Parental Reflective Functioning, Personality Traits and Parenting Stress in Mothers with Substance Use Disorders

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IV
Abstract

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Main supervisor: Merete Glenne Øie. Co-supervisor: Eivind Ystrøm

Background: Mothers with substance use disorders (SUD) often show impairments in parental reflective functioning (PRF), which may have adverse effects on their capacity for sensitive caregiving. Parenting personality, as well as the experience of and coping with parenting stress, are also associated with caregiving. However, no studies have investigated how these individual factors may contribute to variance in PRF. Methods: In the current thesis, PRF, personality, and parenting stress experienced by 43 mothers with SUD were assessed. PRF was assessed by administering the Parent Development Interview. Personality traits were assessed by the Revised Neuroticism-Extraversion-Openness Personality Inventory, and parenting stress was assessed by the Parental Stress Index Long Form. SUD and other mental health symptoms were assessed by various questionnaires and interviews. The data used in this thesis was cross-sectional, and collected as part of an ongoing doctoral thesis called the 1“Mosaic Project”. The relationships between the constructs of interest were investigated through descriptive data, bivariate and multivariate analyses, and various approaches to mediation. Results: The analyses revealed several significant associations between personality and PRF. However, the Openness factor was the only broad personality trait significantly able to predict PRF. Mediation analyses indicated a full mediation effect of parenting stress in the relationships between the facet Hostility and PRF, and between the facet Tender-mindedness and PRF. Conclusion: The results indicate that higher levels of the Openness trait are associated with better PRF. Furthermore, we suggest that the Hostility and Tender-mindedness facets may affect PRF through their effects on parenting stress regulation. More research is needed in order to assess the relationships between PRF, personality, and parenting stress in SUD.

1 The “Mosaic project” is a collaboration between Inland Norway University of Applied Sciences and Innlandet Hospital (See also Håkansson, Halsa, Söderström, Skårderud, & Øie, 2015). The project’s aim is to generate knowledge about, and promote well-being for children residing in families with parental substance abuse and/or parental mental illness. The project receives financial support from The Research Council of Norway.
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It is with great pleasure and pride that we now submit our thesis. The process has been lengthy, and felt frustrating and overwhelming from time to time. However, most of all it has been interesting and highly rewarding. Since the summer of 2017 we have dived into distinct topics, and integrated old and new literature within broad and fundamental areas of psychology. We have also brushed up our statistical skills, analyzed and interpreted the data ourselves, and gained insight into important assessment tools. In many ways, we find that our study elaborates the current understanding of mentalization in a vulnerable group of society. What makes this project especially meaningful, is that our findings may have implications for treatment approaches regarding this particular group. This insight is something that we will utilize as future professional practitioners.

We would not have been able to go through this process without the help and guidance from our highly competent and supportive supervisors at the Department of Psychology, University of Oslo: Thank you to our main supervisor, Merete Glenne Øie, for constructive feedback, sharp ideas, and for being so incredibly available throughout the project. Thank you to our co-supervisor, Eivind Ystrøm, for superb input regarding our topics, and for guiding us through statistics and methods in the last phase of the process. Furthermore, we want to thank Anne-Marie Hallberg for being available to us in the early phase, contributing with your statistical knowledge when we felt stuck in the methodical landscape. We also want to thank Ulrika Håkansson at Inland Norway University of Applied Sciences, for sharing data and knowledge, and including us in your ongoing doctoral project. Without the participation of the 43 mothers in the study, and their babies, we would not be able to investigate these important topics.

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Oslo, April 2018

Ingebjørg Emilie Aarnes and Lise Horndalsveen Eilertsen
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1 Introduction

1.1 Background

Maternal substance abuse is an individual as well a societal problem of great concern, posing a risk to the child’s social, emotional and cognitive development, causing distress to the mothers, and subsequently leading to major socioeconomic costs (Ross, Graham, Money, & Stanwood, 2015; Nygaard, Moe, Slinning, & Walhovd, 2015). Despite the fact that substance abuse does not cause maltreatment in itself, it is the single most common factor predicting removal of children from parental care (Perry, Newman, Hunter, & Dunlop, 2015). Accordingly, there is an explicit political commitment to improve health and welfare services for these women and their children. Identifying the complex mechanisms involved in maladaptive parenting of mothers with substance use disorders (SUD) is found to be important in improving the interactions between mother and child.

Addiction can interfere with parenting, affecting the mother’s attitudes and way of responding to her child’s needs, and subsequently the quality of attachment between mother and infant (Siqveland, Smith, & Moe, 2012; Parolin & Simonelli, 2016). As a group, mothers with substance use disorders (SUD) often struggle to make sense of and modulate their own difficult emotional states, and they are especially vulnerable to stress in the parenting role (Suchman & Luthar, 2001). They may also show difficulties understanding the meaning of their infant’s emotions and behavior, and in responding appropriately to the children’s cues, compared to mothers without substance use problems (Suchman, DeCoste, McMahon, Rounsaville, & Mayes, 2011; De Falco et al., 2014). These abilities are essential components in what is called parental reflective functioning (PRF; Slade, 2005). The construct derives from the broader concept of mentalizing, defined as “the capacity to perceive and understand oneself and others in terms of mental states (feelings, beliefs, intentions, and desires)” (Fonagy, Target, Steele, & Steele, 1998, p. 7). Making sense of what is happening around us and inside ourselves emotionally is considered to guide self and affect regulation, and the development of social relationships (Søderstrøm & Skårderud, 2009; Slade, 2005). This crucial capacity is considered fundamental in sensitive caregiving, and thought to play an important role in the intergenerational transmission of attachment (Slade, 2005).
Although research has shown that mothers with SUD often have impairments in PRF, individual variations are demonstrated (Pajulo et al., 2012; Suchman et al., 2017). Several factors may contribute to variation in PRF and associated parenting behavior in this group. For instance, several studies have investigated the effects of parenting personality in sensitive caregiving (Bornstein, Hahn, & Haynes, 2011; Chapparo & Grusec, 2016). Personality traits are also consistently associated with individual differences in stress vulnerability, maladaptive coping with stress (Matthews, Lin, & Wohleber, 2017), and in the experience and appraisal of parenting stress more specifically (Plotkin, Brice, & Reesman, 2014). Finally, adverse effects of parenting stress on the mother-child interaction and on the mothers’ capacity to mentalize have been reported (De Falco et al., 2014; McQuillan & Bates, 2017). These associations give rise to hypotheses about the importance of personality for caregiving behavior, the experience of stress in the parenting role, and subsequently their combined effects on PRF. As far as we know, no studies have focused on the possible associations between PRF, personality traits and parenting stress in mothers with SUD. The primary aim of this master thesis is to investigate the suggested relationships among these variables in a sample of 43 mothers with SUD. First we will present theory on PRF, personality and parenting stress in relation to mothers with SUD. Thereafter, we will describe the possible associations between them.

1.2 Parental Reflective Functioning (PRF)

1.2.1 Mentalization and Reflective Functioning

Reflective functioning (RF) is the observed manifestation of the mental processes assumed to underlie mentalization, and constitutes an empirical framework for understanding this complex capacity (Katzenelson, 2014). The construct emerged within the fields of psychoanalysis and attachment theory, specifically those areas concerned with explaining the intergenerational transmission of attachment. RF has traditionally been measured through the Adult Attachment Interview (AAI; Main & Goldwyn, 1990). Impaired RF has been empirically linked to various types of psychopathology (Katzenelson, 2014), e.g., Borderline personality disorder (Fischer-Kern et al., 2010; Gullestad, Johansen, Høglend, Karterud, & Wilberg, 2013) and depression (Fischer-Kern et al., 2013). Studies on the impact of RF on psychotherapeutic process and outcome indicate that RF may be a mechanism of change,
affecting how patients make use of psychotherapy. Of special relevance to our study, RF has been found to profoundly affect the quality of caregiving (Camoirano, 2017).

1.2.2 Parental Reflective Functioning

Acknowledging the effect of caregiving on child development, researchers within the field have become increasingly more interested in the role of parental reflective functioning. PRF is defined as a parent’s capacity to think reflectively about his/her child’s internal experience, experiences of being a parent, and the ongoing relationship with the child (Slade, 2005). The construct is intended to explore the parent-child relationship more closely, and can be considered a more focused subcomponent of the broader concept of RF, yet often overlapping (Katznelson, 2014). Instruments such as the Parent Development Interview (PDI; Aber, Slade, Berger, Bresgi, & Kaplan, 1985) and the Working Model of The Child Interview (WMCI; Zeanah & Benoit, 1995) have been developed to assess PRF through the parents’ description of the ongoing relationship, as it is currently evolving and activating strong emotions in the present. This as opposed to AAI, where a caregiver’s ability to mentalize in relation to the child must be inferred through descriptions of his/her own attachment experiences in the past (Slade, 2005).

The definition of PRF implies an active reflexive process of connecting observed behavior to underlying mental states in accurate and meaningful ways. The capacity gives parents important information that allows them to respond sensitively to the child’s cues, implicitly communicating to the child that their needs are being met, and that their experienced stress can be resolved (Roisman et al., 2017). The observable ability to accurately perceive and interpret the child’s signals, and respond adequately and promptly is referred to as parental sensitivity or sensitive caregiving (Bretherton, 2013). This responsiveness is considered especially important in infancy when the child primarily communicates its mental states non-verbally (Suchman, DeCoste, Leigh, & Borelli, 2010) and depends on the caregiver’s help with affect regulation (Fonagy, Gergely, Jurist, & Target, 2004). PRF is commonly rated as average to high, or negative to low (Taubner et al., 2013). Highly reflective parents are characterized as more aware of their own and others’ feelings, the complexity of mental states, and how it affects behavior. This enables them to experience affect-laden situations without becoming overwhelmed or shutting down emotionally. However, parents described as having low RF tend to deny, altogether, that parenting provokes emotional reactions, and can
often seem unaware of thoughts, feelings and needs in themselves and/or the child. Thus leading to insensitive caregiving behavior (Kelly, Slade, & Grienenberger, 2005; Stacks et al., 2014).

1.2.3 The development of reflective functioning

The mentalizing capacity is argued to be innate or “prewired,” but the full development is commonly considered a developmental achievement guided by the quality of early caregiving experiences, especially in infancy (Fonagy et al., 2004; Luyten & Fonagy, 2015). The capacity is thought to emerge as the infant experiences that his/her mental states are being reflected on during emotional experiences with the caregiver (Slade, 2005), especially when following moments of distress (Cicchetti, Cassidy, Jones & Shaver, 2013). Being understood as an individual with a mind, with emotional attunement and availability, is considered a prerequisite for the development of the self, affect regulation and interpersonal understanding. This is intuitively understood by most caregivers in the early interaction with the infant (Søderstrøm & Skårderud, 2009).

The theory of mentalization emphasizes the affect regulatory mechanisms involved in early infant-caregiver interaction, arguing that the infant can only discover and regulate its primary affective states through the caregiver’s representations of them. The caregiver’s capacity for “marked mirroring” is found especially important (Bigelow, Power, Bulmer, & Gerrior, 2015), in which he/she responds to the infant’s affective changes in a contingent way with tone, voice, facial expression, affect and intensity, but in a manner that is slightly different from the child’s expression (Fonagy et al., 2004). It can be considered an early form of PRF, as the behavior that caregivers choose to reinforce and share through mirroring inevitably is guided by their perception of the infant’s underlying emotion (Søderstrøm & Skårderud, 2009). The re-representation of the infant’s mental states is thought to help the child to distinguish between self and others, and to experience ownership of internal states (Slade, Grienenberger, Bernbach, Levy, & Locker, 2005), as he/she gradually internalizes and integrates them into a self-representation (Søderstrøm & Skårderud, 2009). Through this process the infant starts to understand that others have different thoughts and feelings concerning the same external stimuli, i.e., grasping the concept of mental representations. This developmental achievement is commonly understood as the beginning of symbolic capacity (Fonagy et al., 2004).
In sum, the quality and extent of the caregiver’s ability to keep the infant’s mind in his/her own mind, seems to affect the child’s development of the very same capacity (Borelli, St John, Cho, & Suchman, 2016; Cicchetti et al., 2013). It is empirically proven that higher PRF is associated with better mentalizing abilities in children, including older children, with implications for their quality of attachment (Camoirano, 2017; Rosso, Viterbori, & Scoepsi, 2015; Scoepsi, Rosso, Viterbori, & Panchieri, 2015).

