2013; Mulder et al. 2017). Different types of common elements, and combinations of these elements and processes, may cause, mediate, moderate, potentiate, or regulate helpful change in interventions. Figure 2 shows categories of elements and factors likely to be in play when helpful change occurs or becomes across different problem domains and contexts. Using the novel common elements methodology, we can identify actionable practice-, process-, and implementation elements that are likely to be helpful in interventions. The methodology can inform hypotheses about what combinations and interactions of elements, factors, and characteristics are likely to be useful as discrete mechanisms or more ecological compounds of mechanisms (e.g., multi-element interventions or programs). Experimentally testing and exploring these hypotheses using complementary methods of inquiry may increase understanding of intervention content, processes, and implementation, which can hopefully lead to more precise, efficient, effective, and implementable interventions.

Figure 2

Factors and Elements Causing, Potentiating, Regulating, or Becoming Change
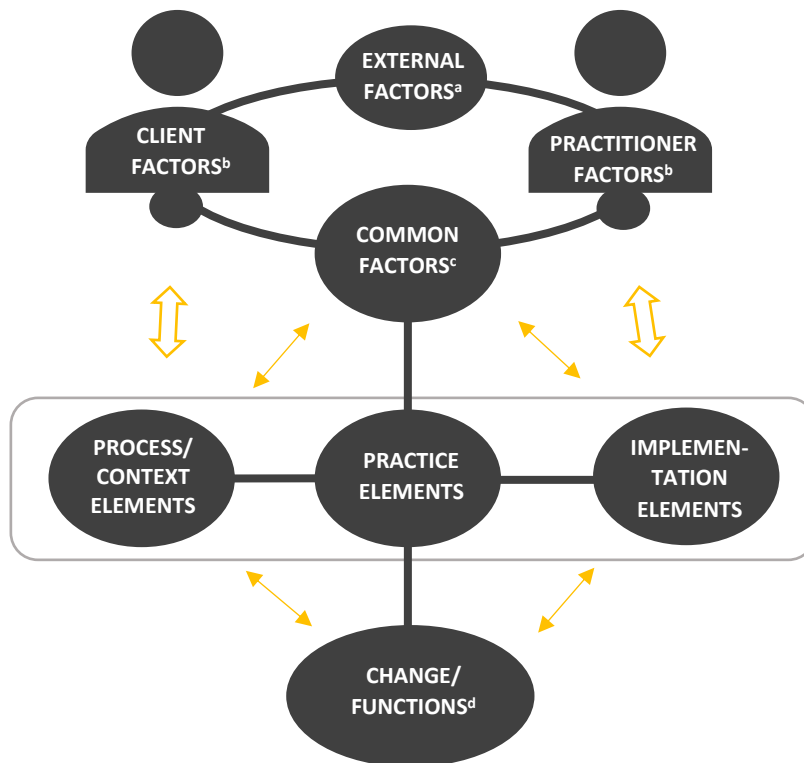
[a] *E.g., social norms, culture, and government policies*
[b] *E.g., personality, genomics, values, motivation, competence, vulnerabilities, and other dispositions*
[c] *E.g., therapeutic alliance, allegiance, and epistemic trust*
[d] *Functions refer to a proximal change that might serve as a mediator or catalyst to a process or medial target outcome (such as motivation, engagement, or altered behavior).*

4.1 Philosophical and theoretical considerations

To my understanding, the common elements-conceptualization explained above appears to be philosophically versatile. I use several philosophically tied terms in describing the concept deliberately (i.e., elements, distillation, tendency to cause, becoming, ecological, and emphasis on processes). In its short existence, the evidence-based paradigm has predominantly dismissed other paradigms' scientific legitimacy, and ontology and causal theory have been given limited consideration. However, with the apparent fallibility of the evidence-based paradigm in the complex social world, common elements may present an opportunity to purposefully combine the paradigm's strengths with the strengths of complementary philosophical views in a collective effort to improve public health and wellbeing. Our fundamental understanding of how and why standardized compounds of

practices can be effective is limited (Cuijpers et al., 2019; Kazdin, 2009). Subsequently, our understanding of why implementation of them is difficult in non-research settings may be lacking. Services to promote mental health and welfare may benefit from researchers asking fundamental philosophical questions about interventions and implementation as part of their scientific endeavor. Questions such as what helpful intervention *is* in natural practice settings (ontology), and what can we *know* about it (epistemology) to improve it and make it happen in non-research settings are relevant.

Moving the level of evidence from complex programs to discrete elements, mechanisms, and processes may provide a basis for scientific inquiry that affords a range of ontological and epistemological views to study it. Utilizing strengths of different explanatory and interpretative perspectives, and complementing each other's limitations, may bring about a more complete understanding of helpful intervention and implementation in non-research settings - a step the evidence-based paradigm to some extent skipped past in its transition to the social sciences. The concept of common elements may facilitate such inquiry, from a favorable starting point of a vast literature on evidence-based programs and implementation, transformed into knowledge that appears more reconcilable across philosophical views.

Ontological and epistemological views on common elements

Giving the theory of common elements merit as a form of scientific evidence violates principles of positivism (i.e., deterministic and objective truth). Even if a practice element had been used in almost all effective evidence-based programs (EBPs), that does not qualify the practice element as evidence-based because the measured effect cannot be attributed to that specific practice element. However, if a practice element is used across a large number of compounds of practice elements (i.e., programs) that have been proven probable to cause an outcome, and these compounds tend to vary in the practice elements they contain, common elements theory make a rational assumption saying that the practice element is more likely than less frequent practice elements to have contributed to causing the outcome. Rather than being varying degrees of 'evidence-based,' a pragmatic rationalization would leave common elements being 'evidence-informed,' seeing as they are derived from empirically tested interventions across contexts (i.e., informed by them). A positivist perspective would have to reject the quality 'evidence-informed' representing scientific knowledge. However, a positivist can agree evidence-informed elements are likely candidates. Subsequently, a positivist can empirically test them using the same scientific principles as for EBPs and ultimately conclude whether they are evidence-based. However, common elements theory

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does not necessarily rest on positivist epistemological assumptions or another purist epistemology or ontology. Common elements can be explained, studied, and provide implications for practice using a range of different ontological and epistemological views that may complement each other, which will be exemplified in the following.

Disentangling effective programs into its parts and assuming that the parts have effective qualities is reductionism. Ecological approaches could argue that EBPs are more than the sum of their parts, and that the effectiveness of an EBP may only be necessitated by qualities emerging in its delivery as a whole (e.g., $1 + 1 = 3$, Fetter & Freshwater, 2015). From a reductionist standpoint, continuous progression of element-level evidence would ultimately identify these effective ecological programs. In that case, EBPs would be 're-invented' with a more precise understanding of how and why they work, and how to improve them. Subsequently, acknowledging both reductionist and ecological perspectives in common elements-based research would likely speed up discovering how and when EBPs are more than the sum of their parts.

The common elements concept may also appear deterministic and in opposition to views in process philosophy. Many applications of common elements arguably are deterministic by approaching elements as forms with static 'essences' that will 'work' as long they are used properly under the right circumstances, and maybe some are. Process ontologies and metaphysics, however, emphasize the dynamic nature of being and would assert that no helpful intervention is an assembly of practices with static qualities delivered by someone with static competencies. Instead, process theory argues that such qualities are not existing but *becoming* or emerging as processes (Whitehead, 1929). Even though such a perspective largely rejects the validity of standardized EBPs with 'essences' that work, it does not necessarily contradict the notion that certain characteristics of processes tend to be more favorable than others, just that this tendency is also a process (i.e., in a constant state of change). Although intervention science traditionally emphasizes either practice elements or common factors as the primary sources of helpful intervention, their processual being may also be vital. That is, how these elements or entities occur or become beneficial in time and space - the processual spatial aspects of them. By also giving explicit attention to these aspects of interventions, the common elements concept can be fit for research and practice from perspectives of process theory, which appears to be increasing in utility across sciences and sectors (Hofmann & Hayes, 2019; Krakauer et al., 2020; Nicholsen & Dupree, 2018; Rocca & Anjum, 2020).

A constructivist would argue that helpful intervention is constructed through people interacting in the social world (Piaget, 1952). That is, helpful interventions are not known in advance. Instead, clients and therapists are collaborating partners that construct the helpful intervention together through their interactions. A prescriptive protocolled program that details the intervention process would obstruct this construction. Elements, however, are smaller entities that do not necessarily have to dominate or compromise the social construction of an intervention process. They do not necessarily have to be the focal points. Instead, they may be commonly useful tools to integrate when clients and practitioners find them appropriate to the construction, and disregarded when they do not.

A (critical) realist would emphasize that certain elements may have causal powers or tendencies that may or may not assert their causal mechanisms in complex interactions and processes. Realist inquiries can help investigate how, why, where, and for whom intervention elements and interactions potentiate helpful mechanisms. Such perspectives have gained traction in the intervention, implementation, and organizational sciences (Eld et al., 2020; Minary et al., 2019; Mingers & Standin, 2017). Similarly, a dispositionalist would argue that helpful intervention results from the complex interaction of multiple intrinsic properties or causal tendencies (i.e., dispositions) sensitive to context. To a dispositionalist, useful intervention elements would be actionable dispositions that have causal tendencies that may manifest, emerge, or be interfered with when they interact with other dispositions. That is, specific activities and processes (i.e., dispositions) can have intrinsic causal powers or tendencies and manifestations partners (Anjum & Mumford, 2018). From such a perspective, common elements can be likely candidates as dispositions with intrinsic causal tendencies. Further, the characteristics commonly combined with common elements when they tend to work can be potential manifestation partners (i.e., specific client variations or contextual circumstances).

Dispositionalism and realism suggest another ontological modality (dispositions/tendencies/causal powers) that may be useful in explaining complexity, connectedness, and why, for instance, competent delivery of an evidence-based practice in the right circumstances *tend* to cause an outcome, but not necessarily. Pluralist research into dispositional causality may increase our understanding of how causal mechanisms manifest through relationships of elements and factors in individuals, contexts, and their connections (Rocca & Anjum, 2020). The common elements-methodology developed for the KOBA-study can provide evidence-informed hypotheses about such relationships to test experimentally. However, more inductive methodologies are also needed to prevent this research from

operating in a vacuum without openness to novelties (i.e., only re-inventing itself). For instance, mixed-methods randomized trials can combine explanatory and interpretative methods to (1) study whether these relationships are on average likely to produce beneficial outcomes in a population, (2) study the mechanisms that caused beneficial outcomes in unique cases (and compare with mechanisms inferred using population-level averages), and (3) identify common dispositions/elements that potentiate or negate these mechanisms. Such inquiry would also increase our understanding of when mechanisms tend not to be caused, even though they have a high probability of it based on population averages (e.g., causal understanding of non-responders and adverse effects of interventions). Thus, even though scholars advocating such ontologies are typically critical of the evidence-based paradigm (Anjum et al., 2020), unifying these paradigms in research, via element-approaches, can provide more complete understandings of interventions than one paradigm can alone.

In sum, the conceptualization of interventions and implementations on the level of elements, facilitated by advanced common elements approaches, provides opportunities to pragmatically unify evidence-based interventions and implementations with a range of popular ontologies and epistemologies. Using several causal theories in research can increase our understanding of causal mechanisms in interventions in complex contexts, the 'what,' 'how,' and 'when' interventions work, complementing the primacy to the 'whether' and 'how often' dominating the evidence-based paradigm. That is not a rejection of the evidence-based paradigm's usefulness to inform decisions in the non-research world. Rather, it suggests recognizing both the strengths and the limitations of the paradigm and realizing the potential of complementary perspectives on how intervention to improve people's health and well-being is and works. Such pragmatic pluralism resembles what operationalizations of evidence-based practice often look like in non-research settings already. However, such pluralism is rarely purposefully recognized in intervention science, which may account for some of the disconnect and misalignment observed between research and practice.

5. Co-designing the intervention and implementation strategies

5.1.1 Engaging stakeholders in Knowledge Translation and co-design

Integrated knowledge translation (IKT) is an approach to research that engages researchers and stakeholders in collaborative partnerships to exchange, co-create, and utilize diverse forms of knowledge and perspectives to address research gaps and improvement needs (Jull et al., 2017). In the KOBA-study, we partnered with four Norwegian child welfare services (CWSs) to engage in IKT to respond to the needs for academic support. Our goal was

to co-design, implement, evaluate, and sustain or de-implement academic support for children in CWSs.

      We combined IKT principles with the EPIS implementation framework introduced in chapter 2.2, our common elements-methodology, collaborative design methodologies (Kirchner et al., 2014), and techniques from change management practice (Friedman, 2005) to create a coherent translational process referred to as IKT-K. We designed the process to guide the collaboration from before the conception of the academic intervention and to the end at sustainment or de-implementation. Thus, IKT-K was designed as a microcosm of the translational continuum with the features suggested in chapter 2.2, where knowledge from implementation science and non-research contextual expertise inform decisions throughout the translational continuum. As depicted in figure 3, IKT-K was structured in five phases: synthesis, co-design, implementation, evaluation, and sustainment or de-implementation.

Figure 3

Integrated Knowledge Translation - KOBA (IKT-K)
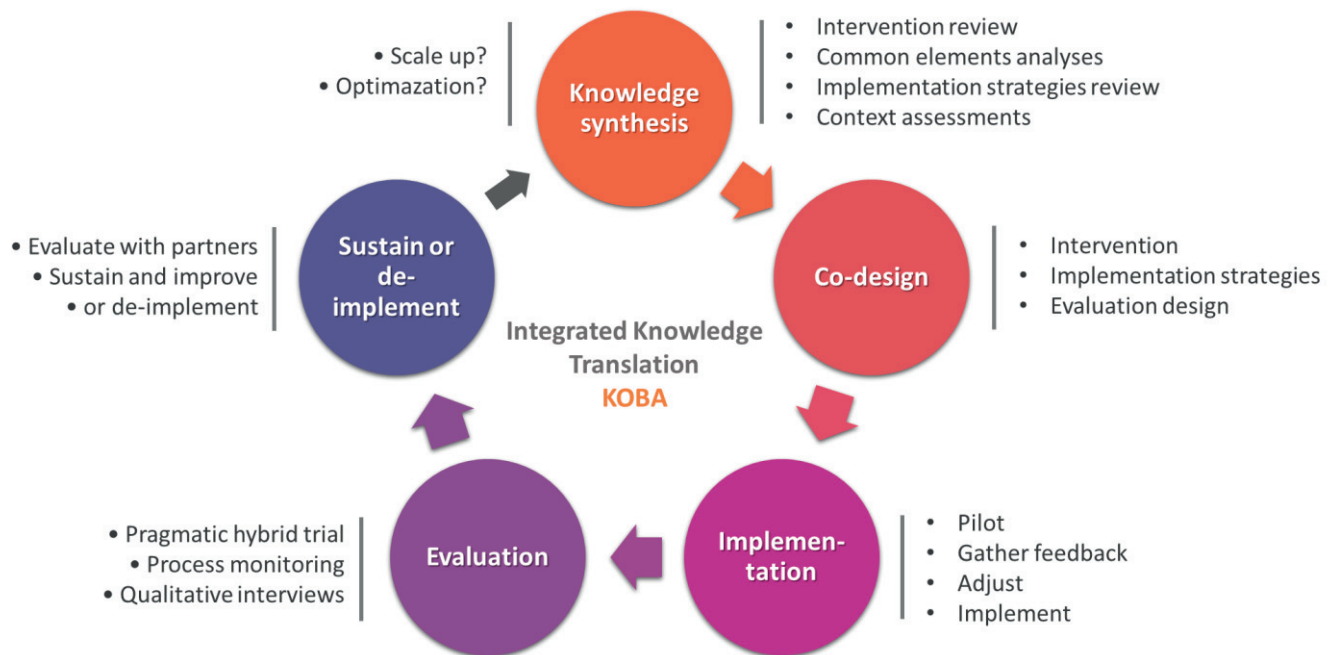
IKT-K had some guiding principles throughout all phases of translation. These principles were to be maintained in decision making across all levels of the project, such as in partnership with the services, in co-design with stakeholders, in the implementation team, and the research team.

1. We use **evidence-based practice** as a guiding principle, where three equal forms of knowledge represent evidence: (1) knowledge and preferences from children and parents, (2) expertise from practitioners and managers, and (3) knowledge from research, framed within contextual considerations. Decisions should union these sources of knowledge.

2. **Naturalistic/pragmatic approach**. The research adapts to contextual circumstances, and not the other way around. We do not manipulate context conditions unless it is an experimental manipulation, a specified project goal, or necessary to reach goals. Decisions where prioritizing internal or external validity is in question should go in favor of external validity. The purpose of this is threefold: (1) make the study feasible to conduct despite challenging study settings, (2) align with existing contextual conditions to make changes implementable and sustainable over time, and (3) evaluate under as close to natural conditions as possible.

3. **Change-minimalism**. Similarly, we strive to induce as little change as possible, other than the changes defined as a necessary part of the project. The concept of "minimum change needed" guides our decision making. For instance, we strive to hold meetings within existing structures, build on existing strengths and expertise, and integrate implementation strategies within existing routines.

4. We strive for **consensus in decision making**. When consensus cannot be reached, we review our guiding principles and re-discuss iteratively. We only use majority decision making as a last resort.

5.1.2 Facilitation

Facilitation was an overarching strategy in IKT-K used during the planning, co-design, and other relevant decision-making processes. Facilitation can be understood as guiding and supporting processes of interactive problem solving that occurs in the context of a recognized need for improvement and a supportive partnership (Stetler et al., 2006). Such partnership should be based on mutual respect with all participating stakeholders. Successful IKT facilitation is said to require establishing a supportive environment within which knowledge can be exchanged and utilized to develop improvements and overcome obstacles (Metz et al., 2014).

In the KOBA-study, facilitation was carried out by including and guiding stakeholders in significant decision-making throughout the project. The partnership formed co-design teams for each participating CWS consisting of local practitioners and supervisors,

representatives from key CWS collaborators (i.e., schools), parents with local experience as service recipients, youth from user organizations with experience as service recipients, and the project group from The Regional Centre for Child and Adolescent Mental Health (RBUP, researcher, educator, coordinator, and the doctoral candidate). These teams worked together in workshops in the co-design phase, and will meet to co-design adjustments, sustainment strategies, or de-implementation strategies after the evaluation phase. The partnership between RBUP and implementation teams at the CWSs dealt with more day-to-day decision making. A project web-portal was created for all participants for information, organizing meetings, keeping track of tasks, sharing documents and meeting minutes, and work together on documents. A written updated version of this portal (the Project Dashboard) was distributed to implementation teams and co-design teams before all meetings and workshops.

5.1.3 Facilitated Co-design

In the context of intervention and implementation design, co-design can be understood as an active engagement of stakeholders in creative processes to develop, tailor, or adapt practices, strategies, systems, models, or routines. Co-design is similar to co-creation or co-production. However, co-design specifically concerns collaboratively working out the form of something specific, while co-creation and co-production are terms more broadly applied (Boaz et al., 2018). Facilitators play a crucial role in co-design, and key elements and guiding principles in facilitated co-design is listed in table 3.

Table 3

Key Elements and Guiding Principles in Facilitated Co-Design

Multiple perspectives represented (Stakeholders with different worldviews and interests relevant to the objectives)
Active and equal participation (Ensure participants are actively engaged and given the change to contribute equally)
Common language (exercise to create an equal understanding of prevalent terms and concepts and avoid unnecessary jargon and offensive terms)
Facilitation (guide group towards decision making informed by guiding principles)
Provide process structure without compromising creativity
Mind group biases (prevent or manage their impact on decision making)

Throughout four to six workshops with each local co-design team, the teams developed the intervention Enhanced Academic Support, lean and flexible academic practices tailored to CWSs (details below). Next, the co-design teams tailored plans for an EAS training program, implementation strategies, and an evaluation design.

5.2 Enhanced Academic Support: Lean and flexible academic practices

Enhanced Academic Support (EAS) was designed to be a flexible supplement to the support families in CWS already receive. Thus, EAS is delivered in addition to the family's child welfare support. In the basic structure, the four core elements of EAS (see table 4) are delivered to families in six sessions over a period of 6 months with support and follow-up between sessions. The sessions are delivered at home visits or in other settings at the family's preference. The practitioners are free to integrate EAS core elements into other interventions or support they provide, or they can deliver EAS in separate sessions with the family using or altering the basic structure.

The first session is assigned to build alliance and engagement with the family, assess the family's living situation, and formulate goals together. One session at the end is set to evaluate, repeat core elements as needed, and create a sustainment plan. The four sessions in between are assigned to the four core elements. Each core element includes two to four components: specific actions and activities (practice elements, e.g., paired reading) for the practitioners and the families to engage in. Practitioners also receive instructions about carrying out activities (process- and structural elements, e.g., parent and child together, at least one hour a week for four months). Each core element has adaptation alternatives that can be useful to tailor to individual and contextual circumstances (e.g., use the less complex version of paired reading) and suggestions for tasks to work on in between sessions. Each core element also has a few key determinants of success and minimum fidelity requirements to prioritize essential components in situations where completing all components is not feasible. Pre-defined adaptation alternatives are designed to either (1) provide options for tailoring, or (2) help establish prerequisite conditions for the core element to assert its function. The abovementioned features are based on results from paper 1 and input from stakeholders in co-design

Table 4.

Core Elements (1-4), Components (a-m), and Functions of Enhanced Academic Support

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1. Parent training in positive parental involvement in school

Core function: Promote positive parental involvement in the child's academic life

   a. Psychoeducation in the importance of parental involvement in school

   b. Psychoeducation in positive academic expectations on child's behalf

   c. Training in parental involvement practices and communicating positively about school

---

Key determinants of success: repeat over time, use concrete advice and assignments and follow up, tailor parental involvement practices and assignments to parent's preferences and needs

---

Example adaptation alternative: If needed, use the appropriate translation of the information pamphlet about the Norwegian school system and what schools expect of parents as part of the psychoeducation before starting the parent training.

---

2.   Structured tutoring in reading and math

Core function: Prevent or close children's knowledge gaps in math and reading

   d. Direct instruction adaptive math tutoring game on tablets (or analog math tutoring games)

   e. Paired reading

   f. Plan appropriate tutoring schedule

   g. Provide tutoring reminders and progress feedback

Key determinants of success: Repeat tutoring over time (at least four months), use reminders and feedback throughout tutoring, use individually appropriate progression

---

Example adaptation alternative: If parents are unable to read with their children, investigate alternatives such as engaging a sibling/neighbor/relative, red cross homework support, or other volunteer services and instruct them in the paired reading technique and establish a routine. If the paired reading technique is too complicated, use the simple version.

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3. Guidance in home learning structure, routines, and support

Core function: Establish sustainable home learning routines and homework completion

   h. Establish family-tailored structure and routines for home learning activities and homework

---

i. Establish appropriate homework environment tailored to the 'child's needs and preferences

j. Psychoeducation to parents in the importance of homework expectations

k. Parent training in appropriate homework support

Key determinants of success: Talk to the child about their preferences and needs, tailor structure and routines to fit the family's everyday life, follow up on routines throughout the intervention period.

Example adaptation alternative: If the family already has a functional weekly planner or system, use this instead of the EAS-plan and work with the family to identify strengths and areas for improvement.

4. **Guidance in positive reinforcement, praise, and feedback**

   Core function: Promote parent's appropriate use of positive reinforcement and feedback

l. Parent training in the appropriate use of positive reinforcements

m. Parent training in the appropriate use of corrections and feedback

Key determinants of success: Repeat training multiple times throughout intervention, tailor reinforcements to the child's needs and preferences, use of rewards or homework contracts needs active involvement from the child in decision making.

Example adaptation alternative: Consider involving other key persons in the child's life, such as a sibling, a neighbor, a relative, a family friend etc.

5.2.2 Operationalized flexibility

Seeing as the majority of elementary school children in CWS appear to need academic support, EAS was designed to be used with all families receiving support from the CWS, regardless of referral reason, problem domains, or other circumstances. To enable EAS to be used broadly, several opportunities for adaptations were built into its delivery. A detailed and sequenced basic structure is available for practitioners to use. However, flexibility within fidelity to core elements and components is encouraged. In reductionist terms, this means practitioners can adapt the basic structure in the following ways:

- reorder the sequence of elements
- increase or reduce the dose of elements and components
- combine elements and components in sessions
- integrate elements in other interventions or other forms of support
- alter the number of sessions needed and duration of the intervention
- Use pre-defined adaptations alternatives and tailor adaptable features

In more ecological and processual terms, this flexibility means practitioners are encouraged to adapt and tailor core elements and processes to individual and contextual needs and preferences as they see fit to create a coherent process. Practitioners are also encouraged to use new eclectic adaptations when they deem necessary and are asked to report them in a fidelity measure. Even though EAS facilitate freedom and autonomy, practitioners are encouraged and trained to adhere to the practice and process elements considered essential components of core elements. That is, the interaction of activities deemed most likely to potentiate functions leading to academic learning, based on a combination of evidence-informed common elements and expertise of practitioners and clients. In the KOBA-study, fidelity to elements and components, and the flexibility mentioned above, is monitored using double informant fidelity measures.

5.2.3 Educational and organizational material

An EAS handbook was developed and given to practitioners and managers. The handbook is 32 pages and details the basic structure of EAS, core elements and components, key determinants of success, adaptation alternatives, suggestions for between-session assignments, and examples of "tips and advice." The handbook also includes brief material that supplements core elements and components, such as guidance for carrying out activities (e.g., brief paired reading instructions), summaries of relevant content and practices that can be used in sessions and given to parents, family planners and an EAS goals tracker, as well as information and guidance related to the research project.

5.2.4   EAS Training and implementation

The co-design teams developed a blended implementation strategy consisting of five core implementation strategies; (1) 14 hours dynamic training, (2) four-hour booster session per semester, (3) ongoing consultation, (4) an audit and feedback system, (5) and a pragmatic handbook with supporting material (details inpaper 2). The training consisted of approximately 50% didactic education, 20% role-play, and 30% discussions, problem-solving, and dialogue. Trained practitioners practiced delivery of EAS with families they were already working with during 4 to 10 months of piloting before being assigned new families in the RCT evaluating EAS's effect. The practitioners initially received ongoing consultation from local EAS champions at each site and from the external implementation team upon request. This implementation strategy was changed after one year due to inconsistent consultation, and consultation calls with practitioners every other month during EAS delivery was initiated. Some implementation strategies were built into the co-design process and the intervention,

such as stakeholder engagement and facilitation, and making the intervention dynamic and flexible. More detailed operationalization of discrete implementation strategies following reporting standards are available in paper 2.

6. Designs and Methods

6.1 Systematic review and common elements analyses (paper 1)

Design

Paper 1 is a hybrid of a methodology paper and a systematic literature review of common elements of out-of-school-time academic interventions (OSTA interventions). The first part of the paper is a traditional systematic review following standards of the Cochrane Handbook for Systematic Reviews of Interventions (Higgins & Green, 2011). After search, selection, and quality appraisal, we used the new common elements methodology introduced in chapter 4 to code and analyze common elements instead of using traditional meta-analyses. The methodology is inspired by the Distillation and Matching procedure developed by Chorpita and Daileiden (2009) and combines data mining techniques and frequency-based interaction-detection algorithms to identify common elements and common patterns of elements used across a selection of interventions. The paper describes this methodology and publishes a complete manual for using it. Further, we used the methodology to identify common practice-, process-, and implementation elements of effective OSTA interventions, and commonly effective combinations of them, accounted for their inclusion in ineffective interventions.

Populations, Interventions, Comparisons, and Outcomes

Eligible **populations** were children attending primary school identified as being at risk of academic failure or dropout, either through observed academic underachievement or being considered at risk based on social or family background. Eligible **interventions** included OSTA interventions that aimed to improve academic achievement. We defined an intervention as out-of-school-time when its core elements (i.e., the elements considered indispensable to the intervention) were delivered in an out-of-school environment and outside school hours. Eligible **comparison** conditions included no intervention, other academic interventions, and school-based interventions. Eligible primary **outcomes** were academic achievement measured either by grade point averages or assessments of academic skills. Eligible secondary outcomes were parental engagement/involvement in school and any adverse events or harms.

Search, selection, and quality appraisal

We systematically searched a comprehensive selection of relevant databases and grey literature using search strategies developed with professional librarians. We hand-searched online libraries and relevant journals not indexed in the databases. Titles, abstracts, and full texts were reviewed for eligibility by two independent reviewers. Conflicts were resolved by discussion or a third reviewer. Two reviewers independently assessed the risk of bias of studies meeting eligibility criteria. Only studies meeting set quality standards were included for common elements analyses. The original search was conducted in April 2016, and we re-ran the search in November 2019 to look for new relevant studies to account for retrospectively.

Effectiveness classification

We classified interventions in the review as either positively effective, ineffective, or negatively effective per outcome. For randomized controlled trials, we classified interventions as effective if at least one effect measure on a primary or secondary outcome was statistically significant ($p < .05$). For non-randomized controlled trials and interrupted time series, we classified interventions as effective if there was a statistically significant post-intervention difference between the intervention group and the comparison group on a primary or secondary outcome, and there was a statistically significant pre to post change on the same outcome. Interventions that could not be classified as effective were classified as ineffective. An intervention classified as effective for one outcome (e.g., reading) could also be classified as ineffective for another outcome (e.g., math). No eligible interventions reported negative effects.

Coding of elements and characteristics

We gathered available information about included studies (scientific papers, reports, dissertations, intervention manuals) and coded all available information about their interventions and studies in matrices. This included practice elements (*what* you do in interventions), process- and contextual elements (*how* you do it and under what *circumstances*), implementation elements (what *made* you do it), and other relevant characteristics such as outcomes measured, intervention structure (e.g., dose and duration), and theoretical orientations (e.g., behavioral or cognitive).

Coding options were prepared based on consensus mapping with coders, but not forced, allowing both inductive and deductive coding. Four pairs of coders independently coded each intervention in separate matrices. Conflicts were resolved by discussion or a third

coder, and codings were gathered in a master matrix for analyses. There were 4.972 coding inputs to the matrix done by five coders, and each input could be traced to its origin study and coder using unique identification numbers (IDs). I was part of all review-pairs, and therefore reviewed, assessed, and coded all studies.

Common elements analyses

The 25% most frequent practice elements in effective interventions, accounted for in ineffective, were defined as common elements based on convenience. Specific algorithms were then used to count frequencies and patterns across the matrix to identify the most common practice elements of effective interventions for specific outcomes, and what process elements, implementation elements, study characteristics, and other practice elements a specific practice element was most commonly combined with when it was effective. The same procedure was done for when the common practice element was ineffective, and then the *commonness* values (frequency values, FVs) of the practice element and combinations were adjusted accordingly. The algorithms were repeated for each common practice element and for each outcome for which the practice element was effective. Results were summarized in tables.

6.2 Protocol for hybrid randomized controlled trial (paper 2)

Paper 2 is a protocol describing the KOBA-study as it was initially planned. Study protocols describe study rationale, aims, designs, population, research questions, procedures, and measures before commencing them. Protocols are important to register and publish for several reasons. Firstly, publishing a protocol provides transparency and accountability in research and can help prevent and detect research misconduct. For instance, the scientific community can evaluate whether future results are consistent with the protocol's research questions. Secondly, protocols prevent wasteful research. It informs the scientific community about ongoing studies and contemporary ideas and methodology, which can help avoid duplication, coordinate research efforts, and disseminate novel improvements of methods early (Ohtake & Childs, 2014). Thirdly, completing a rigorous peer review process before commencing a study can provide valuable feedback from relevant experts in the field on how to improve and refine the study. Paper 2 briefly describes all phases of the integrated knowledge translation process developed for the study and details the hybrid pragmatic randomized controlled trial. This section will briefly describe the study setting, hybrid designs, pragmatic trials, and what parts of the trial this thesis addresses.

Study setting

When the KOBA-study started in January 2016, four municipal child welfare services (CWSs) located in southeastern Norway participated as partners. One of the services had to withdraw before implementation due to substantial turnover and capacity constraints. The three remaining CWSs varied in size from medium to large by Norwegian standards measured by catchment area and number of practitioners. One CWS was located in a dense urban area with a population of predominantly low- to medium socioeconomic status (SES) and an above-average percentage of ethnic minorities, and the second and third in a suburban area with a range of low to high SES population.

Hybrid type 2 design

Hybrid designs were proposed as a means to translate research more rapidly into practice. Instead of first evaluating the effectiveness of an intervention and then do additional studies to evaluate implementation aspects, hybrid designs blend evaluation of effectiveness and implementation in the same study (Curran et al., 2012). There are currently three categories of hybrid designs, type 1, 2, and 3. Being a type 2 design refers to an equal focus on the intervention and the implementation of it. The KOBA study is a hybrid type 2 because it has equally focused aims of evaluating the effectiveness of Enhanced Academic Support and aspects of the integrated knowledge translation process as a blended implementation strategy.

Pragmatic randomized controlled trial

In the evidence-based paradigm, randomized controlled trials (RCT) are the gold standard for testing causal effects. These experiments are designed to establish whether or not an experimental condition (i.e., the independent variable, the intervention) is responsible for changes in outcomes (i.e., dependent variable) – a cause and effect relationship. These experiments, usually referred to as efficacy trials, try to increase internal validity as much as possible by removing potential sources of bias and controlling the conditions being compared. Optimally, only the experimental variable (i.e., the intervention) should be the difference between the experimental condition and the comparison condition to establish valid efficacy. Higher internal validity (less uncontrolled variation and bias) equals more faith in the results being accurate. What increases the internal validity of an RCT can be at the expense of external validity (i.e., the ability to generalize the results to the extended population and other conditions).

There is concern that efficacy trials are poor predictors of interventions' effectiveness in non-research settings (Loudon et al., 2015). Pragmatic trials, also referred to as effectiveness trials, tries to balance internal and external validity to make the results more applicable (or generalizable) to non-research settings. In short, pragmatic trials aim to establish whether an intervention works in natural practice settings, sometimes referred to as real-world, or real-life contexts. Thus, the conditions compared are less manipulated. Biases and confounding variables are allowed to exist dynamically, instead of controlling them, because that is how they typically exist in 'reality'. Such conditions are likely suboptimal to demonstrate effects. However, a benefit of pragmatic research is that any observed effects are more likely to be sustainable and scalable because the conditions more closely resemble natural practice. The research may have induced less unnatural changes to the practice settings, such as hiring extra resources, temporarily reducing the practitioner's workload to deliver the experimental intervention, or cherry-picking clients that fit the intervention. The 'pragmatism' in pragmatic trials is dimensional. The more external validity, the more pragmatic the trial is.

PRECIS is a tool that can be used to guide the design of pragmatic trials. This tool emphasizes nine domains of trials that can be made more or less pragmatic to balance internal validity with external: eligibility criteria, recruitment, setting, organization, flexibility in intervention delivery, flexibility in participant adherence, follow-up, primary outcome, and primary analysis. Each domain can be scored on a five-point Likert scale to indicate how pragmatic a trial is. The KOBA-study scores high on all domains and can thus be considered highly pragmatic. That is, the study is conducted in close to real-world conditions.

Adjustments to protocol

When doing highly pragmatic trials, reality is likely to interfere with plans (Glasgow, 2013). Several adjustments have had to be made from the original protocol throughout the KOBA-study. Adaptations and adjustments have been registered using a framework for reporting study adaptations at each site (Stirman et al., 2017). This can provide transparency in reporting to funders and participating services, publications to the scientific community, and ourselves as researchers. In combining this registry with registrations of resource and capacity use, we can collate and disseminate data that can be useful to inform future pragmatic trials in CWSs. The adjustments most influential for this thesis has been postponements due to recruitment challenges and the covid-19 pandemic. At this date (December 2020), the trial is in its evaluation phase, 18 months overdue, which is why the

thesis does not include papers testing the main implementation hypotheses as per protocol. Instead, the thesis includes papers on the knowledge synthesis, co-creation, and implementation phases of the protocol.

6.3 Cross-sectional study (paper 3)

Design

Paper 3 is a cross-sectional study of implementation climate in CWSs, with data collections before and after implementation of Enhanced Academic Support (EAS). The study investigated two practitioner factors related to well-being at work (job satisfaction and job stress), two demographic factors (length of tenure and post-graduate education), and whether practitioners were active participants in implementing EAS as predictors of implementation climate. The study included translating the Implementation Climate Scale (ICS, Ehrhart et al., 2014) from English to Norwegian in collaboration with the scale developers and developing a questionnaire measuring staff job stress and job satisfaction. All three scales underwent psychometric testing before regression analyses were used to test our hypotheses about the association between practitioners' characteristics and implementation climate. The study also investigated cross-national generalizability to inform further use of the Norwegian translation of ICS.

Sample and data collection

Characteristics of participants are presented in table 5. The T1 data collection was conducted during the spring of 2017, before the implementation of EAS at four CWSs. The T2 data collection was conducted approximately 20-24 months after T1, well into the implementation. Due to one CWS withdrawing from the study right before implementation, and turnover and hiring new practitioners during the period from T1 to T2, only about a third ($n = 51$) of the respondents participated in both data collections. We, therefore, decided to treat T1 and T2 as two different samples. Data collection was done electronically and took about 15-20 minutes to complete. A lottery for a gift card in each of the three CWSs was used as an incentive. The response rate was 58% at T1 and 77% at T2.

Table 5

Demographic and Background Information of Participants

Characteristic	T1	T2
N	129	157
Mean age (*SD)*	40.98 (10.29)	42.71 (11.35)
Gender (% female)	90.7	89.9
Tenure in child welfare (*%)*		
0-1 yrs	9.3	7.6
1-3 yrs	18.6	14.0
3-7 yrs	34.9	24.2
7-10 yrs	10.1	19.1
>10 yrs	27.1	35.0
% from each CWS site		
Site 1	41.3	51.9
Site 2	32.6	33.5
Site 3	24.0	14.6
Site 4	2.1	Dropped out
% child welfare education	46	45
% social work education	31	41

Measures

The Implementation Climate Scale (ICS, Ehrhart et al., 2014) was used to assess the organizational climate for implementing evidence-based practice. The scale consists of 18 items rated on a five-point scale (ranging from 'not at all' to 'a great extent'). Higher scores indicate an organizational climate more conducive to implementing evidence-based practices. The scale has six subscales consisting of a) focus on EBP, b) educational support for EBP, c) recognition for EBP, d) rewards for EBP, e) selection (employment) for EBP, and f) selection (employment) for openness. The ICS has been validated with practitioners in 32 mental health organizations and 12 child welfare services in the USA (Ehrhart et al., 2014; Ehrhart, Torres, Wright, Martinez, Aarons, 2016). The first and last author completed a translation process in collaboration with scale developers. Two discrepancies in the use of terms were identified and resolved through conferring with expert colleagues. Details of the translation process are available as supplementary material in the paper. The overall reliability alpha was $\alpha = .87$ at T1 and $\alpha = .88$ at T2. The subscales' reliability alphas ranged from .52 to .88 at T1 and .61 to .93 at T2. The subscale measuring rewards for EBPs had a low alpha of .52 at T1 and .61 at T2. We ran confirmatory analyses of the ICS with each of the subscales as indicators of the general IC-construct at each time point to test its factorial structure in our samples. The results supported its use.

Job stress and job satisfaction index. We developed a pragmatic questionnaire measuring individual- and organizational implementation determinants during the first phase of the KOBA-study. The questionnaire was used as an implementation capacity and readiness assessment to inform the co-design of the intervention and implementation strategies, and to study conditions for implementation in Norwegian CWSs. The full questionnaire consisted of 32 items rated on a five-point scale (ranging from 'strongly disagree', to 'strongly agree') and targeted characteristics of both the organization and of the respondent him- or herself, such as quality assurance, openness to change, adaptability, job functionality, job stress, job satisfaction, and training needs. Two subscales were computed using items from this questionnaire. Items were chosen based on content validity judged by the first and last author.

For job stress, principal components analysis and exploratory factor analysis with item reductions using the T1 sample supported a scale of the following five items: 'In this agency, we often show signs of stress and hardship,' 'In this agency, we have a workload that prevents our efficiency,' In this agency, we experience a lot of frustration among staff,' 'In this agency, we are able to spend enough time with our clients,' and 'My large workload prevents me from doing my job effectively.' We ran confirmatory factor analyses using the T2 sample, and the results supported its use. The reliability alphas of the job stress scale were acceptable ($\alpha = .80$ at T1 and $\alpha = .69$ at T2).

For job satisfaction, the same analyses with the same sample supported a scale of the following five items:' I enjoy being at work,' 'I feel like my work is appreciated,' 'We in this agency experience that our opinions are listened to and considered by the leadership,' 'I experience that my job tasks are aligned with the goals of our agency,' 'We experience that we can raise questions and concerns to the leadership.' We ran confirmatory factor analyses using the T2 sample, and the results supported its use. The reliability alphas of the job satisfaction scale were acceptable ($\alpha = .85$ at T1 and $\alpha = .79$ at T2). The survey also included questions about background and demographic information.

