

Heavy Episodic Drinking and Self-Harm in Adolescents.

A Longitudinal Investigation of Gender Differences.

Sunniva Johnsen Skaar



Submitted as a Master Thesis at The Department of Psychology

The University of Oslo

Spring 2022

Acknowledgements

I would like to thank my main supervisor Ingunn Olea Lund and my co-supervisor Jasmina Burdzovic for invaluable feedback and guidance. Without them, this research would not have been possible.

The data used in this thesis were collected as part of the Young Lifestyle Monitoring Study [The MyLife Study]. Therefore, I would like to thank those who have worked on the design, distribution, and data collection for this dataset. In addition, I want to thank the participants for taking the time to participate.

I am also grateful to my fiancé, as he has provided me with enough coffee to finish this thesis.

English Summary

Author: Sunniva Johnsen Skaar

Title: Heavy Episodic Drinking and Self-harm in Adolescents. A Longitudinal Investigation of Gender Differences

Main supervisor: Ingunn Olea Lund

Co-supervisor: Jasmina Burdzovic

Background: This thesis investigated longitudinal gender differences between heavy episodic drinking and self-harm thoughts in study one, and self-harm behavior in study two. There do exist some research on the longitudinal relationship between adolescent heavy episodic drinking and deliberate self-harm, but it is more than 20 years old. To the best of my knowledge, there has been no previous longitudinal investigation of gender differences in self-harm thoughts and heavy episodic drinking, and neither has there been such an investigation for self-harm behavior and heavy episodic drinking. The research from this thesis is important, as it investigates the association between heavy episodic drinking and self-harm in ways it has not been previously.

I assumed that heavy episodic drinking and self-harm would be associated, both within the same time measures and longitudinally. In addition, to assuming that self-harm would precede heavy episodic drinking in girls, and that heavy episodic drinking would precede self-harm in boys.

Method: Data used in this thesis were collected for the MyLife study and the MyLife pilot study. Both of them are longitudinal datasets, and the data from the MyLife study was collected with a 12-month gap, while the data from the MyLife pilot were collected with a six-month gap. The participants who participated in the MyLife study or MyLife pilot study were Norwegian students in eighth, ninth and 10th grade at the first time measure. In time measure two and three, they had naturally progressed to a higher grade. With the exception that those who participated in the MyLife pilot study were still in the same grade in time measure two as they were in time measure one. In order to investigate heavy episodic drinking and self-harm thoughts in study one and heavy episodic drinking and self-harm behavior in study two, a cross-lagged panel analysis was conducted in STATA 16, for each study. Study one, which investigated heavy episodic drinking and self-harm thoughts, was based on data from the MyLife study, and had 2,975 participants, 56% girls, and 44% boys.

Study two, which investigated heavy episodic drinking and self-harm behavior, was based on data from the MyLife pilot study, and had 447 participants, with 55% girls and 45% boys.

Results: This thesis offers support for heavy episodic drinking being partially associated with both self-harm thoughts and self-harm behavior, longitudinally and within the same time measure. However, the assumptions related to gender were not true, as both girls and boys reported heavy episodic drinking before self-harm thoughts and behavior.

Norwegian Summary

Forfatter: Sunniva Johnsen Skaar

Tittel: Tung Episodisk Driking og Selvskading blant Ungdom: En Longitudinell Undersøkelse av Kjønnforskjeller

Hovedveileder: Ingunn Olea Lund

Biveileder: Jasmina Burdzovic

Bakgrunn: Denne oppgaven undersøkte longitudinelle kjønnforskjeller mellom tung episodisk drikking og selvskadingstanker i studie en, og selvskadingsatferd i studie to. Det eksisterer forskning på det longitudinelle forholdet mellom tung episodisk drikking og bevisst selvskading hos ungdom, men denne forskningen er mer enn 20 år gammel. Så vidt jeg vet, finnes det ingen tidligere longitudinell undersøkelse av kjønnforskjeller i selvskadingstanker og tung episodisk drikking, og heller ikke for selvskadingsatferd og tung episodisk drikking. Forskningen fra denne oppgaven er viktig, da den undersøker sammenhengen mellom tung episodisk drikking og selvskading på nye måter. Jeg antok at tung episodisk drikking og selvskading ville være assosiert, både innenfor samme tidsmål og longitudinelt. I tillegg, antok jeg at selvskading skjer før tung episodisk drikking hos jenter og tung episodisk drikking skjer før selvskading hos gutter.