1.2.4 Explaining the intergenerational transmission of attachment

Research has demonstrated that a parent’s state of mind in relation to his/her own attachment history predicts the child’s quality of attachment (Cicchetti et al., 2013). However, it has proven hard to empirically explain this intergenerational transmission (Slade, Grienenberger, et al., 2005). The behavioral measure of parental sensitivity has been found not to fully mediate this link between parent and child (Bretherton, 2013; Van Ijzendoorn, 1995), and RF/PRF is proposed to be one underlying mechanism explaining this empirical gap (Fonagy & Target, 2005). The development of both mentalizing and attachment security seems to rely on the same type of sensitive parent-child interactions, e.g., contingent affective mirroring (Borelli et al., 2016). Adequate to high PRF is found to predict better parental sensitivity, both when measured during and after pregnancy (Kelly et al., 2005; Rosenblum, McDonough, Sameroff, & Muzik, 2008; Slade, Grienenberger, et al., 2005), and in clinical and non-clinical samples (Borelli et al., 2016; Huth-Bocks, Muzik, Beeghly, Earls, & Stacks, 2014; Smaling et al., 2016; Stacks et al., 2014). Secure attachment in the parent (measured through AAI) is further found to predict higher PRF (Slade, Grienenberger, et al., 2005), which in turn is empirically linked to secure attachment in the child (Kelly et al., 2005; Stacks et al., 2014). This finding also applies to older children (Borelli et al., 2016). In total, PRF seems to be a product of the parents’ own attachment experiences, and is found to be one factor underlying parental sensitivity, which in turn seems to predict child attachment organization. Thus, initial research suggests that PRF partially mediates the association between parent and child attachment. Further research exploring this relationship in more depth is considered important, and has already yielded more specific findings with implications for sensitive caregiving (Camoirano, 2017).
1.2.5 Empirical studies of PRF with implications for sensitive caregiving

Research teams have attempted to explore the established link between PRF and adequate caregiving in more detail. For instance, PRF has been found to positively correlate with mind-minded comments, i.e., comments that reflect appropriate attributions of mental states in the infant (Rosenblum et al., 2008). In a study by Smaling and colleagues (2016), higher PRF during pregnancy predicted more positive behavior in interaction with the infants during free play, teaching tasks and the Still Face Paradigm (Tronick, Als, Adamson, Wise, & Brazelton, 1978). On the contrary, low PRF is associated with different types of negative parenting behavior (Camoirano, 2017). Kelly and colleagues (2005) found that low PRF significantly predicted a higher overall level of disrupted affective communication in observed mother-infant interaction, using the Atypical Maternal Behavior Instrument for Assessment and Classification (AMBIANCE; Bronfman, Parsons, & Lyons-Ruth, 1999). This implies affective communication errors, role or boundary confusion, fearful and disorganized behavior, intrusiveness and withdrawal. It is argued that this type of negative or disrupted maternal behavior is more critical for the transmission of attachment than parental sensitivity, and that PRF seems to be a mechanism (Kelly et al., 2005). Furthermore, several studies support the notion that parents with lower PRF are less capable of helping their children with affect regulation (Camoirano, 2017; Esbjørn et al., 2013; Heron-Delaney et al., 2016; Smaling et al., 2017).

1.2.6 Understanding individual differences in PRF in mothers with substance use disorders (SUD)

As a group, mothers with SUD exhibit low PRF compared to low-risk populations (Suchman, DeCoste, Leigh, et al., 2010). This finding derives from studies of both pre- and postnatal PRF (Pajulo et al., 2012; Smaling et al., 2015; Suchman, DeCoste, Leigh, et al., 2010). Mentalization-based clinical interventions, supporting parents to engage in conscious mentalizing of the child, have proven effective in improving PRF and parental sensitivity in this group (Camoirano, 2017; Pajulo et al., 2012). Pajulo and colleagues (2012) found a significant increase in average PRF, measured both in pregnancy and the postnatal phase, in mothers with SUD who received mentalization-based treatment. However, this group also demonstrates considerable variation in PRF and response to treatment (Suchman et al., 2017). For instance, in the same study by Pajulo and colleagues (2012), abuse of alcohol and maternal trauma history were associated with a lower increase in PRF. The mothers with the
lowest PRF scores (pre- and postnatal) also more often relapsed to substance use after completing the residential treatment period, and their children were more likely to be placed in foster care. Thus, further exploration of individual differences in PRF may have important implications in helping these parents to manage emotional distress in the dyad. For instance, a study of substance abusing mothers by Suchman, DeCoste and Borelli (2010) indicated that it was the ability to access and deal with own emotional experiences in relation to the child (self-mentalizing) that was most strongly related to parental sensitivity, compared to reflections about the child’s mental states (child-mentalizing). Arguably, self-mentalizing might be a first crucial step in improving parent-child interaction in this group (Suchman, DeCoste, & Borelli, 2010).

Other factors may contribute to explain variation in PRF. Parental sensitivity also involves executive functions (EF), which is found to be impaired in substance abusing individuals (Håkansson, Søderstrøm, Watten, Skårderud, & Øie, 2017). Neuroscientific studies depict how high arousal activates a switch from controlled mentalizing (explicit, conscious, verbal, reflective) to automatic mentalizing (implicit, faster, reflexive, biased), especially if the individual’s attachment needs (e.g., fear of rejection, closeness/intimacy) are activated. This impairment may lead to confusion of internal and external reality, self-regulation through external sources (e.g., use drugs) or excessive control (Luyten & Fonagy, 2015; Suchman, Ordway, De Las Heras, & McMahon, 2016). This coincides with the observed struggle to regulate arousal related to negative emotions among mothers with SUD (Suchman & Luthar, 2001), and studies indicating a strong link between distress in close relationship and substance use (Fairbarn et al., 2018). Personality is another factor found to guide individual differences in caregiving (Prinzie, Stams, Dekovic, Reijntjes, & Belsky, 2009). Although RF has been empirically linked to the development of personality disorders (Gullestad et al., 2013), no studies to our knowledge have investigated how personality and personality traits may affect the capacity for PRF, and not in caregivers with SUD specifically.

### 1.3 Personality

The concept of personality is usually thought of as the characteristic individual patterns of thinking, feeling and behaving (Larsen & Buss, 2018). RF and personality have been discussed in terms of overlapping constructs (Fischer-Kern et al., 2010), as the capacity to consciously reflect on self and others’ intentions, wishes, thoughts and feelings may also
reflect aspects of personality. On the other hand, personality is conceptualized as a much broader construct than RF. This term captures aspects of self and other perceptions, as well as defense style, coping strategies, moral values, preferences, and reality testing (Campbell, Jayawickreme, & Hansen, 2015). The study of personality is contributing to our understanding of the relatively enduring and organized traits and psychological mechanisms that constitutes individual differences (Larsen & Buss, 2018).

1.3.1 The Big Five personality traits

The beginning of a consensus in the field of personality started with the work of Allport and Odbert (1936) and their identification of 4,500 trait descriptive terms. They were inspired by the “lexical hypothesis” of Sir Francis Galton (1884), whose approach claimed that the most important individual differences were encoded as single terms in the natural languages of the world. The development of factor analytic methods accelerated the identification of personality terms and their replicability (Thurstone, 1934; Cattell, 1947). A vast majority of research has proven five oblique factors to be replicable, better known as the Big Five (Fiske, 1949; Norman, 1963; McCrae & Costa, 1987). Conceptualizing personality from the perspective of The Five Factor Model (FFM), has led to a large body of research concerning etiology, development and stability, life outcomes, and universality of the five broad personality traits (McCrae & Costa, 2008). The Big Five factors have a bipolar structure and have traditionally been labeled: Factor 1, Extraversion (vs. introversion); Factor 2, Agreeableness (vs. antagonism); Factor 3, Conscientiousness (vs. lack of direction); Factor 4, Emotional Stability (vs. Neuroticism); and Factor 5, Openness (vs. Closedness) to Experience (McCrae & Costa, 1987).

One of the most frequently used instruments to operationalize the Big Five personality traits, is the Revised Neuroticism-Extraversion-Openness Inventory (NEO PI-R; Costa & McCrae, 1992). It emphasizes a hierarchical organization of the personality taxonomy, with five domains descriptive of behavior, located at the highest level, each of them incorporating six more narrow traits:

Neuroticism (N) is referred to as emotional instability and impulsiveness, anxiety and irritability, as well the tendency to worry and feeling depressed. The factor is made up of the facets: Anxiety, Hostility, Depression, Self-consciousness, Impulsiveness, and Vulnerability (to Stress).
Extraversion (E) comprises the tendency to seek excitement in the external environment, as well as a preference for social participation and assertiveness. The corresponding facets are: Warmth, Gregariousness, Assertiveness, Activity, Excitement Seeking, and Positive Emotion.

Openness to Experience (O) encompass a broad range of intellectual, creative and artistic interests and skills, as well as curiosity, unconventionality and awareness of one’s emotions. The associated facets are: Fantasy, Aesthetics, Feelings, Actions, Ideas, and Values.

Agreeableness (A) is made up of traits that predispose the individual to trust others, be cooperative and compliant, as well as being tender-minded and thoughtful of others. Trust, Straightforwardness, Altruism, Compliance, Modesty, and Tender-mindedness are the corresponding facets.

Finally, Conscientiousness (C) is a domain of work-related behavior, constraint and responsibility. It encompasses the facets: Competence, Order, Dutifulness, Achievement-striving, Self-discipline, and Deliberation.

1.3.2 Stability and change in personality traits during the lifespan

People display behavior corresponding to various levels of traits over the course of the day. This makes behavior substantially predictable in aggregate. Nevertheless, traits are also situationally specific or contextualized (DeYoung, 2015): The observed behavior is influenced by the individual’s trait level, the situational demands and the interaction of trait(s) and the situation (Blum, Rauthmann, Göllner, Lischetzke, & Schmitt, 2018). The fact that people follow more or less similar developmental paths of personality, suggests common underlying factors for both stability and change. According to the meta-analysis of Vukasović and Bratko (2015), on average, 60% of individual differences in personality can be explained by environmental factors which affect how the traits manifest over time. For instance, psychotherapy can have a relatively large impact in reducing absolute levels of traits (Roberts et al., 2017). Behavioral genetics suggest that the remaining 40% of the variability in personality are due to genetic contributions (Cervone & Pervin, 2014).

There are different ways to conceptualize personality stability and change: Differential stability/rank-order stability reflects the degree to which people change relatively to one another, whereas absolute change reflects the degree to which traits decrease or increase among all people in a population, on average (Hopwood & Bleidorn, 2017). Longitudinal
research suggests both stability and change in personality across the lifespan. Edmonds, Goldberg, Hampson and Barckley (2013) demonstrated differential stability in personality over as much as four decades. They found that the E- and C-factors showed the highest levels of stability, whereas N and A showed the least stability. Interestingly, observer-ratings of the O-traits demonstrated higher levels of stability compared to self-reporting. However, a longitudinal study over a period of 63 years appeared inconsistent with this result (Harris, Brett, Johnson, & Deary, 2016). The lack of trait stability was explained in terms of changes in life circumstances and decline of physical and cognitive abilities in older age. Taken together, there is strong support for the hypothesis that personality changes gradually throughout life. Speaking of absolute change, absolute levels of personality seem to mature as a function of development. The transition from early to middle adulthood is a particularly dynamic phase marked with profound changes. Specifically, people tend to become less prone to negative emotions, more responsible and more agreeable (Bleidorn, 2015). When it comes to the E- and O-traits, patterns of absolute change, show some decline over the lifespan (Lucas & Donnellan, 2011).

1.3.3 Maladaptive personality traits in relation to personality disorders and SUD

An individual’s personality trait score reflects the direction and extremity of behavior-relevant cues. Hence, personality disorders may be considered as maladaptive extremes within the range of the five traits that define normal personality functioning (Suzuki, Samuel, Pahlen, Krueger, & Goodman, 2015). Dimensional models consisting of internalizing and externalizing factors have been found reasonable in understanding the structure of personality disorders and other psychopathology at the highest level (Kendler & Myers, 2014): The internalizing factor represents a propensity to express distress inwards, characterized by unipolar depression, rumination, and anxiety. This also correspond to the N-factor as measured within The Five Factor Model. In contrast, the externalizing factor represents a tendency to express distress outwards, characterized by substance use and antisocial behavior, and may be associated with the FFM traits of sensation seeking and the E-factor. Borderline personality disorder is also characterized by impulsive, self-destructive behavior, intense negative affect and high levels of the N-trait, and linked to both the internalizing and externalizing domain (James & Taylor, 2008). Both Borderline and Antisocial personality disorders are associated with comorbid addiction (Kienast, Stoffers, Bermpohl, & Lieb, 2014;
Goodwin & Hamilton, 2003), hence personality traits could also be understood as part of the etiology of substance dependency. Theories have focused on two distinct domains of personality traits related to the development and maintenance of addiction (Castellanos-Ryan & Conrod, 2013): The first one is the inhibited domain characterized by more negative affect, feelings of hopelessness, anxiety sensitivity and introversion. Substance abuse may be a result of a self-medication habit in such individuals in response to stressors, and higher levels of the N-trait in SUD is consistent with this hypothesis (Kornør & Nordvik, 2007). The second trait domain associated with abuse, is the disinhibited one. This domain is characterized by a tendency towards sensation seeking and impulsivity as well as low levels of the C-trait (Terracciano, Löckenhoff, Crum, Bienvenu, & Costa, 2008).

In sum, the five personality domains measured within the FFM have displayed predictable links to common mental disorders and the vulnerability to substance abuse and risk-taking behavior (Ruiz, Pincus, & Dickinson, 2003; Kotov, Gamez, Schmidt, & Watson, 2010; Terracciano et al., 2008). High N and low C are consistent patterns of the personality profiles of people with SUD (Brooner, Schmidt, & Herbst, 2002; Carter et al., 2001; Terracciano et al., 2008). The combination of high A and low O have been shown to predict reduced alcohol consumption and the odds of alcohol abstinence in a meta-analysis of eight cohort studies (Hakulinen et al., 2015). Nevertheless, the direction of causality between personality and SUD is still somewhat ambiguous. A certain lifestyle associated with drug abuse and addiction may also have causal implications for personality development. Furthermore, researchers have also discovered genetic factors moderating personality traits that interact with the environment, and with the drugs themselves, subsequently determining an individual’s vulnerability or resilience to developing SUD (Belcher, Volkow, Moeller, & Ferrè, 2014).

1.3.4 Personality traits and the impact on parenting and parenting stress

Belsky and Barends (2002) and Prinzie with colleagues (2009) proposed that aspects of parenting can be predicted by an individual’s standing on the FFM dimensions: Neuroticism (N) may lead to less positive interactions in the parent-child dyad. Parents with higher levels of the N-factor tend to be overprotective, not responding adequately to the child’s signals, and attribute negative intent to the child’s behavior more often than parents with lower N-scores. More emotional stable parents tend to be more supportive, sensitive and responsive to their children. Extraversion (E) is associated with sociable and emotionally positive interactions
between parents and offspring. Mothers with higher levels of the E-trait tend to be more sensitive and provide greater warmth to toddlers, however highly extraverted mothers may be overstimulating, causing the child to be overwhelmed. Openness to Experience is likely to foster curious and imaginative parents who enjoy sharing new experiences with their child. These types of parents provide more intellectual stimulation. Agreeableness is associated with parents providing warmth, empathy, support and positive attributions regarding their children’s behavior. Conscientiousness (C) tends to be associated with less negative and over-controlling parenting, even if the parenting style itself is likely to be structured, well organized and goal-oriented. On the other hand, parents with very high C-scores may be too demanding and have unrealistic expectations regarding their children.