Missing data

Four participants (3.3%) did not respond to ICS at T1, and seven participants (5.8%) did not respond at T2. Four participants (3.3%) did not complete the stress or job satisfaction index on T1, and three did not complete these at T2. At T1, three participants (2.5%) had missing values on six out of 18 items on ICS. Two participants at T2 had missing values on 15 out of 18 items on ICS. A series of sensitivity analyses were run. There were no significant differences between respondents and non-respondents on any study variable at T1 or T2. The regression models for T1 and T2 were run with incomplete cases excluded, with

missing cases excluded, with incomplete cases ignored, and with incomplete values substituted with means. The results from the different regression analyses did not produce different predictions. There were minor differences in means and variances explained; however, predictions did not change. Thus, multiple imputation was not considered necessary. The results reported are from analyses with cases with incomplete values excluded.

Analyses

We tested the model dimensionality of scales using comparative fit indices, and the root mean square error of approximation. All models fit the data well with a comparative fit index greater than .95 with values less than .06, indicating a good fit (Boateng et al., 2018). The Cronbach's alpha was used to assess the reliability of all scales and the subscales in ICS. We ran descriptive statistics, frequencies, and bivariate correlations of all variables. We tested assumptions of normality, linearity, and homoscedasticity at both time points. Assumptions were met.

We tested a three-stepped hierarchical multiple regression model at T1 and T2, respectively, with ICS sum scores as the dependent variable. The other variables (respondents' tenure in the CWS, active versus passive participation in the implementation, and post-graduate education) were entered in step one to analyze their contribution to IC and control for these variables in steps two and three. We expected job satisfaction to be the more dominant contributor to IC. Thus, we entered job stress in step two and job satisfaction in step three to test whether job satisfaction would predict IC even after controlling for job stress.

6.4 Mixed methods case study (paper 4)

Mixed methods research combines quantitative and qualitative scientific inquiry for the purpose of breadth and depth of understanding and corroboration of results (Johnson et al., 2007). Mixed methods research typically also combine philosophical views, and actively invites '*multiple ways of making sense of the social world, and multiple standpoints on what is important and to be valued and cherished* (Green, 2007, p. 20)'. In doing so, limitations of one view or method can be offset by another's strengths (Creswell & Clark, 2018), and their strengths combined can produce added value. A mixed methods case study design refers to applying mixed methods in the in-depth and detailed description and analysis of one or multiple cases. 'Cases' may refer to individuals, groups, organizations, diseases, properties, or activities as their unit of analysis (ibid.)

Design

Paper 4 is a mixed methods case study where EAS's implementability is the case being subjected to in-depth analysis, and how characteristics of EAS influence implementability are investigated. We used a fully integrated design, which refers to quantitative and qualitative inquiry interacting throughout EAS implementation. Qualitative and quantitative data were collected both independently and together using multiple data sources at several time points, and results from one data collection could inform another. Instead of using a purely constructivist approach to describe the case, which is typically done in case studies (Cresswell & Clark, 2018), a pluralistic approach was applied where implementability was described using corroboration of quantitative and qualitative data, and the influence of intervention characteristics was investigated using in-depth qualitative analyses that mixed deductive and inductive inquiry. We tried to use a meta-paradigmatic perspective in analyses to interpret data from different viewpoints (Johnson, 2018).

Sample

Thirty-one practitioners and supervisors had received training in EAS during the study and were eligible for participation in the study's quantitative part. Twenty-four (77.42%) agreed to participate, three of them were supervisors, and one was a trained implementation champion. The majority of the respondents held the position of caseworker (46%) or family therapist (37.5%). Nine out of 21 eligible (three lost to turnover) participated in the qualitative interviews (42.86%). All participants in the qualitative sample participated in the quantitative sample. One year into implementation, all participants who had completed EAS with at least one family in the study were invited to participate in focus groups. Four practitioners agreed, and one interview was conducted. Ten months later, more practitioners were eligible due to having more families completing the intervention. Three additional practitioners agreed to participate, and another interview was conducted. At the same time, supervisors of the three departments with trained practitioners were invited to participate in individual telephone interviews. Two agreed to participate, and one was unavailable. Measures, methods, and samples are depicted in table 6.

Table 6.

Measures and Methods

Constructs	Qualitative *n**	Quantitative *n*
Intervention Feasibility	9	24
Intervention Acceptability	9	24
Intervention Appropriateness	9	24
Intervention Usability	9	21
Free text feedback from fidelity monitoring	120	

* Two focus groups with seven practitioners total, two individual interviews with supervisors, 120 feedback/experiences related to adaptations from open-ended questions on fidelity checks

Quantitative data collection

The first data collection was conducted approximately 18-24 months after the initial implementation of EAS. Participants either responded to quantitative instruments as part of the second data collection with the implementation survey used in paper 3, or as part of a web-based post-intervention survey which was sent to practitioners when a family assigned to them in the KOBA-study completed the intervention. The fidelity monitor could be used at any time during the intervention period. Most participants used the monitor right after sessions with families where core elements of EAS were used or within 1-2 days after.

Instruments

Feasibility, acceptability, appropriateness

Intervention feasibility, acceptability, and appropriateness were measured using three four-item five-point scale questionnaires ranging in response choices from "completely disagree" to "completely agree": Acceptability of Intervention Measure (AIM), Intervention Appropriateness Measure (IAM), and Feasibility of Intervention Measure (FIM). The three questionnaires have exhibited acceptable psychometric properties (Weiner et al., 2017). In the current study, the Cronbach's alpha for AIM, IAM and FIM was .96, .98, and .91, respectively.

Usability

Usability was measured using the Intervention Usability Scale (IUS, Lyon, Koerner, & Chung, 2020), a 10-item questionnaire rated on a five-point scale, ranging in response choices from "strongly disagree" to "strongly agree". The questionnaire is an adaptation of the widely used Systems Usability Scale (SUS, Brooke, 1996), which is a sensitive and robust measure used to evaluate the usability of technologies and other systems and products across a wide range of contexts. In the IUS, only minor adaptations to more appropriate fit the context of psychosocial interventions have been made: The term "system" has been replaced with

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"intervention", "functions" have been replaced with "components", and "technical person" have been replaced by "expert consultant". In the current study, Cronbachs' alpha of IUS was .88.

Free text feedback using fidelity monitor

After each session of EAS with a family, practitioners were instructed to complete a dynamic fidelity checklist on their smartphone or computer using an online survey. The survey took about 5–10 min to complete, depending on the number of core elements and adaptations that were used in the session. In addition to pre-defined adaptations, practitioners reported the use of additional adaptations and general feedback about the delivery of EAS using free text options. These free text feedback reports contained information directly related to EAS's implementability and were included in qualitative analyses. More details about the fidelity monitoring are described in paper 2.

Qualitative interviews

Two focus group interviews were conducted. The first interview had four participants, lasted 119 minutes, and was conducted in May 2019 at the intermediary organization's offices. The second had three participants, lasted 129 minutes, and was conducted in March 2020 at the participant's child welfare office. Each focus group was facilitated by an experienced child welfare professional and educator with no affiliation to the study. She used a semi-structured interview guide based on the quantitative implementability-questionnaires and implementation determinants in the EPIS framework. Each focus group had a secretary with a checklist who made sure all themes were addressed and took field notes. The interviews were audio-recorded and later transcribed for analyses. The facilitator and secretary received a one-hour didactic training in themes of the interview guide.

Two individual telephone interviews were conducted with the supervisors of the participants in the focus groups. The interviews were recorded and lasted 52 and 37 minutes, respectively. The structure and questions were the same as in the focus group, with more emphasis on leadership, implementation strategies, and sustainment, and less emphasis on core elements of EAS and adaptations. These interviews were conducted by the first author, who knew the participants professionally through collaboration in the study. The participants were reminded of the importance of limiting any biases and speaking honest opinions about themes in the interview, regardless of whether they were positive or negative.

Analyses

Quantitative

Descriptive analyses in IBM SPSS 12 were used to calculate mean and total scores for each of the four scales. IUS total scores are usually calculated by multiplying the sum score by 2.5 (high score, range: 0-100). Due to human error, item 8 on the usability scale ("I find the intervention very cumbersome to use") was not included in the questionnaire. Thus, to ensure the range of scores on a scale ranging from 0 – 100 for comparison purposes, we multiplied the sum score by 2.78, similar to the procedure applied by Lyon and colleagues (in press). To calculate an overall sum score for all four scales, we multiplied the sum score of each of the three other scales (acceptability, appropriateness, feasibility) with five so that scores would range from 0-100. We then calculated the mean score of these four scores to find the overall implementability score. We also tested bivariate correlations.

Qualitative

Qualitative analysis was completed using the Framework method (Gale et al., 2013), a descriptive and exploratory approach to thematic analysis. NVivo 12 Pro software and built-in matrices were used in analyses. The EPIS framework was used as a theoretical framework to inform deductive data interpretation across time (phases of implementation) and at multiple levels of implementation (inner and outer organizational setting, innovation factors, and bridging factors).

Some adjustments to the Framework method were applied to facilitate pragmatic interpretations from multiple viewpoints. To analyze data in light of existing theory, codes were constructed following the EPIS-framework in initial analyses. In in-depth analyses of intervention characteristics (a domain of EPIS), an analytical framework was applied based on the operationalization of implementability theorized by the study (appropriateness, acceptability, feasibility, usability), and themes were coded within these four constructs. To view data from a more interpretive perspective, inductive coding was also used, and novel codes were made for themes not applicable to the four implementability-constructs to inform expansion on the analytical framework and give rise to new theory. Specific intervention characteristics were not defined as codes in advance to allow characteristics to emerge as themes during analyses inductively. However, I was biased by already being familiar with EAS's following characteristics that had been deliberately designed to support implementability: flexibility in delivery, cross-domain integration of core elements, and alignment with contextual constraints. Thus, coding of intervention characteristics was also a mix of induction and deduction. Themes pertaining to implementation strategies were also coded and analyzed. Results from these analyses were outside the scope of paper 4 and planned for use in a future mixed methods study of implementation and intervention

outcomes. However, particularly relevant qualitative results about implementation strategies are presented in the thesis.

The second author and I independently coded data before we charted the data in a framework matrix and analyzed and interpreted the data through discussions. The last author reviewed the analytical framework and charted data, summaries of data and interpretations, and discussed alternative interpretations and adjustments.

Mixed methods

Quantitative and qualitative results were merged in tables, and results from each data source were compared for convergence or divergence. Qualitative results were used to complement the descriptive quantitative results to provide a more in-depth understanding of the constructs indexing implementability and expand on how intervention characteristics influenced these constructs.

7. Ethical considerations

Research involving vulnerable families, and especially children, require thorough ethical considerations. Also, as reviewed in chapter 2.1, CWSs and their staff face challenging work climates and are prone to stress, burnout, and secondary trauma. Subsequently, conducting implementation efforts in CWSs also requires ethical considerations. For the KOBA-study, our primary concerns were considerations of informed consent to participate, benefits versus risks and demands in participation, and data protection and security. We first sought ethical consultation and review from the Regional Committee for Medical and Health Research Ethics (REK). REK decided that the research conducted in the KOBA-study was not bound by the Norwegian Health Research Act (§§ 2 and 4) and that REK was not the appropriate body to review and approve the study. Instead, the Norwegian Center for Research Data (NSD) was considered the appropriate body. NSD approved the study (47161) and has been a valuable consultation partner in ethical questions during the study. The introduction of new General Data Protection Regulations (GDPR) in 2018 also instigated re-evaluation of all our systems and routines for data protection and informed consent. Risk assessments were completed and led to revisions of consents and new routines for data protection in line with GDPR requirements. Paper 2 elaborates on ethical considerations with regards to children and families in the study (e.g., benefits and risks, randomization, informed consent, and data protection). Ethics related to implementation in CWSs is especially relevant for this thesis's work, and ethical considerations in light of our results follow in the discussion.

8. Results

8.1 Paper 1

Common elements of practice, process, and implementation in out-of-school-time academic interventions for at-risk children: A systematic review

Table 7 depicts the search and selection process starting with 11.704 records identified through searching leading to 36 studies of out-of-school-time-academic (OSTA) interventions being included for common elements analyses. A total of 147 elements were identified, 62 were practice elements, 49 were process elements, and 36 were implementation elements.

Table 7

Prisma Flow Diagram
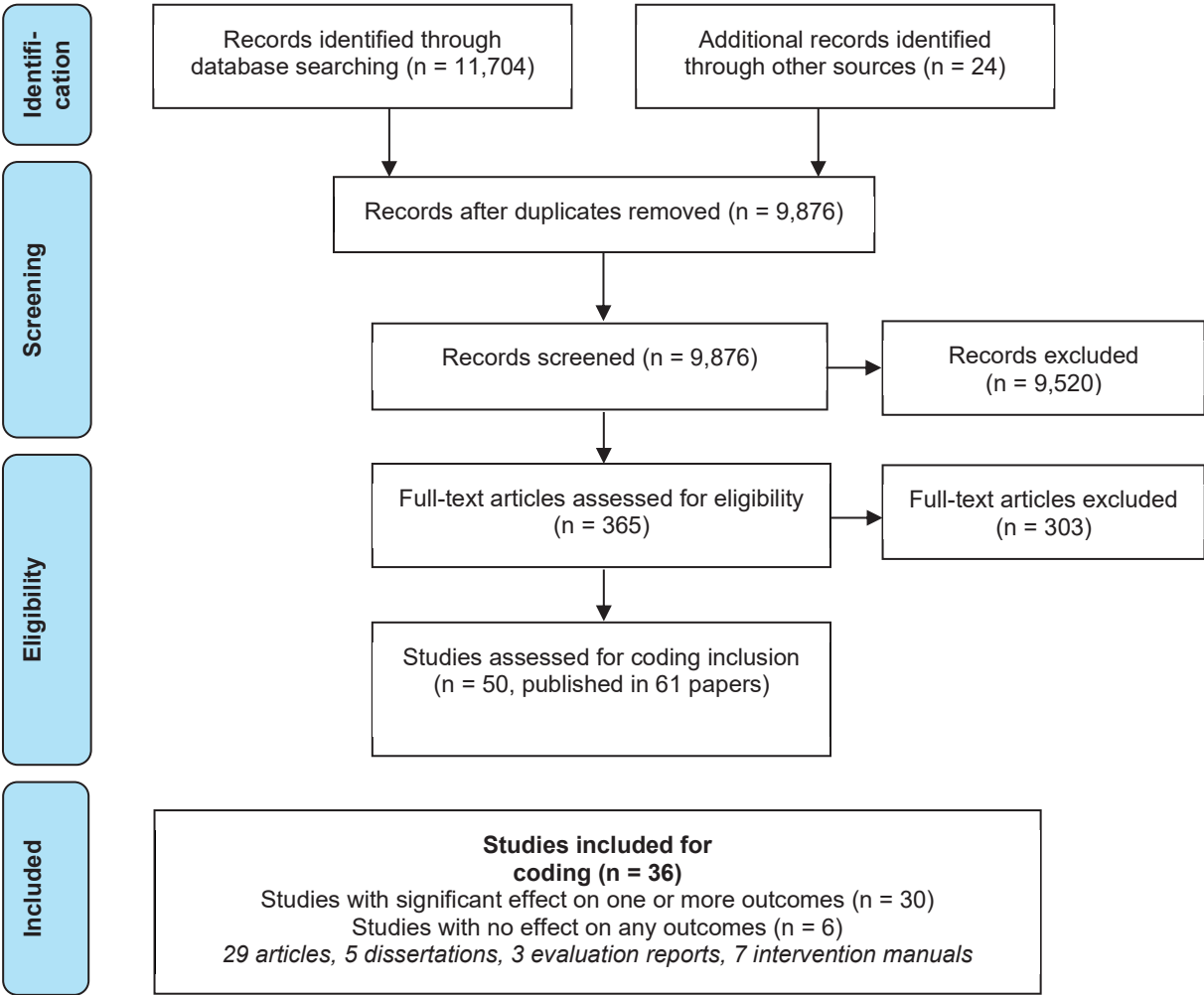
The 25% most common practice elements used in effective interventions, accounted for in ineffective interventions (i.e., the highest frequency values) were *homework support*, *training in positive parental school involvement*, *positive reinforcement*, *structured tutoring*, *psychoeducation, correction and feedback, literacy training*, and *use of explicit goals*.

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Structured tutoring was the most frequent practice element in effective studies, however, accounting for its inclusion in ineffective studies, it only had the fourth highest frequency value. The common elements matrix also provided further refined details on the level of components of practice elements, providing options in co-design. For instance, homework support consisted of the components; guidance in (1) homework structure and discipline, (2) homework instruction and support, and (3) homework environments, and further details on how and under what circumstances each component was delivered could be distilled from the matrix.

The most common process element was *regular support to intervention receiver* (e.g., consultation calls in between sessions), and the most common implementation element was *quality monitoring* (e.g., monitoring intervention fidelity). We also identified frequency values for common combinations, pertaining to how often each common process- and implementation element was combined with each common practice element when they were used in effective interventions accounted for in ineffective. The most commonly effective combination of elements was *professional practitioners training caregivers* in *parental school involvement at home* and *homework support* combined with the use of *positive reinforcement.* In this combination, *organizational materials* were commonly used as intervention aids, caregivers *regularly received intervention support*, and the intervention was commonly implemented using *quality monitoring* and *educational material*. Reading abilities were the academic outcome most often improved.

8.2 Paper 2

Knowledge translation in child welfare - improving educational outcomes for children at risk: study protocol for a hybrid randomized controlled pragmatic trial

Paper 2 is a peer-reviewed protocol and did not contain data collection. The protocol describes bringing diverse and local stakeholders together in a translational process (IKT-K) to collaboratively find solutions to a recognized societal issue, helping children in CWS academically. The results of this process were Enhanced Academic Support (EAS) - lean and flexible academic practices for children and families in CWSs, locally tailored implementation strategies for implementing EAS, and a pragmatic hybrid randomized controlled trial to evaluate the implementation of EAS in CWSs and its effectiveness for primary school children in CWSs. The IKT-K process represents a transdisciplinary microcosm of the translational research continuum, and studying it may inform ways to improve it.

Although the trial is currently ongoing, we already know that we failed some important implementation strategies or completed them with limited fidelity, and this might have implications for implementation in the trial. We were not able to complete the technical programming of the audit and feedback system, and thus we were not able to deliver monthly feedback reports to practitioners. We planned to provide organizational level feedback on fidelity to core elements, adaptations, and parent and child comprehension, satisfaction, and involvement. Instead, I created study level feedback reports and presented them visually in booster sessions two times a year, which is unlikely to be enough for audit and feedback to be effective (Ivers, Jamtvedt, Flottorp, Young, Odegaard-Jensen et al., 2012). Having the ongoing coaching being voluntary on practitioner's requests during the initial implementation year resulted in the amount of ongoing coaching being variable across practitioners. The early adopters and engaged practitioners more often requested consultation, which presented opportunities for us to coach and problem solve with them. Other practitioners rarely or never requested consultation and thus received limited coaching.

8.3 Paper 3

Individual level predictors of implementation climate in child welfare services

This study found practitioner's job satisfaction to be a strong predictor of implementation climate (IC) in CWSs. Job satisfaction was a unique predictor of IC at T1 (β = 1.12, $p < .001$,) and T2 (β=0.98, $p < .001$) in the complete model controlling for tenure, implementation participation, postgraduate education, and job stress. Higher job satisfaction was associated with more positive perceptions of IC. At T2, tenure was also a unique predictor in the complete model ($\beta = -1.49$, $p < .01$), where more tenure was associated with less positive perceptions of IC. Job stress was associated with IC at T1 (*p < .001*) and T2 (*p < .01*) controlling for tenure, implementation participation, and post graduate education, where more stress was associated with less positive IC. However, adding job satisfaction to the model canceled out the association, indicating that the contribution of job stress to the model could be explained by job satisfaction. Table 8 provides model summaries with variance explained, and table 9 provides results from regression analyses for each variable.

Table 8

Model Summary of Hierarchical Regression

	T1 (N=122)					T2 (N=148)			
Step	R	R^2	ΔR^2	P		R	R^2	ΔR^2	P
1^a	.10	.01	.01	.762		.31	.10	.10	.002
2^b	.34	.11	.10	.000		.38	.15	.05	.005
3^c	.51	.326	.19	.000		.51	.26	.11	.000

[a] Tenure, active versus passive participation, and post graduate education [b] Job stress [c] Job satisfaction

Table 9

Hierarchical Regression Analysis for Variables Predicting Implementation Climate

	Step 1			Step 2*			Step 3**		
Variables	β	SE	St.β	B	SE	St. β	β	SE	St.β
T1 (*N=122*)									
Tenure	-.37	.64	-.06	-.67	.61	-.10	-.65	.55	-.10
Participation	-1.33	1.64	-.08	-.70	1.57	-.04	-.42	1.40	-.02
Post grad edu	-.13	1.72	-.01	-.41	1.64	-.02	-.69	1.47	-.04
Job stress				-.64**	.17	-.33	-.32	.17	-.16
Job satisfaction							1.12**	.20	.46
T2 (*N=148*)	Step 1*			Step 2*			Step 3**		
Tenure	-1.53*	.58	-.22	-1.53*	.57	-.22	-1.49*	.53	-.22
Participation	-1.12	1.87	-.04	-1.24	1.99	.05	-1.12	1.87	-.05
Post grad edu	-2.72	1.65	-.14	-2.79	1.61	-.15	-2.41	1.51	-.13
Job stress				-.52*	.18	-.22	-.24	.18	-.10
Job satisfaction							.98**	.22	.35

* p < .01 ** p < .001

The Norwegian translation of the Implementation Climate Scale also exhibited acceptable psychometric properties. In comparisons of scores from Norwegian CWS with those of CWSs in the USA (Ehrhart et al., 2016), there were significant differences on the sub-scales educational support for evidence-based practice (EBP), recognition for EBP, and

rewards for EBP at both time points. The differences in recognition and rewards for EBP may reflect differences in interpretations of items and may have resulted in higher scores from Norwegian practitioners, inflating the overall results.

8.4 Paper 4

Exploring how intervention characteristics affect implementability: a case study of common elements-based academic support in child welfare services

Table 11 shows descriptive quantitative results on EAS's feasibility, acceptability, appropriateness, and usability. EAS received an average score of 75.33 (*SD* = 15.57*)* out of 100 on the implementability index that accumulated all four scales.

Table 11.

Descriptive Results on the Implementability of EAS

Construct	N	α	Item mean	SD	Scale mean	SD	Max. Score	Index score	SD
Feasibility	24	.91	3.59*	.71	15.71	2.82	20	78.54	14.10
Acceptability	24	.96	4.13*	.91	16.50	3.65	20	82.50	18.30
Appropriateness	24	.98	3.59*	1.11	14.38	4.43	20	71.88	22.16
Usability	21	.88	2.71**	.65	24.38	5.87	36	67.78	16.32
Implementability index	24						100	75.33	15.57

* scale 1-5, four items   ** scale 0-4, 9 items

The quantitative results generally aligned well with the qualitative results, and in-depth analyses identified both beneficial characteristics and pitfalls in designing an academic intervention to fit everyday practice needs and constraints in CWSs. Deliberately designing core elements for integration with other practices and counseling was vital to implementability. Due to complex needs and unpredictable contextual dynamics, practitioners were rarely able only to provide academic support in meetings with families. Also, alignment with existing practice and encouraging different forms of flexibility appeared to appeal to practitioner's autonomy, increase learnability, and make the core elements usable across dynamic complexities.

> *"I would say the flexibility has been the most important with this project, that you can go in, and based on what the needs are, having that EAS structure as a frame of reference and still step outside of it and find other solutions"*

The same characteristics could also justify down-prioritizing or abandoning less preferred or inappropriate core elements, or certain components of them. The alignment also rendered a few practitioners finding the implementation effort unnecessary, and only appropriate for less experienced colleagues.

> *"This isn't rocket science, so to speak, but its things we are familiar with, put in a system and structure."*

The core elements *positive parental involvement in school*, *home learning structure and routines*, and *positive reinforcement* appeared most implementable in CWSs because they were viewed as important and relevant for clients and compatible with existing practices, preferences, and values. Opinions were more ambiguous regarding *structured tutoring in reading and math*. Appropriateness was the sub-scale of implementability with the lowest average score and the largest standard deviations. The qualitative data indicated that this was primarily due to some practitioners perceiving the structured tutoring as inappropriate or uncomfortable, especially when working with families who experience severe hardships such as domestic violence.

> *"I think it doesn't always fit in, when really serious problems come in as a factor"*

A few other practitioners expressed structured tutoring as a favorite and mention using academic support as a 'gentle way in' to working with family conflicts. Cooperation with schools and teachers surfaced as an important bridging factor in making the academic support useful and a potentially missing core element of EAS. A more fixed structure during initial implementation and more intensity in training and coaching on core elements would likely benefit learning and use. Also, differentiated approaches to implementation based on practitioners' characteristics and preferences may further improve implementability.

> *"I did it in my own way, and then I felt it got easier. It felt more natural, more real… I took away the things I didn't think was that relevant and spent more time on one of the core elements. At first I was so occupied with doing all of them."*

From a perspective of the evidence-based paradigm (e.g., postpositivism), the flexibility that appears to promote implementability is accompanied by substantial concerns for adherence to core elements. The freedom allows an extent of deviation from the form with which these elements were used when they were effective in research that makes replication questionable. From a more pragmatic view, a compromise may have to be accepted because practitioners (1) express they would likely have to abandon EAS altogether if it was not flexible, and (2) those who would prefer a more fixed structure in implementation expressed

that they will use core elements flexibly in time regardless. Practitioners do not seem to mind using a more fixed structure when appropriate. However, they appear to need the flexibility to integrate at least some academic support into the dynamic situations requiring multiple priorities. And these situations seem to be most common, and not exceptions. From a more constructivist or process perspective, having core elements trained as flexible competencies seem to make them easier to integrate into a coherent strength-based counseling process with the families, despite unpredictable circumstances and needs emerging during their interactions. However, a more rigid structure initially still seems temporarily appropriate and beneficial for learning purposes.

> *".. it's about being creative all the time, to figure out how we get this in in a way that makes it fun. There is sort of something about finding where the energy is in the children and the parents. That's important, and not always easy."*

Additional analyses for thesis

There were several indications of insufficient implementation strategies. For instance, a few participants expressed misunderstanding of the fidelity monitor's function, technical difficulties with the math game application, being absent from booster sessions and consultations where important issues were addressed, and not receiving adequate responses from the implementation team to concerns raised in consultation. In addition, research infrastructure such as random allocation of clients and waiting for measurement feedback appeared to be a source of frustration.

For practitioners who were organized as generalists (i.e., caseworkers), all core elements appear to have limitations in their alignment with existing practice and contextual constraints. These practitioners do home visitation much more seldom compared to family therapists and have more limited capacity for delivering interventions during their work hours. These practitioners did not participate in interviews. However, anecdotally through consultations and meetings, we are aware of substantial practical barriers, and we recognize that lack of feasibility for them likely limited their opportunity to use EAS.

9. Discussion

The four papers include detailed discussions of their respective results in isolation, while the following discussion will integrate results across papers and methodologies. The thesis has a hybrid focus on development and implementability of academic support in child welfare services (CWSs), CWSs as implementation contexts, and common elements methodology and co-design. Thus, I first discuss the implementability of academic support in CWSs and then turn to CWSs as implementation contexts more generally. Next, I discuss the common elements-methodology and co-design, and implications for translational science. Lastly, I mention limitations in all papers and suggest future directions.

9.1 Implementability of academic support in child welfares services

Enhanced academic support (EAS) appears implementable to the majority of child welfare practitioners working as family therapists or counselors. EAS may thus be implementable in general child welfare practice - the categories of child welfare support labeled advice and guidance and other unspecified types of interventions and home-based support. These categories of support account for most of the intervention and counseling delivered to families by CWSs (SSB, 2020), indicating that EAS has the potential of reaching many children in need of academic support. For the KOBA study, however, there are substantial concerns in terms of implementation strategies and subsequently the fidelity to core elements of EAS, demonstrating that a flexible element-based intervention format does not remove the need for high-quality implementation. Findings from the papers identified ways EAS may be adjusted to fit the variety of practitioners and families better and facilitate more fidelity to core elements. However, contextual constraints still give rise to concerns. A more intensive, structured, and ongoing implementation process is likely needed to obtain higher fidelity for practitioners who are not early adopters of the intervention or especially engaged. Doing so appears to require meticulous sensitivity to context to be feasible and ethically sound. EAS was less implementable for practitioners' working as generalists, primarily because of practical barriers and capacity constraints making process elements less feasible (e.g., home visitation and frequent feedback and follow up).

Implementability differed between the four core elements of EAS. *Positive parental involvement in school*, *home learning structure and routines*, and *positive reinforcement* appears to be implementable for most practitioners and clients, which is uplifting considering that both paper one and previous reviews find positive parental involvement and home learning structure to be important for academic outcomes (Engell et al., 2020; Wilder, 2014;

Nye et al., 2006). Also, paper 1 found positive reinforcement to be among the most common elements of effective parent- or teacher mediated interventions across different problem domains and settings (Brown et al., 2017; Chorpita et al., 2009; Engell et al., 2020; Lindsey et al., 2014; McLeod et al., 2016; Sutherland et al., 2018). However, in our theory of change in EAS, these three core elements' primary functions are more preventive of gaps in learning and improving academic learning conditions. We theorize *structured tutoring* and subsequently practicing academic skills over time as necessary to close learning gaps.

The implementability of structured tutoring (i.e., guidance in paired reading, facilitating the use of a math game, and establishing routines) appears to depend on the characteristics of practitioners and clients. While a few practitioners held tutoring-components as favorites and frequently used them, a few others found the tutoring uncomfortable, too divergent from their current practice and responsibilities, and often inappropriate with families with complex and severe difficulties. These perceptions indicate that structured tutoring lacked compatibility with their sense of coherence at work (work-SOC). In terms of work-SOC theory, structured tutoring may occasionally be experienced as inappropriate to address the demands and needs their clients present with, and are thus insufficiently meaningful and valuable for the practitioners to commit to using it (Vogt et al., 2013).

Even practitioners who liked to use the tutoring found tutoring components occasionally inappropriate, most notably with the families experiencing complex challenges such as severe conflicts and violence. Tutoring is a practice mostly associated with teachers and schools, and academics can be difficult to prioritize in the face of hardship and conflict. These findings converge with studies of CWS practice in Norway (Christiansen, 2015) and the USA (Urgelles et al., 2012), characterizing the need to "put out fires" before having the opportunity to work more purposefully with specific interventions. At the same time, times of hardship may be when vulnerable children are in the greatest need of academic support and the stability that academic structure can provide. Naturally, knowledge gaps tend to emerge or exacerbate during challenging times (Sebba et al., 2015). As such, competing priorities and complexities may cause paradoxes where those children who need academic support the most may receive less of it and vice versa. Children in the KOBA-study had, on average, severe gaps in math and reading abilities, and under half of the children with severe academic needs received special education from schools (Kirkøen et al., in review). Taken together, these findings speak to the importance of finding feasible solutions for providing academic support (tutoring included) alongside other types of support requiring attention, and our results indicate that flexible cross-domain integration may be a viable approach to optimize.

Several practitioners expressed integrating at least some core elements of EAS into their practice despite other complex needs requiring priority at the same time. Such flexible integration aligns with cross-domain benefits articulated about element-approaches to interventions (Barth et al., 2012; Becker et al., 2015; Chorpita et al., 2005; Garland et al., 2008; Hogue et al., 2019). This integration may be particularly important for academic support in CWSs because academics have traditionally been secondary to their priorities. However, the integration appeared to vary considerably, and the potential potency, or causal tendencies, of core elements may be 'watered down' if they are not integrated proficiently. Flexible integration came naturally to some practitioners, however, likely require specific training and ongoing coaching to build proficiency. The processual aspects of core elements (i.e., process elements) appear most likely to be compromised in integration.

In complex and dynamic circumstances, which are the more ordinary circumstances in CWSs general practice, a sufficient dosage of practice elements and fidelity to important process elements may be challenging to maintain. For instance, the common elements-review found that structured tutoring tended to need the conjunction of process elements such as 'repeated training' with 'progressive difficulty' and 'feedback over time' to be effective. Providing such continuous process-support in times of recurring crises and conflicts may require a degree of responsiveness to client needs that justify fidelity-inconsistent adaptations and reducing the dosage. In such circumstances, there may be a thin line between adherence to the academic support providing benefit and being an excessive burden, and findings from paper 4 indicate that the balance may be unpredictable and non-linear. As such, attempts to prescribe that balance is likely to be inaccurate and may occasionally cause more problems than value because the academic support may disturb or obstruct other crucial supports at the time.

The problem above resonates with what Olsvik and Saus (2020) describe as paradoxical tensions in CWS between standardization and individual adjustment. They find that the need to make individual adjustments while simultaneously fulfilling standards and expectations for what constitutes high-quality services is perceived as a contradiction. The understandable misconception of implementation quality (i.e., intervention fidelity) as synonymous to service quality raises the question of whether intervention fidelity should be judged based on the degree of adherence to core elements or also be judged in relation to adapting to contextual circumstances (e.g., individual adjustments), both for EAS specifically and interventions in general. Fidelity measures focused on adherence are essential for the internal validity of effect estimates in research. However, when implementing in non-research

settings, appropriate fidelity in a particular case may be a configuration of adherence to core elements and responsiveness to contextual circumstances (e.g., client characteristics and preferences, the therapeutic alliance, the atmosphere, moods). By emphasizing adherence to one intervention (i.e., EAS) as an indicator of service quality, instead of how adherence to that intervention relates to the totality of CWS practices and circumstances, we may be maintaining the 'disconnect' between research and practice contexts reviewed in chapter 3.

Von Thiele Schwartz and colleagues (2019) have suggested a value-equation that may provide explicit attention to these dynamics. They conceptualize an intervention's value as a configuration of fidelity (i.e., adherence) to an intervention's internal validity, adaptations to accommodate context and individual needs, and how well implementation strategies optimize the fit between the intervention and context. They also emphasize that an intervention's value is a product of its multi-leveled influence on clients, practitioners, organizations, systems, and societies. Further, they theorize that the optimal value-configurations will vary across circumstances, which was supported by findings in papers 3 and 4. Paper 3 found that implementation strategy-needs may vary based on individual differences in practitioners such as job satisfaction and tenure. Paper 4 found that practitioners could value core elements within EAS differently depending on compatibility with preferences, sense of coherence, and client needs. The authors recognize that the equation is theoretical and complicated, however, it may also have a practical side.

Such a value-equation in EAS's practice would require reducing the emphasis on adherence to core elements and focusing more on the core functions, processes, and proximal outcomes the academic support is meant to potentiate. For instance, we would then train for and implement the components for home learning structure and routines in their research-supported form as a starting point. However, the quality assurance would not focus on practitioners' completing these components as per protocol. Instead, we audit and feedback information about homework completion and school attendance - the protocolled components' proximal target outcomes. The practitioner then is trained in what the research indicates is the most effective way, on average, to achieve these proximal outcomes. However, they can use their expertise and experience to adapt and tailor components to a family's unique needs when necessary, without experiencing the tension of that tailoring being judged as 'poorer quality service.' The adaptations may be adherence-inconsistent, but they may also help improve homework completion and school attendance for this particular family. The audit and feedback will indicate if that is the case and provide accountability and quality assurance on

what matters the most in practice; the help achieved. Evidence-informed core elements are tools to achieve these outcomes and not necessarily goals in themselves.

Such value-configurations may have implications for other practice contexts and align with views of evidence-based practice that emphasize the role of ethical virtues in integrating the best available research evidence with practitioners' expertise and client characteristics, culture, and preferences (Berg, 2020). A strategic selection of core functions and proximal outcomes, in addition to longer-term outcomes, can inform ongoing quality improvement within the larger practice ecology without necessarily constraining practitioners with too specific instructions. Instead of reacting to drift in adherence to protocols, not seeing the proximal outcomes expected can be what invoke supervision and problem solving (e.g., re-training in core elements, ongoing coaching, learning collaboratives, improvement cycles, group reflections).

In support of the diffusion of innovation theory (Rogers, 2003) and the many contemporary implementation theories it has influenced (Nilsen, 2015), we found that the compatibility between EAS and practitioners' preferences and professional autonomy was highly influential of implementability. The climate for implementation in the general practice in CWSs appears to demand a high degree of compatibility with the practitioners as individuals and the contextual dynamics and constraints with which they work. We also found that compatibility differs within groups of practitioners and between the different core elements. Similarly, we found that alignment of core elements with existing practices was generally a positive feature, but with potential damaging pitfalls depending on individual perceptions. For instance, content alignment taken too far may preserve the status quo by practitioners interpreting their existing practice as adhering to core elements, contrary to the intention to strengthen the core elements by facilitating more evidence-informed use. However, the status quo practice may be the more appropriate use of the core elements. Quality assurance targeting core functions and proximal outcomes would illuminate whether current practice is sufficient or more intensive implementation is needed, or something entirely different. Unintended consequences for other types of needs and support may also need to be monitored to ensure the use of academic support is ethically appropriate.

A few of the more experienced practitioners found EAS too aligned with current practice to be worth the implementation effort and suggested that less experienced practitioners benefit more. This speaks to the importance of ensuring that a new practice has *relative advantage* over a similar existing practice (Damschroder et al., 2009; Rogers, 2003) and how overreaching to ensure *learnability* as a usability goal (i.e., how easily and rapidly

the practice is understood and learned) may backfire. More experienced practitioners may demand higher degrees of novel learning to experience relative advantage, and aligning training with too familiar practices may be perceived as undermining practitioners' competence and create resistance to implementation. A few other practitioners expressed that even though several core elements were familiar, they now integrate them more systematically in their practice knowing that they are evidence-informed. Coinciding, they spoke about the need to be responsive to emerging situational needs and circumstances to adapt to every unique case. This integration of knowledge from population-level averages with knowledge from unique cases may demonstrate an example of reconcilement of values from the evidence-based paradigm with the more practice-based, person-centered, or value-based paradigms called for in complex human service contexts (Brady & Redmond, 2017; Fulford, 2008; Mitchell, 2011).

9.2 Potential improvements in EAS and implementation strategies

The most substantial potential for improvement of EAS appears to relate to its implementation strategies. A more fixed structure with less flexibility during initial implementation and more intensity in training and ongoing coaching would likely benefit learning and use. For instance, initial implementation could involve hand picking families with less complex challenges to enable practitioners to use EAS's basic structure with fidelity to gain proficiency. The complexity of cases could be increased as experience using EAS grows, and more flexibility could be explored gradually with supervision and coaching. Such an approach does, however, increase implementation demands for services, which may challenge its feasibility. Hand-picking 'easy' families are not always possible, and especially not for several practitioners at the same time. Regardless, training and ongoing coaching should be more intensive and consistent than we did in the KOBA study. We likely took our co-design principle of 'change minimalism' too far in our attempt to accommodate capacity constraints. With only 14 hours of training, the supervision and coaching that follows is likely to be crucial and should be more consistent (Edmunds et al., 2013). A format of small coaching cohorts may be an efficient alternative strategy (Stirman et al., 2017), or implementing core elements stepwise based on occurring needs.

Individual differences in practitioners' characteristics and preferences influenced both perceptions of implementation climate and implementability of core elements. These findings may call for a differentiated approach to implementation instead of offering the same implementation to everyone. For instance, practitioners could receive the same basic introductory training and choose a specialization based on their preferences and needs.

Sutherland and colleagues (2019) tested such an implementation model to implement practice elements for social-emotional learning to elementary school teachers. Teachers initially expressed preferences for autonomy in choosing practice elements to receive training and implementation in and were given the choice of six out of eight practice elements. However, after a pilot, teachers expressed preferences for receiving training in all eight elements instead. They appreciated an implementation that was "*already designed and packaged for their use*" while still requiring flexibility in executing the implementation in practice (ibid. p. 15). Instead of going the opposite route for EAS, a middle ground may be to plan for responsiveness to individual preferences and needs emerging through ongoing coaching in implementation, and not necessarily starting with specialization by choice. For instance, even though all practitioners receive the same initial training, ongoing coaching could in time transfer into coaching small cohorts of practitioners with similar preferences and needs (e.g., typically receive the most complex cases or encounter similar obstacles). That would ensure coherence across the workforce and make sustainment less vulnerable to turnover while also allowing for some degree of specialization and shared experiences (i.e., small communities of practice) based on preferences and needs.

Audit and feedback is one the most empirically proven implementation strategies for maintaining implementation quality (Ivers et al., 2014), and a successful audit and feedback system would have likely improved implementation of EAS. For applied effectiveness studies and hybrid trials, such systems should preferably be integrated into existing quality assurance systems to be sustainable. Alternatively, there should be plans for doing so in an eventual sustainment phase. Future use of EAS, or sustainment of the current implementation, should consider implementing quality assurance as discussed in relation to value-configurations above.

Ecological program or element-based integration?