In order to help parents improve their interactions with their children, personality strengths and weaknesses should be identified. Furthermore, parents’ experience of stress in the parenting role should also be considered: Transactional theory suggest a reciprocal influence between the child’s temperament, parenting personality, coping mechanisms and situational characteristics in determining parenting practices in response to stress (Newland & Crnic, 2017). A recent study by Ruiz-Ortiz and Barnes (2018) using both the NEO PI-R and The Parenting Stress Index (Abidin, 1995), demonstrated that parental personality predicted the extent of stress experienced by parents when facing an infant’s difficult temperament. In turn, parenting stress was related to more negative child emotional and behavioral outcomes at 51 months. Especially higher levels of the N-trait were significantly associated with more parental distress. They suggested that some parents are less able to effectively cope with a difficult infant than others because of their inherent anxious and nervous characteristics.

1.4 Parenting Stress in mothers with SUD

Stress refers to processes involving the perceptions, appraisals and responses to possible harmful, threatening or otherwise challenging stimuli (Lazarus, 1999). The experience of stress can be both emotionally and physiologically challenging (Yaribeygi, Panahi, Sahraei, Johnston, & Sahebkar, 2017), and the individual will strive to regain a certain feeling of homeostasis through activation of a stress response and other adaptive processes (McEwen, 2007). Stress is often associated with a negative affective state and feelings of distress (Lovallo, 2016). On the other hand, mild to moderately challenging stimuli can be
experienced as “good stress” if it fosters cognitive and behavioral responses that generate a sense of mastery (Aschbacher et al., 2013).

### 1.4.1 Individual differences in appraisal and regulation of parenting stress

The individual differences in perception and appraisal of stress relies on different factors: Firstly, the actual presentation of a stimuli. Secondly, it depends on psychological mechanisms, such as the combination of personality traits, coping strategies and expectancy of mastery. Differences in executive functions and the role of specific brain regions responsible for mediating the appraisal of stimuli as distressing, should also been taken into account (Sinha, 2008; Crandall, Deater-Deckard, & Riley, 2015). For instance, caring for an infant can be stressful for any mother. Yet those dealing with drug addiction and common comorbid problems may experience even more distress and lack internal and external strategies to handle it (See the Introduction part 1.5.1). In these women, substance use may be a way of coping with the subjective experience of stress, as well as the more general and objective life stressors (Hassanbeigi, Askari, Hassanbeigi, & Pourmovahed, 2013; Neger & Prinz, 2015).

The reward and stress systems in the brain are affected in individuals with SUD. According to the sensitization theory of addiction (Gilpin, 2014; Berridge & Robinson, 2016), drug-paired stimuli or trigger cues motivate the addictive behavior (wanting effect). By comparison, the pleasurable impact of the drug (liking effect) in individuals with SUD, will maintain drug abuse because the behavior is associated with reduced negative affect, i.e., heightened reward and reduced stress (Cooper, Robison, Mazei-Robison, 2017). The adverse physiological and/or subjective reactions individuals with SUD may experience while abstinent, produce solid craving effects that may also play an important role in relapse.

### 1.4.2 Three sources of parenting stress related to mothers with SUD

In general, the subjective experience of parenting stress and strains, specifically related to mothers with drug addiction, are well documented. According to Suchman and Luthar (2001) it may derive from three primary sources: First, parenting stress is influenced by the mother’s appraisals of child characteristics. In a study by Molfese and colleagues (2010), mothers who perceived their infants’ temperament as more difficult, reported higher levels of parenting stress measured by the Parenting Stress Index (Abidin, 1995); A second source of elevated
parenting stress is the mother’s experience of rejection from the infant, or otherwise dissatisfaction with the mother-child relationship (Suchman & Luthar, 2001). Attachment and interaction, including the parent-offspring bond, promote resilience in coping with stress and drug abuse (Tops, Koole, Ijzerman, & Buisman-Pijlman, 2014). One hypothesis, extracted from knowledge within the field of biology and close relationships, has focused on the neuropeptide Oxytocin. This hormone has a crucial role in lactation, mother-offspring bonding and parenting (Feldman, 2012), and is also thought to increase interpersonal trust and to reduce stress responses (McGregor & Bowen, 2012). Because of its role in protecting against stress, Oxytocin may function as a buffer for addiction (Buisman-Pijlman et al., 2014); Thirdly, the substance abusing mother’s own well-being may be affected because of the society’s moral judgement of substance abusing parents, her fear of losing custody of her child, and subsequently her feelings of personal guilt and shame (Stone, 2015). This may further increase the risk of withdrawal from social involvement, and possibly less social support, which predicts drug relapse (Kendler, Ohlsson, Sundquist, & Sundquist, 2017).

Substance abuse is also often accompanied by other related problems; for example, psychiatric comorbidity, somatic health concerns and unemployment (Dalen, Holmen, & Nordahl, 2015; Ruglass, Shevorykin, Brezing, Hu, & Hien, 2017). These factors may also have impact on general life stress and the mother’s feelings of outsiderness.

### 1.5 Substance Use Disorders and parenting

A study by Lund and colleagues (2012) in a Norwegian sample of pregnant women enrolled in Opioid Maintenance Treatment (OMT), showed that illegal substance use remained stable and low from the last month of pregnancy to one year after giving birth. Despite this, alcohol use increased among the women. Longitudinal research on the same population (Lund, Brendryen, & Ravndal, 2014), implied that the proportion of Norwegian OMT women with psychological problems was significantly higher four years after giving birth. If not treated, comorbid psychological problems make the women especially prone to relapse (Arnaudo, Andraka-Christou, & Allgood, 2017). Another mechanism often underlying maternal SUD is the experience of attachment disruptions, including loss and/or trauma in the mothers’ own history (Taplin, Saddichha, Li, & Krausz, 2014). Drugs are to some of these mothers a way of compensating for a painful feeling of alienation or disconnection from self and others (Khantzian, 2011), or a way to avoid thinking about the impact of substance abuse on others (Allen & Fonagy, 2006).
Between 35 and 45 children in Norway are born annually to mothers in OMT (Sarfi, Smith, Waal, & Sundet, 2011). It is estimated that 50-150,000 children in Norway reside in homes marked by parental substance abuse and its accompanying effects on caregiving (Rossow, Moan, & Natvig, 2009). Substance dependent mothers are found to be at risk for a wide range of deficits in caregiving practices, beginning when their children are infants and continuing as their children develop through school-age and adolescent years. As a group, they show patterns of poor sensitivity and responsiveness to children’s emotional cues, permissiveness, neglect, juxtaposed with intrusiveness, provocation and over-involvement (Suchman, Mayes, Conti, Slade, & Rounsaville, 2004; Suchman & Luthar, 2001). Marked fluctuations between intrusive, threatening, over-controlling behavior and passive withdrawal is reported (Suchman et al., 2016; Kelley, Lawrence, Milletich, Hollis, & Henson, 2015). They also seem to lack understanding about basic child development tasks (Suchman et al., 2004). A study by Siqveland, Haabrekke, Wentzel-Larsen and Moe (2014) showed that infants of mothers with SUD, expressed more negative affect as well poorer adaptive behavior and communication skills compared to nonclinical infants at 12 months. These clinical dyads also showed less mutuality and poorer affective quality of interaction patterns. Rasmussen, Borelli, DeCoste and Suchman (2016) demonstrated that mothers’ representational disengagement (emotional coolness, detachment and indifference towards their child) predicted a decrease in their children’s engagement cues. If the child fails to elicit the parent’s help, it may consequently discourage the parent from responding as well. This supports the notion that mothers with SUD and their children mutually adjust their emotional and behavioral disengagement with one another, and emphasizes the importance of considering the parent-child relationship as bidirectional (McAdams et al., 2014).

1.6 Associations between PRF, personality and parenting stress in mothers with SUD

1.6.1 Personality and sensitive parenting

High PRF has shown associations with caregiving behaviors like flexibility, responsiveness, curiosity and willingness to understand the child’s mental states (Fonagy, Steele, Moran, Steele, & Higgit, 1991; Fonagy et al., 2004; Luyten, Mayes, Nijssens, & Fonagy, 2017). Even though parenting practices have long been acknowledged as an expression of parents’ personality (Belsky, 1984), studies in the field of mentalization have suffered from a lack of
consideration of individual differences in explaining variations of PRF (Sarfi et al., 2011; Luyten & Fonagy, 2015). Bornstein and colleagues (2011) described Openness as a positive parenting trait, related to mothers’ parenting knowledge, and their reported competence and investment in parenting. Openness was also related to mothers’ symbolic play with children. As earlier mentioned, Extraversion may reflect the parent’s degree of interpersonal interaction and positive affect towards the child. A meta-analysis of Prinzie and colleagues (2009) found this trait to be crucial in predicting parenting warmth. This outcome often refers to the extent to which parents intentionally foster individuality, self-regulation and support, by being attuned and indulgent to the child’s demands. Coplan and colleagues (2009) also found Agreeableness to be positively related to parental warmth, responsiveness and authoritative parenting in general, as well as promoting more positive emotion regulation in their children. On the other hand, the same researchers found Neuroticism to be most negatively associated to warm and responsive parenting. In a study by Plotkin and colleagues (2014), parents who reported higher levels of Neuroticism were more likely to rate their children as displaying greater externalizing, internalizing, and overall behavioral difficulties. This finding is consistent with the notion that high levels of parental Neuroticism are related to more negative, intrusive, and over controlling patterns of parenting behavior (Chaparro & Grusec, 2016).

1.6.2 Parenting stress and the possible mediating role of stress in the association between personality and PRF

PRF is also related to parenting stress (Luyten et al., 2017; McQuillan & Bates, 2017). Rutherford, Goldberg, Luyten, Bridgett and Mayes (2013) demonstrated that more curiosity about the child’s mental states was related to increased distress tolerance in the parent. They hypothesized that a parent’s reflections about, and willingness to understand the child’s expressed behavior, help him/ her to regulate and interpret own mental states when faced with a dysregulated or otherwise distressed infant. This may consequently generate a more adequate response to the infant’s affective signals. Sarfi and colleagues (2011) studied the impact of maternal style and parenting stress on the mother-child interaction in a sample of OMT mothers. They found that maternal interactive behavior, such as high sensitivity, positive regard of the infant, low intrusiveness and detachment, had overridden the influence of parenting stress and psychological distress when dyadic quality was assessed.
Research has demonstrated the benefits of Openness and Agreeableness on stress responses (Penley & Tomaka, 2002). One explanation suggested by Costa, Sommerfield and McCrae (1996), is that individuals high on Openness and Agreeableness are more willing to try new coping strategies. Vermaes, Janssens, Mullaart, Vinck and Gerris (2008) and Plotkin and colleagues (2014) also demonstrated that individuals with higher levels of Extraversion tend to experience lower levels of parenting stress. Stress is expected to be correlated with single personality traits, or associated with a combination of several traits (Matthews, Lin, & Wohleber, 2017; Matthews et al., 2017). Schneider, Rench, Lyons and Riffle (2012) showed that Neuroticism and Openness were significantly related to an individual’s appraisals of stressors. In their study, Neuroticism predicted higher threat appraisals and lower positive affect in the situation, whereas higher scores on the Openness trait predicted lower subjective experience of threat and less negative affect. In another study, researchers found that the Actions and Ideas facets of Openness, also predicted lower cortisol responses (associated with lower objective stress) to an impending social stress test (Oswald et al., 2006). In sum, differences in personality may be important in explaining the parent’s appraisal and experience of stress. Consequently, individual differences in parenting stress may account for some of the relationships between certain personality traits and PRF.

1.6.3 Towards a more comprehensive understanding of the mechanisms underlying PRF

Models of PRF should emphasize a reciprocal interplay between biological, psychological and environmental factors. Research points at the complexity of parenting processes among mothers with SUD and the need to closely examine underlying processes and mechanisms linking risk factors with maladaptive parenting (Suchman & Luthar, 2001). To our knowledge, no prior research has explored the associations between PRF and personality functioning in a sample of substance abusing mothers. A review of the literature within the fields of mentalizing, parenting, personality and stress, draws attention to the role of personality in relation to PRF, and the possible mediating role of parenting stress. Thus, we sought to investigate how personality and parenting stress commonly contribute to variance in PRF in a sample of mothers with SUD. The results may highlight the relevance of the NEO PI-R in clinical practices, and help identify possible areas of intervention in order to improve the interaction between these mothers and their children. This may also positively affect the children’s development of own reflective functions.
1.7 The current study

The main purpose of this thesis was to investigate how personality traits and associated facets relate to parental reflective functioning in a sample of substance abusing mothers.

We hypothesized that in a group of mothers with SUD, high levels of the Agreeableness, Openness and Extraversion traits were associated with better PRF. Further, we predicted higher levels of Neuroticism to be associated with lower PRF. Given the limited research literature on this topic, the choice of predictors was guided by general knowledge in the field of personality and sensitive parenting. Our research was mainly exploratory, and therefore we made no specific hypotheses about the relationship between PRF and personality at the facet level.

Our second objective was to determine if the relevant personality factors and facets, discovered in aim 1, and parenting stress, were commonly associated with PRF. We hypothesized that the effects of specific personality traits upon PRF were mediated by the subjective experience, appraisal, and regulation of parenting stress that mothers with SUD demonstrate in the parenting role.
2 Methods

Participants were tested and interviewed on a large battery of measures, and only selected data are included and presented in the current study.

2.1 Participants

Originally, the project included 45 mothers with SUD, and their infants, who were recruited during pregnancy or their postpartum period. However, one mother withdrew because of death in the family, and another died in the middle of the assessment period. Their data is not included in the analyses. Our study is based on data from the remaining 43 mothers who completed the entire assessment battery. Twelve of these mothers (27.9%) were recruited from outpatient clinics, and six mothers (14.0%) were recruited by health nurses working in nearby municipalities. The remaining 25 mothers (58.1%) were recruited from treatment facilities specialized in caring for pregnant women and families with small children, with a concurrent substance abuse problem. The recruitment period lasted for two years. The mean subject age was 31 years (SD = 6.4 years, range 19-44). The inclusion criteria were a former substance use problem and a current SUD diagnosis, with or without a comorbid mental illness. Their diagnoses were based on the International Classification of Mental and Behavioural Disorders (ICD-10; World Health Organization [WHO], 1992), and confirmed by the assessments used in the study. The mothers were reportedly abstinent during the assessment period. The exclusion criteria were an estimated full-scale IQ below 70 in the mothers, twinning pregnancy, premature birth (<32 weeks and 1500 g), or a severely ill or multi-handicapped child. Children with neonatal abstinence syndrome (NAS) were not excluded, and eleven babies (25.6%) were born with the diagnosis. The sample consisted of 15 baby girls (34.9%), and 28 baby boys (65.1%), with mean age 8.6 months (SD = 3.8, range 1-18 months). The majority of mothers (62.8%) participated with their first-born child. Sixteen mothers (37.2%) also had older children, but only one mother was still in custody of the sibling of the target child. During the inclusion period, 12 of the mothers (27.9%) lost custody of the child participating in the study. For more details, see descriptive data Table 1.

2.1.1 Socio-demographic background data
The mothers had 7-18 years of formal education, on average 11.5 years. Six participants (14.0%) had studied at the graduate level. Two participants (4.7%) did not complete primary school, and 22 (51.2%) did not complete high school. Nearly half of the mothers (51.2%) were single, 30.2% had a cohabitant, and 16.3% of the mothers had a partner who was not a cohabitant. Only one participant was married. Twenty-four mothers (55.8%) reported that the father of the child, included in the current study, had an ongoing substance abuse problem. Fifteen mothers (34.9%) reported previous substance abuse problem in the father. Five of the mothers (23.8%) who reported having a partner at the time of assessment, also reported current substance abuse problem in the partner, and 12 (57.1%) reported a previous substance abuse problem in this partner. For more socio-demographic variables, see Table 1.

2.1.2 Mental health data

The participants reported various comorbid mental health problems, assessed by the Norwegian version of the Mini-International Neuropsychiatric Interview 5.0.0 manual (M.I.N.I; Sheehan et al., 1998). All mothers except two (95.3%), met the criteria for previous depression. Sixteen mothers (37.2%) met the criteria for a current depression, and 29 (67.4%) reported previous suicide attempts. Self-harm behavior was also reported by 28 mothers (65.1%). Among the anxiety disorders, PTSD (67.4%), panic disorder (60.5%), general anxiety (53.5%), social phobia (48.8%) and agoraphobia (27.9%) were most frequently reported. Relative to its prevalence, psychosis (41.9%) and anorexia nervosa (37.2%) were also commonly reported. More than half of the mothers (51.2%) had experienced a drug induced psychosis. For more mental health data, see Table 1.

2.1.3 Substance abuse data

The use of psychoactive substances was examined using the Norwegian translation of European Addiction Severity Index 5th edition (Europ-ASI; McLellan et al., 1992). About three out of four mothers (74.4%) reported having a problematic relationship with many narcotic substances. Use of cannabis (81.4%) was most frequently reported, followed by medicational drugs (74.4%) and amphetamine/cocaine (72.1%). Amphetamine/cocaine (37.2%) and opiates (32.6%) were also the most preferred substances of choice in this sample. Alcohol was reported as the preferred substance by 16.3% only, and 41.9% reported having a problematic relationship with alcohol. However, alcohol had the lowest mean debut age, 13.09 years ($n = 42$, $SD = 2.98$). For more substance abuse data, see Table 1.
Table 1

**Sample characteristics**

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<tr>
<th>Demographic data</th>
<th>Range</th>
<th>Mean (SD)</th>
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</thead>
<tbody>
<tr>
<td>Mother’s age</td>
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<td>Child’s age (months)</td>
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<td>Number of children</td>
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<td>Children in daily custody</td>
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<td>Romantic partner</td>
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<tr>
<td>High school</td>
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<td>Master/professional degree</td>
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<tr>
<td>Previous suicide attempt</td>
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<td>67.4</td>
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<tr>
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<td>Mani</td>
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<table>
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<th>Preferred %</th>
<th>Mean debut age (SD)</th>
<th>Problematic % (N=43)</th>
</tr>
</thead>
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<tr>
<td>Alcohol</td>
<td>16.3</td>
<td>13.09(2.98) (n=42)</td>
<td>41.9</td>
</tr>
<tr>
<td>Medication</td>
<td>0.0</td>
<td>18.08 (5.79) (n=37)</td>
<td>74.4</td>
</tr>
<tr>
<td>Cannabis</td>
<td>14.0</td>
<td>16.21(4.39) (n=42)</td>
<td>81.4</td>
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<td>Amfetamin/Cocaine</td>
<td>37.2</td>
<td>17.82(4.42) (n=38)</td>
<td>72.1</td>
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<tr>
<td>Opiates</td>
<td>32.6</td>
<td>20.28(5.95) (n=25)</td>
<td>46.5</td>
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<tr>
<td>Many</td>
<td>0.0</td>
<td>18.36(4.78) (n=36)</td>
<td>74.4</td>
</tr>
</tbody>
</table>

2.2 Measures

2.2.1 Mental health variables and use of psychoactive substances

The European Addiction Severity Index (Europ-ASI)
We used the Norwegian version (Lauritzen, 2010) of the fifth edition of The European Severity Index (Europ-ASI; McLellan et al., 1992) to register use of psychoactive substances in our sample. This is a semi-structured clinical interview asking for information concerning seven themes or dimensions: physical health, employment and/or educational situation, use of alcohol, use of narcotic substances and medicine, crime, family history and social relations and psychological health. The reliability and validity of Europ-ASI is reported to be satisfactory (Kessler et al., 2012; Kokkevi & Hartgers, 1995).

Mini-International Neuropsychiatric Interview 5.0.0 manual (M.I.N.I)
In order to screen for comorbid psychiatric disorders the diagnostic interview M.I.N.I plus version 5.0.0. was administered (Sheehan et al., 2002). This is a semi-structured clinical interview screening for diagnostic criteria related to the fourth version of the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV; American Psychiatric Association, 2000), The ICD-10 (WHO, 1992), and subscales of Europ-ASI (McLellan et al., 1992). The validity and reliability of the English version has been found satisfactory (Sheehan et al., 1998).

2.2.2 Parent Development Interview – R2 (PDI-R2)
In our study, the Parent Development Interview revised was used to assess reflective functioning (PDI-R2; Slade, Aber, Berger, Bresgi, & Kaplan, 2005; Aber et al., 1985; Fonagy et al., 1998). It is a semi-structured clinical interview intended to investigate a parent’s ability to think reflectively about their child, themselves in the parent role, and their relationship with their child. Thus the interview gives information about how the parent understands the child’s behavior, thoughts and feelings. The questions cover different themes concerning the parent’s current relationship with the child, including descriptions of the child, views on the relationship, the affective experience of parenting, parental family history, and experience of separation/loss. Examples of interview questions are: “Describe a time during the last week when you and your child really clicked,” and “Tell me about a time in the last week or two when you felt really angry.” The interview was recorded and transcribed from audio files, and coded by an independent coder in accordance with evaluation guidelines developed by
Fonagy and colleagues (1998). A second coder coded 25% of the interview to ensure stronger inter-rater reliability. It was found to be 93%, which is considered satisfying. The validity of the PDI-R2 has been found satisfactory, both in populations with substance abusing mothers and in non-clinical populations (Slade, 2005).

The interviews were scored on an 11-point scale from -1 to 9, i.e., organized along a continuum from low to high RF. In the scoring manual, a score of -1 implies negative RF, and includes responses characterized as distinctively anti-reflective, bizarre or inappropriate in the context of the interview. A score of 9 indicates exceptional RF, with complex, elaborating, sophisticated and surprising reflections. A score of 5 is termed definite or ordinary RF, involving some elements that makes the reflection explicit (Slade, Bernbach, Grienenberger, Levy, & Locker, 2005). However, research indicates that a lower score should be considered the average capacity in vulnerable populations (Taubner et al., 2013). In a stressed, or otherwise vulnerable population, scores of 4 or above should be considered average. The cut-off point in our study was therefore set at 3. Mothers having a total PRF score of 3 or lower was associated with negative or low PRF (See also Håkansson et al., 2017).

2.2.3 Revised NEO Personality Inventory (NEO PI-R)

Personality was assessed using the Norwegian version of the Revised NEO Personality Inventory (NEO PI-R; Costa & McCrae, 1992; Martinsen, Nordvik, & Østbø, 2003). The NEO PI-R is a self-report questionnaire with 240 items, developed to measure the five major domains of personality described in the Five Factor Model of personality: Neuroticism (N), Extraversion (E), Openness to Experience (O), Agreeableness (A), and Conscientiousness (C). Each factor consists of six more specific facets, thought to depict personality in a more nuanced manner (See also part 1.3.3). Respondents answer on a five-point likert scale, ranging from strongly agree to strongly disagree. In the Norwegian norms, men and women are almost equally represented, and sampled from a wide array of populations, including patients with psychiatric illnesses. The age range is between 17 and 80 years with a mean age of 30.5 (SD = 10.5) (Martinsen, Nordvik, & Østbø, 2005). The NEO PI-R profile is generated from raw scores, but visually represents standardized t-scores. The profile marks five intensity categories (Costa & McCrae, 2008): The first interval, 20-34, indicates very low scores. The second consists of low scores in the area 35-44. Average scores are found between 45-55. The interval 56-65 indicates high scores, and t-scores between 66-80 are considered very high.
The psychometric properties of the NEO PI-R have been studied extensively and are considered satisfactory (Costa & McCrae, 2008; McCrae, Kurtz, Yamagata, & Terracciano, 2011). Average Cronbach’s alphas of the five factors in the Norwegian version, are N: .93, E: .90, O: .89, A: .85 and C: .90, and average reliability of facets is .73 (Martinsen et al., 2005). When measured with the NEO PI-R, the FFM-traits show similar structure, development, reliability and validity across a wide range of different cultures (McCrae et al., 2004; Ispas, Iliescu, Ilie, & Johnson, 2014), including North-European countries (Martinsen, Nordvik, & Østbø, 2011). However, the N- and O-traits do have relatively less support for their universality (De Raad et al., 2010; Gurven et al., 2013). Despite this, studies have demonstrated satisfactory evidence of convergent and construct validity (Hopwood et al., 2009; Boyle, Saklofske, Matthews, & Matthews, 2015; Bagby, Costa, Widiger, Ryder, & Marshall, 2005; Murray & Booth, 2015).

2.2.4 Parenting Stress Index (PSI) Long Form

The Norwegian version of the Parenting Stress Index, third edition (PSI Long form; Abidin, 1995) was administered to assess parenting stress. PSI is a widely used self-report measure developed to identify parents under severe stress, and the potential for parental behavior problems and child adjustment difficulties within the family. It is based on the assumptions that (1) stressful circumstances are additive in their effects, (2) sources and types of stress are multifactorial, and (3) parent’s appraisal and coping attempts are critical (Abidin, 1995). PSI measures the parent’s experience of stress in relation to (1) child characteristics and the appraisal of them, (2) the appraisal of own parent characteristics and family variables that make parenting challenging, and (3) stressful circumstances outside parent-child interaction. A total score named Total Parenting Stress is based on the sum of the child and parent characteristics scale. Items concerning stressful circumstances outside the parent-child dyad yields a separate index score, labelled General Life Stress. Psychometric tests demonstrate good reliability and validity, and the index has been found to predict dysfunctional parenting and deviant development across different populations (Kornør & Martinussen, 2011).

PSI consists of 120 items which are mostly rated along a five-point likert scale, from strongly disagree to strongly agree. Some items are rated Yes/No. According to the manual, scores above the 85th percentile should be considered the cut-off distinguishing normal stress levels from high scores (Abidin 1995). Research on the psychometric properties of the PSI Short
form in a high-risk sample of mothers, suggested a lower clinical cut-off relative to the published 85th percentile (Barroso et al., 2016). The mothers in the current study were sampled from a highly stressed and vulnerable population. Due to this, another division of cut-offs could be meaningful. In our study, total parenting stress scores were specified using three cut-offs corresponding to a normal range of 16-64, a borderline range of 65-84, and a clinically significant high risk range of 85-99+ percentiles.

2.3 Procedures

Examinations and assessments of the participants were conducted in their homes or in the treatment facilities during 3-6 sessions. In total, the assessment took approximately seven hours. The mothers were interviewed with Europ-ASI and M.I.N.I plus to determine or confirm SUD diagnoses and comorbid mental health diagnoses according to ICD-10. A clinical psychologist (UH) collected all the data, supervised by a specialist in clinical neuropsychology (MGØ).

2.4 Ethical considerations

Ethical dilemmas may arise at any stage of the research process, particularly when examining a vulnerable group of mothers with SUD and their infants. Since substance use may reduce a participant’s ability to give informed consent, ongoing substance use was an exclusion criterion. The project was approved by The Norwegian Regional Committee for Medical Research Ethics in Eastern Norway (REK-Ost, Nr. 2012/1370). The research was conducted in accordance with the Helsinki Declaration of the World Medical Assembly (See also Håkansson et al., 2015; 2017). The mothers provided their written consent to be included in the study. Participation in the study was voluntary, and was not considered harmful for the mothers or the infants. The information revealed in the study was not supposed to have negative consequences in the form of how the mothers’ ability as caregivers was assessed. This factor was important in order to ensure reliable responses. However, it is always a difficult trade-off between the mother’s trust and the children’s needs. In this case, heightened ethical awareness was ensured by using the expert panel and the project group as forums for ethical reflection. The relevance of this project may be considerable, due to its treatment promoting focus, in order to enable mothers to better meet their children’s needs. The
potential benefits of this knowledge to individuals, professional practices, and to society, may outweigh the ethical concerns.