Another potential improvement that requires consideration is designing and implementing EAS as a more traditional program with more of the infrastructure that often entails (i.e., delivered as a separate and specialized intervention, more focused on a specific structure, practitioners with adjusted caseloads, selected clients, intervention specific quality assurance). Implementing EAS as a more ecological program would likely be beneficial for implementation purposes, especially during the initial implementation phase to build proficiency. However, if EAS is to be used broadly in the dynamic general CWS practice, a more traditional program format appears unlikely to be sustainable. Too many circumstantial barriers prevent practitioners from delivering EAS following its basic structure, with the most

prominent barriers being capacity constraints and competing priorities. Services with the capacity and resources to sustain EAS as a separate specialized intervention would likely be able to deliver EAS with fidelity to its basic structure. However, It is unlikely that general practitioners would have the capacity to continuously do so without being at the expense of the other support they need to provide. Encouraging fidelity to EAS's basic structure at the expense of what practitioners find appropriate would be ethically questionable. EAS is experimental, and the study design emphasizes that EAS should complement, not replace, practice as usual. Further, the empirical evidence EAS builds on does not consider the unique individual circumstances of struggling families in the CWS and should not be given precedence over professional opinion.

Instead, a more successful element-based intervention format and its implementation may need to find a dynamic middle ground between traditional programs and a highly flexible and lean format. For instance, starting out resembling a more ecological program in the initial implementation, however, facilitating the core elements themselves becoming the ecological entities sustained within the practitioner's professional autonomy. Doing so may leverage the strengths of both approaches and offset some of their limitations. Stepwise and needs-based implementation of core elements may also be an alternative to spread the implementation burden out more evenly. The goal would not be to implement and sustain EAS, but to sustain and continuously improve core academic practices and processes, independent from EAS as a 'branded' intervention, add new core elements when needed, and have quality assurance focused on their core functions and proximal outcomes as discussed in the section above. EAS could be viewed as an implementation tool to use and re-engage when needed (e.g., drift observed in quality assurance, maintenance, implementation for new practitioners). Findings from paper four indicate that such element-based integration is possible and fits CWSs general practice. However, we were likely unable to implement sufficient proficiency in doing so.

Another alternative that may be useful is making EAS leaner and simpler (Lyon et al., 2020). Paper 4 found that the material supports (e.g., handbook, EAS planners, pamphlets for parents, math game) has a potential for improved usability. Also, the alignment with current practice found for positive reinforcement may justify removing it, or only offering implementation of it when needed. The value gained by reducing complexity and capacity needs in EAS may be greater than the value produced by strengthening practitioners' training in a core element they are already more or less proficient in using. Or, removing positive reinforcement as a core element may make room for another core element on facilitating

home-school collaboration, which paper 4 found was a potentially missing element in EAS. Further, results from the effectiveness trial converged with qualitative narratives from participating families may inform components of core elements to remove.

9.3 Child welfare services as implementation contexts

The thesis's results support previous studies finding that the organizational climate and conditions for implementation in CWSs tend to be complex and challenging (Aarons & Palinkas, 2007; Aarons, 2004; Acin et al., 2014). To enable substantial improvements of implementation climate and capacity, system- and organizational level intervention is likely needed. However, findings from the thesis did identify ways interventions and implementation strategies can be tailored towards fitting contextual circumstances in CWSs general practice. Appropriately matching of strategies to context is highlighted as necessary for implementation success (Leeman & Nilsen, 2020; Waltz et al., 2019). Our findings suggest that strategic priorities and role selection based on levels of job satisfaction, job stress, tenure, and perceptions of intervention implementability may inform such matching and help implementation processes utilize more of the implementation potential available in the organizations' current climate.

We know from prior studies that practitioners in CWS have among the most taxing jobs within health and welfare systems and are prone to burnout, turnover, emotional exhaustion, and even secondary trauma (Baugerud et al., 2017; Chung & Choo 2019; Travis et al., 2016). Thus, implementation efforts that impose on their daily work should be sensitive to their needs, perceptions, and especially their capacity. Findings from paper 3 implicate job satisfaction as an important determinant for implementation and high levels of job stress as a significant barrier. Ensuring sufficient job satisfaction, and absence of high job stress, may be considered a prerequisite for commencing implementation efforts in child welfare contexts. Considering the value of an implementation as a multi-leveled construct, even a seemingly successful implementation can be ethically questionable if it excessively increases demands and strain on practitioners.

Paper 4 illuminated some of the intricacies in the balance between implementation in CWSs being valuable, unnecessary, or excessively demanding, with the common feature being that this balance depends on individual differences in practitioners and clients. As mentioned above, compatibility with professional autonomy appeared to be particularly important, in line with several existing implementation theories (Nilsen, 2015; Rogers, 2003). Findings in paper 4 may add details to these theories and suggest that compatibility can depend on the (1) qualities of the intervention *content,* such as alignment with values and

sense of coherence, and (2) qualities of the intervention *design,* such as degree of intervention structure and usability across client needs.

Our findings also indicate that in developing and implementing evidence-informed interventions in complex general practice, considering and accommodating the whole scope of practice may benefit implementability and potential for sustainment. That is, thoroughly considering how a particular intervention relates to other interventions and support existing in current practice: What needs does the new intervention meet, and which does it not meet? How well does it fit with the current practice climate and culture? What practices can it replace, and how can it co-exist with other interventions and support? For instance, paper 4 indicates that if an intervention requires high fidelity in a complex practice setting, it may need to explicitly address how practitioners can be responsive and adapt when high fidelity is inappropriate. Designing and implementing core elements for integration with other contextually relevant interventions and support may help its co-existence within a complex practice ecology.

In line with previously articulated benefits (Chorpita et al., 2005; Garland et al., 2008; Hogue et al., 2019; Lawson et al., 2018; Mitchell, 2011; Sutherland et al., 2018), element-level evidence appears to offer opportunities for contextual accommodation. In being discrete meaningful entities, they may be integrated into, or shaped compatible with, existing practice across contexts. For instance, paper 4 found that some combinations of elements (i.e., guidance in positive reinforcement and parental involvement in school combined with psychoeducation) may align with existing strengths in services and can thus be implemented or reinforced efficiently. In contrast, other elements may be more novel to a practice context (i.e., guidance in tutoring techniques with support over time) and demand more tailoring and intensive implementation strategies over time. Thorough assessments of context and the intervention can inform initial tailoring. Recurrent implementability testing during development may help inform optimization.

A need for tailoring to fit the totality of the practice context does not exclude more complex ecological programs. However, it does pose the same demands on them and their ability to accommodate implementation climate and context, unless a program (including its implementation infrastructure) can appropriately replace a substantial amount of current practice. For instance, in the case of an implementable transdiagnostic program that is effective for multiple complex needs across the CWS population, an investment in that program as a base for general practice (including its infrastructure and quality assurance systems) may be the more value-producing option. In such a case, core elements based on

common elements-reviews may complement the program to inform the remaining practice needs. In children's mental health services, the modularized transdiagnostic program 'MATCH' show promise as such a program (Chropita & Daleiden, 2009), seeing as it includes 33 common elements-based modules for multiple comorbid needs and fixed algorithms that help practitioners choose the right modules for individual needs of children. However, in recent studies of MATCH, the authors come to conclusions about meeting the needs of real-world mental health workforces that resonate with findings and interpretations in this thesis. Chorpita, Daleiden, Vera, & Guan (2021) suggest that future intervention architecture should design intervention modules (i.e., core elements) to operate as an "*expandable library of masterable skills (*p. 5)" instead of defining fixed structures of modules. Similarly, Chorpita and Daleiden (2018, p. 11) emphasize the importance of viewing interventions as "*one part of a larger coordinated strategy for systems to achieve their shared vision,*" and they argue against standardizing EBPs and rigorously managing their adherence. Instead, they stress the importance of facilitating practice *wisdom* that balances the competent awareness of research evidence with values and sensitivity to needs and preferences emerging in practice.

To sum up findings and interpretations of CWSs as implementation contexts, participants in the study gave the impression that practitioners in child welfare services want to use research evidence to improve their services. However, we need to deliver evidence they can use. The primary barriers appear to be practical (i.e., capacity constraints, contextual fit, compatibility) rather than ideological (e.g., resistance to EBPs) or professional (e.g., insufficient education). We found no indications of CWSs being an exception to the research to practice disconnects articulated by intervention- and implementation researchers (Lyon, Dopp et al., 2020). Policy may mitigate this disconnect, by, for instance, significantly increasing investments in CWSs or fundamentally improving their organizational structures and climates. However, CWSs and the children and families they help will likely benefit most from several quality improvement pathways being used. That includes continuing to improve current EBPs and their reach, explore alternative formats for evidence-informed quality improvement, considering the totality of CWSs service systems in intervention development and implementation, and organizational improvements of CWSs and especially work climate for practitioners.

9.4 Implications for the translational continuum

The modality of implementability operationalizes how implementation science can be leveraged in intervention development and research. Implementability can complement the

modalities of efficacy and (cost-) effectiveness when interventions journey through the translational continuum. The relevance of doing so is exemplified by the value-equation suggested by von Thiele Schwarz and colleagues (2019). For instance, it encapsulates that:

> *A less complex intervention that can be delivered by less skilled staff and that requires less implementation resources (e.g., supervision, re-organization of care) may result in higher value than a highly efficacious intervention that stands little chance of being used in practice.* (p. 7)

Measures of implementability may be useful tools that can indicate the fit between an intervention and an implementation context, a vital part of the value equation, and mitigation of the research to practice disconnect. Implementability, as a modality, can express an intervention's potential for successful implementation in a real-world context and therefore indicate its potential for reach and scalability. Hence, effectiveness and implementability may together index an intervention's potential for impact in real-world settings.

The modality of implementability also operationalizes why and how knowledge from contextually relevant stakeholders is critical throughout the translational continuum. It brings the end-destination into the research process by necessity. As implementation research progresses, some normative knowledge about implementability will likely emerge for sub-populations and sub-categories of contexts, and findings from the thesis, for instance, have theorized specific characteristics and mechanisms that influence implementability in CWSs. However, one of the more agreed-upon pieces of knowledge in implementation science is that some extent of adaptations to both the intervention and the implementation will continue to be needed to accommodate individual and contextual variations (Stirman et al., 2017; Moore et al., 2013). What is implementable in a context at one time is not necessarily implementable in the same, or a similar, context at another time, and the uncertainty increases across different contexts. In the KOBA study, where local supervisors, practitioners, and clients were active participants in co-designing the intervention to be implementable (i.e., early in the microcosm of the translational continuum), asking some of the same practitioners and supervisors about implementability after implementation identified ways implementability needs to be improved. This contextual awareness is fluid knowledge only available to us through those who know the specific context closely at a particular period in time. Thus, the modality of implementability demonstrates that stakeholder knowledge and perspectives have direct relevance for the qualities of what is developed, researched, and implemented, and not just for ideological purposes such as ensuring democratization and equity in research processes.

Ensuring implementability can be viewed as an organic co-design process, where iterative improvement cycles together with stakeholders optimize and account for continuous changes throughout the translational continuum, and later when the intervention moves into natural practice. The KOBA study provides an example of how stakeholders can be purposefully involved in co-designing interventions and implementations. However, implementability of EAS would have likely benefitted from being a more ongoing process. That is, several iterations of development, testing, and adjustments together with stakeholders before commencing experimental testing. Tools for doing so are now tailored to intervention and implementation science, such as prototyping inspired by human-centered design (Lyon, Brewer et al., 2020) and agile science methods (Klasnja et al., 2017).

9.5 Common elements-methodology: beyond specific practices

The common elements review provided the co-design teams with options for developing an academic intervention, and we were able to integrate the most common practice and process elements into the EAS core elements. While the four most common elements became the four core practice elements of EAS, the four other common practice elements were also included in EAS. For instance, psychoeducation in the form of educating parents about how and why their involvement in their children's academic life influence academic learning became a component of the parent training. Literacy training in the form of paired reading became a component of the structured tutoring, and formulating explicit goals were included in the first session. As discussed in the previous section, we may have included too many elements and could have benefited from optimizing a more limited number of them. To help choose among the common elements, supplementary information from the review could have been used purposefully, such as giving more weight to results in contextual circumstances that more closely resemble the local CWSs.

The identification of common combinations, or conjunctions, of common elements in the review, instead of focusing primarily on practice elements, had notable implications. While the practice elements provided relatively "fixed" information (i.e., concrete activities that were used, or not used, such as structured tutoring), process elements offered more tailorable information. For instance, tutoring was found effective using direct instruction from a tutor, a parent, a peer, and computer applications. Effective tutoring was done individually and interactionally, while other elements were not effective in groups. Tutoring did not necessarily need high intensity, but it had to be repeated over time, and with different ways of progressing in difficulty that had to be tailored to individual needs. Such process elements

may represent the more malleable features of an intervention that developers and stakeholders can tailor to contextual needs or use as adaptation options.

Also, substantial barriers to implementability may relate to accommodating such process elements. The processual aspects of an intervention or an implementation typically occupy the most time and capacity, both for clients and practitioners, making these processes vulnerable to drift or breakdown. A practice may only exist in a limited moment in time (i.e., an activity in a session with a family). However, the process that practice is meant to potentiate often needs to persist (i.e., be or become) over a more extended period. For instance, a family may need to gradually implement changes in behavior at home to facilitate a process of change becoming internalized. A practitioner may need to maintain a trusting relationship with the family and provide feedback and support over time. The processual aspects of interventions, such as consistency in reading practice progressing in difficulty over time, may even be the more causally powerful features of interventions, compared to other contributing features such as the specific activities (e.g., a particular type of reading instruction) or the relationship with the practitioner (e.g., a trusting alliance). Thus, neglecting process elements in common elements reviews may be missed opportunities to identify crucial conditions and contributors to improving both the implementation and effectiveness of interventions. Such inquiries resonate with the emergence of process-based interventions emphasizing the core mediators and moderators of process changes as primary targets for interventions (Hofman & Hayes, 2020).

In the co-design of EAS, our primary focus was on the implementability of activities in a practice situation - a specific moment *in* time, with less emphasis on facilitating the necessary processual aspects of them *over* time. With a more explicit focus on how process elements fit with the contextual circumstances practitioners work in, we could have, for instance, avoided designing core elements that practitioners working as generalists had limited opportunity to adhere to over time. Also, we could have differentiated intervention complexity based on opportunities to adhere to necessary processes. Further, we could have optimized practitioners' conditions to provide continuous ongoing support and feedback to families by implementing strategic nudges and choice architecture (e.g., automated reminders and feedback reports calibrated with schedule). Doing so would likely *afford* and motivate practitioners to maintain important process elements with less cognitive strain and capacity use.

The example above also illustrates how specific implementation elements (i.e., discrete implementation strategies) can be linked to specific practice- and process elements.

Continuing to view interventions and implementations separate from each other may preserve the translational gaps that challenge implementation of interventions and their replicability. In intervention and implementation science currently, including the KOBA-study, we typically conceptualize and study the intervention and the implementation as two different complex interventions. However, by conceptualizing the implementation of a specific practice as a necessary condition in its theory of change, we may purposefully connect intervention and implementation science in a way that can help alleviate the research to practice disconnect. Common elements reviews can identify commonly effective conjunctions of practice-, process-, and implementation elements across settings in efficacy and real-world effectiveness research. These effective conjunctions may represent combinations of elements that comprise an appropriate fit between an effective practice and real-world contextual requirements and constraints.

In our review of common elements of OSTA interventions (paper 1), finding such combinations was limited by poor reporting of implementation strategies in the primary studies. With the emergence of more detailed reporting standards both for implementation strategies (e.g., Leeman et al. 2017), evaluation of interventions (e.g., Montgomery et al., 2018), and element-level details in evaluations (Dymnicki et al., 2020), the usefulness of reviewing such combinations will increase. In paper 1, we also suggest reporting element-level data on dosage and fidelity (e.g., adherence, competence, and adaptations), which will enable reviews to reduce bias and increase the validity of their results.

9.6 The prospect of common elements and element-level evidence

Doing common elements reviews based on the scientific literature includes bias that needs consideration in interpretations of the results. The bias inherent in the results of primary studies is transferred to the results of the review, and additional bias such as publication bias, confirmation bias, and what I have coined 'popularity bias' is added (i.e., tendency to include elements that are popular, regardless of the elements' effectiveness, appropriateness, or frequency in ineffective interventions). In paper 1, we suggest ways of mitigating these biases, such as (1) accounting for inclusion in ineffective and harmful studies, (2) facilitate inductive coding in addition to the deductive coding based on pre-defined taxonomies, (3) weighting interpretations based on risk of bias and publication bias, (4) and provide nuance to results by using dosage and fidelity-data from primary studies. However, a more substantial decrease in bias can be obtained by using individual participant data (IPD) in common elements reviews.

IPD meta-analyses are increasing and offer substantial advantages over aggregate data meta-analyses to improve statistical power and reduce bias (Riley, 2010). The common elements-methodology for this study was developed with individual data and other big data approaches in mind, such as machine learning. The emphasis on coding combinations of elements, processes, participant characteristics, and other (unlimited) types of study characteristics with unique identifiable IDs makes the underlying logic advantageous for IPD analyses and compatible with big-data programming. IPD availability is likely to increase, and an IPD sharing statement is now mandatory in registrations of evaluation trials at Clinicaltrials.gov. When IPD becomes more widely available, combining IPD with element-based coding systems such as the one developed for this study, on the level of individuals instead of populations, can enable well-powered statistical testing of the mechanisms of change in interventions and implementation. Such testing can discern when and for whom these mechanisms are, and are not, likely to be caused or regulated. With mixed methods-data available from individuals (i.e., quantitative and qualitative narratives), complementary perspectives can be used to study the same causal mechanisms. However, there are ethical questions attached to IPD, particularly regarding large databases accumulating IPD and using machine learning to increase precision in predicting behavior and outcomes. Data protection laws will likely regulate the potential progression to which common elements-approaches can contribute. Whether IPD will be widely available or not, a natural progression of common elements-approaches is using big-data with sophisticated statistical models and artificial intelligence. Such approaches are in development in the field of behavior change (Michie et al., 2017), which has substantial overlap with both intervention and implementation science.

9.7 Limitations

Paper 1. Common elements of Out-of-School-Time (OSTA) interventions

As previously described, common elements are not empirical research evidence in themselves. Instead, they are informed by accumulations of empirical evidence (i.e., evidence-informed, not evidence-based) and need to be interpreted accordingly. Also, in being a synthesis of published literature, common elements reviews are subject to publication bias, which we did not assess in our review. Further, analyses based on frequencies introduce popularity biases (i.e., tendency to include popular elements). Implications of common elements may vary according to paradigm orientation. However, most orientations would necessitate that common elements cannot have precedence over professional opinion or client preferences in practice.

The original literature search for the review was conducted in April 2016, while the pragmatic review of studies from the updated search (between April 2016 and November 2019) did not fully replicate the original rigorous review procedure because of capacity constraints. I may have missed relevant studies when I screened abstracts from the updated search, which could have influenced the review results.

The average publication year of included studies was 1997. Even though we found that many specific practices used in OSTA interventions remain relevant today (e.g., direct instruction tutoring), other potentially more effective elements may have recently emerged (e.g., game-based tutoring applications, virtual reality learning). Therefore, it is important to interpret common elements results as a reflection of the research literature available from the time periods of the studies reviewed, and publication year may be a relevant factor to account for in analyses.

Figure 4

Risk of Bias in Included Studies Assessed Using Cochrane Risk of Bias Tool
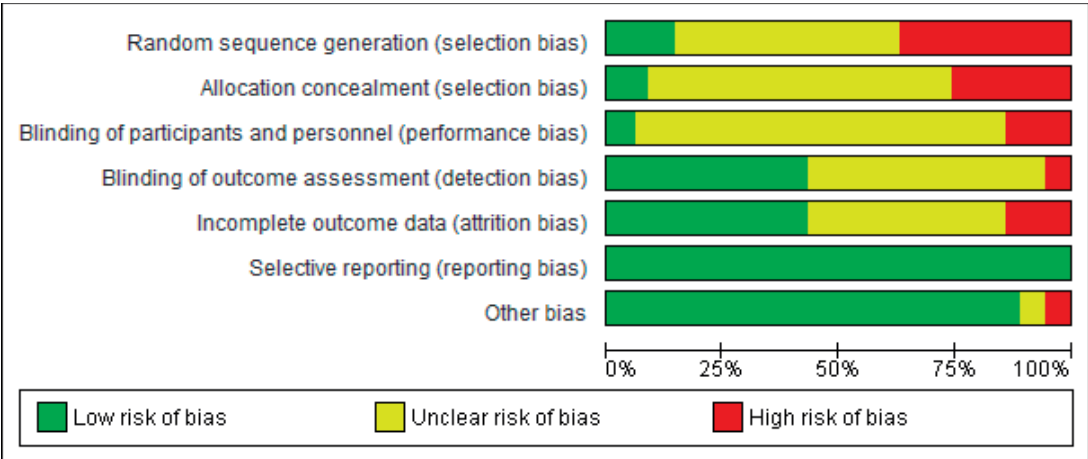
As depicted in figure 4, there were notable biases in the primary studies that influence the review results. Several studies were non-randomized or did not specify a randomization procedure, which limits grounds for causal inferences about their experimental interventions. Several studies also lacked in reporting handling attrition and outcome assessment, making the risk of these biases unclear. Insufficiencies in reporting may reflect several studies being published before reporting standards were widely disseminated and used. We excluded studies with a substantial risk of bias. However, weighting results based on risk of biases in included studies could provide more appropriate interpretations of results. As discussed in the paper, there are valid arguments for weighting results differently based on risk of specific types of bias (e.g., blinding participants in social interventions might be less important than

random allocation) and other characteristics of studies (e.g., use of active or passive comparison conditions).

We were unable to obtain intervention manuals for all interventions and had to code these interventions based on information available from scientific papers, appendixes, evaluation reports, and dissertations. Lacking descriptions of the intervention and study characteristics limit the amount and precision of details coded. Also, implementation science has established that effectiveness studies often have varying extents of correspondence between intervention manuals and adherence to the manuals when used in the study. This is a severe limitation inherited by common elements-reviews that threatens the validity of the results. Future reviews should code dimensions of fidelity (e.g., adherence and adaptations) and account for them in results and interpretations when possible.

Paper 2. Protocol for the KOBA study

This protocol paper does not have results, and the trial is currently ongoing. I will mention some limitations in how we protocolled the study that is particularly relevant for this thesis's work. Because EAS consists of four core elements that are meaningful entities on their own, a randomized factorial design could have been used to test each core element's effects or the effects of specific combinations of elements and implementation strategies. Such designs could test the potential effectiveness of several conditions (i.e., "ingredients" of EAS and its blended implementation strategy), which could inform optimization of the intervention and implementation before testing its population-level average effects as one condition (i.e., an ecological program). However, doing so would increase implementation demands and prolong the translational process.

We conceptualized the implementation process as a vessel for transferring the intervention into practice, which is a common way to view interventions' implementation. This led us to develop separate theories of change for EAS and the implementation of EAS. In doing so, we missed opportunities to theoretically connect implementation, intervention, and context, which could have improved implementability of specific practices. For instance, we might have already at the conception of EAS developed adaptations for practitioners working as generalists to make core elements implementable despite the inclusion process elements that were less feasible for them, such as home visitation and frequent follow up. We could have also developed specific adaptations and training components for practitioners typically working the most severe cases and used more intensive ongoing coahing with them.

Lastly, we did not plan for routine measurement of important proximal functions and outcomes of core elements. Instead, we planned for routine audit and feedback using

measures of adherence to core elements and components, adaptations, client comprehension, and child and parent satisfaction and involvement. Frequent measurements of, for instance, parental involvement and academic communication, children's academic motivation and self-efficacy, tutoring and homework completion, and school attendance and class participation could increase our understanding of how EAS potentially works and improve the internal validity of more distal effect estimates after the trial. We did, however, plan for measuring these outcomes retrospectively through questionnaires and qualitative interviews (see theory of change in appendix). The proximal measures mentioned above would have perhaps been more appropriate quality assurance measures considering that the study is conducted in natural practice settings requiring responsiveness to individual needs, and because the intervention is experimental. Also, feedback based on these measures would likely be more informative and motivational for practitioners and clients than traditional intervention fidelity measures (i.e., adherence to core elements).

Paper 3. Predictors of implementation climate in child welfare services

The development of scales for job satisfaction and job stress did not adhere to best practice guidelines for scale development (Boateng et al., 2018). Using face-validity, we chose items from a larger readiness-questionnaire we developed for the study to index the two constructs and proceeded with psychometric testing. Doing psychometric testing with the complete 32-item questionnaire could have yielded a different factor structure. Also, implementation climate is theorized as a unit-level construct that can be influenced by characteristics across levels in the unit's inner and outer setting (i.e., individuals, teams, departments, organizations, systems). Therefore, multi-level and cross-level analyses can often be appropriate in measuring associations across levels of analysis. As few studies had investigated individual-level predictors of perceptions of IC, single-level analysis was found suitable to test the hypotheses in this study (Kozlowski & Klein, 2000). Finally, the use of the term "prediction" in this study does not necessarily infer causality.

Paper 4. Implementability of Enhanced Academic Support

This case study has several limitations. The sample size of both quantitative and qualitative data was small, and the results are largely descriptive and interpretive. Therefore, the data quality and subsequent inference transferability is limited and calls for cautions in implications (Cresswell & Clark, 2018). We were also unable to recruit participants from one of the three implementation sites to participate in qualitative interviews. No prior study has, to our knowledge, used the quantitative measures in CWSs (several underways). Thus, we have

no data available from other interventions in CWSs to compare scores with yet, which limits the grounds for interpretation of the quantitative results. This study also viewed implementability through the lens of practitioners and supervisors only, while the perspectives of families engaged in EAS will be explored in interviews planned for 2021. There is also a risk of increased researcher bias in the paper, seeing as I was involved in developing the intervention, implementing the intervention, conceptualizing the mixed methods study, did the two interviews with supervisors, and participated in analyses.

10. Future directions

Future experimental studies of EAS should consider using factorial RCTs or other dismantling trials to study each core element in isolation and in combinations. Such trials should measure both implementability, proximal outcomes, and long-term effects. Complementing these trials with phenomenological and realist evaluation can be appropriate to study mechanisms and narratives from multiple perspectives. Such studies may also consider experimentally testing different degrees of flexibility in intervention structure to discern what configurations of fidelity produce the most value, and use qualitive methods to explore how. Similarly, experimental studies may consider testing universal implementation strategies (i.e., the same training and supervision for all) against differentiated strategies based on practitioners' preferences and needs (e.g., more intensive training and supervision to practitioners typically working the most severe and complex cases), and compare cost-effectiveness. The mechanisms theorized from findings in paper 4 may inform hypotheses for such studies.

Before experimental trials, studies should do iterative cycles of testing and adjusting EAS and implementation strategies with relevant stakeholders. The structured tutoring components may require improved usability to ensure they can help close learning gaps. Results about the effectiveness of EAS for children and families in the KOBA-study will likely influence implications from this thesis. Regardless of those results, however, EAS should not be implemented without appropriate quality assurance.

Future efficacy and effectiveness research should include measures of implementability to test how implementability is associated with intervention fidelity, sustainment, and scalability. More mixed-methods studies of implementability with larger samples are also needed, preferably across different interventions and contexts. Such studies may identify specific content and design characteristics that tend to favor particular

practitioner profiles and contexts. They can also test whether such profiles are moderated by characteristics in the implementation climate, such as job satisfaction and job stress. There are also needs for testing how implementation climates shape implementation over time and, for instance, whether job satisfaction can causally explain implementation determinants and outcomes. To assess implementation climate in Norwegian CWSs, the Norwegian translation of the Implementation Climate Scale can be a pragmatic tool. Future use of the translation should specify how respondents should interpret the term 'evidence-based practice.'

Future common elements reviews should review combinations and conjunctions of different types of intervention elements and contextual characteristics. They should focus on intervention implementation and processes in addition to practice techniques and activities. Data on fidelity dimensions and common factors should be utilized in common elements reviews when available, and approaches for reducing and accounting for bias should be used to improve the validity of results. The future of common elements reviews depends on progressions in intervention and implementation science in general. However, common elements reviews are likely to transition into big data- and IPD approaches with sophisticated statistical models and artificial intelligence. The use of such approaches includes ethical concerns that have to be addressed.

Future translational work may consider using the modality of implementability to inform intervention development and research throughout the translational continuum. Doing so may help ensure interventions are implementable in their intended non-research contexts. Implementability is context-specific, and contextually relevant stakeholders should be included as key informants and collaborators in ensuring implementability.

Development and implementation of interventions for complex practice contexts such as in CWSs may benefit from conceptualizing the intervention within the larger ecology of practice across the intended context. Doing so would include considering how the intervention's core elements can co-exist, combine with, or replace existing practices. Also, intervention quality should be operationalized as the value produced by dynamic configurations of adherence to the intervention's core elements and appropriate responsiveness to unique needs, preferences, and contextual circumstances. Measuring the important functions and proximal outcomes core elements are meant to contribute to can indicate the immediate value. For instance, in future use of EAS, that would entail measuring the achieved motivation and intentions for parental school involvement instead of measuring whether parent psychoeducation components were completed as protocolled. Such quality-systems may also be pragmatic, informative, and motivational for practice because functions

and proximal outcomes are the immediate observable changes practitioners and clients can experience that will, in theory, lead to sustained improvements over time. Further, more long-term value indications should include considering value and consequences in relation to the larger practice ecology, and not just one intervention or problem-domain.

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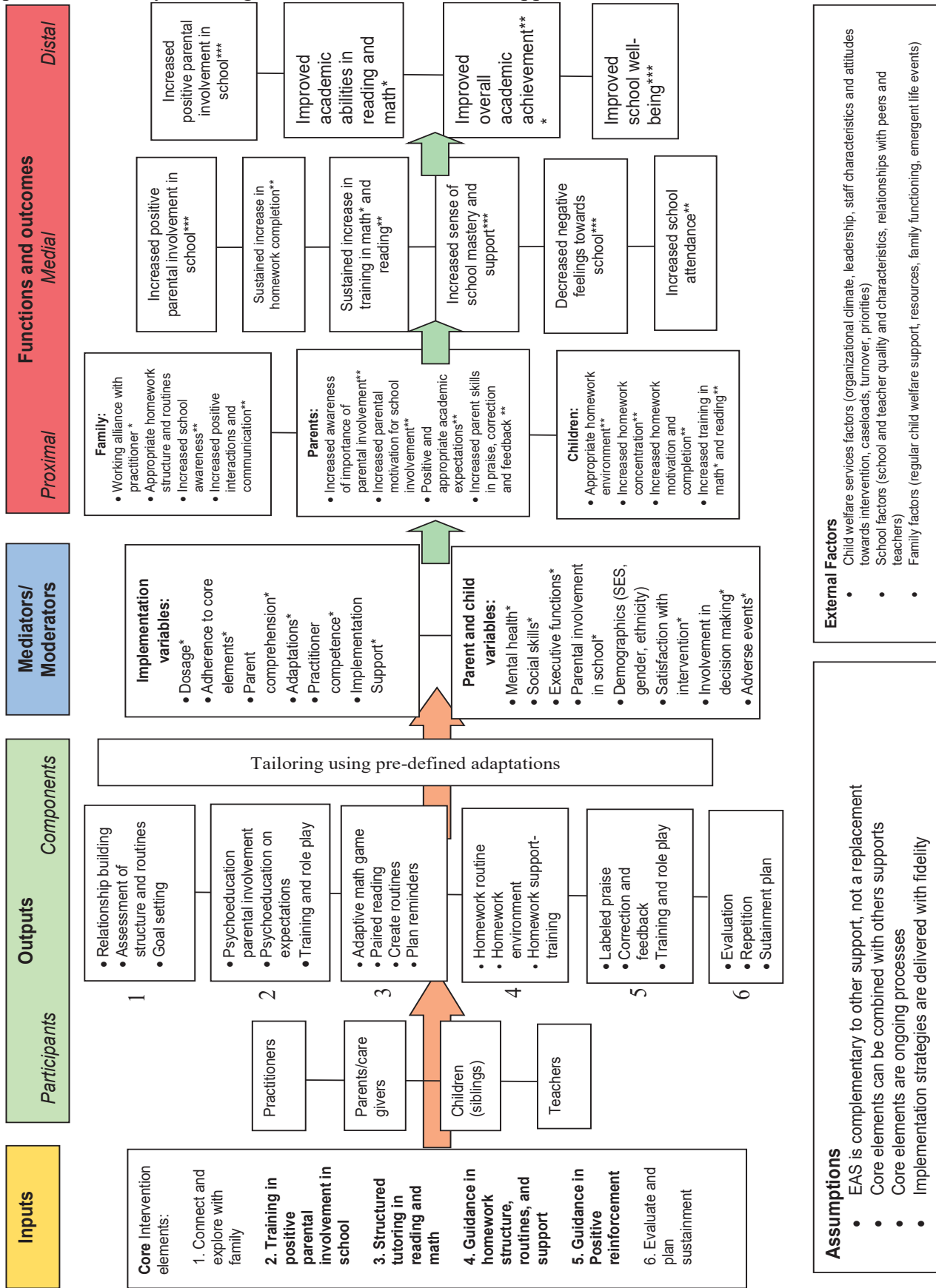
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Appendix 1: Theory of change in Enhanced Academic Support

Inputs

Core Intervention elements:

1. Connect and explore with family

2. **Training in positive parental involvement in school**

3. **Structured tutoring in reading and math**

4. **Guidance in homework structure, routines, and support**

5. **Guidance in Positive reinforcement**

6. Evaluate and plan sustainment

Outputs

Participants

- Practitioners
- Parents/care givers
- Children (siblings)
- Teachers

Components

1.
- Relationship building
- Assessment of structure and routines
- Goal setting

2.
- Psychoeducation parental involvement
- Psychoeducation on expectations
- Training and role play

3.
- Adaptive math game
- Paired reading
- Create routines
- Plan reminders

4.
- Homework routine
- Homework environment
- Homework support-training

5.
- Labeled praise
- Correction and feedback
- Training and role play

6.
- Evaluation
- Repetition
- Sustainment plan

Tailoring using pre-defined adaptations

Mediators/ Moderators

Implementation variables:
- Dosage*
- Adherence to core elements*
- Parent comprehension*
- Adaptations*
- Practitioner competence*
- Implementation Support*

Parent and child variables:
- Mental health*
- Social skills*
- Executive functions*
- Parental involvement in school*
- Demographics (SES, gender, ethnicity)
- Satisfaction with intervention*
- Involvement in decision making*
- Adverse events*

Functions and outcomes

Proximal

Family:
- Working alliance with practitioner *
- Appropriate homework structure and routines
- Increased school awareness**
- Increased positive interactions and communication**

Parents:
- Increased awareness of importance of parental involvement**
- Increased parental motivation for school involvement**
- Positive and appropriate academic expectations**
- Increased parent skills in praise, correction and feedback **

Children:
- Appropriate homework environment**
- Increased homework concentration**
- Increased homework motivation and completion**
- Increased training in math* and reading**

Medial

- Increased positive parental involvement in school***
- Sustained increase in homework completion**
- Sustained increase in training in math* and reading**
- Increased sense of school mastery and support***
- Decreased negative feelings towards school***
- Increased school attendance**

Distal

- Increased positive parental involvement in school***
- Improved academic abilities in reading and math*
- Improved overall academic achievement** *
- Improved school well-being***

External Factors
- Child welfare services factors (organizational climate, leadership, staff characteristics and attitudes towards intervention, caseloads, turnover, priorities)
- School factors (school and teacher quality and characteristics, relationships with peers and teachers)
- Family factors (regular child welfare support, resources, family functioning, emergent life events)

Assumptions
- EAS is complementary to other support, not a replacement
- Core elements can be combined with others supports
- Core elements are ongoing processes
- Implementation strategies are delivered with fidelity

*measured quantitatively, **measured qualitatively, ***measured both quantitatively and qualitatively

I

Paper 1

Common Elements of Practice, Process and Implementation in Out-of-School-Time

Academic Interventions for At-risk Children: a Systematic Review

Common Elements of Practice, Process and Implementation in Out-of-School-Time Academic Interventions for At-risk Children: a Systematic Review

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Abstract

Academic achievement is a strong preventive factor against marginalization. Children at risk of academic failure and drop out can benefit from out-of-school-time academic (OSTA) interventions. Wide-scaled implementation and sustainment of effective interventions remain a struggle across education, welfare, and health. The need for approaches to increase implementability, effectiveness, and efficiency of interventions is pressing. Advancements in the field of education and mental health suggest identifying and studying discrete elements that are common across interventions for the purpose of hypothesis generation, intervention optimization, design improvement, and implementation. This review identified OSTA interventions for primary school children at risk of academic failure. Common elements methodology was used to code practice elements ($n = 62$), process elements ($n = 49$), and implementation elements ($n = 36$) in 30 effective and six ineffective OSTA interventions in matrices. Based on frequency counts, common practice, process, and implementation elements across the interventions were identified, and given frequency count values (FV) reflecting how often elements were included in effective studies as opposed to in ineffective studies. The five common practice elements with the highest FVs were homework support, training in positive parental school involvement, positive reinforcement, structured tutoring, and psychoeducation. The most common process element was regular support to intervention receiver, and the most common implementation element was quality monitoring. Common combinations of elements were also identified and given FVs. Results from this review can inform efforts to design or optimize OSTA interventions, and inform education, implementation, and practice to improve academic achievement for children at risk.

Keywords Academic interventions · Common elements · Practice elements · Process elements · Implementation elements · Children at risk · Primary school children · OSTA interventions

Introduction

Poor academic achievement and school dropout are among the unfavorable outcomes experienced by children exposed to poverty, unstable home environments, involvement with child protection services, and poor parenting skills (OECD 2016). Children at risk often develop gaps in knowledge early in their academic careers. These early educational shortcomings often exacerbate over time and contribute to academic failure and dropout in later school years (Sebba et al. 2015). Academic achievement is a strong protective factor against marginalization in adulthood (Johnson et al. 2010). Children at risk who achieve academically are less likely to experience illness, to use drugs, to engage in criminal behavior, and to become recipients of welfare services (Berlin et al. 2011). Thus, preventing academic failure can be valuable to children

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at risk, which in turn may result in social and economic returns for society at large (OECD 2016). Out-of-school-time academic (OSTA) interventions may be effective in promoting academic achievement for children at risk (Knopf et al. 2015). Interventions delivered outside of school hours avoid the potential stigma associated with receiving special education in class or being removed from the classrooms. OSTA interventions also do not re-place the regular classroom curriculum. Furthermore, in-volving parents in academic interventions at home can improve children's educational achievement (Wilder 2014).

OSTA interventions, such as Teach Your Children Well (Maloney et al. 1990) or On The Way Home (Trout et al. 2012), often consist of multiple academic and psychosocial elements. Some elements directly target academic skills (e.g., tutoring), some focus on behavior (e.g., use of home-work contracts and routines), and others may target moti-vation and emotions (e.g., positive reinforcement and self-regulation). Typically, these elements are structured and sequenced following an instructive manual, and adopting the intervention includes comprehensive implementation strategies requiring infrastructure and resources to obtain and maintain intervention fidelity. Many OSTA interven-tions share these features with evidence-based psychoso-cial interventions for children and families. The well-engineered nature of many evidence-based interventions likely contributes to their effectiveness. However, their re-source and implementation demands, multitude of ele-ments, and structural rigor can make them complex to im-plement and sustain as intended (Hogue et al. 2017). In addition, they usually target single outcome domains. Schools and welfare services often require several different interventions to cover the width of educational and psycho-social outcomes they need to address, but successfully implementing multiple complex interventions is not al-ways feasible. This offers some explanation as to why widespread adoption and population level impact from evidence-based interventions appear to be limited (Glasgow et al. 2012; Lau et al. 2015). To increase the reach of effective interventions at scale, there is a need for ways to decrease intervention complexity and improve *implementability* (feasibility, appropriateness, acceptability and usability, Lyon and Bruns 2019) without compromis-ing effectiveness, and to identify interventions that can be effective across multiple outcome domains.

Disentangling interventions into discrete elements can fa-cilitate re-design of interventions and alternative modes of delivery that are potentially less demanding to implement and sustain (e.g., single element practices or leaner combina-tions compared with more complex multi-element interven-tions). OSTA interventions are likely to share elements that may or may not be important for intervention effectiveness,

and we do not know whether all practical and structural ele-ments of an intervention are necessary. Further, there might be specific elements across interventions that have a stronger potential for effectiveness than others, and some might be effective across multiple outcome domains. To answer these questions, researchers can benefit from evidence-informed hy-potheses about what the effective elements and combinations of elements are, and which are expendable. Elements that are frequently shared among effective interventions are more like-ly than less frequent elements to contribute to effectiveness. Identifying these *common elements* can inform studies of in-tervention optimization and design for improving implementability, efficiency, and effectiveness (Chorpita et al. 2011). To date, several studies have identified common elements of various psychosocial interventions (e.g., Hogue et al. 2017) and psychotherapy (e.g., Okamura et al. 2019). Results from these studies have been used for design of mod-ular and element-based interventions tailored to individual needs (e.g., Murray et al. 2018), empirical testing of singular elements (e.g., Leijten et al. 2015), and to inform training and consultation in children's mental health services (e.g., Dorsey et al. 2016). To our knowledge, no prior study has systemat-ically identified the common elements of effective OSTA in-terventions for children at risk.