2.5 Statistical analyses

All cases ($N = 43$) were included in the analyses, and there was no missing data. The IBM Statistical Package for Social Sciences (SPSS) version 25 was used to carry out the analyses.

**Aim 1 – Associations between personality factors/facets and PRF**

In aim 1 of the study, descriptive data of personality, parental reflective functioning and parenting stress measures were presented first. Next, the relationship between personality factors/facets, as measured by the NEO PI-R, and PRF, as measured by the PDI-R2, were tested using a Pearson correlation coefficient analysis.

When conducting multiple analyses on the same dependent variable, the chances of committing Type I error increases. In interpreting the results, a compromise between detecting false positives and failing to detect an actual relationship, should therefore be taken into account. In order to correct for the possibility that a significant result was incidental, we conducted a Bonferroni correction. The corrected critical value was set at $0.05/35 = .001$.

**Aim 2 – Mediation model of personality trait(s), parenting stress and PRF**

We were aware that data derived from the NEO PI-R, the PSI and the PDI-R2 were reported as t-scores, percentiles and raw scores respectively. In order to make meaningful interpretations and comparisons of these measurements, we converted all data to standard scores ($z$). Standardization of t-scores from the NEO PI-R was conducted using the general mean and standard deviations in the norm population ($M = 50, SD = 10$). We used the NORM.S.INV function in Excel to get the placement on the standard normal distribution from the percentile score, i.e., transformation from percentile to z-score. Because our sample is selected, and expected to have clinically low scores on the PDI-R2, we decided to use sample distributions derived from the SUD population in particular. The process of computing means and standard deviations from this norm population was based on the research of Stacks et al., ([$M = 4.57$, $SD = 1.47$], 2014), Pajulo et al., ([$M = 3.1$, $SD = 1.00$], 2008; [$M = 3.00$, $SD = 1.00$], 2012) and Suchman et al., ([$M = 3.1$, $SD = 0.5$], 2017). These researchers studied PRF in a total of 209 women with SUD. The mean PRF scores derived from these studies
constituted an average PRF score in the population of $M = 3.4$ ($SD = 1.0$). These values were set as the standard of reference in our sample when transforming raw scores of the PDI-R2 to standard scores.

Since the majority of our data did not meet the assumptions of normality, confidence intervals and significance tests of the regression analyses were computed using the Bootstrapping technique (Efron & Tibshirani, 1993). This non-parametric test gets around the problem of violations of assumptions, and is considered robust to outliers (Field, 2018, p. 264). Bootstrapping estimates the properties of the sampling distribution from the original sample data. The mean is calculated from 1000 bootstrap samples and ordered. Next, the procedure defines the limits within which 95% of them fall, which is set as a confidence interval for the parameter.

In aim 2, the possible mediating role of parenting stress in the relationship between the relevant personality traits and facets, and PRF was investigated. First, three simple linear regression analyses, and one multiple regression analysis were conducted for each significant relation derived from aim 1. In this way we sought to establish that zero-order relationships among the variables existed, as predicted by theory (Baron & Kenny, 1986): In the first step of the regression analyses, the direct effect of the relevant personality factors and facets upon the total PRF score was tested. The personality trait was entered as the independent variable, and the total PRF score was entered as the dependent variable. In the second step, simple regression analysis was executed, with the personality trait as the independent variable, and the suggested mediator, parenting stress, as the dependent variable. In the third step, we conducted a simple linear regression predicting the outcome from the suggested mediator. In the fourth step, assuming there were significant relationships from step 1 through step 3, we conducted a multiple linear regression analysis with the relevant personality trait and the mediator predicting PRF. In order for either full or partial mediation to be established, the reduction in variance explained by the independent variable from the first to the fourth regression analysis, must have been significant. This was tested using the Sobel’s test (Sobel, 1982) and verified with the Bootstrapping method using 95% confidence interval. The Sobel’s test and Bootstrapping method were applied using the Indirect.sbs tool, version 2.0 Beta, added to the IBM SPSS 25 (See also Preacher & Hayes, 2008).
3 Results

3.1 Aim 1 - Associations between personality factors and facets and PRF

Scores on the PDI-R2 indicated an average poor total PRF for the group (mean score was 2.91, \(SD = 1.17\)), as 74.4\% of the mothers scored at the cut-off point (e.g. 3) or lower. Although the variability in total PRF scores were moderate, extending from 0 to 6.

The descriptive statistics of the NEO-variables are presented in Table 2. Due to the subdivision mentioned in part 2.2.3 (Costa & McCrae, 2008), the sample mean of the factor Neuroticism (N) is located in the “high” area compared to a normative sample. Mean values of the corresponding facets Anxiety (N1), Hostility (N2), Depression (N3), Self-consciousness (N4) and Vulnerability (N6) are located in the “high” area; however the mean level of the facet Impulsiveness (N5) is “average”. The mean value of Extraversion (E) was found in the “low” area of the distribution. All corresponding facets, except Warmth (E1), have mean levels in the “low” area. The mean score of the facet Warmth was “average.” The two factors Openness (O) and Agreeableness (A) were both in the “average” area. Their associated facets were also found in the “average” area, except for Actions (O4) and Trust (A1) which were located in the “low” area. Conscientiousness (C) was to be found in the “low” area, however mean scores on facets Order (C2), Dutifulness (C3), Achievement Striving (C4) and Deliberation (C6) were in the “average” area. One should note the large range of values in all factors and facets. When the 75th percentile was used as the cut-off for extreme scorers, the frequency of mothers with t-scores above 55.67 on the N-factor was 77\%. Corresponding frequencies of extreme scores below the 25th percentile, were 70\% for the E-factor (t-score ≤ 46.99), 40\% for the O-factor (t-score ≤ 42.05), 33\% for the A-factor (t-score ≤ 44.02) and 58\% for the C-factor (t-score ≤ 45.12).
Table 2

Personality profile descriptives

<table>
<thead>
<tr>
<th>Personality profile a)</th>
<th>Range</th>
<th>Mean (SD)</th>
<th>t-score intervals b)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Neuroticism (N)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anxiety (N1)</td>
<td>33-82</td>
<td>61.84 (9.57)</td>
<td><strong>HIGH</strong></td>
</tr>
<tr>
<td>Hostility (N2)</td>
<td>42-78</td>
<td>60.47 (8.43)</td>
<td></td>
</tr>
<tr>
<td>Depression (N3)</td>
<td>22-94</td>
<td>58.33 (12.88)</td>
<td></td>
</tr>
<tr>
<td>Self-consciousness (N4)</td>
<td>43-80</td>
<td>60.70 (8.59)</td>
<td></td>
</tr>
<tr>
<td>Impulsiveness (N5)</td>
<td>38-82</td>
<td>61.40 (10.24)</td>
<td></td>
</tr>
<tr>
<td>Vulnerability (N6)</td>
<td>27-75</td>
<td>49.33 (10.73)</td>
<td></td>
</tr>
<tr>
<td>Extraversion (E)</td>
<td>33-82</td>
<td>61.72 (12.36)</td>
<td></td>
</tr>
<tr>
<td>Warmth (E1)</td>
<td>15-76</td>
<td>40.33 (13.05)</td>
<td><strong>LOW</strong></td>
</tr>
<tr>
<td>Gregariousness (E2)</td>
<td>24-68</td>
<td>47.09 (11.36)</td>
<td></td>
</tr>
<tr>
<td>Assertiveness (E3)</td>
<td>15-65</td>
<td>38.37 (10.73)</td>
<td></td>
</tr>
<tr>
<td>Activity (E4)</td>
<td>24-67</td>
<td>42.77 (11.22)</td>
<td></td>
</tr>
<tr>
<td>Excitement-seeking (E5)</td>
<td>26-67</td>
<td>44.65 (10.05)</td>
<td></td>
</tr>
<tr>
<td>Positive Emotion (E6)</td>
<td>24-66</td>
<td>45.47 (9.03)</td>
<td></td>
</tr>
<tr>
<td>Openness (O)</td>
<td>13-71</td>
<td>42.35 (14.81)</td>
<td></td>
</tr>
<tr>
<td>Fantasy (O1)</td>
<td>32-71</td>
<td>46.26 (9.57)</td>
<td><strong>AVERAGE</strong></td>
</tr>
<tr>
<td>Aesthetics (O2)</td>
<td>31-68</td>
<td>47.30 (9.53)</td>
<td></td>
</tr>
<tr>
<td>Feelings (O3)</td>
<td>16-70</td>
<td>49.26 (11.05)</td>
<td></td>
</tr>
<tr>
<td>Actions (O4)</td>
<td>33-75</td>
<td>49.07 (10.35)</td>
<td></td>
</tr>
<tr>
<td>Ideas (O5)</td>
<td>17-61</td>
<td>44.77 (8.09)</td>
<td></td>
</tr>
<tr>
<td>Values (O6)</td>
<td>33-65</td>
<td>47.37 (10.02)</td>
<td></td>
</tr>
<tr>
<td>Agreeableness (A)</td>
<td>31-71</td>
<td>46.53 (8.58)</td>
<td></td>
</tr>
<tr>
<td>Trust (A1)</td>
<td>14-79</td>
<td>48.88 (12.78)</td>
<td><strong>AVERAGE</strong></td>
</tr>
<tr>
<td>Straightforwardness (A2)</td>
<td>9-74</td>
<td>39.26 (14.45)</td>
<td></td>
</tr>
<tr>
<td>Altruism (A3)</td>
<td>25-72</td>
<td>50.51 (11.22)</td>
<td></td>
</tr>
<tr>
<td>Compliance (A4)</td>
<td>17-70</td>
<td>50.53 (13.22)</td>
<td></td>
</tr>
<tr>
<td>Modesty (A5)</td>
<td>12-76</td>
<td>50.53 (13.03)</td>
<td></td>
</tr>
<tr>
<td>Tender-mindedness (A6)</td>
<td>36-71</td>
<td>53.05 (9.69)</td>
<td></td>
</tr>
<tr>
<td>Conscientiousness (C)</td>
<td>23-74</td>
<td>51.26 (10.39)</td>
<td></td>
</tr>
<tr>
<td>Competence (C1)</td>
<td>17-69</td>
<td>43.00 (11.97)</td>
<td><strong>LOW</strong></td>
</tr>
<tr>
<td>Order (C2)</td>
<td>13-74</td>
<td>41.58 (13.68)</td>
<td></td>
</tr>
<tr>
<td>Dutifulness (C3)</td>
<td>30-70</td>
<td>41.88 (13.68)</td>
<td></td>
</tr>
<tr>
<td>Achievement striving (C4)</td>
<td>17-69</td>
<td>45.47 (11.47)</td>
<td></td>
</tr>
<tr>
<td>Self-discipline (C5)</td>
<td>31-67</td>
<td>45.49 (9.43)</td>
<td></td>
</tr>
<tr>
<td>Deliberation (C6)</td>
<td>20-69</td>
<td>41.88 (12.42)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>16-68</td>
<td>46.44 (11.13)</td>
<td></td>
</tr>
</tbody>
</table>

Note. N=43 SD=Standard deviation, a) Revised NEO Personality Inventory (NEO PI-R). Values are reported in t-scores, b) t-score intervals (See Costa & McCrae, 2008).

The values of the Parenting Stress Index are reported in percentiles (See Table 3). The statistic identified considerable within-group variability for both the total level of parenting stress, and the three other subdomains. The average total parenting stress score was elevated compared to normal samples (Abidin, 1995), and the distribution of scores was markedly skewed to the left. The mean percentile score was 70.3 (SD = 20.8) which corresponded to
scores in the borderline range (See the Measures part 2.2.4). Approximately a third (32.5%) reported having a total stress level in the normal range, equivalent to scores below the 65th percentile. The majority of mothers (37.2%) had a total stress score in the borderline range, between the 65th to 84th percentiles. The proportion of mothers with a total stress level corresponding to a clinically significant group, above the 85th percentile, was 30.2%.

Table 3

Descriptive statistics of the Parenting Stress Index

<table>
<thead>
<tr>
<th>Stress domains a)</th>
<th>Range</th>
<th>Mean (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Stress</td>
<td>5-98</td>
<td>70.3 (20.8)</td>
</tr>
<tr>
<td>Child Domain</td>
<td>10-98</td>
<td>61.3 (22.4)</td>
</tr>
<tr>
<td>Parent Domain</td>
<td>7-98</td>
<td>74.4 (19.1)</td>
</tr>
<tr>
<td>Life Stress</td>
<td>25-99</td>
<td>82.8 (18.0)</td>
</tr>
</tbody>
</table>

Note. N=43 SD=Standard deviation,
a) The Parenting Stress Index (PSI) Long Form. Values are reported in percentiles. Normal range 16-64, borderline range 65-84, clinically significant/ high risk > 85th percentile.