In this review, we used a novel common elements methodology to identify discrete intervention contents and characteristics frequently shared by effective OSTA interventions. We distinguish between practice, process, and implementation elements. *Practice elements*, also known as *specific factors* in the psychotherapy literature (Mulder et al. 2017), are specific activities or actions used to evoke or influence an outcome (e.g., positive reinforce-ment). A practice element, however, might affect change differently depending on how, for whom, and under what circumstances it is delivered and implemented. *Process elements* cover these delivery forms and contexts (such as *home visitation* or *role-playing* in parent training). *Implementation elements* are discrete strategies to facili-tate or enable the delivery of practice and process ele-ments (such as *ongoing training* or *tailoring to context*). Additionally, we identify common combinations of prac-tice, process, and implementation elements in effective interventions. Analyses of frequencies do not merit con-clusions about the effectiveness of elements. However, we assess frequencies of the most common elements and combinations in effective interventions across different academic outcomes, while also taking into account the frequencies with which they appear in ineffective or harmful interventions. This approach provides additional nuance to interpretation of common elements. The results can help generate new hypotheses about what combina-tions and interactions of elements, factors, and character-istics that are likely to cause, mediate, or moderate change
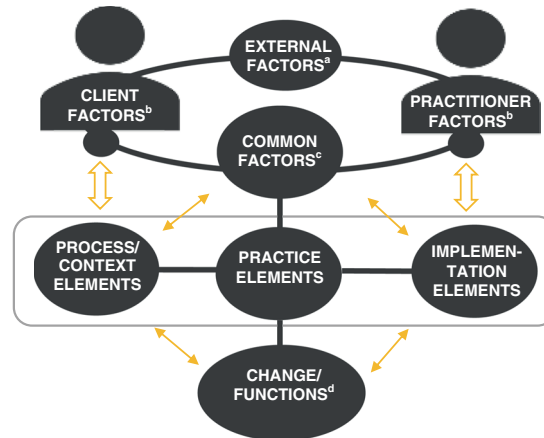
Fig. 1 Factors and elements causing change mechanisms in an interaction between a practitioner and a client. Elements in focus in this review are placed inside the rectangular box. [a]Examples of external factors can be social norms, culture, and government policies. [b]Examples of client and practitioner factors can be personality, biology/genomics, values, motivation, and competence. [c]Examples of common factors can be therapeutic alliance, allegiance, and epistemic trust. [d]Functions refer to a proximal change that might serve as a mediator to a medial target outcome (such as motivation, engagement, or altered behavior). Figure created in MS word

in OSTA interventions across different academic outcomes (Fig. 1).

Methods

Research Questions

What are common practice, process, and implementation elements of effective OSTA interventions for primary school children at risk?

How frequently are the most common elements used in effective OSTA interventions, and how frequently are the common elements used in interventions without statistically significant effects (or with harmful effects) on academic achievement?

What are the most frequent combinations of common practice, process, and implementation elements used in effective OSTA interventions, also taking into account the frequency of common combinations in ineffective interventions?

Eligibility (PICO)

Eligible populations included children attending primary school (aged 5–13 years) identified as being at risk of academic failure and/or dropout. This included both children identified through observed academic underachievement (e.g., students with low grade point averages or low scores on academic assessments) and those considered at risk based on their social or family background (e.g., children in foster care and children living in socioeconomically disadvantaged families). Studies on populations with developmental disabilities or other cognitive impairments were excluded.

Eligible interventions included those classified as out-of-school-time academic (OSTA) interventions that aimed to improve academic achievement. We defined an intervention as out-of-school-time when its core elements (i.e., the elements considered indispensable to the intervention) were delivered in an out-of-school environment and outside of school hours. We included methods of tutoring, mentoring, academic training, homework support, and parent training as OSTA interventions. We excluded home schooling used as a substitute for attending public school. We also excluded summer schools because we considered them more similar to a regular school compared with OSTA interventions. Further, regular assigned homework was excluded, as the interventions needed to offer something in addition to the regular curriculum. Finally, we excluded interventions specifically aimed at learning disorders such as dyslexia, aphasia, or processing disorders.

Eligible comparison conditions included no intervention, other academic interventions, and school-based interventions. Eligible primary outcomes were academic achievement measured either by grade point averages or assessments of academic skills in reading, math, or other school subjects. Eligible secondary outcomes were parental engagement/involvement in school and any adverse events or harms (e.g., stigma or missing out on leisure time activities due to receiving academic support, or anxiety due to being indicated as underachieving in school). We included studies with short- (< 2 months), middle- (2–12 months), and long-term (> 12 months) outcome assessments.

Literature Search and Selection

We systematically searched MEDLINE (Ovid), PsycINFO (Ovid), PubMed, The Cochrane Library (CENTRAL,

DARE), ERIC, ISI Web of Science (Science and Social Science Citation Index), Clinicaltrials.gov, OpenGrey, Social Science Research Network (SSRN), Google, and Google Scholar for published and unpublished studies and gray literature. We hand-searched the Campbell Collaboration Library, Youth Services Review, and What Works Clearinghouse. Search strategies for electronic databases included terms (both text words and subject headings) describing compensatory/extracurricular education, combined with terms describing academic achievement, as well as appropriate study designs. Complete search strategies are given in Online Resource 1. The search was conducted on April 01, 2016, without limits on language or publication year. Titles, abstracts, and full texts were reviewed for eligibility by two independent reviewers. Conflicts were resolved by discussion or a third reviewer.

Risk of Bias Assessment

Using the criteria outlined in the Cochrane Handbook for Systematic Reviews of Interventions (Higgins and Green 2011), two review authors (TE and KTH) independently assessed the risk of bias in each study meeting the eligibility criteria. We rated each study at high, low, or unclear risk of bias across risk of bias domains. Disagreements were resolved by discussion. Only studies rated at low or unclear risk of bias across a majority of domains were included in the common elements analyses.

Effectiveness Classification

We classified interventions in the included studies as either positively effective, ineffective, or negatively effective per outcome. For randomized controlled trials, we classified interventions as effective if at least one effect measure on a primary or secondary outcome was statistically significant ($p < .05$). For non-randomized controlled trials and interrupted time series, we classified interventions as effective if there was at least one statistically significant difference between the intervention group and the comparison group on a primary or secondary outcome, and there was a statistically significant pre to post change on the same outcome. Interventions that could not be classified as effective were classified as ineffective. An intervention classified as effective for one outcome (e.g., reading) could also be classified as ineffective for another outcome (e.g., math). Common elements analyses were done per outcome, and the coding procedure allowed for three different outcomes to be coded. The three primary or secondary outcomes that most frequently were significantly affected by an intervention were chosen for common elements coding and analyses.

Gathering Study Information

In addition to publications identified in the database search, we searched the internet for intervention manuals to inform the data extraction for each included study. We used piloted forms to extract the following data: methods (study design, timing of outcome measures, whether intention-to-treat analyses were used), information about participants (age, gender, type of risk, number of participants, attrition, reach), details on interventions and control conditions, outcome measures, funding source, and publication type.

Coding of Elements

We coded the elements using a manual developed by two of the authors (TE, HK, Online Resource 2), inspired by Chorpita and Daleiden's (2009), distillation and matching procedure which combines data-mining techniques, frequency counts, and interaction-detection algorithms. In our review, we distinguish between *practice elements* (such as training in paired reading), *process elements* (such as home visitation to provide dyadic training in paired reading), and *implementation elements* (such as ongoing training to practitioners delivering training in paired reading). In addition, we adopted current classifications and definitions of implementation elements from the implementation science literature (Powell et al. 2015).

We coded elements in a Microsoft Excel matrix. Coding options (elements available for coding) were prepared, but not forced. Using consensus mapping with coders, elements that were anticipated to be included in studies were listed in the matrix a priori. During coding, coders were also encouraged to identify new unanticipated elements in addition to the listed in the matrix. New unanticipated elements were discussed and added if coders agreed they were different from prepared elements. Subsequently, coders reviewed the interventions again to look for unanticipated elements added during first round of coding. This procedure was chosen to reduce confirmatory bias and to facilitate discovery of novel elements. Four pairs of coders independently coded each intervention in separate matrices. Conflicts were resolved by discussion or a third coder. Percentage of agreement between each coding pair and all coders together was calculated based on each coder's amount of coding input and amount of coding conflicts (differences between coder's inputs). Information about coders is reported in Online Resource 1.

Identification of Common Elements and Combinations

We counted frequencies to identify the most frequent practice elements of effective interventions. We then matched the practice elements with process and implementation elements and

characteristics that were most frequently used with the practice elements when the interventions were effective. We also identified combinations of practice elements most frequently used in effective interventions. Further details are provided in Online Resource 2. All elements were given a frequency count corresponding with the number of times they were included in studies with significant positive effects on the three most frequently affected outcomes. To our knowledge, no cut-off exists to define what is considered *common* in a selection if interventions. Based on convenience, we defined the 25% most frequent elements in the included effective interventions as *common elements.*

Ineffective Interventions and Frequency Count Values

We also coded practice elements in ineffective interventions. A traditional vote-counting procedure (Bushman and Wang 2009) was used to determine a frequency count value (FV). If a common practice element was included in an intervention classified as ineffective, a frequency count of one was deducted from the total frequency count of that practice element and from the process and implementation elements used in combination with that practice element. This approach provided a total FV reflecting how often the element was included in effective interventions minus the number of times it was included in ineffective interventions. If a common practice element was included in a harmful intervention (negative effect on outcome), a frequency count of two would have been deducted. However, no interventions with negative effects were identified in the review.

The vote-counting procedure was performed to reduce *popularity bias*, which can be defined as the tendency to include elements that are frequently used in interventions based on the element being perceived as important, regardless of the elements' effectiveness, appropriateness, or frequency in ineffective interventions. FVs are, however, likely skewed because of publication bias (Easterbrook et al. 1991).

Results

As depicted in Fig. 2, we identified 50 eligible studies in 61 publications after reviewing 9.876 unique records. Titles and reasons for exclusions are given in Online Resource 1. Of these, two did not meet our risk of bias criteria, and 12 did not provide enough data to classify effectiveness. We included 36 independent studies of 30 effective interventions and 6 ineffective interventions for common elements analyses based on information from 29 articles, 5 dissertations, 3 evaluation reports, and 7 intervention manuals. Summaries of study characteristics are given in table 1 (available online).

Included OSTA Interventions

Effective Interventions Eleven effective interventions were parent mediated and typically included different parent training elements in academic involvement. Nine interventions were child-focused interventions including tutoring and other academic enhancement activities and support, and six interventions were combinations of the above. Three interventions were after school programs, one intervention targeted child self-regulation, and another targeted child self-esteem.

Ineffective Interventions Six interventions were classified as ineffective. No studies reviewed reported negative or harmful effects. Five of these had positive trends or significant effects on at least one outcome measure but did not meet effectiveness classification criteria. Two interventions were after school tutoring and academic support programs, one after school program combined child tutoring and support with parent training, two interventions were parent-mediated child tutoring, and one after school program focused on sports and homework support. Risk of bias assessments of included studies and elaborate descriptions of study and intervention characteristics are available in Online Resource 1.

Common Practice, Process, and Implementation Elements (Research Question 1)

We identified 62 discrete practice elements in 36 OSTA interventions for children at risk. The 25% most common practice elements were *structured tutoring*, training and guidance in *parental school involvement at home*, training and guidance in *homework support*, various forms of *literacy training*, *positive reinforcement*, *psychoeducation*, *correction* and *immediate feedback*, and *use of explicit goals*. Reading abilities ($n = 21$), mathematical abilities ($n = 6$), and grade point average (GPA, $n = 6$) were the three most frequently statistically significantly affected outcomes. Frequency counts for each common practice element per outcome are depicted in Table 1. Frequency counts for remaining practice elements are given in table 2 (available online).

We identified 49 discrete process elements in the interventions. The most common process elements overall were *regularly support to receiver*, *use of educational material*, *delivered by professional (4 years of relevant education or more)*, *repeated training*, *received by caregiver*, *delivered by caregiver*, *low intensity*, and *long duration* (less than 3 h a week, more than 4-months), *1-on-1 delivery*, and *multi-element intervention*. We identified 36 of the 73 pre-defined implementation elements used to implement the interventions. The most common implementation elements overall were *quality monitoring*, *providing ongoing consultation*, *distributing educational material*, *conducting educational meetings*, *clinical supervision*, *conduct ongoing training*, *use train the trainer*, and *involve end-users*.
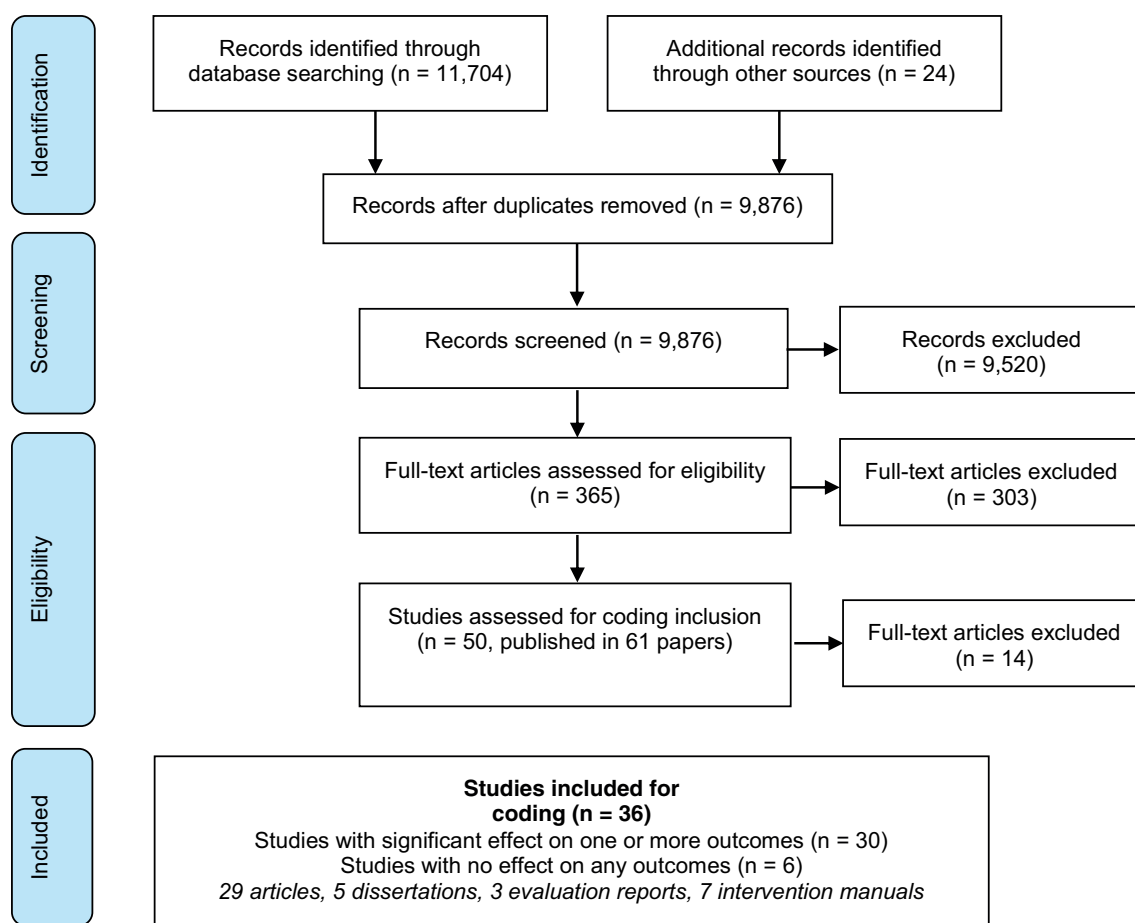
Records identified through database searching (n = 11,704)

Additional records identified through other sources (n = 24)

Records after duplicates removed (n = 9,876)

Records screened (n = 9,876)

Records excluded (n = 9,520)

Full-text articles assessed for eligibility (n = 365)

Full-text articles excluded (n = 303)

Studies assessed for coding inclusion (n = 50, published in 61 papers)

Full-text articles excluded (n = 14)

Studies included for coding (n = 36)
Studies with significant effect on one or more outcomes (n = 30)
Studies with no effect on any outcomes (n = 6)
29 articles, 5 dissertations, 3 evaluation reports, 7 intervention manuals

Identification | Screening | Eligibility | Included

Fig. 2 Prisma flow diagram depicting number of records identified, screened, assessed for eligibility, assessed for coding inclusion, excluded, and included. Figure created in MS word

Eleven unanticipated elements were identified and included during coding. One of these elements, *direct instruction* as delivery method, was a commonly used process element with effective structured tutoring (FV = 11). Frequency counts for all process and implementation elements are given in Online Resource 1. The mean number of coding inputs per intervention was 170.70 (SD = 97.50). Total coding agreement between coders was at 90.4%. Further coding statistics are provided in Online Resource 1.

Common Elements of Effective and Ineffective Interventions (Research Question 2)

Five interventions classified as effective on one outcome were classified as ineffective on another outcome. Frequency counts for each common practice element's inclusion in effective (+) and ineffective (÷) interventions per outcome category are depicted in Table 1. Frequency count values (inclusion in effective minus ineffective interventions, FVs) are given for each common practice element per outcome category. *Homework support* had the highest FV with 12 for reading, followed by *training in parental school involvement at home*

and *positive reinforcement* with FVs of 10. *Positive reinforcement* and *correction and feedback* had the highest FVs for math with 4. Training in parental school involvement at home had the highest for GPA with FV of 3. Training and guidance in parental school involvement at home, positive reinforcement and praise, psychoeducation, and use of explicit goals were used in interventions with positive FVs across all three outcomes.

FVs of process and implementation elements used together with specific common practice elements are shown in parentheses in Table 1, meaning the FVs accounts for the number of times the process element was used in combination with the specific practice element in effective interventions subtracting the number of times it was used in ineffective interventions. Overall, process elements with peak FVs were *received by caregiver* (14), *delivered by professional* (13), *delivered by caregiver* (13), *1on1 delivery* (12), *repeated training* (12), and *feedback on performance* (12). Implementation elements with peak FVs were *quality monitoring* (13), *distributing educational materials* (12), and *ongoing consultation* (10). However, FVs of process and implementation elements are practice element–specific and vary according to what practice

element they have been combined with. Structured tutoring had the biggest difference between frequency count and FV, with being ineffective in 3 out of 14 interventions on reading, and 3 out of 5 interventions on math. Literacy training had the second biggest difference with being ineffective in 4 out of 11 interventions on reading.

Common Combinations of Elements (Research Question 3)

Commonness of combinations of elements in effective interventions as opposed to ineffective interventions can be read from Table 1 by viewing the row of a common practice element and connecting it to commonly used process elements in column four (e.g., delivered by caregiver), commonly used implementation elements in column five (e.g., quality monitoring), and to other practice elements in the last column that the common practice element were frequently combined with. The most common combination of elements in effective interventions minus in ineffective was *professionals training caregivers* in *parental school involvement at home* and *homework support* combined with *use of positive reinforcement*. In this combination, *organizational materials* were commonly used as intervention aids, *caregivers regularly received intervention support*, and the intervention was commonly implemented using *quality monitoring and educational material*. The second most common combination was similar in terms of process and implementation elements, but without *homework support* and with *psychoeducation* combined with *training in parental school involvement* and *positive reinforcement* instead. The third most common combination was *structured tutoring* combined with *training in parental school involvement at home* and *positive reinforcement*. When structured tutoring was included, the following process elements were more common: *feedback on performance*, *repeated training*, *direct instruction* as delivery method, *progressive difficulty* of tutoring, and use of *educational material*.

Discussion

This review had three main aims: (1) to identify common practice, process, and implementation elements of OSTA interventions, (2) to review how often common elements and combinations of elements were used in effective studies subtracting how often it was used in ineffective or harmful studies, and (3) to identify common combinations of common practice, process, and implementation elements in effective interventions as opposed to in ineffective.

A total of 147 intervention elements were identified in included studies. Of these, 62 were practice elements and eight of these fulfilled criteria as common practice elements. We identified 49 process and 36 implementation elements used in combination with the common practice elements. Eleven unanticipated elements were discovered during coding, one of which turned out to be a common process element (direct instruction as delivery method). This speaks to the importance of allowing discovery of elements during the coding procedure. Using only a priori options increase the likelihood of confirmation bias (identifying expected elements only) and potentially significant elements might go undetected.

The three common practice elements with the highest FVs almost exclusively involved parents (training in parental school involvement at home, homework support, positive reinforcement). This is in line with prior research showing that parental involvement and support is important for children's academic outcomes, especially in the form of positive expectations and home activities to improve learning (Wilder 2014). For instance, we found that training parents in how to engage themselves in their children's academic experiences in combination with psychoeducation often was effective. While psychoeducation provides parents with an understanding of their role in their children's education and why their involvement and expectations are important, training helps parents focus on activities that ameliorate their involvement and expectations appropriately. The results indicate that adding parent training elements in homework support and positive reinforcement can be beneficial as well.

A noteworthy finding is that all 11 interventions training parents in providing homework support to their children were effective. These findings appear to contradict prior studies. Wilder (2014) synthesized nine meta-analyses on parental involvement and concluded that homework support was the least effective element of parental involvement regardless of outcome measure. In the studies Wilder reviewed, homework support was mostly defined as parents helping their children directly with homework or checking homework. We defined homework support as a combination of the following three closely related discrete practice elements: Training and guidance in (1) how to appropriately support and instruct children during homework, (2) appropriate homework structure and routines, and (3) appropriate homework environments. Moreover, we defined checking homework as a separate discrete practice element. When these discrete practice elements appeared in effective interventions, they were always used in combination with other forms of parental involvement, such as academic learning activities at home or facilitating home-school collaboration. Using our definition, only the first discrete element is comparable with homework support reviewed by Wilder. We found no interventions delivering homework support only in the form of helping children with homework, which might explain the contradictive results. Similarly,

Table 1 Common practice elements, common combinations of practice, process, and implementation elements, and frequencies in effective and ineffective interventions

Common practice elements Definitions	Frequency counts						Elements used in combinations with common practice elements		
	Reading (29 studies)		Math (8 studies)		GPA (6 studies)		Process elements (FV[d])	Implementation elements (FV)	Practice elements (FV)
	+ [a]	÷	+	÷	+	÷			
Homework support[b] *Guidance in; appropriate homework structure and discipline (1), homework instruction and support (2), and (3) homework environment*	12 FV=12 (n = 1338[c])		1 FV=1 (n = 105)				• Delivered by professional (4 y. training) (12) • Received by caregiver (11) • Multi-element (10) • Regularly support to receiver (9) • 1on1 delivery (8)	• Quality monitoring (7[d]) • Provide ongoing consultation (7) • Conduct educational meetings (6) • Conduct ongoing training (5) • Involve end-users (4) • Remind practitioners (4)	• Training in parental school involvement at home (11) • Structured tutoring (8) • Use of positive reinforcement (8) • Use of incentives/rewards (7) • Monitor performance (7) • Correction and feedback (FV=7)
Training in parental school involvement at home *Training or guidance in any form of engagement by caregivers to support a child academically at home*	10 FV=10 (n = 1194)		2 FV=2 (n = 177)		3 FV=3 (n = 56)		• Received by caregiver (14) • Delivered by professional (13) • Regularly support to receiver (12) • Use of organizational material (11) • Use of educational material (10) • Multi-element (10)	• Quality monitoring (13) • Distribute educational materials (12) • Provide ongoing consultation (8) • Remind practitioners (5) • Clinical supervision (4) • Conduct ongoing training (4) • Centralized technical assistance (4) • Involve end-users (4)	• Homework support (11) • Psychoeducation (10) • Use of positive reinforcement (9) • Use of incentives/rewards (8) • Structured tutoring (8)
Positive reinforcement and/or incentives[b] *Use of positive responses (1) or incentives (2) to welcomed behaviors or performances*	11 FV=10 (n = 771)	1	4 FV=4 (n = 331)		2 FV=1 (n = 100)	1	• Delivered by caregiver (13) • 1on1 delivery (12) • Use of rewards or incentives (11) • Regular support to deliverer (11) • Delivered at home (11) • Multi-element (9) • Less than 3 hours a week, more 4 months (9) • Use of educational material (9)	• Quality monitoring (11) • Provide ongoing consultation (9) • Distribute educational materials (7) • Remind practitioners (5) • Conduct educational meetings (5) • Involve end-users (4)	• Parental school involvement at home (10) • Homework support (8) • Correction and feedback (7) • Monitor performance (7) • Structured tutoring (7)
Structured tutoring[b] *Direct Instruction from a teacher or an instructor (1), or interactional learning (2) following a curriculum or more or less stringent instruction*	14 FV=11 (n = 1458)	3	5 FV= 2 (n = 1403)	3			• Repeated training (12) • Feedback on performance (12) • Use of educational material (11) • Direct instruction as delivery method (11) • Progressive difficulty (11) • Less than 3 hours a week, more 4 months (10)	• Quality monitoring (9) • Distribute educational materials (9) • Provide ongoing consultation (8) • Conduct ongoing training (5) • Involve end-users (5) • Conduct educational meetings (4) • Feedback in training (3)	• Training in parental school involvement at home (10) • Child reading aloud to someone (9) • Use of positive reinforcement and incentives (9) • Training in parental homework instruction (7)
Psychoeducation *Any form of empowerment and/or educating of the affected using "condition-specific" information.*	7 FV=7 (n = 771)		2 FV=2 (n = 172)		2 FV=2 (n = 56)		• Received by caregiver (8) • Delivered by professional (8) • Delivered in group (5) • Less than 3 hours a week, less than four months (5) • Multi-element (5)	• Quality monitoring (5) • Provide ongoing consultation (4) • Distribute educational materials (4) • Conduct educational meetings (4)	• Parental school involvement at home (10) • Homework support (6) • Literacy training (5) • Positive reinforcement (5)
Correction and feedback *Using specific instruction based on behavior or performance to alter*	7 FV=7 (n = 1354)		4 FV=4 (n = 1403)				• Delivered by caregiver (4) • Feedback on performance (4)	• Provide ongoing consultation (8) • Quality monitoring (6) • Distribute educational materials (5) • Clinical supervision (4)	• Structured tutoring (8) • Positive reinforcement (7) • Literacy training (6) • Homework support (6) • Parental school involvement at home (6)

Table 1 (continued)

unwanted behavior or performance					• Conduct educational meetings (4)	• Use of explicit goals (5)
Literacy training Various literacy training techniques aggregated in one category[e]	11 4 **FV=7** (n = 1458)			• Repetitive training/instruction (10) • Less than 3 hours a week, more 4 months (9) • Use of educational material (8) Progressive (8)	• Provide ongoing consultation (10) • Quality monitoring (7) • Conduct ongoing training (7) • Conduct educational meetings (6) • Clinical supervision (4)	• Structured tutoring (12) • Parental school involvement at home (9) • Homework support (9) • Positive reinforcement (7) • Correction and feedback (5) • Playing reading game (5) • Discussion (5)
Use of explicit goals Targeting explicitly stated proximal or distal goals to be achieved by engaging in the intervention	5 **FV=5** (n = 401)	3 **FV=3** (n = 1326)	1 **FV=1** (n = 77)	• Received by child k 4-7 (7) • Less than 3 hours a week, more than 4 months (6) • Delivered at home (6) • Use of organizational material (6) • Regular support to deliverer (6)	• Provide ongoing consultation (6) • Quality monitoring (5) • Distribute educational materials (5)	• Correction and feedback (6) • Positive reinforcement (5) • Homework support (5) • Parental school involvement at home (4) • Structured tutoring (4)

[a] Frequency count value (FV) = frequency of the practice elements' inclusion in effective interventions (+1) accounted for inclusion in ineffective interventions (-1)

[b] The common practice element is an aggregation of two closely related practice elements

[c] Total amount of participants in the studies where the practice element was used in an intervention

[d] The frequency count value of process elements used in combination with the practice element in effective interventions (+1) accounted for in ineffective interventions (-1)

[e] Reading aloud: +10, word recognition: +7, reading comprehension: +6, phonics training: +4, word decoding: +5, paired reading: +4. See Online Resource 1 for definitions

checking homework had a frequency count of 6 in effective studies. However, checking homework was either combined with homework instruction, structure and routines, homework contracts, structured tutoring, or positive reinforcement when it was used in effective interventions. Wilder did report on meta-analyses that found positive results from interventions targeting homework routines and appropriate homework environment, offering additional explanation. One way of interpreting these results is that homework structure, routines, and environment may be of greater importance than direct homework assistance (or checking homework) by parents. Conversely, the effectiveness of homework support appears contingent upon it being coupled with training in other forms of parental involvement.

Interestingly, structured tutoring was the most common practice element, being used in 15 effective interventions. However, 25% of the studies using structured tutoring did not elicit statistically significant improvements. This demonstrates the added nuance of also reviewing elements in ineffective studies. Popular elements are not necessarily the most effective, and reviews of common elements should be mindful of popularity bias. Some elements can depend on other elements and characteristics for effectiveness. This review indicates that structured tutoring can be effective for reading skills; however, it appears more likely to be effective when it progresses in difficulty, includes reading aloud and receiving

feedback, is repeated over time, and is combined with positive parental involvement.

The most frequently measured outcome was by far children's reading abilities (21 studies), an important consideration when interpreting the results. The systematic search and selection did not favor studies measuring reading and so there appears to be a disproportionate high number of studies on OSTA interventions measuring reading skills compared with math skills, grade point average, or other academic skills. Reading difficulties might be viewed as particularly important compared with other academic difficulties because reading skills are necessary in most academic subjects. Another explanation could be that reading difficulties are more noticeable compared with problems with math or other academic skills. Nevertheless, there seems to be a gap in the literature about effective interventions for academic abilities other than reading skills.

Implications and Recommendations for Research

The primary implication from the present review concerns common elements for helping children at risk improve reading abilities. The results also offer some support for common elements to improve math abilities and grade point average. In addition, the methodology applied in the review adds to existing common elements methodology and can inform

future reviews of common intervention elements. Implications are threefold:

(a) Generation of Evidence-Informed Hypotheses The methodology used in this review provides details about how and under what circumstances common practice elements are most frequently delivered, implemented, and combined in effective interventions accounted for in ineffective interventions. This can enable generation of hypotheses about how, when, in what forms, and for whom these common elements are likely to function. Experimentally testing these hypotheses could increase our understanding about mechanisms of change in OSTA interventions, and in turn inform research and practice. We identified four common practice elements used in interventions that were effective across all three outcomes (reading, math, and GPA). Identifying elements that are effective across multiple outcome domains should be prioritized in further studies in efforts to increase reach and utility of interventions. For instance, as shown in table 3 (available online) positive reinforcement, psychoeducation, and goal setting have been identified as common practice elements in several reviews of effective psychosocial interventions. An element's contribution to effectiveness might be contingent upon other elements, factors, or structure (e.g., sequencing of elements). Future reviews should add structural elements such as sequencing, temporality, and dosage to coding of common elements, as they can likely improve hypotheses generation as well.

(b) Inform Design and Re-design of Interventions The results of this review can be used to re-design OSTA interventions in efforts to optimize effectiveness and efficiency. For instance, elements with high FVs can be added as these likely contribute to favorable outcomes, and/or elements with low FVs can be removed as they might be superfluous. The results can also inform psychosocial interventions for children at risk looking to add elements of academic support, either as new core intervention elements or adaptations. In addition, common practice, process, and implementation elements can be tailored and assembled into new or alternative forms for practice, suitable for design approaches such as co-creation and user-centered design (Engell et al. 2018; Lyon and Koerner 2016).

(c) Inform Education and Practice Many practice settings in need of quality improvement are unable to meet implementation demands for evidence-based practices. Some argue that in such circumstances, an appropriate course of action is to educate and train practitioners in common elements of effective interventions seeing as they likely contribute to positive outcomes, are less resource- and readiness-demanding, and may be perceived as more implementable (Hogue et al. 2017; Dorsey et al. 2016). Results from this review can inform choices about OSTA practices to implement and how to

deliver and implement them to help children at risk academically. However, to counterbalance the lack of evidence of causal inferences from specific elements, the implementation and use of common elements should be accompanied by quality measurement and assurance.

Recommendations for Reporting Several studies in this review were limited in their reporting of details. Common elements analyses would benefit from more details about practices, delivery methods, and contexts in intervention studies, either in articles, manuals, or appendices. Future intervention studies should also adopt current reporting standards for implementation strategies (e.g., Leeman et al. 2017). Data on dosage and fidelity (e.g., adherence, competence, and adaptations) of specific intervention elements could further improve analyses. Increased use of computer science (e.g., machine learning) to review and accumulate scientific literature (e.g., Michie et al. 2017) will enable the field to manage, interpret, and learn from extensive amounts of available data.

Limitations

The literature search was completed in April 2016, which is already somewhat dated. However, to our awareness, there are no more updated reviews on OSTA interventions recently published or ongoing. To form an impression of how potentially missed studies after April 2016 would influence common elements results, an updated search and pragmatic review was conducted for studies published from April 2016 to November 2019 prior to publication. The first author screened 2091 abstracts and 33 full texts and found four new eligible studies. The studies were reviewed for practice, process, and implementation elements. One of the studies would not have had any influence on common elements results due to lack of details reported about the intervention. Three would have had some minor influence on certain frequency counts, without changing any implications from the results (see online resource 1 for elaboration). Changing the results based on the pragmatic update would not be appropriate because the review process did not fully replicate the original rigorous review and coding process. More details about the updated search and included and excluded studies are available in online resource 1.

We were unable to translate five non-English written studies and excluded them even though they could have been relevant. The average publication year was 1997, which raises questions about relevance given that educational support measures are subject to renewal and development. However, the review of intervention characteristics (Online Resource 1) demonstrates that many specific practices used in OSTA interventions withstand the test of time and remain relevant today (e.g., direct instruction tutoring). Several included

studies were either non-randomized or did not specify randomization procedures and causal effects cannot be inferred. Some studies reported high attrition or inadequately addressed attrition which introduces risk of bias. Type of risk was not weighted in risk of bias assessment. Arguably, certain types of risks should be given more weight than others (e.g., blinding of participants in social interventions might be less important compared with random allocation). The same applies to weighting based on use of active or passive comparison conditions, which was not done in this review. Chances of significant differences between two active conditions are lower than comparing an intervention to nothing. Weighting based on risk of bias and comparison criteria could have influenced study inclusion and should be considered a priori by future reviews.

All six studies labeled as ineffective in the review had positive results but did not reach statistical significance. Thus, deducting a frequency count value based on an element's inclusion in these studies is a conservative interpretation. In the absence of intervention manuals, the interventions were coded based on published articles, appendixes, evaluation reports, and doctoral theses. Limited descriptions of interventions influence the amount and precision of intervention details coded. We used broad criteria for inclusion of populations and coded for diversity in terms of gender, two age groups, and reason for being considered at risk. Further studies should consider more detailed coding of population characteristics such as more age categories and ethnicity to enable differentiation. Frequency counts and frequency count values represent a synthesis of published literature and are thus subject to publication bias. Future reviews of common elements should employ tools to assess risk of publication bias to inform interpretation of results (e.g., Page et al. 2018).

Differences from Protocol (registry: 2016, CRD42016032887)

Several alterations of the original protocol have been made (Engell et al. 2016): Similarly to recent common elements reviews (e.g., van der Put et al. 2018), we combined a partial systematic review with common elements analyses in one article instead of two separate. Since a standard systematic review was not completed, risk ratios or standardized mean differences have not been calculated, and we have not conducted a random-effects meta-analysis, sensitivity analyses, explored heterogeneity in effects estimates, subgroup analyses, meta-regressions, or assessed publication bias.

Compliance with Ethical Standards

Conflict of Interest The authors declare that they have no conflict of interest.

Ethical Approval This article does not contain any studies with human participants or animals performed by any of the authors

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II

Paper 2

Knowledge translation in child welfare—improving educational outcomes for children at risk:

study protocol for a hybrid randomized controlled pragmatic trial

Trials

CrossMark

Knowledge translation in child welfare—improving educational outcomes for children at risk: study protocol for a hybrid randomized controlled pragmatic trial

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Abstract

Background: In Norway, a disproportionately high number of children receiving Child Welfare Services (CWS) struggle academically and drop out of school. Academic attainment is one of the strongest protective factors against societal marginalization. The present study is part of a knowledge translation project in collaboration with local CWS with the aim to develop, implement, and evaluate Enhanced Academic Support (EAS) for primary school children in CWS.

Methods/design: The study is a mixed-methods hybrid type 2 randomized, controlled pragmatic trial. The participants are approximately 120 children whose families receive support measures from three child welfare agencies in and around Oslo, Norway, and practitioners from these agencies. Families are randomly assigned to either the EAS condition or "business as usual" support. Primary outcomes are math and reading skills, parental involvement in school, and intervention fidelity. Questionnaires and academic tests are administered at baseline, post-intervention (after 6 months), and at follow-up (after 12 months). Implementation drivers are assessed before and after the trial period, and intervention fidelity is monitored during the trial through checklists and structured telephone interviews. Semi-structured interviews and focus groups are conducted after the trial.

Discussion: This hybrid study has two implications. (1) The effects of providing EAS to children in child welfare will be investigated. The study also explores how each core component of the intervention and the use of specific adaptations, implementation drivers, and other important child-level covariates moderate the overall effects. The results can provide valuable knowledge about how to deliver precise and effective academic support to increase academic skills and prevent dropout. In turn, this can promote academic completion and well-being, outcomes that are beneficial for both children and society at large. (2) The study also evaluates the feasibility of applying an Integrated Knowledge Translation model designed to develop, implement, and evaluate research-supported practice in health, care, and welfare services in less time than is usually the case. If deemed successful, this model will provide an efficient collaborative approach to translate the best available evidence into effective evidence-based practice, applicable in effectiveness research and quality improvement efforts.

Trial registration: ISRCTN, ISRCTN38968073. Registered on 18 September 2017. https://doi.org/10.1186/ISRCTN38968073.

Keywords: Effectiveness study, Hybrid study, Knowledge translation, Implementation, Academic support, Child welfare, Education, Primary school children, Core components, Common elements

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Background

Translating knowledge into effective and sustained practice

The translation of knowledge from research into effective and sustained practice is a critical issue in health, care, and welfare systems [1]. More successful translational efforts will likely result in improved services for patients, clients, and users and less inadequate treatment and care [2]. Municipal health, care, and welfare services in Norway experience increasing demands to ensure safe and effective services of high quality. Steps toward meeting these demands likely include identification of factors that contribute to favorable outcomes, supply and translation of the best available knowledge, and the establishment of quality monitoring and feedback systems.

Need for knowledge translation in Child Welfare Services

In Norway, the Child Welfare Services (CWS) need support to succeed in quality improvement endeavors. The majority (approximately 70%) of CWS is delivered by municipal agencies located across the country [3]. These agencies vary considerably in size and organizational structure. They differ in terms of methods of practice, approaches for quality improvement, and quality monitoring systems. Although a state-led body governs and serves the municipal CWS agencies, the responsibility for ensuring and improving quality of services rests with local municipal government and the agencies themselves. CWS agencies often juggle demanding directives, high caseloads, scarce resources, and a high rate of staff turnover. Their practitioners hold challenging jobs and are prone to stress and burnout [4]. The Norwegian Child Welfare Act, section 4-4 [5] states: "The child welfare service shall contribute to provide the individual child with sound circumstances and opportunities for development by providing advice, guidance and assistance." To meet increasing demands to ensure safe, effective, and high-quality advice, guidance, and assistance, municipal child welfare agencies would benefit from professional support.

Marginalization and academic achievement among children in child welfare

Contributing to a healthy upbringing is important in itself, but it is also a good investment socially and economically. As a group, children in families who receive CWS are at greater risk of developing mental health issues and behavioral and substance abuse problems, and are also at greater risk for future unemployment and engaging in criminal behavior [6].

Children in child welfare in Norway are more than twice as likely to drop out of school compared to their peers [7]. Only two in ten children who have been involved with CWS complete secondary school on schedule, and 35%

are neither employed nor in education by the time they reach 23 years of age [7]. In comparison, six in ten children in the general population complete secondary school on time, and under 10% are neither employed nor in education at the age of 24 years [8]. Children in CWS are often found to have knowledge gaps very early on in their academic careers, deficits that over time grow bigger and frequently result in academic failure and dropout [9]. Additionally, individual factors such as mental health, social skills, and executive functioning are likely to affect these children's ability to succeed academically [10, 11]. Academic achievement is one of the strongest protective factors against later marginalization [12, 13]. In a study of 7000 Swedish children with a history of foster care, academic achievement strongly predicted positive outcomes in adulthood (i.e., not being on welfare, and showing less illness, drug abuse, and criminal behavior), even when other factors such as socioeconomic status were controlled [9]. Most studies on the provision of academic support to children in the CWS have focused on children in foster care [14–16]. Recently published statistics in Norway, however, show that children involved with CWS who are living with their biological parents are at a similar risk of academic failure as children who are placed outside the home [7].

Practitioners in CWS have reported that the children in their care need more appropriate and tailored support to succeed academically [17]. However, child welfare agencies lack the methods, training, and allocated resources to provide academic support. Research has indicated that providing academic support to children and their families outside of school hours, and especially at home, has very useful potential [14, 15]. Meta-analyses have shown that positive parental involvement (e.g., homework support, parent-teacher communication, positive communication about school, positive parental expectations) affects children's academic performance positively [18, 19]. A systematic review of out-of-school-time academic (OSTA) programs for children at risk of dropout in the USA found that reading- and math-focused OSTA programs can improve reading and math achievement [20]. The authors highlighted the need to combine OSTA programs with other educational, community, and family support to achieve sustained effects.

Using Integrated Knowledge Translation to develop and evaluate academic support in child welfare

To support child welfare agencies in the development of appropriate academic support, the current project applied an Integrated Knowledge Translation (IKT) model in collaboration with three child welfare agencies. IKT is an approach to research that engages researchers and stakeholders (e.g., child welfare managers and practitioners, youth and parents with child welfare experience,

and school personnel) in collaborative partnerships to exchange, create, and utilize knowledge to address research issues [21]. The IKT model applied in the present project has combined IKT principles with methods from quality improvement and innovations in knowledge synthesis (we have labeled our model IKT-K, to distinguish it from other knowledge translation approaches). IKT-K entails synthesizing the best available evidence and translating the evidence into locally tailored and flexible research-based practice. IKT-K is structured in five phases: synthesis, co-creation, implementation, evaluation, and sustainment or de-implementation. During the first three phases, a locally tailored academic support intervention (Enhanced Academic Support, EAS) was developed based on common elements of effective academic interventions. EAS was implemented in three child welfare agencies, and its effects on academic achievement and parental involvement will be evaluated in this randomized controlled trial. The trial also evaluates the quality of EAS implementation and feasibility of the IKT-K model.

Aims and hypotheses

The present study has three overarching aims:

1. To evaluate the feasibility of the IKT-K model designed to develop, implement, and evaluate empirically supported practice in CWS
2. To evaluate the effects of the intervention, EAS, on children in CWS and their families
3. To explore associations between implementation drivers (readiness, climate, fidelity) and outcomes for children and families.

The following research questions will be examined to evaluate Aim 1:

- To what degree are the core components of EAS implemented in the CWS?
- What adaptations are made to the core components of EAS?
- What are stakeholders' perceptions of the IKT-K model's feasibility and usefulness, as assessed in focus groups?
- To what degree are climate for implementing evidence-based practice (EBP) and susceptibility for change of practice (readiness for change) associated with intervention fidelity in the CWS?
- To what degree will practitioners in the experimental group increase their perceived competence in delivering academic support to children and families from pre- to post-intervention?

- To what degree is adherence to core components of EAS associated with academic achievement and parental involvement for families in the EAS group?

The following hypotheses will be tested to evaluate Aims 2 and 3:

- Children in families who receive the EAS intervention will improve their academic achievement relative to children and families in a parallel, active comparison group who receive "business as usual" (BAU) support.
- Parents who receive the EAS intervention will increase their engagement in their children's school situation relative to parents who receive BAU.
- Intervention effects will be moderated by child age, readiness for change, and climate for implementing EBP.
- Covariates include children's mental health, social skills, and executive functioning scores, as well as child gender and pre-intervention academic performance (math and reading) and parental involvement.
- Intervention effects (measured by academic performance tests and parental involvement) are associated with climate for implementing EBP and readiness for change.
- More adherence to EAS principles will be positively associated with academic achievement and parental involvement for families in the EAS group

Methods and design

This study is a randomized controlled pragmatic trial conducted in three ordinary child welfare agencies in and around Oslo, Norway. The agencies differ in size, organizational structure, and demographic characteristics. Selected practitioners at each site have received training in the EAS intervention. Practitioner selection to EAS training was mostly a matter of practicality (i.e., half of the practitioners in a team, geographic area, or unit were selected by their managers to receive training). Participating families are recruited individually at each site and randomized either to an EAS-trained practitioner or to a practitioner not trained in EAS who is delivering regular child welfare support measures (BAU). EAS is delivered over the course of 6 months. Participants are assessed before and immediately after EAS, and at follow-up, 6 months after the end of the intervention. The schedule of recruitment, allocation, assessments, and experimental conditions is provided in Fig. 1. The Standard Protocol Items: Recommendations for Interventional Trials (SPIRIT) checklist is provided as Additional file 1.
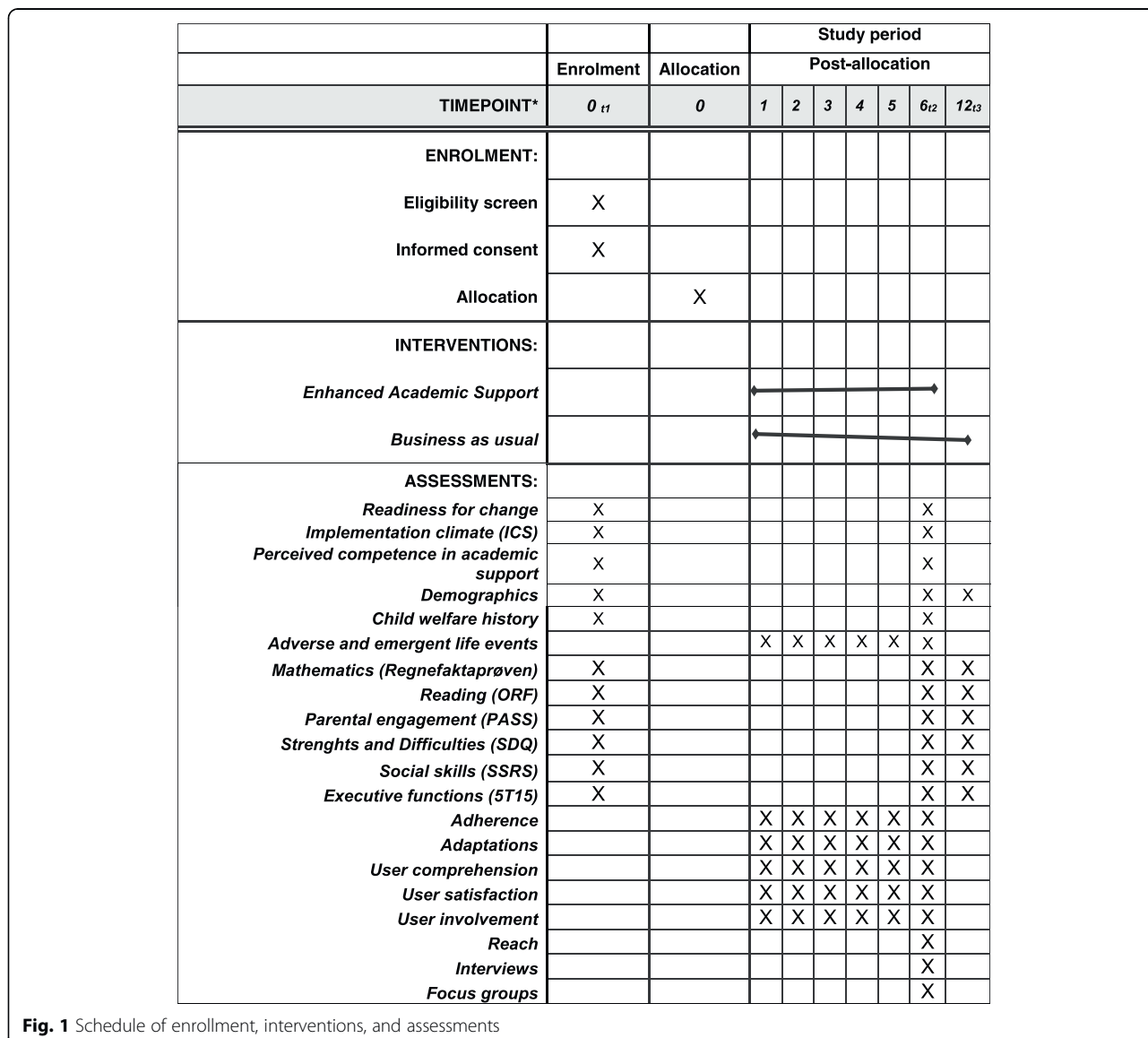
	Enrolment	Allocation	Post-allocation						
			Study period						
TIMEPOINT*	*0 t1*	*0*	*1*	*2*	*3*	*4*	*5*	*6t2*	*12t3*
ENROLMENT:									
Eligibility screen	X								
Informed consent	X								
Allocation		X							
INTERVENTIONS:									
Enhanced Academic Support									
Business as usual									
ASSESSMENTS:									
Readiness for change	X							X	
Implementation climate (ICS)	X							X	
Perceived competence in academic support	X							X	
Demographics	X							X	X
Child welfare history	X							X	
Adverse and emergent life events			X	X	X	X	X	X	
Mathematics (Regnefaktaprøven)	X							X	X
Reading (ORF)	X							X	X
Parental engagement (PASS)	X							X	X
Strenghts and Difficulties (SDQ)	X							X	X
Social skills (SSRS)	X							X	X
Executive functions (5T15)	X							X	X
Adherence			X	X	X	X	X	X	
Adaptations			X	X	X	X	X	X	
User comprehension			X	X	X	X	X	X	
User satisfaction			X	X	X	X	X	X	
User involvement			X	X	X	X	X	X	
Reach								X	
Interviews								X	
Focus groups								X	

Fig. 1 Schedule of enrollment, interventions, and assessments

Participants

Eligible participants are boys and girls in primary school and their parents, whose family receives support measures from CWS. We plan to recruit 120 children and their parents.

Inclusion criteria

The following inclusion criteria must be met:

1. Children in families receiving support measures from municipal CWS
2. Boys and girls in the 1st to 7th grades and their parents/caregivers
3. Parents/caregivers who give informed consent. Consent, assent, and the questionnaires are available in Norwegian, English, Arabic, and Somali.

Exclusion criteria

The exclusion criteria are as follows:

1. Developmental disability
2. Parents/caregivers not able to give informed consent due to language restriction (not able to understand Norwegian, English, Arabic, or Somali)
3. One child only from each family can participate

The study also includes managers and practitioners at the local child welfare agencies ($N = 160$), the children's teachers, and other stakeholders (parents and youths who previously received CWS, youth from user organizations, and local school counselors; estimated $N = 22$) in and around Oslo, Norway.

Power calculation

The study aims to recruit 120 families. The intervention under study is newly developed; hence, we used a meta-analysis testing the overall effect of similar interventions (targeting parental involvement in children's learning, including "paired reading") to inform the required sample size. The outcomes used to assess effect sizes in the meta-analysis were a combination of different standardized and unstandardized reading measures. The suggested effect sizes were in the range of $d = .65$ to 1.15 [22]. With $\alpha < 0.5$, power = 0.80, and expected effect size $d = .65$, the necessary sample size is $n = 78$, with 39 families in each group. Although the Oral Reading Fluency (ORF) test administered in the current trial is similar to the assessments used by the studies in the meta-analysis, none of those studies used the actual ORF test of this trial. Hence, the power calculation lacks some precision. To account for uncertainty in the power calculation, subgroup analyses (of gender, site, and CWS measure), and possible study dropouts, and to compensate for the possibility of non-normal distribution of scores, more participants than deemed necessary according to the power calculation were recruited. Based on information from the participating CWS agencies about their target groups, this sample size seems attainable.

Knowledge translation procedure

The first phase of the IKT-K model, the synthesis phase, started in January 2016.

In the *synthesis phase*, an adapted common elements methodology [23, 24] was applied to identify common practice, process, and implementation elements ($N = 166$ elements) of interventions with a significant positive effect on academic attainment for children at risk of school dropout. A systematic review was conducted [25]. All information available about the effective interventions ($N = 31$) was reviewed by coders and plotted as elements in a matrix created to compare frequencies. Frequency-based algorithms were applied to identify common elements of effective interventions and common combinations of these. The four most common elements were selected as core components and used in the development of the academic support intervention. The frequency with which these core components appeared in non-effective interventions or interventions with negative effects was also reviewed, and their given weight of importance was adjusted accordingly. Algorithms were also applied to extract process and implementation elements most frequently used in combination with common elements. Taken together, the results of these analyses pointed to specific practice elements (e.g., actions or activities), their rate of involvement in effective interventions, methods of effective delivery, recipient characteristics, delivery conditions,

and promising combinations of elements (a manuscript on the methodology and results is in preparation).

In the *co-creation phase* and through a series of workshops, facilitated teams consisting of researchers, an education specialist, a coordinator, CWS practitioners, users (parents and youths), school personnel, and other stakeholders collaborated in developing a locally tailored academic support intervention (EAS) based on the common elements profiles. The teams also prepared the training program and local implementation plans, and made pragmatic adjustments to the research design.

Prior to tailoring the implementation plan, an assessment of the climate for implementing evidence-based practice and readiness to change was conducted in each CWS. Each phase of the IKT-K model includes specific implementation strategies designed to overcome typical barriers to implementation and sustainment. Assessments of climate and readiness were used to identify particularly prominent or unpredicted barriers and facilitators which warranted increased effort or additional strategies.

In the *implementation phase*, the implementation was prepared, the training program was conducted, recruiters and assessors were trained, and the intervention and research infrastructures were piloted. Particularly engaged practitioners and managers were offered roles as site champions and given additional training in the EAS intervention and knowledge translation. Champions were assigned roles and responsibilities such as coordination, ongoing coaching, following up of recruiters, leadership engagement, etc. Adaptations were made based on feedback from practitioners and other stakeholders during piloting.

In the *evaluation phase*, a hybrid type 2 pragmatic trial will be applied to evaluate the effectiveness of EAS and the feasibility of the IKT-K model. The term "hybrid type 2" refers to research designs that evaluate clinical (or behavioral or educational) interventions and implementation strategies simultaneously [26]. Focus groups and semi-structured interviews with practitioners, users, and other stakeholders will be conducted to gain further understanding of the feasibility and usefulness of both EAS and the IKT-K model.

In the *sustainment or de-implementation phase*, data from the evaluation phase will inform an overall evaluation of EAS together with the co-creation teams. In collaboration, these teams will decide whether to carry out sustainment and improvement strategies or de-implementation strategies.

Intervention

Practitioners who deliver the EAS intervention have participated in a 14-h training program in EAS. The training consisted of approximately 50% didactic education, 20% role play, and 30% discussions, problem solving,

and dialogue. Trained practitioners tried out the delivery of EAS during the 5 months of piloting. They have also participated in a full day booster session, and a second booster session is planned after 6 months of recruitment to the study. The practitioners receive ongoing coaching from local EAS champions at each site and from the external implementation team running the study (The Regional Centre for Child and Adolescent Mental Health, Eastern and Southern Norway, study authors KAH, AA, IBF, TE) upon request. The amount of coaching is monitored. The practitioners have received an EAS handbook, in addition to various pedagogical, educational, and planning materials to be used with children and families.

EAS consists of four core components: (1) guidance in positive parental involvement in school, (2) structured tutoring in reading and math, (3) guidance in homework structure and routines, and (4) guidance in positive reinforcement, praise, and feedback. These four components are delivered to families in six sessions over a period of 6 months with support and follow-up between sessions. The sessions are delivered at home visits, or in other settings at the family's preference. The first session is assigned to build rapport with the family and to identify goals together with the family, and one session at the end is assigned to evaluate, repeat material as needed, and create a sustainment plan with the family. The four sessions in between are assigned to each core component.

Each of the visits consists of specific actions and activities (practice elements) for the practitioners and the families to engage in together. Practitioners are also instructed on how these actions and activities ought to be carried out (process elements). Important implementation elements such as ongoing support, local tailoring, and intervention flexibility are integrated into the delivery of the intervention. Even though core components are assigned to separate sessions, and practice and process elements are clearly described, flexibility within fidelity is encouraged. This means that practitioners can adapt the sequence of components, emphasis on components, combinations of components, and time between sessions as they see fit, as long as they adhere to the practice and process elements of the core components and report adherence, dosage, and adaptations in the monitoring checklists after each session (see the section "Monitoring and safety"). Additionally, pre-defined component-specific adaptations that are likely to be useful in different settings and scenarios are described and encouraged in training and in the handbook.

EAS is designed to be a flexible supplement to the support that families in CWS already receive. Hence, EAS is delivered in addition to the family's child welfare measure. The practitioners are free to combine EAS sessions with other measures or help they provide, or they can deliver EAS in separate sessions with the family. A session usually varies in length from 30 to 120 min. The session length is monitored.

Comparison condition (business as usual)

The comparison condition is "business as usual" (BAU) in Norwegian CWS. The content, structure, and length of BAU vary among agencies and among individual practitioners. Children and families in the BAU condition have been assigned a practitioner who has not received EAS training but who follows the family and offers regular support measures. These measures may include advice and guidance, parent training, financial aid, parent relief, etc. Meetings can take place both at the families' homes and other settings, such as the child welfare office or the school. BAU can also include some academic support, typically in the form of facilitating parent-teacher communication or the use of homework support at the school or in the community. Information about services provided in the BAU condition is collected using end-of-intervention-checklists (see the subsection "Implementation measures").

Implementation strategies

The following tables describe implementation strategies that are either planned, in progress, and/or completed in the study using current guidelines for reporting implementation studies [27, 28]. Table 1 describes implementation actors, and Table 2 describes implementation strategies. To categorize which level each strategy targets, categorization based on a dynamic adaptation process (DAP) framework [29] is used (involving system, organization, provider, and client levels). The first seven strategies are integral in the IKT-K model. Additional strategies are applied based on the intervention, context assessments, and knowledge exchanged between stakeholders in co-creation teams.

Measures

The primary implementation measures are related to intervention fidelity (adherence to core components,

Table 1 Actors involved in implementation strategies

Delivery system actors	• Site champions[a] • Site staff and practitioners
Support system actors	• External implementation team[b] • Co-creation teams, one team for each of the three CWS sites[c]
Synthesis and translation system actors	• External implementation team • Co-creation team

[a]Managers, practitioners
[b]Researchers, educator, coordinator, research assistants
[c]Practitioners, managers, user representatives (youths and parents), researcher, educator, coordinator, facilitator

Table 2 Description of implementation strategies

Strategy	Classification	Category of actor(s)	Action	Dose	Action target (determinant and level)	Temporality[a]	Outcome measure
Integral strategies in the Integrated Knowledge Translation (IKT-K) model							
Engage stakeholders and utilize local knowledge	Process strategy	All systems	Stakeholders are in collaborative partnership to address mutually understood need for practice improvement		To utilize local knowledge on all levels and facilitate stakeholder buy-in and ownership on provider and organization levels	All	Feasibility
Use facilitation	Process strategy	Support system	An assigned facilitator objectively guides co-creation discussions, promotes knowledge exchange, and minds equal participation and power imbalances	Five 4-h workshops[b] with each co-creation team, additional meetings if necessary	Facilitate collaborative problem-solving and promote mutual consultations among stakeholders to ensure integration of different forms of knowledge on organizational and provider levels	Co-creation, implementation, evaluation, and sustainment	Feasibility
Develop glossary	Process and dissemination strategy	Support system	Develop a glossary of frequent, difficult, and potentially ambiguous terms, and ban potentially offensive terms. Align project documents with glossary	4-h introduction workshop with each co-creation team	Promote equal understanding and participation and prevent the use of offensive terms. At organizational level	Co-creation	Feasibility
Assess context	Process strategy	Delivery system and support system	Implementation climate and readiness for change assessed by online survey to all staff. Determinants discussed in co-creation teams	10–15-min online survey, 4-h implementation workshop with each co-creation team	To assess readiness and identify barriers and facilitators to implementation at all levels	Co-creation	Climate for implementing evidence-based practice (EBP), readiness for change
Tailor intervention	Process strategy	Support system and delivery system	Local knowledge and experience utilized to tailor components of the intervention to fit daily practice and address needs at each site	Two 4-h intervention workshops with each co-creation team, feedback from practitioners during and after training and piloting. One 4-h adjustments workshop	To develop a feasible and appropriate intervention on client, provider, and organizational levels	Co-creation	Feasibility, appropriateness, acceptability, fidelity, reach
Tailor strategies	Process strategy	Support system	Local knowledge and experience utilized to tailor implementation strategies to context	4-h implementation workshop with each co-creation team. 4-h adjustments workshop	To tailor strategies to address barriers and leverage facilitators identified through context assessments and knowledge exchange in co-creation teams. On provider and organizational levels	Co-creation	Feasibility, fidelity, reach
Develop a formal implementation plan	Integration and capacity-building strategy	Delivery- and support system	A formal implementation plan has been created describing implementation infrastructure, goals, procedures,	One formal implementation plan, site-specific implementation manuals with adaptations to each site, continuous registration	Guide and organize implementation processes on organizational and provider levels with appropriate and structured adaptations	Developed during co-creation, adaptations throughout all phases	Feasibility, fidelity, reach

Table 2 Description of implementation strategies *(Continued)*

Additional strategies based on the intervention, context assessment, and knowledge exchange in co-creation teams

Strategy	Classification	Category of actor(s)	Action	Dose	Action target (determinant and level)	Temporality[a]	Outcome measure
			strategies, and adaptations to each site	of adaptations			
Make intervention dynamic and flexible	Dissemination strategy	Synthesis and translation system	Common elements of effective interventions have been used as basis for the intervention components to enable dynamic and flexible delivery	Systematic review, common elements analysis	To utilize the best available empirical evidence and improve intervention feasibility, appropriateness, and acceptability at all levels	Synthesis, co-creation	Feasibility, appropriateness, acceptability, fidelity
Train champions	Capacity-building strategy	Support system and delivery system	Champions have received additional training in the intervention, knowledge translation, implementation strategies, and behavior change	7-h group training	Build local implementation and coaching capacity on provider and organizational levels	Implementation	Feasibility, fidelity, reach
Use ongoing coaching	Capacity-building strategy and integration strategy	Delivery system and support system	Intervention practitioners receive group coaching from external implementation team and champions. Individual coaching is provided upon request or in cases of fidelity drift	Bimonthly from external implementation team, monthly from champions, and individually on request (registered)	Promote learning and integration of the intervention in practitioners and champions on provider and organizational levels	Implementation, evaluation, sustainment	Fidelity, reach, perceived competence
Use continuous support	Capacity-building and integration strategy	Support system	Group consultations, booster sessions, telephone support, training of new practitioners, recruiters, and champions	Bimonthly meetings with practitioners, recruiters, and champions, 4-h booster session every 6 months, telephone support, visiting support and training on request (registered)	Provide support and boost engagement, implementation quality[c], and recruitment at the provider and organizational levels	Implementation, evaluation, sustainment	Feasibility, fidelity, reach, perceived competence
Develop contingency plans	Capacity-building strategy	Support system and delivery	In cases of turnover, sick leaves, fidelity drift, or adverse events, specific plans of engagement are described for champions in their implementation plans	Use monitored	Prepare and plan for barriers and other events that threaten implementation at organizational and provider levels	Developed during co-creation, adaptations throughout all phases	Feasibility, fidelity, reach
Develop and distribute educational material	Integration strategy	Support system	Created and distributed intervention handbooks, planning material, and pedagogical material	Approx. 50 handbooks, 150 copies of planning material, 200 copies of sponsored reading and math material	Promote intervention implementation and effectiveness at the provider and client levels	Developed in co-creation, used in implementation, evaluation, and sustainment	Acceptability and appropriateness of material, fidelity, primary effectiveness outcomes

Table 2 Description of implementation strategies (*Continued*)

Strategy	Classification	Category of actor(s)	Action	Dose	Action target (determinant and level)	Temporality[a]	Outcome measure
Develop and distribute implementation resources	Capacity-building strategy	Support system	Created and distributed implementation and recruitment manuals, implementation checklists/ posters to champions, and recruitment flyers in 4 languages	Three site-specific implementation manuals, recruitment manuals, and implementation checklists/posters, approx. 500 flyers	Promote recruitment at client level and EAS implementation quality[c] at organizational and provider levels	Developed in co-creation, used in implementation and evaluation	Feasibility, fidelity, reach
Use implementation audit and feedback	Integration strategy	Support system	Double-informant measures of fidelity, user satisfaction and user involvement	Audit after each intervention session. Group-level feedback to practitioners bimonthly	Motivate and engage practitioners and prevent fidelity drift at the provider level	Evaluation	Fidelity, primary effectiveness outcomes

[a]Phases of IKT-K: synthesis, co-creation, implementation, evaluation, sustainment
[b]Total co-creation workshops (all 4 h); 3 introduction workshops, 6 intervention workshops, 3 implementation workshops, 3 adjustments workshops
[c]Implementation quality should be understood as the degree to which Enhanced Academic Support (EAS) reaches the target population, is used with adherence, competence, and appropriate adaptations by practitioners, and is comprehended by parents and children

parent comprehension of core components, and user satisfaction with delivery of intervention components). Primary effectiveness outcomes are reading and math scores and parental involvement in school. The ORF test has two subscales: a fluency score and an accuracy score. A composite variable of the two reading outcomes will be made.

Secondary outcomes (and covariates) are measures of intervention feasibility, acceptability, and appropriateness; practitioners' perceived competence in providing academic support; and children's mental health and adjustment, social skills, and executive functioning. The theoretical implementation model is shown in Fig. 2.

Organizational readiness for change and organizational climate for implementing EBP are measured to inform the implementation process and to be tested as predictors in the implementation model (see Fig. 3).

Implementation measures

The following implementation measures are used in this study:

- A monitoring checklist has been developed to measure adherence to core components, dosage, competence in delivery, parent comprehension of core components, adaptations, and user involvement and satisfaction with delivery of intervention components. The checklist is completed by EAS practitioners using smartphones after each intervention session and by parents answering the

same questions in telephone interviews after each intervention session (see the section "Monitoring and safety" for more details).

- An end-of-intervention checklist measures academic support received/given, emergent life events/adverse events, and overall user satisfaction and involvement during the last 6 months (intervention period). It has been developed specifically for this study and is administered at the post-assessment to parents (15 items), children (16 items), and practitioners (20 items) in both conditions. Items are rated on a 4-point scale ("not at all", "to a small degree", "to some degree", "to a large degree"). Each version ends with an open question about any additional information to be answered in free text.

- Intervention feasibility, acceptability, and appropriateness will be measured using three four-item scales: Acceptability of Intervention Measure (AIM), Intervention Appropriateness Measure (IAM), and Feasibility of Intervention Measure (FIM) [30]. The AIM, IAM, and FIM are completed by the EAS practitioners post-intervention.

- Organizational readiness for change is assessed using an unpublished questionnaire made by the study authors with 32 items rated on a 5-point scale (ranging from "strongly disagree", "somewhat disagree", "unsure", "somewhat agree", to "strongly agree"). The questionnaire measures organizational factors, characteristics, needs, and work climate as well as staff characteristics, qualities, and needs. It is
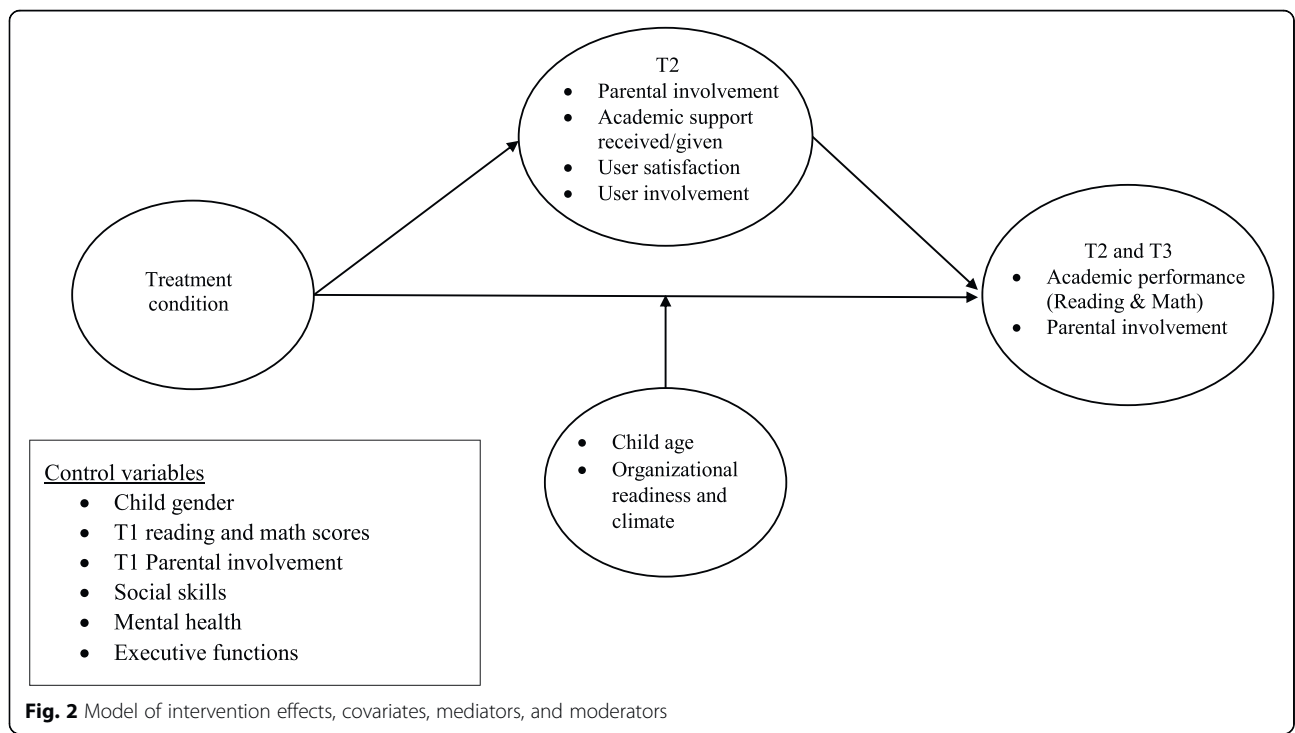
Fig. 2 Model of intervention effects, covariates, mediators, and moderators
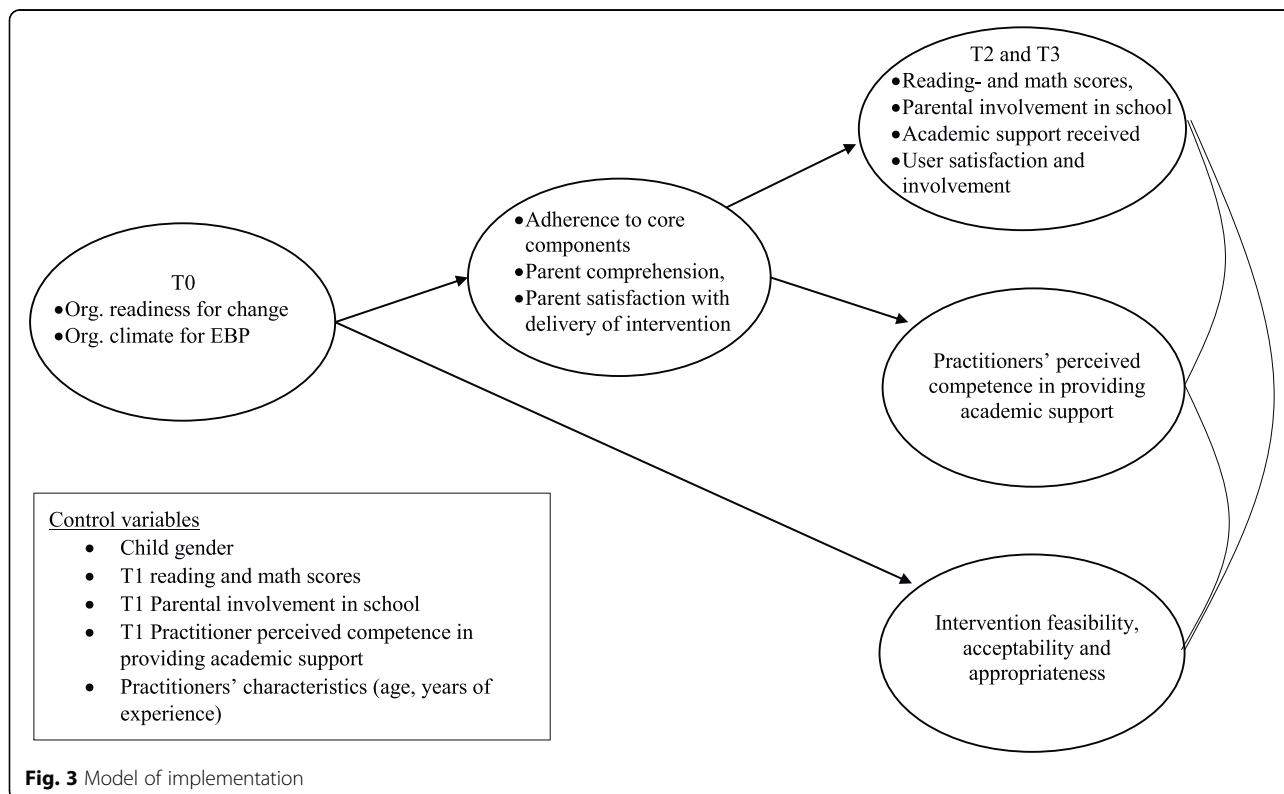
Fig. 3 Model of implementation

administered to all employees at all CWS sites, pre- and post-intervention. Organizational managers answer two additional items measuring organizational resources and opportunities.

- Organizational climate for implementing evidence-based practice (EBP) is assessed using the Implementation Climate Scale (ICS) [31]. The scale consists of 18 items rated on a 5-point scale (from "not at all" to "very great extent"). The ICS assesses the degree to which there is a strategic organizational climate supportive of EBP implementation. Subscales include focus on EBP, educational support for EBP, recognition for EBP, rewards for EBP, selection (employment) for EBP, and selection (employment) for openness. The ICS is administered to all employees at all CWS sites pre- and post-intervention. It has been validated with practitioners in 32 mental health organizations and 12 child welfare services in the USA [31, 32].

- Practitioners' perceived competence in providing academic support is measured using an unpublished questionnaire developed by the study authors. It includes 12 items rated on a 5-point scale ranging from "strongly disagree" (0) to strongly "agree" (5). The questionnaire assesses knowledge and use of competencies relevant to the core components of EAS without using the specific wording of the core components in the EAS handbook. It is administered pre-training and post- intervention to EAS practitioners.

- CWS employees' perceptions of the implementation process and the EAS intervention will be gauged by conducting focus group interviews post-intervention. An interview protocol will be prepared based on the IKT-K model and the DAP framework, including questions about the appropriateness and acceptability of EAS. Some of the topics to be discussed in the focus groups will include results from the quantitative data analyses.

- Semi-structured interviews will be conducted with a selection of participating children and parents after the intervention to learn more about their experiences with EAS. To select families to approach for participation in interviews, a randomization procedure in the Confirmit software will be used. Randomization will be stratified to select families who benefited from the intervention, who did not benefit from the intervention, and families with different ethnicities from each of the three sites.

Effectiveness measures
The effectiveness measures used in the study are described as follows:

- The *Oral Reading Fluency (ORF)* test [33] measures children's reading abilities. The test consists of three short passages that are grade level- and season-sensitive (i.e., there are different passages for fall,

winter, and spring). Children are asked to read the text aloud to the interviewer. Each reading sequence is timed to one minute. The interviewer monitors the reading and alerts the child when the time is up. The number of errors and the number of words read are recorded. The median scores of both errors and number of words read from the three passages are used. The test gives a score for fluency and a score for accuracy in reading. It is normed for children in the 2nd to 5th grades in Norway. The ORF test is administered to children at the pre-intervention, post-intervention, and follow-up assessments.

- The *Test of Arithmetic* (*"Regnefaktaprøven"*), developed by the University of Stavanger, Norway, is used to measure the children's mathematical abilities. It consists of two sets of addition problems and two sets of subtraction problems (each set with a different difficulty level) and one set each of multiplication and division problems. Children are asked to complete as many problems within a 2-min timeframe as they can. The number of correct answers is tallied up. The Test of Arithmetic is normed for Norwegian children in each grade level of elementary school and is administered to children at the pre-intervention, post-intervention, and follow-up assessments.

- Parental involvement in school is assessed using the *Parent and School Survey (PASS)* [34], a 24-item survey scored on a 5-point Likert scale administered to parents. The PASS questionnaire asks parents to indicate how involved they are in their children's schoolwork, school activities, and collaboration with school personnel. It is administered at the pre-intervention, post-intervention, and follow-up assessments.

Secondary measures and covariates
The following are the secondary measures and covariates used in the study:

- The *Strengths and Difficulties Questionnaire (SDQ)* [35–37] is a 25-item questionnaire that measures emotional problems, behavioral problems, hyperactivity, difficulties with peers, and prosocial behavior. Each item is rated on a 3-point scale (0 = "not true", 1 = "sometimes true", 2 = "certainly true"). The SDQ has a child/youth, parent, and teacher version. It also consists of an impact score that measures the degree of negative influence any problems have on different aspects of the child's daily life (such as family activities and learning at school). Large population studies using the SDQ have been conducted in Norway [38, 39]. Regional norms for children and youth in Norway are available. The SDQ will be

administered to children, parents, and teachers at the pre-intervention, post-intervention, and follow-up assessments.

- The *Social Skills Rating System (SSRS)* [40] is a standardized, multi-rater instrument that assesses social skills in children. It is administered to children, parents, and teachers. The children's version has 34 items divided into four subscales: cooperation, assertion, empathy, and self-control. The parent scale includes 38 items measuring cooperation, self-esteem, responsibility, and self-control. The teacher's version has 30 items assessing cooperation, self-esteem, and self-control. Each item is rated on a 4-point Likert scale, ranging from 1 ("never") to 4 ("very often"). The SSRS has been used with Norwegian samples in earlier studies [41], and the teacher's version has been validated and normed for children and adolescents in Norway [42]. The SSRS will be administered to children, parents, and teachers at the pre-intervention, post-intervention, and follow-up assessments

- *Five-to-Fifteen* [43] is a 181-item questionnaire developed to assess attention deficit hyperactivity disorder (ADHD), common comorbid conditions to ADHD, and associated problems in children and youth aged 5 to 17 years. The present study uses four subscales of the questionnaire with a total of 28 items which assess executive functions (attention and concentration, overactivity and impulsivity, passivity/inactivity, and planning/organizing). Items are rated on a 3-point scale ("does not apply", "applies sometimes/to some extent", "applies") and are administered to parents and teachers at the pre-intervention, post-intervention, and follow-up assessments. The parent version of Five-to-Fifteen has been validated and normed with Nordic samples (Swedish, Danish, and Finnish) with acceptable psychometric properties [44]. The teacher version has been validated and normed in Danish samples with acceptable psychometric properties [45].

- *Demographics and background information.* Parents answer questions about their age, gender, marital status, pregnancy, ethnicity, education, occupation, living arrangements, income, relocation during the last 5 years, other children in the household, and whether they receive help from any health, care, or welfare service. Parents also answer questions about the child's gender, age, and school grade, and if the child receives help from any other health, care, or welfare service. The child answers questions about his or her age and gender. Demographic information is collected at the pre-intervention, post-intervention, and follow-up-assessments. Background information about the family's history of child welfare service

(current and previous child welfare measures) is obtained from child welfare practitioners with parental consent.

Procedures

Referral

Children and their families are referred to a child welfare agency by notification of concern (e.g., by teachers, community nurses, physicians, police, or others). The agency either opens a case of inspection or dismisses the note of concern. If probable concern is established, but not in terms of out-of-home placement recommendation, the family is offered support measures from CWS. If the family accepts, they are eligible for study inclusion if they fulfill the inclusion criteria.

Enrollment

At that point, a case worker at the child welfare agency reviews the family's eligibility. If they are eligible, the case worker provides neutral information about the study and asks if the family is interested in participating. If they are interested, the case worker asks for oral consent to provide the research staff with the family's contact information.

If consent is given, the research coordinator calls the parent and provides more information about the study and answers questions.

Consent

A home visit is scheduled to complete the recruitment and pre-assessments. A trained interviewer visits the family and provides detailed information about the study to both parents (if they are both present) and child. The interviewer reviews eligibility, verbal assent is collected from the child, and written, informed consent is collected from parents electronically on iPads. The parent is also asked to give consent to allow the child welfare practitioners to receive an oral summary of assessment results and for the research team to contact the child's teacher. Consents and questionnaires are available in Norwegian, English, Arabic, and Somali.