3.1.1 Bivariate analysis

Associations between personality variables and the total PRF score were tested using a Pearson correlation coefficient analysis. The O-factor was the only broad personality trait significantly associated with the PRF. There was a moderate, positive association between the O-factor and PRF ($r = .44$), with higher levels of O being associated with better PRF. The facets of O which were significantly, yet moderately, correlated with PRF, were O1: Fantasy ($r = .35$), O3: Feelings ($r = .43$) and O5: Ideas ($r = .40$). Hence higher levels of these facets corresponded to better PRF. The facet N2: Hostility, associated with the N-factor, was negatively and moderately correlated to PRF ($r = -.34$), thus lower levels of this facet corresponded to better PRF. The facet A6: Tender-mindedness, associated with the A-factor, was positively and moderately correlated to PRF ($r = .36$). Finally, the facet C4: Achievement-striving, associated with the C-factor, was also positively and moderately correlated to PRF ($r = .34$). See Table 4.
Table 4

Pearson correlation coefficients between personality factors and facets and PRF

<table>
<thead>
<tr>
<th>Personality factors/ facets</th>
<th>PRF$^{(b)}$</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Neuroticism (N)</strong></td>
<td></td>
</tr>
<tr>
<td>Anxiety (N1)</td>
<td>-.15</td>
</tr>
<tr>
<td>Hostility (N2)</td>
<td>-.34$^{*}$</td>
</tr>
<tr>
<td>Depression (N3)</td>
<td>-.24</td>
</tr>
<tr>
<td>Self-consciousness (N4)</td>
<td>.09</td>
</tr>
<tr>
<td>Impulsiveness (N5)</td>
<td>-.16</td>
</tr>
<tr>
<td>Vulnerability (N6)</td>
<td>-.26</td>
</tr>
<tr>
<td><strong>Extraversion (E)</strong></td>
<td></td>
</tr>
<tr>
<td>Warmth (E1)</td>
<td>.29</td>
</tr>
<tr>
<td>Gregariousness (E2)</td>
<td>.07</td>
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<tr>
<td>Assertiveness (E3)</td>
<td>.23</td>
</tr>
<tr>
<td>Activity (E4)</td>
<td>.17</td>
</tr>
<tr>
<td>Excitement-seeking (E5)</td>
<td>-.06</td>
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<tr>
<td>Positive emotions (E6)</td>
<td>.29</td>
</tr>
<tr>
<td><strong>Openness (O)</strong></td>
<td>.44$^{**}$</td>
</tr>
<tr>
<td>Fantasy (O1)</td>
<td>.35$^{*}$</td>
</tr>
<tr>
<td>Aesthetics (O2)</td>
<td>.15</td>
</tr>
<tr>
<td>Feelings (O3)</td>
<td>.43$^{**}$</td>
</tr>
<tr>
<td>Actions (O4)</td>
<td>.02</td>
</tr>
<tr>
<td>Ideas (O5)</td>
<td>.40$^{**}$</td>
</tr>
<tr>
<td>Values (O6)</td>
<td>.24</td>
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<tr>
<td><strong>Agreeableness (A)</strong></td>
<td>.22</td>
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<td>Compliance (A4)</td>
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<tr>
<td>Modesty (A5)</td>
<td>.15</td>
</tr>
<tr>
<td>Tender-mindedness (A6)</td>
<td>.36$^{*}$</td>
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<tr>
<td><strong>Conscientiousness (C)</strong></td>
<td>.26</td>
</tr>
<tr>
<td>Competence (C1)</td>
<td>.29</td>
</tr>
<tr>
<td>Order (C2)</td>
<td>.19</td>
</tr>
<tr>
<td>Dutifulness (C3)</td>
<td>.20</td>
</tr>
<tr>
<td>Achievement striving (C4)</td>
<td>.34$^{*}$</td>
</tr>
<tr>
<td>Self-discipline (C5)</td>
<td>.24</td>
</tr>
<tr>
<td>Deliberation (C6)</td>
<td>.15</td>
</tr>
</tbody>
</table>

*Note. N=43  

$^{a)}$ The Revised NEO Personality Inventory (NEO PI-R)  
$^{b)}$ The Parental Development Interview Revised.  

$^{*}p < .05, **p < .01$
3.2 Aim 2 – Mediation model of personality trait(s), parenting stress and PRF

The purpose of the analyses in aim 2 was to better understand the relationship between personality and parenting stress, and how these mechanisms may affect PRF. This was explored through simple linear and multiple regression analyses and summarized in causal mediation models. All units were standardized before entered in the analyses. The full mediation procedure is only described for the O-factor in relation to PRF.

3.2.1 Simple linear regression analyses

A simple linear regression analysis was calculated to predict participants’ PRF score based on their O-score. A significant regression equation was found ($F(1,41) = 9.94, p < .003$), with an $R^2$ of .20 (Adjusted $R^2 = .18$). The Bootstrapped 95% confidence interval limits = .117, .887.

Table 5

*Summary of linear regression analysis for the Openness trait predicting PRF*

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>95% CI (B)</th>
<th>$\beta$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>-.29</td>
<td>[-.64, .06]</td>
<td>-</td>
</tr>
<tr>
<td>Openness a)</td>
<td>.54**</td>
<td>[.19, .90]</td>
<td>.44</td>
</tr>
<tr>
<td>$R^2$</td>
<td>.20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$F$</td>
<td>9.94**</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note. N=43 CI=confidence interval.*

a) The Revised NEO Personality Inventory (NEO PI-R).

**$p < .01$**

A second simple linear regression was calculated to predict participants’ levels of parenting stress score based on their O-score. A non-significant regression equation was found ($F(1,41) = 3.00, p = .091$), with an $R^2$ of .07 (Adjusted $R^2 = .05$). See Table 6.

Table 6

*Summary of linear regression analysis for the Openness trait predicting parenting stress*

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>95% CI (B)</th>
<th>$\beta$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>.56</td>
<td>[.33, .80]</td>
<td>-</td>
</tr>
</tbody>
</table>
Openness $^a$)  
$R^2$  
$F$

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>95% CI (B)</th>
<th>β</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>-.07</td>
<td>[-.51, .38]</td>
<td>-</td>
</tr>
<tr>
<td>Parenting stress $^a$)</td>
<td>-.67**</td>
<td>[-1.1, .21]</td>
<td>-.42</td>
</tr>
</tbody>
</table>

$^a$) The Revised NEO Personality Inventory (NEO PI-R),  
$^b$) Parenting Stress Index Long Version

A third simple linear regression was calculated to predict participants’ PRF score based on their parenting stress score. A significant regression equation was found ($F(1,41) = 8.66, p = .005$), with an $R^2$ of .17 (Adjusted $R^2 = .15$). The Bootstrapped 95% confidence interval limits = -1.32, -.126. See Table 7.

Table 7  
Summary of linear regression analysis for the parenting stress variable predicting PRF

<table>
<thead>
<tr>
<th>Variable</th>
<th>PRF $^b$)</th>
<th>B</th>
<th>95% CI (B)</th>
<th>β</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td></td>
<td>-.07</td>
<td>[-.51, .38]</td>
<td>-</td>
</tr>
<tr>
<td>Parenting stress $^a$)</td>
<td></td>
<td>-.67**</td>
<td>[-1.1, .21]</td>
<td>-.42</td>
</tr>
</tbody>
</table>

$^a$) Parenting Stress Index Long Version,  
$^b$) The Parental Development Interview Revised.  
**p < .01.

3.2.2 Multiple linear regression analysis

As shown in Table 8, a multiple regression analysis with PRF as the dependent variable and the O-factor and parenting stress as independent variables, showed that these two variables combined explained 29.3% of the variance in PRF (adjusted $R^2 = .26$). The O-trait and parenting stress significantly predicted PRF in combination ($F(1,40) = 8.30, p = .001$).
Table 8

Multiple linear regression analysis with Openness and parenting stress (independent variables) predicting PRF (dependent)

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>95% CI (B)</th>
<th>β</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>.002</td>
<td>[-.42, .42]</td>
<td>-</td>
</tr>
<tr>
<td>Openness a)</td>
<td>.44*</td>
<td>[.10, .78]</td>
<td>.36</td>
</tr>
<tr>
<td>Parenting stress b)</td>
<td>-.52*</td>
<td>[-.97, -.07]</td>
<td>-.32</td>
</tr>
<tr>
<td>$R^2$</td>
<td>.29</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$F$</td>
<td>8.45**</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. N=43 CI=confidence interval.

a) The Revised NEO Personality Inventory (NEO PI-R), b) Parenting Stress Index Long Version, c) The Parental Development Interview Revised. *p < .05, **p < .001

3.2.3 Test of the significance of the mediation effect

The results from the three simple regression analyses and the multiple regression analysis did not assume a mediation effect of parenting stress in the relationship between the O-trait and PRF, according to Baron and Kenny’s procedure. See also Figure 1 below. This was because the O-trait was not significantly related to parenting stress.

![Figure 1. Model of standardized regression coefficients for the relationship between Openness and PRF. The standardized regression coefficient between Openness and PRF, controlling for parenting stress, is in parentheses. *p < .05, **p < .01.]

3.2.4 Test of mediation models of the significant personality facet(s), parenting stress and PRF

We replicated the procedure of mediation analysis mentioned above to investigate whether parenting stress had a mediating effect in the significant relationship between the three facets of Openness, O1: Fantasy, O3: Feelings, O5: Ideas, and PRF, and between the facets N2: Hostility, A6: Tender-mindedness, C4: Achievement striving, and PRF.

We first conducted the Baron and Kenny approach to mediation using a series of regression analyses. These indicated no effect of parenting stress as a mediator in the relationships
between the facets: O1: Fantasy, O3: Feelings, O5: Ideas and PRF. This was because none of the facets were able to significantly predict variance in the parenting stress variable (the standardized regression coefficients between the facets and parenting stress respectively: \( b = .002, p = .98 \) / \( b = -.041, p = .71 \) / \( b = -.119, p = .30 \)). Neither the facet C4: Achievement striving was able to predict parenting stress (\( b = -.151, p = .21 \)), and no mediation effect of parenting stress in the relationship between this facet and PRF was therefore indicated. Four linear regression analyses were then calculated to predict participants’ PRF score based on their levels of O1: Fantasy (\( b = .43, p = .021, 95\% CI [.067, .783] \)), O3: Feelings (\( b = .49, p = .004, 95\% CI [.155, .806] \)), O5: Ideas (\( b = .46, p = .008, 95\% CI [.157, .766] \)), and C4: Achievement striving (\( b = .42, p = .026, 95\% CI [.002, .938] \)), respectively. The Bootstrapped Percentile 95\% confidence interval limits for the predictors are defined between the brackets. The results are summarized in Figure 2.

![Figure 2. Model of the standardized regression coefficients between the facets O1: Fantasy, O3: Feelings, O5: Ideas, and C4: Achievement striving, and PRF. *p < .05, **p < .01.](image)

However, the results from Baron and Kenny’s approach to mediation, indicated a full mediation effect of parenting stress in the relationship between the facet N2: Hostility and PRF. See Figure 3. The standardized regression coefficient of this facet was reduced from \( b = -.31, p = .025 \) in the direct path to \( b = -.14, p = .36 \) in the indirect path when controlling for the mediator. The significance of the indirect effect of parenting stress was tested using the Sobel’s test. However, the indirect effect of parenting stress was not significant, \( p = .073 \) using this approach. Also the bootstrap analysis showed a non-significant indirect effect, with a 95\% bias corrected confidence interval including zero \([-0.500, 0.014]\). In sum, results of the Sobel’s test and bootstrapping did not support the notion that parenting stress completely mediated the relationship, however, given that 0.00 was far from the most likely value based
on the bootstrapped draws, we assumed there was a clear tendency towards a full mediation effect of parenting stress in this relationship (See also Cohen, 1994; Greenland et al., 2016).

![Diagram](image)

*Figure 3. Model of standardized regression coefficients for the relationship between the facet N2: Hostility and PRF as mediated by parenting stress. The standardized regression coefficient between Hostility and PRF, controlling for parenting stress, is in parentheses. 
*p < .05, **p < .01, ***p < .001

The results from the three simple regression analyses and one multiple regression analysis suggested a full mediation effect of parenting stress in the relationship between the facet A6: Tender-mindedness and PRF. This was due to the fact that the standardized regression coefficient of the facet was reduced from $b = .41, p = .02$ in the direct path to $b = .28, p = .09$ in the indirect path when controlling for the mediator. The significance of the indirect effect of parenting stress was tested using the Sobel’s test and verified with Bootstrapping procedures using 95% confidence interval. Regarding the mediating role of parenting stress, results of the conservative Sobel’s test revealed a non-significant indirect effect of parenting stress, $p = .12$. Despite this, the Bootstrapping method revealed a significant estimate of 95% bias corrected confidence intervals excluding zero [.006, .434], thus indicated a statistically significant indirect effect of parenting stress. See Figure 4.

![Diagram](image)

*Figure 4. Model of standardized regression coefficients for the relationship between the facet A6: Tender-mindedness and PRF as mediated by parenting stress. The standardized regression coefficient between Tender-mindedness and PRF, controlling for parenting stress, is in parentheses. 
*p < .05, **p < .01.
4 Discussion

4.1 Aim 1: Associations between personality factors / facets and PRF

We expected that high levels of the Extraversion, Openness and Agreeableness traits were associated with better PRF in our sample of mothers with SUD. Further, we predicted higher levels of Neuroticism to be associated with lower PRF. As expected, we found a significant, yet moderate, correlation between PRF and the Openness factor, where higher levels of Openness predicted better PRF. The corresponding O-facets associated with better PRF were the facets O1: Fantasy, O3: Feelings and O5: Ideas. The facets A6: Tender-mindedness and C4: Achievement striving were also moderately and positively correlated to PRF, whereas the facet N2: Hostility was moderately and negatively correlated to PRF. Contrary to our hypotheses, the overall factors of Neuroticism, Extraversion, or the Agreeableness factors were not significantly correlated with PRF.