Pre-assessment

Directly after consent, pre-assessments commence. The parent and child are each handed an iPad to answer questionnaires, and the interviewer administers the reading and math assessments on paper with the child. The pre-assessments take about 60 min to complete. After completion, an email with a link is sent to the child's primary teacher providing information about the study, an invitation to answer questionnaires, and the secure online questionnaires. Within a week after pre-assessments, an oral summary of results from the assessments of reading and math skills, mental health, social skills, and executive functions is provided to the family's assigned child welfare

practitioner with the parent's permission. The post-intervention and follow-up assessments are also conducted in home visits by an interviewer.

Randomization

At the time of consent, parents and children are informed that they will be randomly allocated to one of two conditions; one group, the BAU condition, receives regular measures from CWS, whereas the experimental condition receives the EAS intervention in addition to a regular child welfare measure. Blinding is not possible in this study; child welfare practitioners who have received EAS training will exclusively give EAS to study families, and parents and children will most likely understand to which group they have been assigned.

After completing the pre-assessment, participants are automatically randomized to either the intervention group (EAS) or the comparison group (BAU). A computer software (Confirmit) generates a random numbers table to assign random numbers to participants within blocks. A block randomization with a block of 10 is used, and randomization is carried out site-wise. The research coordinator informs the team manager at the site to assign the case to a practitioner with or without EAS training. All edit trails in Confirmit are recorded. Outcome assessors are blinded to allocation. In-depth technical details can be provided upon request.

Intervention: Enhanced Academic Support (EAS)

Families allocated to the intervention group are assigned a practitioner with training in EAS. EAS is delivered as described in the "Methods and design" subsection "Intervention".

Comparison condition: business as usual (BAU)

Families allocated to the BAU group are assigned a practitioner without training in EAS. BAU is delivered as described in the "Methods and design" subsection "Comparison condition (business as usual)".

Post-assessment

Six months after pre-assessment, the post-assessment is administered. A selection of participating families will be invited to semi-structured interviews, and a selection of participating practitioners and other stakeholders will be invited to participate in focus group interviews.

Follow-up assessment

Six months after post-assessment, the follow-up assessment is administered.

Statistical analyses

We will consider efficacy for each of the primary outcomes. In other words, efficacy will be gauged in an

outcomes-specific manner. A significance level of .05 will be used.

Outcomes will be evaluated using analysis of covariance (ANCOVA), controlling for baseline scores and covariates. Children's age, implementation drivers, children's mental health, social skills, and executive functions will be tested in regression models, as will possible subgroup analyses. To test for indirect effects (or mediation), models will be tested in a structural equation modeling (SEM) framework. Indirect effects variables include PASS, Five-to-Fifteen , and the end-of-intervention checklist measures. Implementation drivers as predictors of outcomes will be tested in regression models. We will evaluate effectiveness in two parts. The pre-post outcome analysis will use ANCOVA with baseline measures and covariates as control variables. We will test intervention effects including all data waves in SEM. See Figs. 2 and 3 for the theory of intervention change depicting variables included in the analyses.

We will examine and present data both in intention-to-treat (ITT) and as-treated (AT) designs, as the two approaches answer different questions. An ITT design answers the question "Does the intervention make a difference?" An AT analysis, on the other hand, answers the question "What are the effects likely to be if the client (or family) is exposed to the intervention?" We consider both of these questions important. This procedure has been recommended as best practice [46].

We will use multiple imputation for missing values for the pre-post ANCOVA in an ITT design. In the SEM models, missing data will be estimated using full information maximum likelihood.

Monitoring and safety
Audit and feedback
After each session of EAS with the family, the practitioner completes a dynamic fidelity checklist on their smartphone/tablet or computer using an online survey. The survey takes about 5–10 min to complete, depending on the number of core components and adaptations that were used in the session. After completion, an automated reminder is sent to the project coordinator, and an available interviewer calls the parent and conducts a structured telephone interview. Two additional attempts are made if the parent does not answer the call. The interviewer uses an online survey to retrieve an interview guide and plot the parent's answers. The interview guide is based on the checklist the practitioner recently completed. That is, detailed questions are only asked about the core components that the practitioner stated were used in the last session. Additionally, parents are asked if they remember doing something else in the session. If they mention another core component, they are asked detailed questions about that as well. The interview is structured this way to limit the amount of questions asked to practitioners and parents and to prevent attrition due to long checklists and interviews. The total number of questions available to practitioners is 113; however, an average checklist requires 25–30 answers (minimum 19). An average parent interview contains 20–25 questions (minimum 14).

Variables audited
The variables audited are duration of session, contact since last session, adherence to core components, parents' and children's comprehension of core components, use of pre-defined adaptations of core components, use of additional adaptations to core components (free text), client satisfaction, client involvement in decisions, and adverse events or relevant emergent life events.

Feedback
Monitoring data from each site are aggregated bimonthly and used as feedback to the practitioners. KAH and TE, together with the site champions, deliver feedback on team meetings. On request from the practitioners, they can receive individual feedback to use in ongoing coaching with the site champions. Emphasis is placed on adherence to core components, frequently used adaptations, and client satisfaction. Group-level feedback reports are also delivered via newsletters.

In cases of severe drift, serious adverse events, or repeatedly poor client satisfaction, KAH and TE will confer with site champions to commence one of the following contingency plans: additional booster training with the team, individual booster training with a practitioner, or gathering of the local EAS practitioners to discuss additional adaptation or change.

Stopping rules (discontinuation criteria)
The following criteria are considered grounds for discontinuation:

- If a family's regular child welfare measure is concluded or terminated, and the family is no longer receiving child welfare support
- If the CWS practitioners or data collectors uncover acute suicidality, psychosis, abuse, or other conditions that render the EAS intervention and data collection not viable, safe, or ethical
- If the CWS practitioners uncover any serious adverse effects of the EAS intervention, rendering it unsafe to offer clients
- If the child is placed out of home and/or parents lose custody of the child
- Withdrawn consent from the study
- Withdrawn government funding (the Research Council of Norway)
- Breach of ethical standards or regulations.

In cases of dropout or discontinuation, the family will be asked to complete post-assessment if it is deemed ethical and viewed as appropriate by the family's child welfare case worker.

Data management

The Regional Centre for Child and Adolescent Mental Health, Eastern and Southern Norway has a license and data management agreement with Confirmit. All electronic data are collected using the web-based tool Confirmit Authoring, and all websites used to collect data are encrypted with a security clearance. Data on paper are stored in a secure safe with access restricted to authorized research personnel. All data are stored in accordance with standards and regulations set by the ethics committee Norwegian Centre for Research Data (NSD). Sensitive information is stored separately from directly identifiable information. An identification key is stored electronically in a secure database. Only authorized research personnel have access to the key. Further information can be provided upon request.

Handling and follow-up of adverse events, data monitoring committee (DMC)

This study is an effectiveness trial conducted in existing child welfare agencies, not in a research facility. The intervention is considered low risk and no more intrusive than what is normally being delivered to children and families in CWS. The participating agencies have internal procedures for detecting, reporting, and following up on any adverse events in their clients. The study does not pose any restrictions on the agencies' internal procedures for handling adverse events or offering other services if deemed appropriate. In the event of the agency terminating a family's EAS intervention, the research team will be informed, and post-assessment will be conducted if deemed appropriate by the agency. In cases of perceived risk of adverse harm inflicted on people or property, research personnel will report to authority, abiding by law. The trial is not blinded, as the practitioners know what kind of service they offer the children and their families. No interim analyses will be conducted, in order not to bias the progression of the study. For these reasons, the current study has not appointed a DMC.

Access to source data

The Regional Centre for Child and Adolescent Mental Health ensures that the investigator/institution will permit trial-related monitoring, audits, reviews, and regulatory inspections, by providing direct access to source data/documents if needed, and that such inspections do not violate the rights and/or anonymity of trial participants, including children, their families, their therapists, or other CWS employees.

Discussion

This hybrid study has two main aims: (1) to evaluate the feasibility of an Integrated Knowledge Translation (IKT-K) model used in Child Welfare Services (CWS) designed to develop, implement, and evaluate empirically supported practice; and (2) to test the effectiveness of Enhanced Academic Support (EAS), a home-based intervention to improve academic achievement in children and their families in child welfare.

Advances in implementation science have outlined strategies that are likely to be pivotal to succeed in translational efforts, such as developing collaborative partnerships with stakeholders, using facilitation, and adapting and tailoring to context [47]. Similar strategies have long been used in the field of quality improvement, such as co-creation (or co-production) methods [48], often combined with iterative process models designed for continuous improvement [49]. The IKT-K model applied in this study attempts to utilize the best available evidence from implementation science together with established quality improvement methods to advance knowledge translational efforts. Involving stakeholders in mutually dependent partnerships is an integral strategy in this study, operationalized using facilitated co-creation approaches to locally tailor adaptable aspects of the study. The aim of these strategies is to utilize local knowledge and expertise, ensure buy-in from stakeholders, and thus promote acceptability, implementation, and sustainment of the newly introduced practice change. If feasible, this model can offer a pragmatic, efficient, and usable approach to development, implementation, and sustainment of evidence-based practice, which in turn can support knowledge translation and quality improvement in health, care, and welfare services.

Providing effective academic support to children in CWS can be of great value to both individual families and society at large. The need for academic support in child welfare populations is extensive, and CWS agencies are required to contribute to helping these children academically. However, these agencies are not provided with additional resources to deliver academic support to the families they serve. Hence, they need means to deliver academic support that fits within their current practice. EAS is a pragmatic intervention tailored to child welfare daily practice by the CWS agencies using it. Building the intervention around core components offers a much-needed flexibility that enables child welfare practitioner to incorporate empirically supported academic support within their existing practice. EAS requires limited training and resources and, if effective, could prove a highly cost-effective intervention given the large

returns successful investments in education can provide for individuals and society.

Trial status

Recruitment commenced in January 2018, and the trial is currently in progress. The estimated completion date of the trial is December 2019.

Additional file

Additional file 1: SPIRIT 2013 checklist: recommended items to address in a clinical trial protocol and related documents. (DOC 121 kb)

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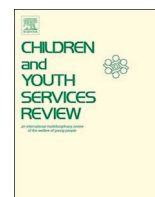**Paper 3**

Individual level predictors of implementation climate in child welfare services

III

Individual level predictors of implementation climate in child welfare services

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ABSTRACT

Background: Child welfare services (CWS) are characterized by having demanding work environments, large diversity in client needs, and limited use of evidence-based practices (EBPs). Thus, CWSs can benefit from quality improvement strategies. Accumulating evidence suggests that an organization's strategic climate towards implementation of change and EBPs (i.e., Implementation Climate [IC]) is a critical determinant for quality improvement, such as implementation of EBPs. It is also important to understand how practitioner characteristics are implicated in successful implementation. Knowledge about how practitioner characteristics predict IC can inform priorities, improvements, and processes at several levels of CWSs to promote successful EBP implementation and sustainment.
Methods: We collected data on IC, job satisfaction, job stress, participation in implementation, and practitioner demographics from a total of 233 participants employed in three Norwegian CWSs during a hybrid trial investigating the implementation and effectiveness of an academic intervention (Enhanced Academic Support) for children and families receiving support from CWSs. Data were collected at two time points; before initial implementation and 20–24 months after initial implementation. We ran confirmatory factor analyses to test the factor structures and intercorrelations of translated measures. We compared Implementation Climate Scale scores with a study using the same scale in United States-based CWSs. Hierarchical multiple regression analysis was used to test whether job stress, job satisfaction, practitioner tenure, postgraduate education, and whether respondents were active or inactive participants in an ongoing implementation process predicted IC.
Results: Measures of IC exhibited acceptable psychometric properties. Significant differences between IC in Norwegian and United States-based CWSs were found for three subscales (educational support-, recognition-, and rewards for EBPs). Composite scores did not differ significantly. Job satisfaction was the strongest and only unique predictor of IC at both time points. Length of tenure was a unique predictor at T2.
Discussion: To improve the climate for implementation in CWSs, strategies should address the job characteristics and demands that can increase job satisfaction and reduce high levels of job stress. Job satisfaction and tenure may inform strategic priorities and role selection in implementation processes. Differences in the work-culture between Norwegian and United States-based CWSs may produce different interpretations of certain items in the Implementation Climate Scale.

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1. Introduction

Child Welfare Services (CWSs) vary greatly in the services and practices they offer to children and families. The effectiveness of their practices is often unknown, evidence-based practices (EBPs) are scarcely used (Christiansen, 2015), and implementation of EBPs in general often fail to be sustained as intended (Hall, Staiger, Simpson, Best, & Lubman, 2016; Stirman et al., 2012). These shortcomings likely have several complex explanations, and studying implementation processes can help shed light on how and why implementation succeeds or fail. Implementation refers to the act of carrying an intention of change into effect (Theobald et al., 2018) and implementation research is defined as "the scientific study of the use of strategies to adopt and integrate evidence-based health interventions into clinical and community settings" (National Institutes of Health, 2019). Attending to organizational and individual *implementation determinants* (i.e. factors that are believed or empirically shown to influence implementation outcomes, Nilsen & Bernhardsson, 2019) before or alongside implementation of practices likely increases chances of sustained implementation success (Aarons et al., 2016). Implementation determinants may be of special importance in CWSs, where implementation processes can be particularly demanding due to challenging contextual characteristics (Aarons & Palinkas, 2007). In this study, we investigate an empirically supported implementation determinant; implementation climate, which refers to an organization's strategic climate towards implementation of EBPs, and whether implementation climate is predicted by level of job stress and job satisfaction among practitioners, their participation in implementation, and by demographics.

1.1. Child welfare services

CWSs work to ensure safety, stability, wellbeing, and a healthy upbringing for children. The vast majority (approx. 70%) of CWS in Norway is delivered by municipal agencies located across the country (Statistics Norway (SSB), 2016). The term CWS is here used as a translation of the Norwegian term 'Barnevernet', which in some countries would be translated to CWS and in others as Child Protection Services. In Norway, the Child Welfare system has the combined function of both helping children and families through compensatory welfare services and protecting children through out of home care placement. Thus, the responsibilities of front-line practitioners in CWSs span from investigating abuse and neglect, delivering family, parent, or child counseling, out of home care placement and support, to offering compensational measures such as parent relief and financial support (Christiansen, 2015). This combined function is a common characteristic of Nordic welfare systems. However, other countries such as United States, United Kingdom, and Canada are more oriented towards child protection (Gilbert, Parton, & Skivenes, 2011). Additionally, Norway has adopted a child-centric orientation where the safety, wellbeing, and rights of children outweigh other considerations such as family preservation. In Norway, as in other countries, CWSs vary considerably in organizational structure (McCrae, Scannapieco, Leake, Potter, & Menefee, 2014; Gilbert et al., 2011), workload capacity (Edwards & Wildeman, 2018), and in available services and practices delivered (Christiansen, 2015). The Norwegian child welfare system is under constant scrutiny. Government directives, negative media attention, and accumulation of legal actions against CWSs place mounting pressure on the CWSs and their staff. For CWSs to ensure safe, just, caring, and effective services, it will likely include improvements of organizational structures, routines, and quality assurance systems, as well as increased adoption of evidence-based practices (i.e. practices based on the best available evidence integrated with practice expertise and client needs and preferences, Palinkas, 2018). Such change efforts are challenging even for highly well-functioning organizations (Decker et al., 2012). CWSs, however, are often burdened with high caseloads, scarce resources, and high levels of staff turnover (Edwards &

Wildeman, 2018; Ryan, Garnier, Zyphur, & Zhai, 2006; Strolin-Goltzman, Kollar, & Trinkle, 2010). CWS practitioners experience high job demands, stressful and emotionally challenging work and work environments, and are prone to stress and burnout (Chung & Choo, 2019; Travis, Lizano, & Mor Barak, 2016). Such high levels of job stress are likely unfavorable to CWSs molar organizational climate (i.e. staffs' shared perceptions of the influence of the work environment on their wellbeing at work, James et al., 2008), which has in turn been shown to affect general wellbeing and health, quality of services, and client outcomes (Glisson & Green, 2011; Griffiths, Royse, & Walker, 2018; Lawrence, Zeitlin, Auerbach, & Claiborne, 2015). CWSs could benefit from enhancing their systematic quality improvement efforts and implementation of evidence-based practices (EBPs). However, a challenging organizational climate, as described above, likely harms implementation determinants such as IC (Williams & Beidas, 2019).

1.2. Implementation climate

Implementation Climate (IC) refers to practitioners' shared perceptions of the extent to which their organization expects, supports, and rewards the use of EBP or specific innovations (Ehrhart, Aarons, & Farahnak, 2014; Klein & Sorra, 1996). These perceptions form when practitioners experience and interpret cues in their work environment through policies, procedures, practices, and communication from leaders and managers (Weiner, Belden, Bergmire, & Johnston, 2011). For instance, IC theory posits that an organization that hires, trains, incentivizes, advocates, and removes barriers for innovations being implemented are more likely to have a positive IC (Klein & Sorra, 1996). Considerable attention has been given to IC in implementation theory (Klein & Sorra, 1996; Moullin, Dickson, Stadnick, Rabin, & Aarons, 2019; Weiner et al., 2011). However, empirical studies on IC have been lagging behind its theoretical implications (Jacobs, Weiner, & Bunger, 2014). Some recent cross-sectional studies have linked higher IC scores to increased adoption of EBPs among practitioners in behavioral health organizations (Williams, Ehrhart, Aarons, Marcus, & Beidas, 2018) and community pharmacies (Turner et al., 2018). Powell and colleagues (2017) reported from their study in child service agencies that IC was linked to more positive attitudes towards EBPs and more knowledge about EBPs among practitioners (Powell et al., 2017), though not adoption of EBPs per se. In a school-based intervention for children with autism, IC interacted with intervention fidelity in predicting intervention outcomes. That is, better student outcomes were registered when scores on both IC and fidelity were high (Kratz et al., 2018). Jacobs and colleagues (2015) found that perceptions of implementation climate among physicians positively predicted implementation effectiveness, defined as the number of patients each physician enrolled in cancer clinical trials. In summary, IC is believed to be an important factor in predicting adoption of EBPs and emergent empirical work supports this association. CWSs likely need to attend to the level of IC in their organizations to succeed with quality improvements and implementation of EBPs. To our knowledge, no prior studies have measured IC in CWSs outside of the United States, and it is uncertain whether existing observations generalize to CWSs outside of United States, such as in Norway. There is a need for studies of cross-national generalizability of IC.

IC is also a modifiable construct that can be targeted through intervention to promote an organization's ability to implement change and EBPs (Klein & Sorra, 1996; Turner et al., 2018). To enable precise and effective employment of strategies for modifying IC, implementation science and practice would benefit from understanding more about factors that promote and inhibit such processes. Several factors at multiple levels of the CWSs may influence IC, and considerable attention has been given to the role of leadership (Aarons, Ehrhart, Farahnak, & Sklar, 2014; Guerrero, Fenwick, & Kong, 2017). Little is known, however, about practitioner characteristics and associations with IC. Practitioners are the users of EBPs, and the purpose of an IC is

to support, reward, and expect practitioners to use EBPs. Thus, practitioners are key sources of information in learning how IC can serve this purpose. Knowledge about practitioner characteristics as predictors of IC can, for instance, inform staff selection, organizational interventions, training needs, role assignment in implementation (e.g. active versus passive participation), priorities, and differential targeting of implementation strategies and support. Moreover, knowledge about predictors of IC can facilitate more precise explanations of why implementation processes succeed or fail. Studies on practitioner characteristics as individual-level predictors of IC are scarce and, to our knowledge, non-existent in the context of CWSs.

There are, however, empirical studies on associations between different practitioner characteristics and organizational determinants that share similarities with IC in other contexts. For instance, a review of 94 studies of organizations from different sectors (e.g., health care, industry, finance, government, education) in the United States pointed to associations between practitioner perceptions of organizational climate and practitioner characteristics such as work attitudes, job satisfaction and job performance (Parker et al., 2003). A review of 21 health care organizations found associations between organizational climate defined as perceptions of social and interpersonal aspects of the work situation, and practitioner wellbeing factors such as burnout, distress, and mental health (Bronkhorst, Tummers, Steijn, & Vijverberg, 2015). Taken together, these reviews suggest individual work-related wellbeing factors of practitioners such as job stress and job satisfaction could contribute to shaping an organizations' IC.

1.3. Individual-level predictors of implementation climate

1.3.1. Job stress

Job stress is theorized to occur when practitioners experience job requirements that exceed personal and social resources and capabilities, and excessive job stress can lead to burnout (Bakker, Demerouti, & Euwema, 2005; Boyas & Wind, 2010). The high prevalence of job stress in CWSs and its negative effects on wellbeing are well documented in the literature (Lizano, 2015). A study in CWSs found practitioners' job stress to be a significant inhibitor of implementation buy-in (attitudes and beliefs about innovation need and appropriateness, McCrae et al., 2014), a construct similar to IC. Job stress has been associated with staff turnover, job satisfaction, burnout, and physical- and mental health issues (Boyas & Wind, 2010; Griffiths et al., 2018; Kim, 2011; Regehr, Leslie, Howe, & Chau, 2000; Sauter, Murphy, Colligan, Swanson, Hurrell, & Scharf, 1999). There are limited studies, however, on how job stress affects IC. A study of research- and development teams in China found high job stress among staff to decrease the positive association between organizational innovation climate and successful implementation (Ren & Zhang, 2015), suggesting job stress as a potential moderator of the relationship between organizational climates (e.g., molar organizational climate and IC) and implementation. A frequent antecedent of job stress and burnout is excessive workload or time-constraints (Maslach, Schaufeli, & Leiter, 2001; Regehr et al., 2000), and studies from CWSs have indicated excessive workload as an important barrier to implementation (Burns & MacCarthy, 2012; Johnson & Hastings, 2002; Oliver & Lang, 2018), and thus a likely predictor of implementation climate as well. Work-related stress is, however, not categorically negative. An individually appropriate level of stress can improve job performance and job satisfaction (Nelson & Simmons, 2003). A study from CWSs in the United States found stressful work climates to be related to improved outcomes for children and youth (Williams & Glisson, 2014). The authors suggested that the complex demands of child welfare practice, and the energy and efforts needed to improve outcomes, will inevitably cause practitioners to experience a stressful work environment when they go the distance.

1.3.2. Job satisfaction

Job stress is related to a perhaps more decisive factor of wellbeing at

work; job satisfaction (Chung & Chun, 2015; Maslach et al., 2001), which is also a potential predictor of IC. While job stress refers to a depletion of personal resources, job satisfaction can be understood as "the extent to which work is a source of need fulfillment and contentment" (Maslach et al., 2001, p 416). Most implementation studies investigating job satisfaction have looked at how implementation processes or determinants influence job satisfaction (Kinjerski & Skrypnek, 2008; Lawrence et al., 2015; Maier, Laumer, Eckhardt, & Weitzel, 2013; Melnyk et al., 2010), and not vice versa. However, a study of United States-based CWSs found job satisfaction, and particularly satisfaction with work communication, to predict *readiness for change* (an organization's abilities and willingness to implement an innovation, Scaccia et al., 2015; Claiborne, Auerbach, Lawrence, & Schudrich, 2013); an organizational level construct similar to IC. Similarly, a study with mental health nurses in the UK found job satisfaction to be associated with perceptions of barriers to implementing change (Laker et al., 2014). A systematic review of nurses' utilization of research in practice found positive associations between job satisfaction and general research utilization (Squires, Estabrooks, Gustavsson, & Wallin, 2011), which to some extent speaks to job satisfaction as an implementation determinant because implementation in some form likely precedes research utilization. In their study of change management, Johnson and McIntye (1998) emphasized that targeted improvements in organizational climate could increase job satisfaction and, in turn, organizational effectiveness. These relationships, however, could be reciprocal in that job satisfaction may function as an antecedent to climate factors that promote organizational effectiveness as well. For instance, more satisfied practitioners may be more likely to exhibit implementation citizenship behavior (i.e., individual behaviors towards other individuals and/or the organization that supports implementation beyond what is expected, Ehrhart, Aarons, & Farahnak, 2015), which would likely improve IC. If so, job satisfaction would be an important target for intervention as well to improve IC and subsequent implementation.

1.3.3. Active participation in implementation

In addition to job stress and job satisfaction, studies in change management have identified active participation in the change initiative as influencing readiness for change (Cunningham et al., 2002; Oreg, Vakola, & Armenakis, 2011; Vakola, 2014; Wanberg & Banas, 2000). A Norwegian study found that mental health practitioners who were active participants in an implementation process reported more favorable intentions towards use of the intervention compared to passive participants (Egeland, Ruud, Ogden, Lindstrøm, & Heiervang, 2016). A practitioner being empowered as an active participant in an implementation process might appeal more to intrinsic motivation for implementation, compared to not being involved, which could, in turn, affect how the practitioner perceives IC.

1.3.4. Tenure and post-graduate education.

The practitioner's tenure and post-graduate education may also predict perceptions of IC. Among mental health and health care practitioners, longer tenure and more education have been associated with less positive attitudes towards EBPs both in Norway (Egeland et al., 2016), Greece (Melas, Zampetakis, Dimopoulou, & Moustakis, 2012), and the United States (Aarons et al., 2012). Discussions suggest that growing confidence in one's competence, which may come with years of experience, decreases practitioners' perceived interest in, and need for, innovations and new practices (Egeland et al., 2016). Conversely, a study in CWSs in the United States found tenure to be positively associated with readiness for change (Claiborne et al., 2013), adding to the uncertainty of how tenure is associated with implementation determinants.

On the other hand, more education may increase competence and self-efficacy, which has been linked to increased readiness for change theoretically (Holt, Armenakis, Harris, & Feild, 2007; Vakola, 2013) and empirically (Oreg et al., 2011). This contrasts with the association

between education level and attitudes towards EBPs mentioned above, showing there are divergent results from different determinants. Moreover, practitioners seeking more post-graduate education might report more change-friendly attitudes. It is uncertain, however, how practitioner characteristics associated with attitudes towards EBPs and readiness for change would also be associated with an organizational level determinant of implementation such as IC.

2. Present study

This study investigated two practitioner factors related to wellbeing at work (job satisfaction and job stress), two demographic factors (length of tenure and post-graduate education), and whether practitioners were active participants in an implementation process as predictors of IC in four Norwegian CWSs. The psychometric properties of the Norwegian translation of the Implementation Climate Scale (ICS, Ehrhart et al., 2014) were also assessed. ICS scores from Norwegian CWSs were compared with scores from a study of United States-based CWSs to compare scores, explore cross-national generalizability, and inform further use of the Norwegian Translation of ICS. Based on results from studies of similar individual-level constructs (e.g. attitudes towards EBPs), we hypothesized that practitioners who are more satisfied with their work and experience less job stress perceive their CWSs IC as more favorable compared to practitioners who are less satisfied and more stressed. We also hypothesized that practitioners having longer tenure, post-graduate education, and who were not an active participant in the implementation would perceive the IC in their organization to be less favorable compared to those with less experience, without post-graduate education, or who were active participants in the implementation process.

3. Method

The present study is part of a randomized controlled trial (RCT) of Enhanced Academic Support (EAS), an academic support intervention in Norwegian CWSs (Engell, Follestad, Andersen, & Hagen, 2018). EAS is a co-designed academic intervention where CWS practitioners use flexible common elements-based practices to help children and families with academics at home. Core elements of EAS include parent training in parental school involvement and positive reinforcement, guidance in appropriate homework structure and routines, and structured tutoring in reading and math (Engell et al., 2020).

Data are collected from participating child welfare services (CWSs) at two time points. One CWS was located in a small urban area with a population ranging from low- to high socioeconomic status (SES), another was located in a dense urban area with a predominantly low- to medium SES population and above-average percentage of ethnic minorities, and the third and fourth in a suburban area with a medium to high SES population. The T1 data collection was conducted during the spring of 2017, before implementation of EAS. The T2 data collection was conducted approximately 20–24 months after T1, well into the implementation.

3.1. Participants

At T1, participants were 129 child welfare practitioners. At T2, participants were 157 child welfare practitioners. Due in part to turnover and hiring of new practitioners during the period from T1 to T2, only about a third (n = 51) of the respondents participated at both data collections. We, therefore, decided to treat T1 and T2 as two different samples. The response rate at T1 was 58%. We were unable to determine whether emails sent to 27 email addresses at T2 were received by respondents due to turnover during the period respondents were sent the emails. With the 27 uncertainties included, the response rate at T2 was 68%. Without the 27 included, the response rate at T2 was 77%. The four participating CWS were all located in southeastern Norway

and varied in size from small to large by Norwegian standards as measured by catchment area and number of practitioners. The four services employ 121 (regional mean = 32), 73 (regional mean = 24), 43 (regional mean = 47), and 15 (regional mean = 47) full-time equivalents and serve child populations aged 0–18 years. The smallest CWS only participated at T1 due to withdrawal from the RCT before T2. At both time points, the female-to-male ratio among respondents was approximately 9:1, a gender distribution that is common in child welfare and social work in Norway (85% women in child welfare in 2011, SSB 2016) and the United States (Griffiths et al., 2018; Kim, 2011). The mean age of the respondents was 41 years (*SD* = 10.29) at T1 (range 23–67) and 43 years (*SD* = 11.35) at T2 (range 22–67). The majority of respondents reported having had some post-graduate training at both T1 (66%) and T2 (71%). The majority of the respondents held the position of caseworker (63% and 57% at T1 and T2, respectively), 20% were family therapists, and approximately 10% were either directors or managers at different levels within the CWS.

The educational background of the respondents was predominately focused on child welfare (46% at T1, 45% at T2) or social work (31% at T1, 41% at T2). The remaining respondents held degrees in psychology, nursing, education, or other related disciplines. At T1, 34% of the respondents were active participants in the implementation of EAS (defined below), whereas at T2, active participants comprised 14% of the sample. Having an active role in the implementation of EAS meant that the participant either was trained in delivering EAS, had participated in the development of EAS, or had been selected to oversee and support the implementation process in the CWS. Passive participants were practitioners in the experimental comparison group in the RCT, practitioners who recruited families to the RCT, and practitioners who had no defined role in either the RCT or implementation but who were colleagues of practitioners with defined roles. The percentage of respondents from each site corresponded to the size of the CWS. For example, the largest site made up 41% and 52% of the participants at T1 and T2, respectively. See table 1 for details.

3.2. Measures

3.2.1. Background and demographic information

Participants answered questions about their demographics and other background information, such as type of current position in the CWS, length and type of education, and whether they had post-graduate training. Typical post-graduate training includes a master's degree in child welfare or social work, specialist education in child mental health, and certified courses in specific interventions and practices. We also asked participants to indicate how long they had worked in the child welfare services.

Table 1
Demographic and background information of participants.

Characteristic	T1	T2
N	129	157
Mean age (*SD*)	40.98 (10.29)	42.71 (11.35)
Gender (% female)	90.7	89.9
Tenure in child welfare (*%*)		
0–1 yrs	9.3	7.6
1–3 yrs	18.6	14.0
3–7 yrs	34.9	24.2
7–10 yrs	10.1	19.1
> 10 yrs	27.1	35.0
% from each CWS site		
Site 1	41.3	51.9
Site 2	32.6	33.5
Site 3	24.0	14.6
Site 4	2.1	Dropped out
% child welfare education	46	45
% social work education	31	41

3.2.2. Implementation climate scale

Organizational climate for implementing evidence-based practice was assessed using the Norwegian translation of The Implementation Climate Scale (ICS, Ehrhart et al., 2014). The scale consists of 18 items rated on a five-point scale (ranging from 'not at all' to 'a great extent'). Higher scores indicate an organizational climate more conducive to implementing evidence-based practices. The scale translated for this study refers to evidence-based practice (EBP) as making decisions based on the best available evidence integrated with practice expertise and client needs and preferences, and the act of carrying out those decisions in the form of interventions as evidence-based practices (EBPs). The scale has six subscales consisting of a) focus on EBP, b) educational support for EBP, c) recognition for EBP, d) rewards for EBP, e) selection (employment) for EBP, and f) selection (employment) for openness. Sample items are: 'The use of evidence-based practice is a priority in this service' and 'This service hires people who are experienced in the use of evidence-based practice'. The ICS has been validated with practitioners in 32 mental health organizations and 12 child welfare services in the US (Ehrhart et al., 2014, 2016). To our knowledge, ICS has not previously been administered to child welfare workers in Norway. The first author, whose primary language is Norwegian and who is close to fluent in English and familiar with implementation terminology, translated the scale to Norwegian. The last author, who is fluent in Norwegian and English, translated the scale back to English without reviewing the original scale. The back-translation was sent to the scale developers (third author and colleagues) for reviewing discrepancies and inadequate expressions. Two discrepancies in the use of terms were identified and resolved through conferring with expert colleagues. The Norwegian translation underwent pre-testing with CWS practitioners ($N = 9$) before being finalized. Supplementary file 1 provides documentation of the initial forward version, back-translation, a summary of identified discrepancies, discussions, and suggested modifications, and final version. In the present study, the ICS was administered to all practitioners at three CWS sites at both time points, and at T1 for the CWS who withdrew from the study before T2. The overall reliability alpha was $\alpha = 0.87$ at T1 and $\alpha = 0.88$ at T2. The subscales' reliability alphas ranged from 0.52 to 0.88 at T1 and 0.61 to 0.93 at T2. The subscale measuring rewards for EBPs had the low alpha of 0.52 at T1 and 0.61 at T2. We ran confirmatory analyses (CFA) of the ICS with each of the subscales as indicators of the general IC-construct at each time point to test its factorial structure in our samples. The results supported its use (see results section).

3.2.3. Job stress index

A job stress index was computed using items from a questionnaire measuring individual- and organizational aspects of the CWSs developed for this study. The full questionnaire consisted of 32 items rated on a five-point scale (ranging from 'strongly disagree', to 'strongly agree') and targeted characteristics of both the organization and of the respondent him- or herself, such as quality assurance, openness to change, adaptability, job functionality, job stress, job satisfaction, and training needs. Principal components analysis and exploratory factor analysis using the T1 sample supported a scale of the following five items: 'In this agency, we often show signs of stress and hardship', 'In this agency, we have a workload that prevents our efficiency', 'In this agency, we experience a lot of frustration among staff', 'In this agency, we are able to spend enough time with our clients (reversed)', and 'My large workload prevents me from doing my job effectively'. We ran CFAs using the T2 sample and the results supported its use, see results. The reliability alphas of the job stress scale were acceptable ($\alpha = 0.80$ at T1 and $\alpha = 0.69$ at T2).

3.2.4. Job satisfaction index

A job satisfaction index was computed using items from the same questionnaire based on content validity judged by the first and third author. Principal components analysis and exploratory factor analysis using the T1 sample supported a scale of the following five items: 'I enjoy being at work', 'I feel like my work is appreciated', 'We in this agency experience that our opinions are listened to and considered by the leadership', 'I experience that my job tasks are aligned with the goals of our agency', 'We experience that we can raise questions and concerns to the leadership'. We ran CFAs using the T2 sample and the results supported its use, see results. The reliability alphas of the job satisfaction scale were acceptable ($\alpha = 0.85$ at T1 and $\alpha = 0.79$ at T2).

3.2.5. Missing data.

Four participants (3.3%) did not respond to the ICS at T1, and seven participants (5.8%) did not respond at T2. Four participants (3.3%) did not complete the stress or job satisfaction index on T1, and three did not complete these at T2. There were no significant differences between respondents and non-respondents on any study variable at T1 or T2. At T1, three participants (2.5%) had missing values on six out of 18 items on ICS. Two participants at T2 had missing values on 15 out of 18 items on ICS. A series of sensitivity analyses were completed, and missing values did not significantly affect the results.

3.3. Procedure

At the beginning of the implementation of EAS in the CWSs, a notice of the opportunity to participate in an upcoming survey was given at general meetings with CWS practitioners. Following this, emails were sent to all practitioners at the four participating CWS. The emails contained a personal link to the questionnaires. Once the respondent clicked on the link, he or she was first directed to a page containing information about the study and a consent form to be electronically signed by checking the appropriate box. Participation was voluntary. Upon consent, the respondents were directed to the questionnaires. The questionnaire took about 15–20 min to complete. To increase the response rate, a lottery for a gift card in each of the three CWSs was used as an incentive. Those who completed the survey were entered into the lottery. A total of three reminder emails were sent out to practitioners who did not respond. The same procedure was used for the T2 data collection for the three remaining CWSs. However, at T2, the following strategies were used to increase the response rate: (1) in addition to the web-based surveys, paper versions of the questionnaires were administered at scheduled meetings with CWS practitioners, (2) the third reminder emails were personalized and sent from research staff to CWS practitioners, and (3) personal phone calls were completed by research staff to practitioners who did not respond after the third reminder email.

3.3.1. Analytic plan

We ran descriptive statistics, frequencies, and bivariate correlations of all variables included in the study (see Tables 1 and 2) in order to assess distributions and meeting statistical assumptions. Next, we tested the factor structure (via confirmatory factor analyses) of the ICS at T1 and T2, respectively. To define job stress and job satisfaction indexes, we conducted principal components analysis with the T1 sample to explore the number of components to assume and exploratory factor analysis via principal axis factoring to explore and propose a factor structure. We did a confirmatory factor analysis with the T2 sample to test the factor structure. To test model dimensionality of ICS, job stress, and job satisfaction, we used a comparative fit index (CFI) with values greater than 0.95 and the root mean square error of approximation (RMSEA) with values less than 0.06 as indicating good fit (Boateng, Neilands, Frongillo, Melgar-Quiñonez, & Young, 2018). Cronbach's alpha was used to assess the reliability of subscales on ICS, the composite ICS, the job stress index, and the job satisfaction index. We then tested a three-stepped hierarchical multiple regression model at T1 and T2, respectively, with ICS sum scores as the dependent variable. The other variables (respondents' tenure in the CWS, active versus passive participation in the implementation, and post-graduate education) were

Table 2

Means, percentages, standard deviations, and sample size of variables.

	T1			T2		
	Mean	SD	n	Mean	SD	n
Active participation (% yes)	34%	–	129	13.9%	–	157
Post graduate education (% yes)	66%	–	129	71%	–	156
Lenght of tenure	2.27	1.30	129	0.71	0.46	156
Job stress	11.45	4.43	125	11.58	3.82	155
Job Satisfaction	15.72	3.53	125	15.83	3.18	155
ICS[a] Focus on EBP	2.78	0.67	122	2.78	0.66	148
ICS Educational support for EBP	1.99	0.84	122	1.99	0.76	148
ICS Recognition for EBP	2.18	0.74	122	2.21	1.00	148
ICS Rewards for EBP	1.23	0.73	122	1.22	0.81	148
ICS Selection for EBP	2.42	0.73	122	2.44	0.83	148
ICS Selection for openness	2.84	0.58	122	2.24	0.65	148
ICS Total sum	45.14	9.59	122	45.03	10.51	148

[a] Implementation Climate Scale (ICS).

entered in step one to analyze their contribution to IC and control for these variables in steps two and three. We expected job satisfaction to be the more dominant contributor to IC. Thus, we entered job stress in step two and job satisfaction in step three to test whether job satisfaction would predict IC even after controlling for job stress.

4. Results

4.1. Factor analyses

4.1.1. Implementation climate

We tested a 6-factor CFA model of the Implementation climate scale at T1, with its six subscales as indicators of the latent variable, Implementation Climate (IC). The model fit the data well χ^2 (9) = 10.71, p = .30, RMSEA = 0.04 (90% CI, = 0.00–0.11), and CFI = 0.99. Next, we ran the same CFA model on the data from T2; The model fit the data well χ^2 (7) = 12.03, p = .10, RMSEA = 0.07 (90% CI, = 0.00–0.13), and CFI = 0.97. The error variances of two sets of indicators were correlated in the T2 model (Selection for EBP and EBP Focus and Selection for EBP and EBP Training), accounting for the difference in degrees of freedom between the models at T1 and T2. These analyses suggest that the factor structure validated with United States-based samples also fits for Norwegian CWS staff as well.

4.1.2. Job stress

Based on content validity judged by the first and last author, seven items indexing job stress from the questionnaire developed for this study (individual- and organizational aspects of the CWS) was entered in a principal component analysis (PCA) using the T1 sample. Five items loaded above 0.7 on one component, while the following two items 'In this agency, our physical work environment meets our job requirements' and 'In this agency, we are able to change our work habits and procedures to meet emerging needs' loaded above four on two components. PCA was re-run without these items and further analysis with one component was supported. Exploratory factor analysis was

run with the remaining five items indexing one latent factor. All items loaded above 0.5, KMO measure was above 0.7 and verified the sampling adequacy, Bartlett's test of sphericity was significant, and diagonals of anti-image correlation matrix was above 0.7, indicating further analysis was appropriate. The reliability alpha of the job stress scale was acceptable at T1 (α = 0.80). We used the T2 sample to test a CFA model of the job stress index with the five items indicating one latent variable. The model fit the data well χ^2 (5) = 5.98, p = .31, RMSEA = 0.04 (90% CI, = 0.00–0.12), and CFI = 0.99. The reliability alpha of the job stress scale were acceptable at T2 (α = 0.69).

4.1.3. Job satisfaction

Based on content validity judged by the first and last author, seven items indexing job satisfaction from the questionnaire developed for this study (individual- and organizational aspects of the CWS) was entered in a principal component analysis (PCA) using the T1 sample. PCA supported one component, and exploratory factor analysis with seven items indexing one latent factor was completed. Two items, 'In this agency, we communicate poorly with each other' and 'In this agency we get along well' was deleted due to communalities below 0.4. All remaining items loaded above 0.5, KMO measure was above 0.8 and verified the sampling adequacy, Bartlett's test of sphericity was significant, and diagonals of anti-image correlation matrix was above 0.8, indicating further analysis was appropriate. The reliability alpha of the job satisfaction scale was acceptable at T1 (α = 0.85). We used the T2 sample to test a CFA model of the job satisfaction index with the five items indicating one latent variable. The model fit the data well χ^2 (4) = 1.73, p = .78, RMSEA = 0.00 (90% CI, = 0.00–0.07), and CFI = 0.1. Degrees of freedom was four due to the error variances of two sets of indicators being correlated in the T2 model (We in this agency experience that our opinions are listened to and considered by the leadership' and 'We experience that we can raise questions and concerns to the leadership'). The reliability alpha of the job satisfaction scale was acceptable at T2 (α = 0.79).

4.2. Regression analyses

Residuals and scatter plots indicated that assumptions of normality, linearity, and homoscedasticity were met at T1 and T2. As shown in Table 3, job stress and job satisfaction correlated r = −0.39 (p < .001) and r = −0.35 (p < .001) at T1 and T2, respectively. Collinearity statistics (Tolerance and VIF) were acceptable. Examination of Mahalanobis distance scores indicated no multivariate outliers.

Results from hierarchical multiple regressions for the T1 and T2 samples are depicted in Tables 5 and 6. For the T1 sample, results showed that length of tenure, active versus passive participation, and post-graduate education accounted for 1% of the variance and did not significantly predict implementation climate (IC; see Table 5). Adding job stress made the model significant F (1,117) = 13.705, p < .001, and accounted for an additional 10.4% of the variance in IC. Lower job stress predicted higher IC (β = −0.64, p < .001). Adding job satisfaction to the model explained an additional 18.6% of the variance in IC and was also significant F (1,116) = 30.51, p < .001. In model 3

Table 3

Pearson bivariate correlations between main variables at T1 (clear cells) and main variables at T2 (gray cells).

T1	1	2	3	4	5	6	T2
1. Active participation		−0.35**	−0.22**	−0.00	−0.00	−0.01	1. Job stress
2. Post graduate education	−0.03		0.26**	0.20	−0.08	0.04	2. Job satisfaction
3. Lenght of tenure	0.11	0.29**		−0.27**	−0.18*	0.02	3. ICS Total
4. ICS Total	−0.15	−0.02	−0.04		−0.04	−0.05	4. Lenght of tenure
5. Job satisfaction	−0.08	0.08	0.03	0.49**		−0.10	5. Post graduate education
6. Job stress	0.09	−,14	−0.12	−0.26	−0.39**		6. Active participation

* *C*orrelation significant at the 0.01 level (2-tailed).

** Correlation significant at the 0.001 level (2-tailed).

Table 4

Means, standard deviations and alphas of Implementation Climate Scale, and comparison of results with Child Welfare sample in the United States.

	T1 [a] (N = 122)			T2 [a] (N = 148)			Ehrhart 2016 [b] (N = 215)		
	Mean	SD	α	Mean	SD	α	Mean	SD	α
ICS total avg	2.24	0.47	0.87	2.23	0.49	0.88	2.32	0.66	0.89
ICS subscales									
Focus on EBP	2.79	0.66	0.84	2.78	0.66	0.82	2.96	0.90	0.88
Educational support for EBP	2.00*	0.84	0.87	1.97*	0.74	0.79	2.62*	1.01	0.82
Recognition for EBP	2.19*	0.74	0.76	2.19*	0.76	0.78	1.89*	1.00	0.77
Rewards for EBP	1.23*	0.73	0.52	1.20*	0.78	0.61	0.82*	0.97	0.73
Selection for EBP	2.42	0.73	0.88	2.43	0.82	0.86	2.30	1.00	0.88
Selection for openness	2.84	0.58	0.87	2.78	0.64	0.93	2.83	0.87	0.83

[a] Norwegian child welfare services, [b] Child welfare services in the United States (CA, IL, OK), * significant difference between means at P < 0.01.

Table 5

Model summary of hierarchical regression for predictors of implementation climate.

	T1 (N = 122)				T2 (N = 148)			
Step	R	R^2	ΔR^2	P	R	R^2	ΔR^2	P
1[a]	0.10	0.01	0.01	0.762	0.31	0.10	0.10	0.002
2[b]	0.34	0.11	0.10	0.000	0.38	0.15	0.05	0.005
3[c]	0.51	0.326	0.19	0.000	0.51	0.26	0.11	0.000

[a] Tenure, active versus passive participation, and post graduate education.
[b] Job stress.
[c] Job satisfaction.

with all five variables, only job satisfaction was a unique predictor of IC (β = 1.12, p < .001), and together the five independent variables accounted for 30% of the variance in IC.

The step 1 model using the T2 sample was significant *F* (3144) = 5.19, p < .01) with length of tenure, active versus passive participation, and post-graduate education accounting for 10% of the variance in IC. Tenure was a unique predictor (β = −1.53, p < .01); the longer the tenure, the lower the scores on IC. Adding job stress to the regression model in step 2 accounted for an additional 5% of the variance in IC, and the model was significant *F* (1143) = 8.28, *p* < .01). Tenure (β = −1.53, p < .01) and job stress (β = −0.52, p < .01) were both unique predictors of IC. Adding job satisfaction to the model in step 3 explained an additional 11% of the variance in IC and was also significant *F* (1142) = 20.54, *p* < .001. In the final model with all five variables, tenure (β = −1.49, p < .01) and job satisfaction (β = 0.98, p < .001) were unique predictors of IC. The final model accounted for 26% of the variance in IC.

5. Discussion

This study investigated individual-level predictors of implementation climate, a factor that accumulating evidence suggests is important for quality improvement in health- and welfare services. Prior studies have linked implementation climate (IC) to successful implementation of organizational change and EBPs. IC has not, however, been studied in Norwegian CWSs, and little is known about individual-level predictors of IC internationally. In this study, we tested the psychometric properties of a Norwegian translation of the Implementation Climate Scale (ICS, Ehrhart et al., 2014), and whether practitioner characteristics predicted IC in Norwegian CWSs.

5.1. Individual-level predictors of implementation climate

This study confirms associations between certain characteristics of practitioners and their perceptions of their organization's IC. Job satisfaction was a unique predictor of IC at both timepoints and accounted for the majority of variance explained by the practitioner characteristics tested. Length of tenure was a unique predictor of IC at T2 controlling for the other four study variables, however, tenure did not predict IC at T1. Job stress was a significant predictor at T2 controlling for tenure, post-graduate education, and active participation. However, a large proportion of the variance accounted for by job stress was explained by job satisfaction. Contrary to our hypotheses and prior studies on constructs similar to IC (e.g., readiness for change; Oreg et al., 2011; Melas et al., 2012), post-graduate education and active versus passive participation in the implementation process did not predict IC.

Table 6

Hierarchical regression analysis for variables predicting implementation climate.

Variables	Step 1			Step 2*			Step 3**		
	β	SE	St.β	B	SE	St. β	β	SE	St.β
T1 (N = 122)									
Tenure	−0.37	0.64	−0.06	−0.67	0.61	−0.10	−0.65	0.55	−0.10
Participation	−1.33	1.64	−0.08	−0.70	1.57	−0.04	−0.42	1.40	−0.02
Post grad edu	−0.13	1.72	−0.01	−0.41	1.64	−0.02	−0.69	1.47	−0.04
Job stress				−0.64**	0.17	−0.33	−0.32	0.17	−0.16
Job satisfaction							1.12**	0.20	0.46
T2 (N = 148)	Step 1*			Step 2*			Step 3**		
Tenure	−1.53*	0.58	−0.22	−1.53*	0.57	−0.22	−1.49*	0.53	−0.22
Participation	−1.12	1.87	−0.04	−1.24	1.99	0.05	−1.12	1.87	−0.05
Post grad edu	−2.72	1.65	−0.14	−2.79	1.61	−0.15	−2.41	1.51	−0.13
Job stress				−0.52*	0.18	−0.22	−0.24	0.18	−0.10
Job satisfaction							0.98**	0.22	0.35

* p < .01.
** p < .001.

5.2. Job satisfaction

Prior implementation studies on job satisfaction have predominantly investigated how implementation processes and determinants influence practitioners' job satisfaction (Johnson & McIntye, 1998; Lawrence et al., 2015). The present study adds to the literature by finding that more satisfied practitioners rate their organization's IC as better compared to less satisfied practitioners, suggesting that the relationship between IC and job satisfaction could be bi-directional. Thus, job satisfaction could also serve as an important antecedent or proximal indicator of IC. Assessing job satisfaction both at initial phases and during an implementation process, could therefore contribute to explanations of implementation determinants and outcomes. Moreover, highly satisfied practitioners are likely more easily identified by leaders, and they may be a useful resource to empower in implementation. For instance, selecting satisfied practitioners for implementation champion roles may facilitate implementation citizenship behavior as they may spread positive attitudes and perceptions towards implementation among their coworkers. On the other hand, unsatisfied practitioners may pose barriers to IC and call for strategic caution in the selection of roles in implementation. In sum, strategic priorities and role selection based on job satisfaction may help implementation processes utilize more of the implementation potential available in the organizations' current IC, without necessarily changing the IC per se.

5.3. Job stress

We expected job stress to be a strong predictor of IC based on prior associations found between job stress and implementation determinants (implementation buy-in, McCrae et al., 2014; innovation climate, Ren & Zhang, 2015), and the high prevalence of job stress found in CWSs internationally (Boyas & Wind, 2010; Griffiths et al., 2018; Regehr et al., 2000; Sauter et al., 1999). More stressed practitioners generally had lower scores on IC compared to their less-stressed colleagues, and job stress was significantly associated with IC at both timepoints controlling for tenure, post-graduate education, and active versus passive participation. The contribution of job stress to the model, however, could be explained by job satisfaction. Job stress and job satisfaction had a moderate correlation at both time points, in which more job stress correlated with less job satisfaction. In sum, the results imply job satisfaction as the stronger individual-level predictor of IC, and that explanatory contribution to IC from job stress primarily works through affecting job satisfaction. Thus, efforts to increase job satisfaction to improve IC could benefit from reducing job stress among highly stressed practitioners. The relationship may be reciprocal, and improving job satisfaction may also reduce perceptions of job stress, which could make efforts to improve job satisfaction beneficial to IC when job stress is high. Studies suggest that child welfare practitioners can indeed experience high degrees of stress at work and still be satisfied with their job (Stalker, Mandell, Frensch, Harvey, & Wright, 2007). As noted by Williams and Glisson (2014), job stress may even be a necessary feature of effective services in the current demands of child welfare practice, and some practitioners may thrive in a stressful environment when they are able to cope, satisfied, and feel that their efforts are making a difference to children and families. Other studies in social welfare, however, have found high job stress to decrease work performance (Wright & Cropanzano, 1998) and job satisfaction indicated by increased turnover intentions (Liu, Zhu, Wu, & Mao, 2019). Additionally, excessive job stress has consistently been linked to reduced wellbeing among welfare practitioners, especially in the form of emotional exhaustion (Lizano, 2015). Emotional exhaustion has been indicated as the central mechanism of *change fatigue* (Bernerth, Walker, & Harris, 2011), described as apathy and resignation towards change. Thus, organizational structures and strategies designed to push the limits of coping with stress could be to gamble with the practitioner's proficiency, affective wellbeing, and perceptions towards implementation.

5.4. Length of tenure

Job tenure was a unique predictor of IC at T2, with longer tenure being associated with more negative perceptions of IC. There was a similar trend at T1 that did not reach statistical significance. Studies of attitudes towards implementation of EBPs suggest that longer tenure can be accompanied by increased self-efficacy and autonomy, which in turn can decrease positive attitudes towards implementing new practices (Egeland et al., 2016; Oreg et al., 2011). Our results, to some degree, indicate that the same explanation could apply to perceptions of IC; when practitioners become more settled and autonomous in their work, professional curiosity can diminish, implementation of EBPs can appear less appealing, and these attitudes can affect perceptions of IC. Norwegian CWSs have a strong tradition of professional eclecticism, and there has been considerable resistance towards EBPs in Nordic countries, partially due to EBPs being perceived as unfit for the fluctuating and dynamic child welfare practice (Mullen, Bellamy, & og Bledsoe, 2008). Rigid manualized practice, sometimes associated with EBPs, can be perceived as a threat to practitioners' professional autonomy (Borntrager, Chorpita, Higa-McMillan, & Weisz, 2009). Thus, as experience and sense of autonomy grow, attitudes towards EBPs and perceptions about IC might decrease because practitioners experience EBPs as divergent from current practice and incongruent with their preferences and needs (Aarons, 2004). In other words, tenure may assert its effects on IC through the mediating effects of perceptions about EBPs (e.g., contextual appropriateness). Regardless of whether these perceptions are correct, they may represent significant barriers to implementation in CWSs. To improve attitudes and climate for implementing EBPs in CWSs, tailored implementation strategies may be needed to demythologize EBPs as inflexible and unfit for child welfare practice. Coinciding, strategies for re-design and adaptation of EBPs to better accommodate contextual needs and preferences could also be warranted (Lyon & Bruns, 2019). Thus, practitioners' perceptions of EBPs, and especially how acceptable, appropriate, and usable they perceive EBPs to be, could be key to successful re-design and subsequent implementation.

An alternative or complementary explanation could be that experienced practitioners have gained more contextual awareness about organizational characteristics of CWSs and its conditions for implementation. When practitioners are constantly under scrutiny, working with high caseloads, scarce resources, and demanding directives, implementation of new practices can appear insurmountable. Thus, in their skepticism towards their IC, practitioners with more experience may be more aligned with reality compared to the less experienced and more optimistic practitioners. As observed by Williams and colleagues (2018), a positive IC can depend on a positive molar organizational climate to promote successful implementation. Having highly stressed and unsatisfied practitioners is likely detrimental to the molar organizational climate. Consistently experiencing these conditions through organizational changes may induce change fatigue (Bernerth et al., 2011). As such, working on changing the premises (i.e. molar organizational climate) that induces high stress and low job satisfaction and, subsequently, unfavorable perceptions about IC could be necessary to build long term capacity for quality improvement and implementation of EBPs in CWSs. Organizational interventions focusing on improving culture and climate for implementation (e.g., Availability, Responsiveness, and Continuity [ARC] intervention, Glisson & Schoenwald, 2005; Leadership and Organizational Change for Implementation intervention, Aarons, Ehrhart, Farahnak, & Hurlburt, 2015) have the potential to improve these premises. However, system-level intervention and change may also be needed to address these issues long term.

The discrepancy observed at T1 and T2 could be due to either of the mechanisms theorized above, or a combination. The stronger

association between tenure and perceptions of IC at T2 could reflect the more experienced practitioners having their skepticism strengthened by observing implementation barriers between T1 and T2. The implementation process did encounter significant barriers, and this could reinforce the already slightly negative perceptions of EBPs as unappealing or conditions for implementation as unfavorable. Practitioners with less tenure may have remained more positive to IC because of more positive experiences with the implementation process and the practices implemented, or they may not have experienced reoccurring implementation barriers to the same degree as more experienced practitioners. We cannot be certain the discrepancy reflects a change in individuals because only a minority of the sample participated at both timepoints.

Tenure may be a factor to consider in assigning roles in implementation processes. Regardless of why less experienced practitioners are more positive towards implementation, they may be more likely to exhibit implementation citizenship behavior in an implementation champion role. However, because of their limited experience, they may be less likely to be local opinion leaders, which may be a vital characteristic of champions who effectively create and sustain implementation engagement among co-workers (Kirchner et al., 2012). Thus, strategically assigning less experienced (and satisfied) practitioners to champion the more practical aspects of implementation strategies may be more beneficial. For instance, coordinating communication with intermediaries, providing local technical assistance (e.g., support audit and feedback system, manage implementation material), or contingency plan management is all essential tasks that require positive and engaged individuals within the CWS. Less experienced practitioners may also be more eager to learn, and involving these practitioners early in implementation roles may be increasingly beneficial as they gain more experience and status among co-workers.

5.5. Post-graduate education and active versus passive participation in implementation

Our hypothesis suggesting that practitioners with post-graduate education would have lower scores on IC was not supported. Prior studies on associations between education and implementation determinants have found divergent results (Egeland et al., 2016; Oreg et al., 2011), Taken together, more studies would be needed for post-graduate education to have meaningful implications for implementation, and future studies on different forms of education as predictors of implementation determinants should assess associations with multiple determinants for comparison purposes (e.g., IC, attitudes towards EBPs, individual readiness for change).

Active participation is theorized to increase implementation buy-in by creating a sense of agency, contribution, and control over commencing changes (Armenakis & Bedeian, 1999). There may be several possible explanations for our null finding: The implementation may not have been inclusive enough for active participants to create implementation buy-in. Prior studies looking at participation have involved staff in both planning and execution of implementation (Oreg et al., 2011). In the current implementation process, the staff were labeled active participants if they were involved in the experimental intervention or execution of implementation strategies (e.g. received training in the intervention, were trained and used as implementation champions, or were assigned specific roles in implementation), while only a few were directly involved in planning (e.g. co-creating implementation strategies). Active participation at the outset of implementation planning might be necessary to create a sense of ownership strong enough to alter attitudes and perceptions about implementation.

Practitioners may also be able to distinguish between their subjective attitudes towards implementation and their objective rating of their organization's IC. The current implementation process has had variable success in overcoming barriers encountered throughout

implementation, which (1) could be curbing general implementation engagement, and (2) could spread awareness about shortcomings in the implementation climate and thus cancel out effects from being an active participant.

5.6. Norwegian translation of the implementation climate scale

Confirmatory factor analysis (CFA) revealed that the implementation climate scale (ICS) previously validated in CWSs in the United States (Ehrhart, Torres, Wright, Martinez, & Aarons, 2016) also exhibited acceptable psychometric properties in Norwegian CWSs using the Norwegian translation. Results confirm that the Norwegian translation of ICS can be a useful tool for measuring important determinants for quality improvement and implementation of EBPs in Norwegian CWSs.

As depicted in Table 4, total IC scores from the Norwegian CWS samples were somewhat lower compared to that of Ehrhart and colleagues (2016) from CWSs in California, Oklahoma, and Illinois, but the differences were not statistically significant. There were, however, some significant differences between means on IC subscales. Norwegian practitioners scored educational support for EBPs to be lower compared to US practitioners at both time points, which is unsurprising knowing that Norwegian CWSs have a tradition of eclecticism and a history of some resistance towards EBPs. More surprisingly, Norwegian practitioners scored significantly higher on rewards for EBPs at both time points, and to our knowledge, there are no systematic practices in Norwegian CWSs for providing rewards for EBP use. Although scores on this sub-scale were relatively low in all samples compared to scores on the other sub-scales, the Norwegian means were higher on all three subscale items. The largest difference was observed in the item about accumulating compensated time from EBP use. Time compensation is a regular practice bound by law in Norway (Working Environment Act §10-6). Some respondents may have scored this item high because all overtime practice is compensated, and thus EBP use as well. Item 12 could be prone to misinterpretation in the Norwegian translation («Denne tjenesten gir muligheter til å opparbeide avspasering for å kompensere for overtid som følge av bruk av kunnskapsbasert praksis»), and a further specification stating that the item is referring to additional compensation beyond regular compensation might be warranted in further use of the translation. The alphas were low for the rewards subscale at both time points, which may also reflect differences in how it was interpreted, and how practitioners are rewarded in Norway compared to where initial ICS development took place.

Scores on recognition for EBPs were significantly higher in the Norwegian sample at both time points, with the biggest difference observed in the item about EBP use increasing likelihood for promotion. This finding is somewhat surprising, seeing as we are not aware of CWSs practicing promotion policies based on use of EBPs. A likely explanation can be found in the way the use of EBPs are defined and operationalized in Norwegian CWSs. Evidence-based practice translated into "kunnskapsbasert praksis" can be interpreted as competent unification of elements of EBPs with the more autonomous expertise of practitioners and the needs and preferences of clients. Thus, practicing EBPs, although practitioners are not using EBP protocols per se, can be interpreted as synonymous with being a competent practitioner and subsequently increases the likelihood of promotion. Further use of the Norwegian translation should consider stating whether practicing EBPs refers to the integration of elements of EBPs within the more autonomous experience-based practice, or whether EBPs refer to specific protocols of evidence-informed interventions.

6. Limitations

Several limitations should be noted. Firstly, the results may not be completely representative of the population because some invited practitioners chose not to participate. Secondly, the development of the

scales for job satisfaction and job stress did not fully adhere to best practice guidelines for scale development (Boateng et al., 2018). The complete 32 item questionnaire about individual- and organizational aspects of the CWS was not subjected to psychometric testing. Instead, the first and last author chose items indexing job stress and job satisfaction based on content validity and completed separate psychometric testing of the scales. Including all 32 items in PCA and EFA could have resulted in a different factor structure. Third, implementation climate (IC) is inherently a unit level construct, and characteristics at individual, team, organization, and system levels all may be likely to have an impact on measures of IC. Thus, the use of multi-level and cross-level analyses could be utilized when measuring associations across two or more levels of analysis. In tackling multi-level constructs that are underexplored, however, a focus on fewer levels of analysis as a first step can be beneficial to developing theory (Kozlowski & Klein, 2000). As few studies have investigated individual-level predictors of perceptions of IC, single-level analysis was found appropriate in the present study. Finally, while we use the term "prediction" when referring to our analyses, this denotes prediction in a statistical sence and does not necessarily infer causality. Future studies should examine causality and temporal impacts of implementation strategies on implementation determinants, mechanisms, and outcomes.

7. Conclusions

This study furthers our understanding of how individual characteristics are associated with implementation climate (IC) in child welfare services and can aid future exploration of why implementation initiatives succeed or fail. Practitioners' job satisfaction emerged as a strong determinant of IC, more than did job stress, post-graduate education, and whether they were active participants in implementation. These results imply that job satisfaction may play an important role in mechanisms to improve organizational conditions for implementation of EBPs. However, it may also be that IC can affect practioner job satisfaction, a hypothesis that can be tested in future studies. Practitioners with longer tenure in CWSs were more skeptical towards IC, and significantly so in the second sample measuring IC during an implementation process. Experienced practitioners may have more contextual awareness, more skepticism towards EBPs, change fatigue from recurring implementation processes, or a combination of the above. Implementation interventions may consider addressing system, organizational, group, or individual level strategies to increase job satisfaction as a mechanism towards improving IC. Additionally, job satisfaction and tenure may help prioritize implementation strategies and assign appropriate roles in implementation processes.

CRediT authorship contribution statement

Thomas Engell: Conceptualization, Methodology, Formal analysis, Investigation, Data curation, Writing - original draft, Visualization, Project administration, Funding acquisition. **Benedicte Kirkøen:** Data curation, Writing - review & editing, Investigation, Project administration. **Gregory A. Aarons:** Conceptualization, Writing - review & editing, Supervision. **Kristine Amlund Hagen:** Conceptualization, Methodology, Formal analysis, Validation, Writing - review & editing, Supervision, Funding acquisition.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data from the current study is not publicly available due to confidentiality requirements. Data in summarized forms can be obtained from the corresponding author, *details removed to adhere to blind review*, on reasonable request.

Appendix A. Supplementary material

Supplementary data to this article can be found online at https://doi.org/10.1016/j.childyouth.2020.105509.

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Paper 4

Exploring how intervention characteristics affect implementability: a case study of common

elements-based academic support in child welfare services

IV

Exploring how intervention characteristics affect implementability: a case study of common elements-based academic support in child welfare services

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Abstract

Background: Prominent implementation theories and frameworks articulate characteristics of interventions (e.g., contextual alignment) as important determinants of successful implementation in natural practice settings. Yet, few studies have explored such characteristics in-depth. Research is needed to understand how and why interventions' characteristics can make them more or less implementable in their intended practice settings. Child Welfare Services (CWSs) need evidence-informed academic interventions to help children's current and prospective wellbeing. CWSs are complex implementation contexts that likely need interventions to be highly implementable. This mixed-methods case study explored the implementability of Enhanced Academic Support (EAS), a co-designed common elements-based academic intervention for children and families in CWSs, and how characteristics such as flexibility and contextual alignment influenced its implementability.

Methods: We used a fully integrated mixed-methods design and collected data from 24 practitioners and supervisors from three Norwegian CWSs. Quantitative data included measures of intervention feasibility, acceptability, appropriateness, and usability. Qualitative data included focus groups, individual interviews, and feedback logs. Quantitative analyses were descriptive, and qualitative analyses mixed deductive and inductive coding and interpretation. Mixed analyses used convergence and expansion.

Results: EAS scored 75.33 (*SD* = 15.57*)* out of 100 on the implementability index, and convergence with qualitative data indicates that EAS is implementable for most practitioners in CWS, but not all. The core element structured tutoring was occasionally inappropriate with families. Specific content and design characteristics influenced implementability through different mechanisms. The influence could be positive or negative depending on practitioners' preferences and values and their perceptions about appropriateness for clients. Flexibility was a multi-faceted characteristic with potential benefits and pitfalls for implementation. Flexible cross-domain integration of core elements of EAS into other supports was crucial.

Discussion: Perceptions about implementability can vary within groups of practitioners, which may call for designing for differentiation in interventions and implementations. Cross-domain integration may be a promising design characteristic for interventions in complex

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practice settings. Limitations in implementability and competing priorities may cause paradoxes where those children who need academic support the most may receive less of it.

1. **Introduction**

A range of interventions within the health and social sciences demonstrate effectiveness in controlled research settings (i.e., evidence-based programs). Still, studies indicate that many evidence based-programs (EBPs) are unlikely to be implemented and sustained as intended in non-research settings (Stirman, Kimberly, Cook, Calloway, Castro et al., 2012; Hall, Staiger, Simpson, Best, & Lubman, 2016, La Greca, Silverman, & Lochman, 2009; Glasgow, Vinson, Chambers, Khoury, Kaplan and Hunter 2012; Lau, Stevenson, Ong, Dziedzic, Treweek, & Eldridge et al., 2016). Implementation science also finds misalignments between implementation demands of interventions and the implementation capacity and constraints in a range of health and welfare settings (Bach-Mortensen, Lange, Montgomery, 2018; Lau et al., 2016; Mitchel, 2011). As a result, routine delivery of EBPs in an evidence-based manner is restricted, which in turn may limit their societal impact. Such observations have led to calls for design and re-design of interventions that more appropriately fit their intended destinations of practice (Lyon, Dopp, Brewer, Kientz, & Munson, 2020; Jones, Mair, Kuppens, & Weisz, 2019; Mulder, Murra, & Rucklidge, 2017; Kazdin & Blasé, 2011).

Child Welfare Services (CWSs) can benefit from implementation of interventions informed by evidence, and there are prominent needs and untapped potentials for providing academic interventions to children through CWSs (Knoph, Hahn, Proia, Truman, & Johnson et al., 2015; Seeberg, Winsvold, & Sverdrup 2013). CWSs, however, present as complex implementation settings where limitations in interventions' contextual fit may obstruct wide adoption and sustainment (Aarons & Palinkas, 2007). Purposefully designing more implementable interventions may proactively reduce barriers to implementation. Research is needed to understand how and why different characteristics of interventions can make them more or less implementable. Practitioners are key implementation stakeholders, and their perceptions may be crucial to understanding how characteristics of interventions facilitate or obstruct their use in practice.

This paper is a case study exploring intervention characteristics and implementability in natural practice settings. We do so in the context of implementing and evaluating a collaboratively designed common elements-based academic intervention, Enhanced Academic Support (EAS), in Child Welfare Services in Norway. We use mixed methods to

explore EAS's implementability in child welfare practice and how characteristics of EAS influence implementability.

2. Background

2.1 Implementability as an implementation determinant

An implementation determinant is a factor believed or empirically shown to influence implementation outcomes (Nilsen & Bernhardsson 2019). Rooted in diffusion of innovation theory and later advancements in implementation theory (Rogers, 2003; Damschroeder et al., 2009; Proctor et al., 2011; Aarons, Hurlburt, & Horwitz et al., 2011), we use implementability to express *the degree of ease with which an intervention or innovation can be implemented successfully in a given context.* Thus, implementability as an implementation determinant can be seen as a dimensional quality of an intervention determined by its characteristics. Implementability can encompass how appealing, appropriate, and fitting content and of the intervention is to those who engage with it, and how this content is designed, shaped, or packaged in ways that would facilitate or inhibit successful and sustained implementation. Several prominent implementation theories denote intervention characteristics as critical determinants of implementation (Fixsen & Blase, 2020; Aarons et al., 2011; Damschroeder et al., 2009; Harvey & Kitson, 2020). However, these determinants appear under-researched compared to other determinants of implementation (Lyon et al., 2020; Lewis et al., 2015).

Proctor and colleagues (2011) articulated three constructs that influence the implementability of an intervention in particular; (1) *feasibility*, defined as the extent to which an intervention can be successfully used or carried out in a given service or setting, (2) *acceptability*, defined as the perception among implementation stakeholders (e.g., practitioners and managers) that a given intervention is agreeable, palatable, or satisfactory, and (3) *appropriateness*, defined as the perceived fit, relevance, or compatibility of the intervention for a given practice setting, practitioner, or practice recipient. Weiner and colleagues (2017) developed three pragmatic measures for evaluating feasibility (Feasibility of Intervention Measure, FIM), acceptability (Acceptability of Intervention Measure, AIM), and appropriateness (Intervention Appropriateness Measure, IAM), which cover important aspects of how implementable interventions are perceived to be.

A fourth concept relevant to implementability, *intervention usability*, considers how interventions are designed to align with user needs and contextual constraints. Lyon, Koerner, & Chung (2020, p. 3) refers to intervention usability as "the extent to which an intervention can be used by specified users to achieve specified goals with effectiveness, efficiency, and

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satisfaction". They have adapted the Systems Usability Scale (SUS, Brooke, 1996), a ten-item scale popularly used in user-centered design, into Intervention Usability Scale (IUS) to measure the usability of psychosocial interventions (Lyon et al., 2020). IUS measures how easily and efficiently the intervention is to learn and retain, its cognitive demands, its alignment with natural constraints, its reputation, and how it affords recovery from misuse. Although there appears to be some overlap between the measures of feasibility, acceptability, appropriateness, and usability (e.g., reputation and acceptability), these four constructs complement each other and are used to index implementability in this study.

2.2 Need for implementable academic support in child welfare services
Child welfare services (CWS) need academic interventions that can reach a wide range of the children they support (Engell, Follestad, Andersen, & hagen, 2018). In Norway, eight out of ten children in CWSs struggle academically (SSB, 2016), and similar numbers are reported internationally (Jackson & Cameron, 2011). Effective academic support can improve concurrent and prospective wellbeing for children in CWSs, and result in social and economic returns for societies (OECD 2016; Johnson, Brett, and Deary 2010; Falch, Johannesen & Strøm 2009). CWSs, however, present as challenging contexts for implementation of interventions (Engell, Kirkøen, Aarons, & Hagen, 2020), and they experience tensions between increasing demands for standardizing their services and having longstanding cultures of more autonomous practice (Olsvik & Saus, 2020). Although there is debate about CWSs responsibilities towards academics, The Norwegian Directorate for Children, Youth and Family Affairs (Bufdir) launched a series of efforts to improve academic support in CWSs in 2014. Bufdir (2018) has now mandated CWSs to cooperate with schools, attend to children's academic needs in out-of-home care, and piloted an academic intervention for children aged 12 to 18. However, these efforts did not target the largest population of children in need of academic support, primary school children living at home with their biological parents (Kirkøen et al., in review; SSB, 2020).

There are few evidence-based academic interventions available to CWSs (Evans, Brown, Rees & Smith, 2017), however, Out-of-School-Time academic (OSTA) interventions hold promise in promoting academic achievement for children at risk of academic failure (Knoph et al. 2015; Forsman & Vinnerljung 2012; Seeberg, Winsvold, & Sverdrup 2013). Common elements of effective OSTA interventions include combinations of home learning support, structured academic tutoring to children such as paired reading, and parent training in positive academic involvement (Engell, Kirkøen, Hammerstrøm, Ludvigsen, Kornør &

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Hagen, 2020). While schools primarily provide support during regular school hours, CWSs are positioned to provide OSTA interventions seeing as they frequently provide services to families after school hours and in homes. While several EBPs have been effectively implemented in the Norwegian child welfare system (Tømmerås & Ogden, 2015; Ogden, Christensen, Sheidow, & Holth, 2008; Christiansen, 2015), the majority of practice delivered by CWS agencies are interventions and counseling with limited specificity that remains largely eclectic (Christiansen, 2015; SSB, 2020).

Children and families in CWSs often present challenges in multiple domains. Practitioners' responsibilities span investigating abuse and neglect, delivering family, parent, and child counseling, out-of-home care placement and support, and offering compensational measures as parent relief and financial support (Christiansen, 2015). Besides, CWSs are often burdened with high caseloads, high levels of staff stress and turnover, scarce resources, and limited room for prioritizing practice improvements (Olsvik & Saus, 2020; Edwards & Wilderman, 2018; Strolin-Goltzman, Kollar, & Trinkle 2010; Ryan, Garnier, Zyphur, & Zhai 2006). Interventions aiming for broad reach in CWSs need to navigate dynamic practice contexts with limited implementation capacity (Engell et al., 2020; Aarons & Palinkas, 2007). To achieve wide scale adoption and sustainment of academic support, CWSs likely need academic practices that are tailored to their specific contexts. Hence, CWS contexts are likely sensitive to the implementability of interventions and, therefore, well-suited for exploring how intervention characteristics influence implementability.

2.3 Common elements approach to design and re-design of interventions

Common elements are discrete intervention content or practices frequently shared by a selection of interventions (Engell et al., 2020). Common elements-approaches can be used to disentangle a selection of EBPs into evidence-informed elements and components (i.e., lean and granular building blocks for intervention or implementation). From a pragmatic perspective, common elements can be viewed as evidence-informed, and not evidence-based (see Engell et al., 2020 for review). In being evidence-informed building blocks, common elements provide opportunities to design or refine interventions with characteristics that may improve implementability in practice, such as flexibility in delivery, alignment with contextual constraints, and reducing complexity (Barth et al., 2012; Mitchell, 2011; Cabassa, 2016; Hogue et al., 2019; Garland et a., 2008). Subsequently, exploring such intervention characteristics may inform adaptations of EBPs, or the design of new evidence-informed interventions, to improve their implementability in complex and dynamic practice settings

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(Mitchel, 2011). Besides, implementation science is calling for explorations of how intervention characteristics such as flexibility influence mechanisms of implementation (Kirk, Moore, Stirman, & Birken 2020), and qualitative and mixed methods approaches can give rise to theory and hypotheses (Lewis, Boyd, Walsh-Bailey, Lyon, Beidas et al., 2020). Using a mix of inductive and deductive approaches, we can design for and explore characteristics believed to make interventions implementable while simultaneously allowing other characteristics to emerge as influential through analyses.

To develop an academic intervention for CWSs, we first conducted a systematic review and common elements analyses to identify the most common practice-, process-, and implementation elements included in effective OSTA interventions accounted for inclusion in ineffective interventions (Engell et al., 2020). This review provided evidence-informed hypotheses about what the most likely useful elements and processes of OSTA interventions are, and for whom, under what circumstances, and in what combinations. The results were used in collaborative design (co-design) with local stakeholders to develop Enhanced Academic Support (EAS), a flexible common elements-based academic intervention for children and families in CWSs. This case study explores practitioners' perceptions of EAS's implementability and how the intervention's characteristics influence these perceptions. The study also describes EAS and how it was co-designed.

Research questions

1. How feasible, appropriate, acceptable, and usable is EAS perceived to be by practitioners and supervisors in Norwegian CWSs?
2. What characteristics of EAS influence its implementability, and how?
3. How can the implementability of EAS be improved?

3. Methods

3.1. Co-design of intervention and implementation strategies

3.1.1 Facilitated co-design

An intermediary organization partnered with four Norwegian CWSs to co-design, implement, evaluate, and sustain or de-implement academic support for children in CWSs (Engell et al., 2018). This partnership's first aim was to develop an academic intervention tailored to the needs of CWSs and children and families receiving services. We established four co-design teams consisting of local CWS managers and practitioners, youth-representatives, parents with child welfare experience from the local services, local school personnel, and researchers and implementers from the intermediary. A structured co-design process was used to develop

a locally tailored intervention, a training program, and implementation strategies. The guiding principles used are listed in table 1, and complete details about the co-design process and recommendations for future use are available in supplementary file 1.

Table 1 here

3.1.2 The intervention: Enhanced Academic Support (EAS)

Enhanced Academic Support (EAS) was designed as a flexible supplement the support families in CWS receive. In the basic structure, the four core elements of EAS (see table 2) are delivered to families in six sessions over a period of 6 months with support and follow-up between sessions. The sessions are delivered during home visits or in other settings at the 'family's preference. In the study, practitioners were free to integrate the core elements of EAS into other interventions or support they provide to address academic needs in combination with other necessities (i.e., cross-domain integration).

The first session is assigned to build alliance and engagement with the family, assess the family's living situation, and formulate goals together. One session at the end is assigned to evaluate, repeat core elements as needed, and create a sustainment plan. The four sessions in between are assigned to the four core elements. Each core element (e.g., structured tutoring) includes two to four components: specific actions and activities (practice elements, e.g., paired reading) for the practitioners and the families to engage in. Practitioners also receive instructions about carrying out activities (process- and structural elements, e.g., parent and child together, at least one hour a week for four months). Each core element has adaptation alternatives that can be useful to tailor to individual and contextual circumstances (e.g., use the less complex version of paired reading) and suggestions for tasks to work on in between sessions. Each core element also has a few key determinants of success and minimum fidelity requirements to prioritize essential components in situations where completing all components is not feasible. Pre-defined adaptation alternatives are designed to either (1) provide options for tailoring, or (2) help establish prerequisite conditions for the core element to assert its function. The abovementioned features are based on results from the common elements review and input from stakeholders in co-design. Content is described in table 2.

Table 2 here

Operationalized flexibility

As most elementary school children in CWS appear to struggle in school and need academic support, EAS was designed to be used with all families receiving home-based support from

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the CWS, regardless of referral reason, problem domains, or other circumstances. A high degree of flexibility was built into delivery to make core elements usable despite the variation in client needs and circumstances. This "flexibility within fidelity (Kendall Gosch, Furr, & Sood, 2008)" aimed to enable practitioners to adapt the intervention in several ways to tailor to individual and contextual needs and preferences while maintaining core functions. Said in reductionistic terms, this means practitioners could adapt the basic structure in the following ways:

- reorder the sequence of elements
- increase or reduce the dose of elements and components
- combine elements and components in sessions
- integrate elements of academic support in other interventions or other forms of support
- alter the number of sessions needed (minimum 4) and duration of the intervention
- Use pre-defined adaptations alternatives and tailor adaptable features

In more ecological and processual terms, practitioners were encouraged to adapt and tailor core elements and processes as they saw fit to create a coherent and appropriate intervention process.

Educational and organizational material

An EAS handbook was developed and given to practitioners and managers. The handbook is 32 pages and details the basic structure of EAS, core elements and components, key determinants of success, adaptation alternatives, suggestions for between-session assignments, and examples of "tips and advice." The handbook also includes brief material that supplements core elements and components, such as guidance for carrying out activities (e.g., brief paired reading instructions), summaries of relevant content and practices that can be used in sessions and given to parents, family planners and an EAS goals tracker, as well as information related to the research project.

3.1.3 EAS Training and implementation

EAS implementation includes five core implementation strategies; (1) 14 hours dynamic training, (2) four-hour booster session per semester, (3) ongoing consultation, (4) an audit and feedback system, (5) and a pragmatic handbook with supporting material (details in Engell et al., 2018). The training consisted of approximately 50% didactic education, 20% role-play, and 30% discussions, problem-solving, and dialogue. Trained practitioners practiced delivery of EAS with families they were already working with during 4 to 10 months of piloting before

being assigned new families in the RCT evaluating EAS's effect. The practitioners initially received ongoing consultation from local EAS champions at each site and from the external implementation team upon request. This implementation strategy was changed after one year due to inconsistent consultation, and consultation calls with practitioners every other month during EAS delivery was initiated. Some implementation strategies were built into the co-design process and the intervention, such as stakeholder engagement and facilitation, and making the intervention dynamic and flexible. Detailed reporting of implementation strategies is available in the protocol (Engell et al., 2018). Evaluation of implementation strategies and intervention fidelity and are outside the scope of this paper.