4.1.1 Associations between the O-factor/ O1-, O3-, and O5-facets, and PRF

As predicted, we found a significant association between the Openness factor (O), including the associated facets O1: Fantasy, O3: Feelings and O5: Ideas, and PRF in our sample of mothers with SUD. The causal relationship we are suggesting, that O predicts PRF, is supported empirically and theoretically:

O broadly reflects an individual’s receptiveness to new experiences, both internally (exploring internal emotions and ideas) and externally (exposing oneself to new, unfamiliar things). Thus, it distinguishes between those who seek out novelty and avoid structure/rules, and those who seek stability and familiarity. Arguably, how well a person is able to balance external pressures for change, in relation to internal emotional drives, will most likely affect the capacity for adjustment (Piedmont, Sherman, & Sherman, 2012); for instance in relation to one’s child. In light of our results it is plausible that the level of receptiveness to novel features in the child’s behavior, as they spontaneously and unexpectedly occur in interaction, is important for the mother's capacity to interpret the child’s underlying mental states.
We found that an increase in O was related to better PRF. Thus, non-adaptive aspects of low O might be especially relevant for understanding impaired PRF in mothers with SUD. Research has identified secondary difficulties and impairments associated with extreme levels of all the Five Factor traits (Widiger, Costa, & McCrae, 2002). Low O is associated with personal and social adjustment problems, restricted interests, low tolerance for differing perspectives, emotional blandness and inability to understand and express own feelings. Low levels, especially the facets Feelings and Ideas, are also empirically related to the construct of Alexythemia (Widiger et al, 2002). This trait is characterized by difficulties in identifying and describing subjective feelings, limited imagination, and an externally orientated cognitive style (Taylor & Bagby, 2013). Alexythemia is also found to be prevalent in SUD (Taylor, Bagby, Kushner, Benoit, & Atkinson, 2014). The maladaptive aspects of O are collectively labeled Experiential Permeability (EP), defined as an individual’s ability to regulate interactions between internal experiences and external reality of activities and relationships (Piedmont, Sherman, Sherman, Dy-Liacco, & Williams, 2009). Low O is thought to imply impermeable boundaries, which involves alienation and over-regulation of internal experiences (rigidity), over-reliance on external demands, reduced spontaneity and detection of one’s true feelings (Piedmont et al., 2012).

A parent with a very low O-score will likely struggle to tolerate and adjust in situations where the child has different needs and perspectives, which is considered an important indicator of PRF (Slade, Bernbach, et al., 2005). The affect regulatory features associated with low O seem to coincide with the emotional and behavioral disengagement observed in mothers with SUD. This raises the hypothesis that O may affect the ability to identify and regulate own mental states in relation to the child. Arguably this supports previous findings indicating that impaired self-mentalizing may be particularly critical for PRF and parental sensitivity among mothers with SUD (Suchman et al., 2010b). Another important indicator of PRF is the parent’s ability to acknowledge the mutual impact of each other’s mental states and behavior, i.e., to understand the relationship as a transactional process (Slade, Bernbach, et al., 2005). A mother with very impermeable boundaries between internal experiences and the child will naturally struggle with this perspective, and potentially undermine her role or contribution in the dyad.

The O-trait is empirically linked to several constructs that relate meaningfully to PRF: High O is found to predict more creative and divergent thinking (Silvia, Nusbaum, Berg, Martin, &
O’Connor, 2009; Walker & Jackson, 2013). Studies of perception indicate that highly open individuals have a more flexible and inclusive cognition, enabling them to literally see more environmental stimuli compared to people with low O (Antinori, Carter, & Smillie, 2017). Neuroscientific research also indicates that high O and enhanced imagination involves increased functional connectivity in the same brain areas (Beaty et al., 2018). O is also positively associated with intuition, the capacity to implicitly detect and combine complex information based on limited or fragmented cues (Sobkow, Traczyk, Kaufman, & Nosal, 2018). Of relevance to our findings, Sobkow and colleagues (2018) found that the facets Fantasy and Ideas positively predicted a preference for using intuition. Thus, O seems to guide processing of internal and external information that may be important for PRF. Parents who detect more cues from their child’s behavior, and combine these more flexibly, will naturally be able to interpret and re-represent underlying needs and intentions more accurately. The ability to do this automatically based on a few cues, probably ensures more adequate timing and rhythm in the parent’s response. This is especially important during emotional and/or distressing experiences when the infant depends on the caregiver’s help with affect regulation. Furthermore, these characteristics of high O may likely function as a buffer against breakdown in controlled, reflective mentalizing during affect-laden moments with the child. Very high O-scores are also found to contain dysfunctional aspects, and might also affect PRF negatively. Highly open individuals are found to become overly absorbed in own ideas, fantasies, and eccentric thinking, tend to have a diffuse identity and unstable goals, and demonstrate non-conformity (Piedmont et al., 2012). A parent with highly permeable boundaries, marked by emotional intensity and unclear distinctions between self and others, may for example struggle to distinguish between the mental states of the child and one’s own, which in turn might lead to intrusiveness and impaired mutuality in the dyad. We did not investigate such a curvilinear association between O and PRF. This may be of great interest for future research.

4.1.2 Associations between the N2-, A6-, and C4-facets, and PRF

The N-facet N2: Hostility measures the tendency to experience anger, frustration and bitterness, and was found to be negatively correlated with PRF. Hostility has been found to predict aggressive, rejective parenting and emotional unavailability (Buehler, Benson, & Gerard, 2006; Sturge-Apple, Davies, & Cummings, 2006; Rhoades et al., 2011). High levels of this facet are also associated with more frequent triggering of substance use, and coping
styles characterized as avoiding, distancing or confrontive, i.e., attempts to aggressively ignore or alter the problem (McCormick & Smith, 1995). These findings coincide with the specific parenting practices found to characterize mothers with SUD (View section 1.5), especially the tendency to exhibit physical and verbal aggression, and disengagement and rejection with respect to parent-child attachment relationships (Rasmussen et al., 2016; Suchman et al., 2016). Interestingly, as described in the introduction, avoidance – or disengagement strategies have also been associated with low PRF among substance abusing mothers (Borelli, West, DeCoste, & Suchman, 2012). The observed relationship between the N2-facet and PRF is especially interesting due to the fact that we also expected comorbid personality pathology to influence our result (See sections 1.3.3 and 4.3.4). Bagby and colleagues (2005) emphasize that the Five Factor Model has the potential to provide a valid framework from which to assess personality psychopathology as conceptualized in the DSM-IV. Their investigation demonstrated that the N2-facet was most strongly correlated to Borderline personality disorder compared to other personality disorders. Borderline is also known to be highly associated with impaired RF (Badoud et al., 2018). We therefore expected undiagnosed personality disorders to affect the observed relationship between the Hostility facet and PRF.

The A-facet A6: Tender-mindedness, was positively correlated with PRF in our study. This was not surprising since we expected the overall A-factor to be important in predicting PRF. The facet is thought to be a crucial component in compassion (Costa & McCrae, 2008). High scores on A6 involve a tendency to be moved by others, whereas those with low scores are often described as callous and rarely overwhelmed or affected by sympathy or concern for others. It is worth noting that several items of the PDI-R2 assess the affective experiences occurring in the parenting role and in interaction with the child (Slade, 2005). Since the A6-facet measures the degree to which one is guided by feelings when making judgements and forming attitudes, we assume that this facet especially underpins the PDI-items. Thus, we suggest that the facet is a prerequisite for adequate PRF, as it seems to predispose the mother to make herself aware of her own and the child’s feelings, and how this affects behavior.

We did not expect the C-factor to be able to predict variance in PRF, despite this we found a positive correlation between the facet C4: Achievement striving and PRF. However, the C-trait is associated with less drug use (Turiano, Whiteman, Hampson, Roberts, & Mroczek, 2012) and better health in general (Hagger-Johnson, & Whiteman, 2007), and higher levels of
C4 may in this way be related to better PRF in this group of women. As mentioned in the section 1.4.2, mothers with SUD may experience more guilt and embarrassment in their parenting role (Stone, 2015). It is also possible that mothers who spend more time worrying about the impact of substance abuse on the child, both have better PRF and ability to stay abstinent in the post-partum period. It is also likely that in facing a difficult or otherwise distressed child, mothers high in C4 tend to use active, problem-focused coping methods, characterized by developing a goal to deal with the problem. These mothers may allocate their resources more efficiently, and be more persistent, until their goal is met and the child is satisfied. In this way we suggest that the C4-facet is an important mechanism underlying PRF. Future research should identify whether C4 is a resilient factor in this group, in terms of absence from substance use, better mental health, and in turn PRF.

4.1.3 The lack of associations between the N-, E-, and A-factors and PRF

We were surprised not to find significant associations between the factors N, E, and A, and PRF, in accordance with our hypotheses. These factors have been found to differentially predict qualities of sensitive caregiving (Baardstu, Karevold, & Von Soest, 2017; Prinzie et al., 2009; Ruiz-Ortiz & Barnes, 2018), in which PRF is assumed to be a crucial mechanism (Slade, Grienenberger, et al., 2005; Smaling et al., 2017). Although many of these findings are not derived from samples with SUD, we nevertheless find that they also apply to typical caregiving characteristics of this group. For instance, high N is consistently related to more negative and intrusive parenting behavior and negative attributions to the child’s mental states (Prinzie et al., 2009), caregiving behavior that also is found in samples with SUD (Suchman & Luthar, 2001). One possible explanation is that most of the involved facets of N, E, and A do not adequately underpin the crucial reflective component of PRF, as measured by the PDI-R2. Quality of PRF depends on the parent’s capacity to both reflect and re-present the child’s mental states accurately (Fonagy et al., 2004; Kelly et al., 2005). Given the inherent characteristics of these three personality domains, it is likely that they are more related to the more global construct of parental sensitivity (View section 1.2.2). For instance, N and E are commonly associated with the degree and quality of positive versus negative features in parent-child interaction, and A with parental warmth, support, and positive attributions (Prinzie et al., 2009). Arguably these qualities do not directly affect the receptiveness and flexibility in relating to mental states, such as the O-dimension. Thus, PRF may not be relevantly and uniquely explained by the facets/factors under consideration.
4.2 Aim 2: Mediation model of personality traits, parenting stress and PRF

We expected parenting stress to play a mediating role in the relationship between personality and PRF. This hypothesis was only confirmed when testing the mediation models of N2: Hostility and A6: Tender-mindedness as predictors of PRF. Their ability in predicting PRF was thought to depend on their role in appraisal and regulation of parenting stress.

In terms of N2: Hostility, this facet measures the tendency to experience anger (Martinsen & Østbø, 2003). Scores on this facet are often elevated among patients with Borderline personality disorder as mentioned above, and we have reason to believe that this diagnosis is present in our sample. We suggest that mothers with higher N2-scores may experience the emotional demands of the baby as more overwhelming, and show propensity to attribute too much into the infant’s cues. They may feel anger and frustration over the infant, and tend to interpret the baby as attacking or hostile. As a result, the mother’s perception of the baby may lead to a lower PRF score. This is in line with available literature on Borderline and parenting difficulties (Newman, 2015). However, the direct effect of N2 upon PRF disappeared when controlling for parenting stress. Our mediation model suggests that parenting stress fully explains the association between the facet and the outcome. In this way, the N2-facet is important in predicting variance in parenting stress. We expect mothers with elevated scores on this facet to become more frustrated and irritable, and thereby reporting the parenting role as more stressful. Subsequently this may lead to less adequate interpretation of her child’s cues, and thereby lower PRF.

The direct effect of the facet A6: Tender-mindedness upon PRF also vanished when controlling for parenting stress. In the parenting literature, high scores on the A6-facet is related to parents who are better able to identify and respond to their child’s needs (Le Vigouroux, Scola, Raes, Mikolajczak, & Roskam, 2017). We suggest that mothers with high A6-scores may be very considerate, which likely improves PRF. Furthermore, the A-trait in general is also positively associated with social support seeking, active coping, planning, and positive reappraisals, when encountering a distressful experience (Afshar et al., 2015). In this way, we expected mothers with lower A6-scores to report more parenting stress and subsequently lower PRF. Our results may confirm this notion, and suggest that the effect of parenting stress clarifies the nature of the relationship between A6 and PRF.
Contrary to our expectations, the relationships between the O-factor, and each corresponding facets, and PRF, were not mediated by the parenting stress variable. This was due to the non-significant regression coefficients between these personality dispositions and parenting stress. This was somewhat surprising, since motivational aspects of the O-trait, like the need for variety, tolerance for ambiguity, and preference for complexity, may be associated with better stress regulation. High O is also associated with individuals who engage in more positive reappraisals of stressful interpersonal relations (Leger, Charles, Turiano, & Almeida, 2016). Hence, the O-trait should be able to predict variance in parenting stress (Williams, Rau, Cribbet, & Gunn, 2009). One explanation for the lack of mediation effect in the relationship between the O-factor/facets and PRF, may be due to the role of executive functions (EF). Several studies have emphasized the importance of EF, and cognitive flexibility in particular, in predicting the O-trait (Savine, McDaniel, Shelton, & Sculling, 2012; Murdock, Oddi, & Bridgett, 2013). Research conducted by Håkansson and colleagues (2017), on the same sample of mothers included in our study, found significantly lower EF capacities in SUD mothers with negative to low PRF compared to mothers with adequate PRF. Moreover, impaired EF may also weaken the capacity for emotion regulation in these individuals (Sinha, 2008), and subsequently reduce the mothers stress tolerance. In sum, EF may operate as a confounder in the suggested mediation model, thereby suppressing the effect of the O-trait in predicting parenting stress.

The non-significant mediation effect of parenting stress in the relationship between the facet C4: Achievement striving and PRF, is also somewhat surprising. It is possible that women with higher C4-scores share other common characteristics with impact on stress regulation: The C-factor in general is thought to operate as a protector of substance dependency (Raketic et al., 2017). Therefore, SUD-mothers characterized as having higher C4-scores may be more successful in staying abstinent from drugs. Regarding the definition of the C4-facet, it is also possible that women with higher C4-scores are more able to commit to their work or to their treatment, thereby engage in more social settings and report more well-being. Finally, women with higher C4-scores may also have better EF, which also have implications for stress appraisals (Fleming, Heintzelman, & Bartholow, 2015). Although these conditions may predict less stress in the parenting role, the hypotheses should be tested in future research.
4.3 Statistical pitfalls

In this section we discuss some of the statistical decisions made, and review some of the statistical limitations and implications regarding the assessment tools used in our study.

4.3.1 The limitations of a parametric approach to our analyses

In deciding which statistical techniques to conduct, we had to determine whether a parametric or a non-parametric statistical approach was most appropriate. Most of our data clearly did not meet the assumptions underlying most parametric techniques. This was particularly an issue regarding questions of normality distributions. Our statistical decisions may therefore comprise some limits that most likely affected the observed associations. However, we decided that the power of parametric statistics outweighed the violations of normality assumptions for our purpose, yet the significances of all the conducted regression analyses were verified by the non-parametric Bootstrap method using 95% confidence intervals.

Aim one - The associations between the NEO PI-R and PDI-R2

Nunnally and Bernstein (1994) noted that the size of a correlation coefficient depends on how different the shapes of the distributions are. The more different shapes, the lower $r$ and standardized regression coefficients produced. The distribution of total PRF, as measured with the PDI-R2, is approximately normally distributed. However, the five personality factors, as measured by the NEO PI-R, are not normally distributed. Although, the Kolmogorov-Smirnov and Shapiro-Wilk tests of normality indicated no violation of the assumptions of normality, inspections of the normal probability plots and histograms indicated skewness to a certain extent. This was expected considering our sample of interest. Hence, the non-significant associations between the N, E, and A-factors, and the PRF score, may reflect limitations in our data rather than real lack of associations. It would therefore be of great interest to investigate the relationship between the personality traits and the PRF score in a sample with more normally distributed NEO-profiles and higher levels of mean PRF. Consequently, this could possibly reveal unique insight into which personality traits contribute to PRF-deficits.

Aim two - The mediation analysis

The same arguments for aim one can be made for aim two: our sample had a clustering of parenting stress scores at the high end of the distribution. This distribution differs
significantly in shape compared to the PRF variable. This condition may be responsible for creating artificially low standardized regression coefficients.

Testing the possible mediating effect of parenting stress between the personality predictors and the PRF outcome, was conducted using three different statistical approaches: first, several regression analyses were ran using the Baron and Kenny procedure. If this four-step approach supported a full or partial mediation effect of parenting stress, the indirect effect and its significance was calculated using the Sobel’s test. This test is more accurate than the Baron and Kenny steps, although it does have low statistical power, and large sample sizes are required in order to detect significant effects. This is because the Sobel’s test relies on the assumption of normal distributed samples. A small sample size, and skewness in the distribution of the facets and parenting stress scores, may therefore underestimate the mediation effect. The Bootstrapping method does have some advantages over the Sobel’s test, primarily an increase in power. This is a non-parametric approach, which is recommended for small sample sizes and data that does not meet the assumptions of normality. According to literature, an indirect effect is considered significant if the confidence interval does not exceed zero. We relied on this latter approach when concluding that there existed a significantly full mediation effect of parenting stress in the relationship between the facet A6: Tender-mindedness and PRF. On the other hand, the indirect effect of parenting stress between the facet N2: Hostility and PRF did not reach a level of significance, neither when using the Sobel nor the Bootstrapping approach. Despite this, we assumed there was a clear tendency towards mediation, taking our small sample size into account. We still recommend further replications of this work using a larger sample of mothers.

4.3.2 The limitations of the PDI-R2

That we failed to find a significant association between PRF and certain personality factors may also be attributable to the sensitivity of PDI as a measure. In terms of RF-stability, some argue that this capacity naturally fluctuates under the impact of psychosocial risk factors, such as emotional arousal (stress), mental health disorders and substance use related symptoms (Theran, Levendosky, Bogat, Huth-Bocks, 2005; Leigh, 2011). Little research has been done on how these factors contribute to reliability in PRF assessment, and the high prevalence of the above-mentioned risk factors in our sample, may have affected PRF when measured during the interview. Researchers also call for further research on the psychometric properties
of the PDI, such as the impact of IQ, language competence, education and the child’s age. In terms of the latter, coding and scoring of PRF measures is thought to be affected by the developmental stage of the infants, with inherent challenges regarding the understanding of the infant that is constantly developing and changing (Slade, 2005). Researchers have also questioned that PDI is highly dependent on language, arguing that it reduces the sensitivity of the measure when used in samples of poorly educated parents (Sadler et al, 2016). Inversely, Fonagy, Sleed and Baradon (2016) argue that the scoring of PDI is affected by the mental state talk, produced by the mothers’ narratives, leading to higher scores than what is actually the case. Thus, it is possible that some of the mothers in our sample used more mental state talk during the interview, though they were not really able to mentalize. More generally, it is being questioned whether PRF can be detected solely through verbal measures (Shai & Belsky, 2011a). The research group of Håkansson and colleagues (2017) will study the current sample further, investigating differences in mentalizing using the non-verbal measurement Parental Embodied Mentalizing (PEM; Shai & Belsky, 2011b).

4.3.3 The limitations of the NEO PI-R

Criticisms of the Five Factor Model have focused on the structural aspects of the model and its content. There has been widespread use of exploratory factor analysis in this tradition, and replications of the model are generally achieved through this approach only (Vassend & Skrondal, 2011). Questions regarding the psychometric properties of the NEO PI-R as a measure of the FFM have been tested in different samples using confirmatory factor analyses, and structural inconsistencies have been demonstrated (Vassend & Skrondal, 2011). Although models with more than five factors are known to provide a better fit with the data, problems may arise due to the presence of poorly defined factors and difficulties in replication across samples (Aluja, García, García, & Seisdedos, 2005; Herrmann & Pfister, 2013). De Raad and colleges (2010) claimed that the Openness domain was the least stable of all the FFM domains. Since the reliability of the NEO-scale can vary depending on the sample, it is normally recommended to calculate the internal consistency estimates for all domains and facets using the particular sample. This was not possible to accomplish in our study because the negatively-worded items were not reversed before being entered as t-scores in our data.

The validity of responses derived by the NEO-inventory, may have been diminished in several ways. First, since the scale consists of items with several response alternatives, individual response patterns may diminish the validity of the assessment. Secondly, some
participants may try to fabricate the results by responding in a socially desirable manner. Thirdly, some people accidentally or consciously leave items unanswered, for instance due to poor insight regarding own personality. Others may respond randomly due to a lack of motivation. Carter and colleagues (2001) conducted a study on chronic drug users, and found that about a quarter of the NEO-responses were invalid due to poor motivation among the participants. A third revision of the NEO-inventories has taken some of these challenges into consideration. The NEO PI-3 was published in 2010 and the Norwegian version was finished in 2017 (Martinsen, 2017). Analyses showing that 37 items in the American version of the NEO PI-R were problematic for adolescent respondents and individuals with language deficits, created the need for a third revision. These items were thus selected for replacement, adjusted or simplified (McCrae, Costa & Martin, 2005). However, administration of the Norwegian version of the NEO PI-3 confirms equivalence in comparison to the NEO PI-R, thus the huge amount of research based on the NEO PI-R is still valid (Martinsen, 2017).

### 4.3.4 General strengths and limitations

This study is the first to conduct an in-depth inspection of personality structure in predicting the capacity for PRF, using a high-risk group that is commonly reluctant to commit themselves to research. Based on our theoretical focus, we have tested one model regarding these associations. However, no single model can fully predict reality. Our model is one out of many possible approaches, and other models may be plausible. It is also difficult to distinguish different models in a cross-sectional study, i.e., data is sampled at one point in time, and longitudinal research might be valuable in the future.

Despite robust findings, no missing data, and well validated and acknowledged measurement tools, including semi-structured interviews; our results should be considered preliminary. This study presents several limitations that may have implications for the generalizability of our findings: First, our relatively small sample size restrained the study, and the subjects were heterogeneous in regard to psychopathological syndromes and substance use. Also, selection bias may have occurred in the inclusion phase. For instance, mothers with SUD who are not seeking treatment may often exhibit more risk factors and less motivation towards improving the relationship with their children (Zilberman & Blum, 2005). However, the reader should keep in mind that we are studying reflective functioning, personality and stress in mothers with SUD specifically, and not in the population of mothers in general. In any case, further research should include a larger number of respondents.
Another notable limitation of this study, was the lack of screening for personality disorders. We are aware that there is a high prevalence of such diagnoses in populations of substance abusing individuals (Casadio et al., 2014). Borderline and Antisocial personality disorders are particularly associated with comorbid addiction (Kienast et al., 2014; Goodwin & Hamilton, 2003), hence we expected personality disorders to influence the average personality profile and the PRF scores of our sample. This because most mental disorders, including personality pathology in particular, often involve difficulties with mentalizing (Bateman & Fonagy, 2010). Interestingly, whereas N and E are strongly linked to personality disorders (Widiger et al., 2002), O shows no significant relations to any of them on a meta-analytical level (Samuel & Widiger, 2008). This may support the notion that O is a robust predictor of PRF, possibly less affected by psychopathology. On the other hand, including personality disorders or other psychopathology as potential confounding variables in regression analyses, may lead to overcorrected, anomalous and counterintuitive findings concerning the relationship between personality structure and PRF.

4.4 Clinical implications

The Five Factor dimensions measured by the NEO PI-R might prove useful in clinical practice (Widiger & Presnall, 2013). This personality assessment provide a thorough and respectful understanding of the patients’ strengths and vulnerabilities. The Five Factor Model of personality recognizes that despite the presence of some maladaptive personality traits, other aspects of the self can be highly adaptive, depending on the situation (Widiger et al., 2002). In this way, a comprehensive understanding of personality may help establishing rapport and developing insight in mothers with SUD. The assessment may also help formulating diagnoses, and anticipating the course of therapy. Furthermore, so called personalized therapy is increasingly popular, and selecting the optimal form of treatment for each patient could be accomplished using the NEO PI-R as a treatment guideline. For instance, high O may indicate an interest in exploratory psychotherapy, high A may predict engagement in group therapy, and high C could indicate a willingness to accomplish, and an ability to appreciate the demands and stringency of dialectical behavior therapy (Widiger & Mullings-Sweatt, 2009).

It is recognized that several behavior-oriented programs have failed to help mothers with SUD (Suchman, Pajulo, DeCoste, & Mayes, 2006). However, mentalization-based clinical
Interventions have proven effective in improving PRF and caregiving sensitivity in this group (Camoirano, 2017). A focus on PRF and attachment is therefore considered important in the development of better treatment for this high-risk population and their children (Pajulo et al., 2008). Nevertheless, the mechanisms of change are still not fully understood, and our findings seem to pinpoint a possible role and potential of personality in helping parents with SUD. It is well known that personality can change due to the therapeutic experience (Roberts et al., 2017). Interestingly, Fonagy and Allison (2014) demonstrated that treatments designed to increase RF also promoted personality changes. They argued that mentalization-based approaches to therapy may help patients with personality pathology to reduce rigidity, adjust behavior and actions, and improve their understanding of social relationships. This may explain why O has also been found to increase as a result of cognitive training (Jackson, Hill, Payne, Roberts, & Stine-Morrow, 2012).

As already mentioned, research has not been able to establish significant associations between O and psychopathology. Researchers argue that exploring the dysfunctional aspects of O might help to organize, broaden and enhance our understanding of various disparate clinical features that still lack a coherent nosology. The demonstrated relationship between O and PRF in our study might illuminate some of the nonadaptive aspects of this domain, as a clinical feature in SUD specifically. Our research suggests that the O-trait is an especially important factor underlying individual variations of PRF in mothers with SUD. Addressing differential maladaptive aspects of O will likely have important treatment implications. Individuals who are very low in O, marked by rigidity and inflexibility in thinking, low tolerance for other perspectives, and emotional avoidance and Alexithymia (Piedmont et al., 2012; Taylor & Bagby, 2013), might need a more comprehensive and lengthy mentalization-based treatment to improve access to mental states. Low O is also associated with more superficial learning approaches, i.e. a tendency to reproduce what is taught to meet the minimum requirement (Chamorro-Premuzic & Furnham, 2009). This may indicate a need for more specific and situational training in interpreting mental states. As described, very high O is also associated with adaptive problems, such as absorption in own ideas, intense expressions, and intrusiveness. Highly open parents will likely need more help distinguishing the child’s mental states from their own, and might need help to maintain mutuality and with regulating the intensity of their responses to the child’s behavior.
Finally, although the O-factor and the C-facet Achievement striving were mainly unrelated to parenting stress, the N-facet Hostility and the A-facet Tender-mindedness were both related to PRF through their associations with parenting stress. We therefore suggest that in therapy with mothers scoring high on Hostility and/or low on Achievement striving, the therapist should explicitly address the possibility that these women have major trouble with managing stress in the parent role. Regarding mothers high in Hostility, interventions should focus on whether they are especially prone to negative attributions regarding their infants. On the other hand, when encountering low scorers on the Tender-mindedness facet, therapist should thematize whether the mothers have difficulties seeking social support, or struggle to use positive reappraisals when coping with stressful parenting situations.

4.5 Conclusion

Our primary aim was to investigate the associations between parental reflective functioning (PRF), personality, and parenting stress in mothers with substance use disorders (SUD). The Openness factor was the only broad personality trait significantly associated with PRF, with higher levels of Openness predicting better PRF. This was due to the fact that three corresponding facets, namely Fantasy, Feelings, and Ideas, all correlated significantly and positively with PRF. Also, higher levels of the Agreeableness facet Tender-mindedness and the Conscientiousness facet Achievement-striving were significantly and positively correlated with PRF. The Neuroticism facet Hostility was significantly and negatively associated with PRF. Through several mediation analyses, we sought to illustrate whether these traits affected PRF through their role in appraisal and regulation of parenting stress. In that regard, only the relationships between Hostility and PRF, and between Tender-mindedness and PRF, were mediated by parenting stress. Parenting stress fully mediated these relationships. However, due to certain statistical limitations, we cannot draw any conclusions from these findings. This study was mainly exploratory, and our results call for further research on the suggested relationships between PRF, personality and parenting stress. Still, our results appear promising in terms of gaining a better understanding of the individual differences underlying PRF, with important treatment implications for mothers with SUD and their children. Furthermore, our study emphasizes a new perspective on the clinical utility of personality assessment.
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