3.2 Study context

This study is part of a randomized controlled pragmatic trial evaluating EAS (Engell et al., 2018). Data were collected from three of the four child welfare services (CWSs) participating in co-design. One CWS withdrew before data collection. The three CWSs were located in southeastern Norway and varied in size from medium to large by Norwegian standards as measured by catchment area and number of practitioners. One CWS was located in a dense urban area with a population of predominantly low- to medium socioeconomic status (SES) and an above-average percentage of ethnic minorities, and the second and third in a suburban area with a range of low to high SES population. The data collection for this study started in spring 2019 and ended in spring 2020.

3.3 Study design

This study used a mixed-methods case study designs (Creswell & Clark, 2018). A fully integrated convergence and expansion design was used to investigate the complexity of EAS implementability. Fully integrated refers to quantitative and qualitative inquiry interacting throughout the implementation of EAS. A meta-paradigmatic view was used in analyses to interpret data from different viewpoints (Johnson, 2017).
Table 3 here

3.4 Procedure

CWS supervisors selected staff who would receive training in EAS, and all who received training were asked to participate in the randomized part of the study. They gave informed consent to participate before receiving training in EAS. Email invitations were sent to participants containing a personal link to an implementation survey. The link directed participants to a page with information about the study and a consent form to be electronically

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signed by checking the appropriate box. Upon consent, the respondents were directed to a broader implementation survey, which took about 15-20 minutes to complete. Three of the four measures used in this paper were part of that online survey. A total of three reminder emails were sent out to practitioners who did not respond. In addition to the web-based surveys, paper versions of the consent form and questionnaires were administered at scheduled meetings with CWS practitioners. This data collection was conducted approximately 18-24 months after the initial implementation of EAS. After the broader implementation survey was closed (24 months after initial implementation), participants were given the opportunity to respond to all four measures used in this paper as part of a web-based post-intervention survey which was sent to practitioners when a family assigned to them in the RCT study completed the intervention. If a participant already responded to the broader implementation survey that included three of the four measures, only the fourth measure (Intervention Usability Scale) was included in the post-intervention survey to avoid repeated collection.

One year into implementation, all participants who had completed EAS with at least one family in the study were considered eligible and invited to participate in focus group interviews at scheduled meetings with the implementation team. Four practitioners agreed to participate after the first invitation, and one interview was conducted. Ten months later, more practitioners were eligible due to having more families completing the intervention. Three additional practitioners agreed to participate, and another interview was carried out. At the same time, supervisors of the three departments with trained practitioners were invited to participate in individual telephone interviews. Two agreed to participate, and one was unavailable.

3.5 Participants

Thirty-one practitioners and supervisors had received training in EAS during the study and were eligible for participation in the study's quantitative part. Twenty-four (77.42%) of them agreed to participate. The majority of the respondents held the position of caseworker ($n = 11$) or family therapist ($n = 9$). Nine out of 21 eligible (three lost to turnover) participated in the qualitative interviews (42.86%). Their professions were child welfare educator ($n = 9$), social worker ($n = 6$), Family therapist ($n = 2$), education specialist ($n = 2$), social anthropologist ($n = 1$), and social educator ($n = 1$). All participants in the qualitative sample participated in the quantitative sample.

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Table 4 here

3.6 Instruments

3.6.1 Implementability

Feasibility, acceptability, and appropriateness

Intervention feasibility, acceptability, and appropriateness were measured using three four-item five-point scale questionnaires ranging in response choices from "completely disagree" to "completely agree": Acceptability of Intervention Measure (AIM), Intervention Appropriateness Measure (IAM), and Feasibility of Intervention Measure (FIM). The three questionnaires have exhibited acceptable psychometric properties (Weiner et al., 2017). In the current study, the Cronbach's alpha for AIM, IAM and FIM was .96, .98, and .91, respectively.

Usability

Usability was measured using the Intervention Usability Scale (IUS, Lyon, Koerner, & Chung, 2020), a 10-item questionnaire rated on a five-point scale, ranging in response choices from "strongly disagree" to "strongly agree". The questionnaire is an adaptation of the widely used Systems Usability Scale (SUS, Brooke, 1996), which is a sensitive and robust measure used to evaluate the usability of technologies and other systems and products across a wide range of contexts. In the IUS, only minor adaptations to more appropriate fit the context of psychosocial interventions have been made: The term "system" has been replaced with "intervention", "functions" have been replaced with "components", and "technical person" have been replaced by "expert consultant". In the current study, Cronbachs' alpha of IUS was .88.

AS depicted in table 5, the four scales indexing implementability correlated with correlations ranging from .60 to .79. These high correlations indicate low discriminant validity between the scales.

Table 5 here

3.6.2 Free-text feedback from fidelity monitoring

After each session of EAS with a family, practitioners were instructed to complete a dynamic fidelity checklist on their smartphone or computer using an online survey. The survey took about 5–10 min to complete, depending on the number of core elements and adaptations that were used in the session (see Engell et al., 2018 for details). In addition to pre-defined adaptations, practitioners reported the use of additional adaptations and general feedback about the delivery of EAS using free text options. These free text feedback reports contained

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information directly related to EAS's implementability and were included in qualitative analyses.

3.7 Interviews

3.7.1 Semi-structured focus groups

Two focus group interviews were conducted. The first interview had four participants, lasted 119 minutes, and was conducted in May 2019 at the offices of the intermediary organization. The second had three participants, lasted 129 minutes, and was conducted in March 2020 at the participant's child welfare agency. Each focus group was facilitated by an experienced child welfare professional without affiliation to the study. The facilitator has extensive experience with qualitative interviews. She educates child welfare practitioners weekly and is involved in quality improvement initiatives in CWSs. She made participants aware of her professional experience and her interest in learning more about what makes interventions more or less implementable in child welfare services. She used a semi-structured interview guide based on the quantitative implementability-questionnaires and implementation theory in the Exploration, Preparation, Implementation, and Sustainment (EPIS) framework. The interview guide was structured in four phases: (1) framing the interview (informal talk, information, formalities), (2) participant's experience with EAS, (3) focusing on pre-defined themes, and (4) retrospect and final thoughts. The focusing on themes phase was structured around open questions and follow up questions about the feasibility, appropriateness, acceptability, and usability of EAS, as well as open questions about the core elements of EAS, adaptations to EAS, material in EAS, and implementation strategies, determinants, and sustainment. The follow-up questions were only asked if they had not already been addressed during the flowing discussions. Each focus group had a secretary with a checklist who made sure all themes were addressed and took field notes. During the retrospect phase, participants were asked to elaborate on insufficiently addressed themes. The interviews were audio-recorded and later transcribed for analyses. The facilitator and secretary received a one-hour didactic training in themes of the interview guide.

3.7.2 Semi-structured interviews

Two individual telephone interviews were conducted with the supervisors of the participants in the focus groups. The interviews were recorded and lasted 52 and 37 minutes. The structure and questions were the same as in the focus group, with more emphasis on leadership, implementation strategies, and sustainment, and less on details of core elements of EAS and adaptations. These interviews were conducted by the first author (TE), who is a Ph.D. candidate in implementation science and psychology with prior experience from conducting

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qualitative interviews. He knew the participants professionally through collaboration in the RCT study. They had established a professional relationship with a common goal of improving CWS practice. The participants were reminded of the importance of limiting any biases and speaking honest opinions about themes in the interview, regardless of whether they were positive or negative.

3.8 Analyses

3.8.1 Quantitative analyses

Descriptive analyses in IBM SPSS 12 were used to calculate mean and total scores for each of the four scales. IUS total scores are usually calculated by multiplying the sum score by 2.5 (high score, range: 0-100). Due to human error, item 8 on the usability scale ("I find the intervention very cumbersome to use") was not included in the questionnaire. Thus, to ensure the range of scores on a scale ranging from $0 - 100$ for comparison purposes, we multiplied the sum score by 2.78, similar to the procedure applied by Lyon and colleagues (in review). To calculate an overall sum score for all four scales, we multiplied the sum score of each of the three other scales (acceptability, appropriateness, feasibility) with 5 so that scores would range from 0-100. We then calculated the mean score of these four scores to find the overall implementability score. We also tested bivariate correlations.

3.8.2 Incomplete and missing data

Three participants responded to AIM, IAM, and FIM, but not IUS, because of turnover before IUS was included in the post-intervention survey.

3.8.3 Qualitative analysis

Qualitative analysis was completed using a Framework method (Gale, Heath, Cameron, Rashid, & Redwood, 2013), a descriptive and exploratory approach to thematic analysis. The EPIS framework was used to inform data interpretation across time (phases of implementation) and at multiple levels of implementation (inner and outer organizational setting, innovation factors, and bridging factors). In initial analyses, codes were constructed in accordance with the EPIS-framework. In subsequent in-depth analyses of intervention characteristics (a domain of EPIS), an analytical framework was applied based on the operationalization of implementability suggested by the study (appropriateness, acceptability, feasibility, usability), and themes were coded within these four constructs. Inductive codes were made for themes not applicable to the four implementability-constructs to inform expansion of the analytical framework. Specific intervention characteristics were not defined

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as codes in advance to allow characteristics to emerge as themes during analyses. However, one coder (TE) was already familiar with the following characteristics of EAS that had been deliberately designed to support implementability: flexibility in delivery, cross-domain integration of core elements, and alignment with contextual constraints. Thus, coding of intervention characteristics was also a mix of induction and deduction. TE and AML independently coded transcripts, developed a working analytical framework through discussions, independently applied the analytical framework, charted data into the framework matrix in collaboration, and interpreted data through discussions. TE and AML collaboratively created summaries of data and interpretations for each theme and identified illustrative quotes. TE and AML discussed findings theoretically and identified possible mechanisms and processes influencing implementability. KAH reviewed the analytical framework and charted data, summaries of data and interpretations, and discussed alternative interpretations with TE. Minor adjustments to analyses were made after these discussions.

3.8.4 Mixed methods analysis

Quantitative and qualitative results were merged in tables, and results from each data source were compared for convergence or divergence. Qualitative results were used to complement the descriptive quantitative results to provide a more in-depth understanding of the constructs indexing implementability, and to expand on understandings of how intervention characteristics influenced these constructs.

4. Results

4.1 Implementability of Enhanced Academic Support (EAS)

Table 3 depicts quantitative results on EAS's feasibility, acceptability, appropriateness, usability, and implementability index. EAS received an average score of 75.33 ($SD = 15.57$) out of 100 on the implementability index. Contributing to the index, the feasibility of EAS in child welfare services received, on average, a score of 78.54 ($SD = 14.10$), appropriateness a score of 71.88 ($SD = 22.16$), acceptability a score of 82.50 ($SD = 18.30$), and usability at 67.78 ($SD = 16.32$). Summaries of results from mixed methods analyses follow below. A mixed-methods table summarizing results are available as supplementary file 2.

 Table 6. here

4.1.1 Acceptability

Participants generally scored EAS as acceptable, with an acceptability score of 16.50 of 20 and relatively low variation ($SD = 3.65$). These results converge with the qualitative analyses

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revealing that the theme, academic achievement in CWS, is perceived as highly important by all participants and something a large proportion of the children they help struggle with. Most participants in the qualitative interviews viewed academic support as an important addition to the help and counseling CWS already provides. However, two of the participants were more skeptical and viewed academic support as outside the scope of their work and more as a responsibility for schools or colleagues in the CWS working as caseworkers and not family therapists.

> *"I think this is a very important intervention for children who struggle in school and need this type of support and that bit of close follow-up at school"*
>
> *"Because, actually, I think this perhaps should have been up to the schools"*

4.1.2 Appropriateness

Appropriateness scored 14.38 out of 20, the lowest-scoring subscale of implementability with an average score just below the *agree* position on the scale, and with some notable variation ($SD = 4.43$). These results converge with the qualitative results, which indicate that most participants view EAS as appropriate in the child welfare context. However, this is where participants seem to deviate most in perceptions, demonstrated by the two skeptic participants perceiving EAS as inappropriate for their work, and several participants mentioning occasional inappropriateness. Variation in the outer settings determinant client needs and circumstances largely influence appropriateness and require responsiveness to individual needs.

> *"I think it doesn't always fit in, when really serious problems come in as a factor"*

4.1.3 Feasibility

The feasibility of EAS scored an average of 15.71 of 20, just above the *agree* position on the scale, and with low variation ($SD = 2.82$). This, to some degree, converges findings from the qualitative results. In general, limited capacity, time constraints, and high caseloads limit the practitioner's availability for inner context implementation activities such as consultation and problem solving, and delivery of certain EAS core elements. However, a few practitioners expressed that, despite these barriers, EAS was feasible to implement in child welfare services due to characteristics such as alignment with current practice and different flexibility options.

"Then it is easier to say yes to a EAS-case, when you know it is flexible"

"so, I would say, we have more than enough to do, and that the time we have available is insufficient"

4.1.4 Usability

The usability of EAS scored an average of 67.78 (*SD* = 16.32), out of 100, with notable variation. This, to some degree, converges with findings from the qualitative results indicating that the majority of participants find EAS usable in child welfare settings. Participants highlight familiarity and alignment with existing practice, flexibility options, and easy-to-use handbook, material, and structure as contributing factors. However, one participant mentioned the handbook as too complicated and cumbersome, and a few mentioned usability issues with the math tutoring game (Multi Smart Training, MultiSmart).

> *"I think the handbook has been too complicated, a lot of unnecessary words and chapters.. ..It could have made ten times simpler for my liking"*

4.2 How intervention characteristics influence the implementability of EAS

Two different categories of characteristics were identified as influencing the implementability of EAS: *content* characteristics and *design* characteristics.

4.2.1 Content characteristics

Content characteristics are about how the subject matter of EAS and its core elements was perceived and experienced. The content characteristics that were most influential to imlementability were the *relative importance* of the core elements for children and families in CWSs, *alignment and compatibility* with existing practice and autonomy, and personal perceptions of *relevance* to child welfare practice.

The subject matter of the core elements *parent training in positive parental involvement in schools, guidance in home learning structure and routines*, and *guidance in positive reinforcement* received the most endorsement. These elements are mentioned as valuable and appropriate to use with nearly all families, while a few also highlight the math tutoring game (Multi Smart Training, MultiSmart), a component of the structured tutoring element, as fun and valuable.

> *"The positive parental involvement and their strengths, that's where I kept the main focus, one of the core elements I spent the most time on."*

Perceptions of the *paired reading* component were somewhat mixed. One participant expressed helping children and parents read together as somewhat uncomfortable and too divergent from what they usually do, while another express paired reading as a favorite that naturally could be integrated into his/her practice.

> *"When it comes to [paired] reading, I think that's fine, but I don't think it's our job to teach parents to involve themselves in that way."*

There was acceptance around EAS having feasible and appropriate elements for nearly all families CWSs meet. However, in families experiencing complx challenges such as severe

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conflicts and violence, academic support was perceived as challenging to prioritize. While two practitioners highlighted that these situations require the content flexibility that EAS affords, two other participants viewed EAS as inappropriate when working with severe cases.

> *"There is something in that you have to get some things out of the way before you can start the less dangerous things. You have to sort some things out for the families, you have to talk about what's what there and then, what's on fire needs to be addressed first"*

On the other hand, academic support was also mentioned as a gentle way to establish an alliance with families, and a participant also stresses the importance of academic support to children in situations of severe conflicts and crises.

> *"It's so incredibly important to have focus on school. No matter how, sort of, how difficult life is in any possible way, it is in fact something you need to and have a right to complete… .. It's in some way the only firm point to hold on to"*

Content appeared to be compatible and aligned with the practitioner's current practice, contributing to feasibility, appropriateness, and usability. However, there were differences in opinion as to whether the alignment was positive or negative. The two skeptic practitioners found the training in EAS unnecessary and the content too basic and similar to what they already do, but useful for less experienced practitioners or co-workers in other positions. For the positive participants, alignment and compatibility appeared to be reassuring and reinforce the use of core elements. However, there were also indications of alignment leading practitioners to continue more or less as before because they interpret their existing practice as adhering to core elements.

> *"It doesn't add that much coming with EAS. It's sort of, there is so many of the elements we already use in our counciling"*
>
> *"we already do a lot of what EAS say, so in that sense it's not particularly new. But I think, what I have learned even more is focusing on it (academic support) and bringing it more in [to the counseling]"*

All participants expressed that the content was familiar and easy to work with, although there were mixed opinions about the appropriateness of tutoring elements.

> *"This isn't rocket science, so to speak, but its things we are familiar with, put in a system and structure"*

4.2.2 Design characteristics: different forms of flexibility

Design characteristics are about how the content was structured, formatted, and shaped. Having core elements as the primary unit of instruction, and the opportunities for flexibility that appears to follow such a format, appeared to be the most important design characteristics

affecting implementability. The design of educational and supporting material also had an influence. There were three types of flexibility mentioned: altering structure, tailoring practices and processes, and cross-domain integration. These forms of flexibility appeared to influence implementability through distinct mechanisms specified in the three categories. below. The mechanisms are numbered from 1 to 5:

> *"I would say the flexibility has been the most important with this project, that you can go in, and based on what the needs are, having that EAS structure as a frame of reference and still step outside of it and find other solutions"*

Altering structure

The basic structure provided in EAS seemed well accepted, however, alterations to this structure were expressed as crucial. (1) Tailoring structure of EAS appeared to improve compatibility with individual needs and preferences, which improved all four implementability outcomes. For instance, participants expressed going straight to tutoring components in the first session because of academic needs, and skipping components viewed as unnecessary because the function of the component was already well established in the family (e.g., well-functioning structure and routines).

> *"seeing as I already knew the family, I just combined the first and second session"*

Also, some participants indicated that being able to (2) prioritize elements that were more compatible with their values, preferences, and responsiveness to client needs made EAS more acceptable. For instance, focusing less on components they are uncomfortable with or find inappropriate for clients, and prioritize components that were perceived as both important for clients and compatible with their self-efficacy.

> *"I did it in my own way, and then I felt it got easier. It felt more natural, more real… I took away the things I didn't think was that relevant and spent more time on one of the core elements. At first I was so occupied with doing all of them."*

> *"[interviewer asks follow up question about prioritization] do I understand you correctly that you chose depending on what was appropriate for the family and the children, or was it your own view? [participant] A bit of both, really, but mostly the family"*

Tailoring practices and processes

(3) Having alternatives of how practices and processes could be tailored to different contextual circumstances, and autonomy in choosing and using these adaptations, appeared to improve all four implementability outcomes, particularly usability. Instead of altogether

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abandoning a core element when circumstances prevented its use (e.g., parents unable to do paired reading due to language barriers), practitioners tailored components (e.g., engaged siblings, a family friend, or had the child read to parents for them to learn together).

Further, (4) empowering practitioners to use their expertise and creativity to tailor and adapt appeared to facilitate a sense of ownership and autonomy. Participants talked enthusiastically about how they tailored and adapted. However, one participant also expressed concerns about the integrity of EAS when there is such a degree of freedom in delivery, and there were indeed mentions of tailoring that likely compromised core functions, such as skipping certain components or a core element all together.

> *".. it's about being creative all the time, to figure out how we get this in in a way that makes it fun. There is sort of something about finding where the energy is in the children and the parents. That's important, and not always easy."*

Flexible cross-domain integration

Participants stressed that they typically address multiple problem domains when they interact with families. They were rarely able to deliver EAS on its own. They also expressed that their interactions with families are often unpredictable and require spontaneous flexibility. The design of EAS core elements and components as compatible with other forms of interventions and counseling appeared to be crucial. This enabled (5) cross-domain integration of certain EAS elements and components instead of abandoning EAS altogether. For instance, in situations where other issues such as severe family conflicts or crises required more prioritization, practitioners could choose certain appropriate components to integrate (e.g., combine crisis management with the family structure component to maintain stability through the storm) and adjust intensities of others (e.g., reduce parent training components, but increase follow up with the child on tutoring components).

> *"It has rarely only been about EAS, but other stuff as well, and then EAS has been a part of that, with the core elements."*

> *"Because there has been so much more else in addition, so I have tried to separate, but then I have put some EAS-counciling into the ordinary. So it has been both."*

Also related to integration, delivering EAS as a separate intervention appeared to be unnecessary in some families that had everything school-related in order. However, as one participant mention, they may still benefit from one or two components to reinforce their strengths and prevent negative development.

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"There weren't any academic challenges, and I thought it was important to sustain that. Then it was, look at what the parents do well, what the child do well, and reinforce that. And it was a nice way in to working with other things in the family as well, focusing on these strengths. I liked that. Then I skipped MultiSmart and paired reading. … the positive parental involvement and the strengths, that's where my main focus was"

There were important nuances to the flexibility mentioned. A participant understandably questioned the integrity of the research when allowing such a degree of flexibility, and some expressed preferences towards a more fixed structure.

"for me, it was very difficult to be able to do as we want"
"I think we should have been a bit less open with that flexibility."

Some practitioners also mention using the flexibility in fidelity inconsistent ways (i.e., to a degree insufficient for core functions).

"so I may have simplified it very much, and removed many of the core elements"

A few suggest a more fixed structure during implementation could benefit certain practitioners, especially the less experienced. One of the supervisors advocate training and coaching stricter adherence until practitioners are more proficient in using core elements, but also mentions that to do so, they would have to handpick "easy" families where adhering to a prescriptive manual would be feasible.

"I see that those practitioners who have done EAS several times became more comfortable in time and were able to integrate it in a different way… we need a bit of follow up and coaching on that."

Usability of educational and supporting material
There were differences in opinion regarding the usability of the handbook and the educational material it provides, and designing it simpler may improve usability. A few mentioned it as easy to use and useful in preparing for academic support and as a tool in sessions, one found it too complicated and cumbersome, and another preferred not to use it in sessions because that felt more natural. Some also experienced recurring technical issues using the math game, which was a source of frustration.

4.3 Other determinants affecting implementability
Two participants mention limited time available for house visitation and meeting with children making some core elements less feasible, such as working on family structure and helping the family with tutoring. These barriers may be particularly prominent in the sites

organized as "generalists," meaning that practitioners function as caseworkers and family therapists. These practitioners appear to have less time devoted to visiting families compared to specialist-organized sites where families have a caseworker and a family therapist assigned.

> *"What's difficult is that it's not like we are at home visits with all families that often. So there is a missing link there."*

> *"It can be long between each time we are at home visits, for different reasons"*

Insufficient implementation strategies appears to have influenced perceptions of EAS as well (e.g., insufficient follow-up of absentees from booster sessions and ongoing consultations). As one participant stresses, it was first after consultation he/she felt safe using EAS and its flexibility. Also, two participants express dissatisfaction as a result of misinterpretation of the flexibility and experiencing technical issues, both of which were recurring themes in consultation and boosters.

Cooperation with schools and teachers surfaced as a crucial *bridging factor*, and perhaps a missing core element of EAS. A few practitioners expressed that when they facilitated well-functioning collaborations between the family and teachers, and themselves and teachers, EAS was easier to use and the children's academic situation seemed to benefit more. Also, for the specialist-organized sites, some expressed that integrating core elements of EAS into the referrals from caseworkers to family therapists would help prioritization and thus benefit implementability.

1. <u>Discussion</u>

With an overall implementability score of 75.33 (*SD* = 15.57*)* out of 100, participants' average score landed just above the *agree* position on the scales. Converging with qualitative analyses, Enhanced Academic Support (EAS) appears implementable for the majority of family therapists in CWS. There are, however, several areas to improve. Designing core elements for flexible integration with other interventions across problem domains appeared to be a crucial characteristic supporting implementability. However, the extent of freedom in use of core elements causes substantial concern for fidelity to core functions. Practitioners' individual perceptions about the content of core elements were highly influential of implementability, at least equal to the influence of scientific evidence supporting its importance for clients. Some design adjustments may make EAS fit the variation in individual practitioners better, and some content adjustments may make EAS fit a broader array of clients more appropriately. The implementability of EAS and its core elements were

contingent upon characteristics and will therefore be discussed in conjunction below. The characteristics pertained to either the *content* of EAS or its *design*.

5.1 Content characteristics

The most influential content characteristics were the *perceived importance* of the core elements for children and families in CWSs, *alignment* and *compatibility* with existing practice and preferences, and individual opinions about the *relevance* of EAS to child welfare practice. All of these characteristics seem to influence acceptability, while alignment and compatibility seemed particularly important for feasibility and usability, and relevance for appropriateness. Core elements such as *positive parental involvement in school*, *home learning structure and routines*, and *positive reinforcement* appeared to have all the beneficial content characteristics in this setting and were most notably endorsed. These findings are uplifting for CWS practice considering that several reviews highlight the importance of positive parental involvement and home learning structure for academic outcomes (Engell et al., 2020; Wilder, 2014; Nye, Turner, & Schwartz, 2006). Further, positive reinforcement is among the most common elements of effective parent- or teacher mediated interventions across different problem domains and settings (Engell et al., 2020; Sutherland et al., 2019; Brown et al., 2017; McLeod et al., 2016; Lindsey et al., 2014; Chorpita et al., 2009). However, in our theory of change in EAS, the primary functions of these three core elements are more preventive of gaps in learning and improving academic learning conditions, while *structured tutoring* and subsequently practicing academic skills are likely necessary to close learning gaps.

The alignment of core elements in EAS with existing practice generally supported positive views of implementability and was characterized as reassuring, which supports benefits articulated about contextual alignment (Lyon et al., 2020; Cabassa, 2016; Mitchel, 2011). However, we caution that alignment taken too far may preserve the status quo by practitioners interpreting their existing practice as adhering to core elements, contrary to the intention to strengthen the use of core elements. On the other hand, as suggested by Barth and colleagues (2013), learning that current practices are evidence-informed may reinforce the use of them, which was indicated by some participants. A few practitioners express that even though several core elements were familiar, they now integrate these elements more systematically in their practice, while relying on responsiveness to needs in every unique case. This may demonstrate a type of reconcilement of values from the evidence-based paradigm with the more practice-based, person-centered, or value-based paradigms sometimes

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called for or practiced in complex human service contexts (Mitchell, 2011; Brady & Redmond, 2017; Fulford, 2008).

Two skeptic participants expressed EAS as valuable for the less experienced practitioners, but as too familiar for experienced practitioners to be worth the implementation effort. This speaks to the importance of ensuring *relative advantage* as articulated by implementation theories (Damschroder et al., 2009; Rogers, 2003), suggesting that an intervention is more likely to be adopted if it has a clear advantage over an existing practice. More experienced practitioners may demand higher degrees of novel learning to experience this advantage, and aligning training with too familiar practices may be perceived as undermining practitioners' competence. Thus, the appropriate balance between alignment and novelty likely varies within groups of practitioners, and differentiation in implementation may be beneficial.

Opinions regarding helping families with tutoring in reading and math were mixed. Compatibility and perceptions about relevance seemed to influence opinions, with the skeptic participants finding tutoring outside the scope of their work, and more as a responsibility of schools. On the one hand, these perceptions are understandable seeing as tutoring is a practice mostly associated with teachers and schools. On the other hand, these findings can also be seen as unfortunate considering that the children in this particular study, on average, had severe gaps in math and reading abilities, and under half of the children with severe academic needs received special education from schools (Kirkøen et al., in review). The skeptic participants also expressed finding the tutoring components uncomfortable and inappropriate with families experiencing severe hardship (e.g., violence and abuse), which may account for the lower appropriateness scores with notable variation. These perceptions too are arguably understandable and in line with studies in CWSs both in Norway (Christiansen, 2015) and the U.S (Urgelles, Donohue, Wilks, Van Hasselt & Azrin, 2012) characterizing the need to "put out fires" before having the opportunity to work more purposefully with specific interventions. At the same time, times of crises may be when vulnerable children are in the greatest need of academic support and the stability that academic structure can provide (Sebba, Berridge, Luke, Fletcher, & Bell et al., 2015). Nevertheless, it appears that more differentiation of content based on characteristics and preferences of practitioners, and the clients they most frequently serve, could make implementation more appropriate and training more efficient. Some practitioners expressed difficulties related to collaboration with schools, while others highlighted that fostering collaboration between parents and teachers was key to

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successfully helping the family. More specific guidance home-school collaboration may improve the implementability of EAS and its potential value.

5.2 Design characteristics

Design characteristics appeared to influence implementability greatly, and different forms of flexibility options in particular. Without reasonably high degrees of flexibility, participants indicate that implementation would likely fail, if not immediately, at least eventually. These findings concur with the growing emphasis on the need for continuous adaptation of interventions in natural practice settings in mental health and welfare services (Kirk, 2020; Brady & Redmond, 2017). We add to this literature by observing how practitioners use core elements flexibly when encouraged to adapt as they see fit. Flexibility was a multi-faceted characteristic influencing implementability through several mechanisms. For instance, practitioners altered the sequence, intensity, and combinations of core elements to tailor to individual and contextual needs of families. Moreover, being able to prioritize core elements they preferred seemed to make EAS more acceptable to practitioners. Similar benefits of structural flexibility have also been highlighted by practitioners in US-based CWSs (Aarons et al., 2019), and other common elements-based interventions (Murray et al., 2019). In this study, however, the need for flexibility stretched beyond merely altering the structure, and the degree of flexibility available in EAS provided both benefits and notable concerns for implementation:

Practitioners expressed tailoring core elements and processes using pre-defined adaptation options or using their experience and creativity to find alternative solutions to accommodate unique situations. On the positive side (from an interpretative paradigm view), being able to use these adaptations appeared to help practitioners tailor core elements to fit, respond to, or take advantage of, contextual dynamics and constraints. Facilitating such tailoring is in line with design goals in usability theory, suggesting that intervention designs should address, or be compatible with, contextual properties that may limit its use (Lyon et al., 2020). This form of flexibility also seemed to appeal to practitioners' autonomy and sense of coherence at work, allowing them to find meaning and value in using EAS without compromising their ability to cope with demands posed by their work environment (Vogt, Kenny, Bauer, 2013). These findings also align with implementation theories emphasizing the importance of compatibility or fit between the intervention and practitioners' values and preferences (Rogers, 2003; Proctor et al., 2011). On the more negative side (from an evidence-based paradigm view), considering intervention fidelity, some practitioners chose to

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reduce the use or abandon certain elements, most notably the tutoring elements that were considered less appropriate or uncomfortable, while focusing more on the ones who were preferred and considered more appropriate. This raises questions regarding whether there was sufficient adherence to these core elements to potentiate core functions, and demonstrates that encouraging flexibility may prevent the use of less appealing or inappropriate elements, even though they are considered important for clients. This uncertainty also emphasizes the importance of monitoring flexibility (i.e., adherence and adaptations) closely in pragmatic evaluation research, while indicators of core functions and outcomes should perhaps be of primary importance for quality assurance in non-research practice.

An essential form of flexibility was the flexible integration of core elements of EAS with counseling addressing issues other than academics. In line with prior studies describing the everyday practice context in CWSs (Olsvik & Saus, 2020; Evertsson, Blom, Perlinski, Rexvid, 2017; Mitchell, 2011; Aarons & Palinkas, 2007), participants stress that families present with comprehensive and complex challenges in an unpredictable manner. Already pressed for capacity, delivering EAS in separate sessions to families with complex needs was viewed as unfeasible. However, by having core elements be meaningful entities on their own, practitioners express being able to at least integrate some core elements of EAS despite other needs requiring priority at the same time. Such flexible integration aligns with benefits articulated about common elements-approaches to interventions (Hogue et al., 2019; Becker et al., 2015; Barth et al., 2012; Garland et al., 2008; Chorpita et al., 2009).

Cross-domain integration may be particularly crucial in CWSs due to many competing priorities, and for academic support in particular because academics have traditionally been secondary to other priorities in CWSs. However, although a few practitioners seemed to master flexible integration, training and consultation specific to flexible integration appear to be needed to build more proficiency. Flexible integration runs the risk of the potential potency, or causal tendencies, of core elements being "watered down," and especially processual aspects of core elements such as sufficient and consistent use over time. The training in EAS and implementation strategies like need to focus more on these processual aspects (process elements) of core elements necessary to potentiate core functions.

Future studies, and future use of EAS, may consider engaging practitioners with different characteristics and preferences in iterative small scale simulation and in-vivo testing of core elements before implementation (e.g., usability-testing, Lyon et al., 2020; or generation phase of Agile Science, Hekler, Klasnja, Riley, Buman, Huberly et al., 2016). Doing so can inform improvements and adjustments to remove barriers and design issues that

may limit implementability. Future studies may also consider more intensive and differentiated implementation strategies to build more proficiency in core elements. Proficient cross-domain use of evidence-based (or evidence-informed) core elements and processes may enable appropriate reconcilement of what tends to work on average with responsiveness to individuality and contextual dynamics emerging in practice.

5.3 Implementability index

The quantitative sample in this paper was too small to test the scales' psychometric properties; however, we did do psychometric testing of our data. The four constructs correlated, indicating that respondents may have found it difficult to discriminate between them. This was to some extent expected given the constructs being highly specific and related (Weiner et al., 2017). There was also overlap between the four constructs in corroboration with the qualitative data. For instance, responses to being asked about EAS's feasibility were often coded as pertaining to EAS's appropriateness and vice versa. Future studies with larger samples may consider doing item-reduction analyses.

The descriptive implementability results can be a frame of reference for future studies, and the implementability index composed of the four scales may be useful in intervention development and making decisions about implementation. Implementability may represent a modality of interventions that can complement effectiveness in indicating an interventions' potential for impact. Studies are needed to test whether implementability predicts intervention fidelity, sustainment, and scalability.

5.4 Limitations

This explorative case study has several limitations. The sample size of both quantitative and qualitative data was small, and the implications must be interpreted with caution. Although recruited based on convenience, the qualitative sample was balanced by participants scoring across the full range of the scales from low to average and high. However, we were unable to recruit participants from one of the three implementation sites to participate in qualitative interviews, and this may be due to implementation difficulties being prominent at this site. No prior study has, to our knowledge, used these quantitative measures in CWSs. However, we know that several are underway. Thus, we have no data available from other interventions in CWSs to compare scores with yet, which limits the grounds for interpretation of the quantitative results. Also, this study viewed implementability through the lens of

practitioners and supervisors only, while more broad perspectives of clients and teachers engaged in EAS will be reviewed in a future publication.

2. <u>Concluding remarks</u>

This case study observed beneficial characteristics and pitfalls in the design of an academic intervention to fit everyday practice needs and constraints in CWSs. Interventions in complex and dynamic practice settings, such as CWSs, may benefit from deliberately designing core elements for integration with other contextually relevant interventions in the larger practice ecology. Also, alignment with existing practice and encouraging different forms of flexibility may support interventions' usability and appeal to practitioners. The same characteristics could also justify limiting the use of less preferred elements, and too much alignment may render experienced practitioners finding the implementation effort unnecessary.

The core elements *positive parental involvement in school*, *home learning structure and routines*, and *positive reinforcement* appeared most implementable in CWSs because they were viewed as important and relevant for clients, and compatible with existing practices, preferences, and values. Opinions were more ambiguous regarding *structured tutoring in reading and math,* especially when working with families experiencing severe challenges and hardship. Limitations in implementability and competing priorities may cause paradoxes where those children who need academic support the most may receive less of it.

A more fixed structure during initial implementation and more intensity in training and coaching on core elements would likely benefit learning and use. Also, differentiated approaches to implementation based on practitioners' characteristics and preferences may benefit implementability in complex settings.

Abbreviations

CWS – Child Welfare Service

EAS – Enhanced Academic Support

EBPs – Evidence-Based Programs

RCT – Randomized Controlled Trial

FIM – Feasibility of Intervention Measure

AIM – Acceptability of Intervention Measure

IAM – Intervention Apprpriateness Measure

IUS – Intervention Usability Scale

Ethics approval

This study was reviewed and approved by the Norwegian Centre for Research Data (NSD) October 2017, project number 47161.

Conflict of interest

Authors declare they have no conflicts of interest.

Data availability

Data from the current study is not publicly available due to confidentiality requirements. Data in summarized forms can be obtained from the corresponding author on reasonable request.

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Tables

Table 1. Guiding principles used in facilitated co-design

Multiple perspectives represented in active and equal partnership
Common language (exercise to create an equal understanding of prevalent terms and concepts, and avoid unnecessary jargon and offensive terms)
Facilitation (guide group towards decision making informed by guiding principles)
Evidence-based practice guiding decision making (decisions based on three equal forms of knowledge framed within contextual considerations)
Naturalistic/pragmatic approach (external validity over internal validity)
Change minimalism (minimum change needed to achieve goals)
Consensus decision making (When we cannot reach consensus, we review guiding principles again and re-discuss iteratively)
Provide process structure without compromising creativity
Mind group biases (prevent or manage their impact on decision making)

Table 2 Core elements, components, and functions of Enhanced Academic Support

Core elements, components, and functions in Enhanced Academic Support

EAS includes four core elements (1-4) with two to four core components each (a-m):

5. **Parent training in positive parental involvement in school**

   Core function: Promote positive parental involvement in the child's academic life

   n. Psychoeducation in the importance of parental involvement in school

   o. Psychoeducation in positive academic expectations on child's behalf

   p. Training in parental involvement practices and communicating positively about school

Key determinants of success: repeat over time, use concrete advice and assignments and follow up, tailor parental involvement practices and assignments to parent's preferences and needs

Example adaptation alternative: If needed, use the appropriate translation of the information pamphlet about the Norwegian school system and what schools expect of parents as part of the psychoeducation before starting the parent training.

6. **Structured tutoring in reading and math**

   Core function: Prevent or close children's knowledge gaps in math and reading

   q. Direct instruction adaptive math tutoring game on tablets (or analog math tutoring games)

   r. Paired reading

   s. Plan appropriate tutoring schedule

   t. Provide tutoring reminders and progress feedback

Key determinants of success: Repeat tutoring over time (at least four months), use reminders and feedback throughout tutoring, use individually appropriate progression

Example adaptation alternative: If parents are unable to read with their children, investigate alternatives such as engaging a sibling/neighbor/relative, red cross homework support, or other volunteer services and instruct them in the paired reading technique and establish a routine. If the paired reading technique is too complicated, use the simple version.

7. **Guidance in home learning structure, routines, and support**

   Core function: Establish sustainable home learning routines and homework completion

   u. Establish family-tailored structure and routines for home learning activities and homework

   v. Establish appropriate homework environment tailored to the 'child's needs and preferences

   w. Psychoeducation to parents in the importance of homework expectations

   x. Parent training in appropriate homework support

Key determinants of success: Talk to the child about their preferences and needs, tailor structure and routines to fit the family's everyday life, follow up on routines throughout the intervention period.

Example adaptation alternative: If the family already has a functional weekly planner or system, use this instead of the EAS-plan and work with the family to identify strengths and areas for improvement.	

8. Guidance in positive reinforcement, praise, and feedback
  Core function: Promote parent's appropriate use of positive reinforcement and feedback

  y. Parent training in the appropriate use of positive reinforcements
  z. Parent training in the appropriate use of corrections and feedback

Key determinants of success: Repeat training multiple times throughout intervention, tailor reinforcements to the child's needs and preferences, use of rewards or homework contracts needs active involvement from the child in decision making.

Example adaptation alternative: Consider involving other key persons in the child's life, such as a sibling, a neighbor, a relative, a family friend etc.

Table 3. measures and methods

Constructs	Qualitative *n**	Quantitative *n*
Intervention Feasibility	9	24
Intervention Acceptability	9	24
Intervention Appropriateness	9	24
Intervention Usability	9	21
Free text feedback from fidelity monitoring	120	

* Two focus groups with seven practitioners total, two individual interviews with supervisors, 120 feedback/experiences related to adaptations from open-ended questions on fidelity checks

Table 4. Characteristics of Child Welfare practitioners

	N	*%*	*Mean*	*SD*
Female	*23*	*96*		
Age	21*		43.67	*12.22*
Experience in CWS	22*		2.37 years	*1.42*
Experience with EAS	24		1.25 families	*1.45*
Position	24			
Caseworker	11	46		
Family therapist	9	37.5		
Manager/supervisor	3	*12.5*		
Child welfare consultant	1	4		

* unable to obtain missing variables from three participants due to turnover

Table 5. Person's bivariate correlations between variables

	Acceptability	Appropriateness	Feasibility
Appropriateness	.77**		
Feasibility	.78**	.79**	
Usability	.60**	.65**	.71**

*** p < .001*

Table 6. Descriptive results on the implementability of EAS

Construct	N	α	Item mean	SD	Scale mean	SD	Max. Score	Index score	SD
Feasibility	24	.91	3.59*	.71	15.71	2.82	20	78.54	14.10
Acceptability	24	.96	4.13*	.91	16.50	3.65	20	82.50	18.30
Appropriateness	24	.98	3.59*	1.11	14.38	4.43	20	71.88	22.16
Usability	21	.88	2.71**	.65	24.38	5.87	36	67.78	16.32
Implementability index	24						100	75.33	15.57

* scale 1-5, four items   ** scale 0-4, 9 items