Metode: Data som er brukt i denne oppgaven ble samlet inn til Mitt Liv studien og Mitt Liv pilot studien. Begge disse er longitudinelle datasett og data fra MyLife-studien ble samlet inn med ett 12 måneders mellomrom, mens data fra Mitt Liv pilot studien ble samlet inn med seks måneders mellomrom. Deltakeren fra Mitt Liv studien og Mitt Liv pilot studien, var norske elever som gikk i åttende, niende eller tiende klasse under det første tidsmålet. Ved tidsmål to og tre hadde elevene begynt i klassen over, med det unntaket at de som deltok i Mitt Liv pilot studien fortsatt gikk i samme klasse ved tidsmål to som de gjorde i tidsmål en. For å undersøke tung episodisk drikking og selvskadingstanker i studie en, og tung episodisk drikking og selvskadingsatferd i studie to, ble det utført en cross-lagged panel analyse i STATA 16, for hver studie. Studie en, som undersøkte tung episodisk drikking og selvskadingstanker, var basert på data fra MyLife-studien, hadde 2.975 antall deltakere, 56 % jenter og 44 % gutter. Studie to, som undersøkte kraftig episodisk drikking og selvskadingsadferd, var basert på data fra MyLife-pilotstudien, hadde 447 deltakere, med 55 % jenter og 45 % gutter.

Resultater: Denne oppgaven gir støtte for at tung episodisk drikking er delvis assosiert med selvskadingstanker og med selvskadingsatferd, både longitudinelt og innen samme tid. Antagelsene mine knyttet til kjønnsforskjeller var imidlertid ikke sanne, da både jenter og gutter rapporterte tung episodisk drikking før selvskadingstanker og selvskadingsatferd.

Contents

| | |
|--|----|
| Acknowledgements | 2 |
| English Summary | 3 |
| Norwegian Summary..... | 5 |
| Heavy Episodic Drinking and Self-Harm in Adolescents..... | 10 |
| Defining Hazardous Drinking and Self-Harm..... | 12 |
| Adolescent Self-Harm | 14 |
| The Boundary between Self-Harm and Suicide..... | 14 |
| The Frequency of Self-Harm among Norwegian Adolescents | 15 |
| The Consequences and Hazards of Self-Harm in Adolescents..... | 15 |
| Heavy Episodic Drinking during Adolescence | 15 |
| The Consequences and Hazards of Heavy Episodic Drinking during Adolescence..... | 16 |
| Adolescence: A Common Time to Start Consuming Alcohol..... | 16 |
| Alcohol Consumption during Adolescence: Influencing Factors..... | 17 |
| The Unique Contributions of The Current Thesis | 17 |
| Research Questions for Study One: Heavy Episodic Drinking and Self-Harm Thoughts | 18 |
| Research Questions for Study Two: Heavy Episodic Drinking and Self-Harm Behavior | 18 |
| Methods..... | 19 |
| About the MyLife Project..... | 19 |
| Procedure and Participants | 19 |
| Participants in Study One: Heavy Episodic Drinking and Self-Harm Thoughts..... | 20 |
| Participants in Study Two: Heavy Episodic Drinking and Self-Harm Behavior..... | 20 |
| Measures..... | 21 |
| Heavy Episodic Drinking..... | 21 |
| Self-Harm Thoughts..... | 21 |
| Self-Harm Behavior | 21 |
| Gender..... | 22 |

- Covariates 22
- Ethics and Approvals..... 23
- Data Analysis..... 23
- Results 25
 - Study One: Analyzing HED and Self-Harm Thoughts with a Cross-Lagged Panel Design 29
 - Girls in Study One: Heavy Episodic Drinking and Self-Harm Thoughts..... 30
 - Boys in Study One: Heavy Episodic Drinking and Self-Harm Thoughts 33
 - Evaluating Research Questions in Study One: HED and Self-Harm Thoughts 35
 - Study Two: Analyzing HED and Self-Harm Behavior with a Cross-Lagged Panel Design 35
 - Girls in Study Two: Heavy Episodic Drinking and Self-Harm Behavior 36
 - Boys in Study Two: Heavy Episodic Drinking and Self-Harm Behavior 37
 - Evaluating Research Questions in Study Two: HED and Self-Harm Thoughts..... 38
- Discussion..... 39
 - Main Findings..... 39
 - Thesis Findings in Context of Existing Literature..... 40
 - Implications 41
 - Strengths and Limitations 42
 - Ethics 43
 - Future Research 43
- Conclusion..... 44
- References 45
- Appendix A 53
- Appendix B 54
- Appendix C 55
- Appendix D 55
- Appendix E..... 56
- Appendix F..... 57

Appendix G 58

Appendix H 59

Appendix I 60

Appendix J 60

Appendix K 61

Appendix L 62

Heavy Episodic Drinking and Self-Harm in Adolescents

Making a good decision is hard, even if you are not an adolescent considering to self-harm or to drink hazardously. As adolescents are not fully developed, they are more unsecure in situations involving decision making and often make riskier decisions than adults (Defoe et al., 2015; Halpern-Felsher & Cauffman, 2001). Their decision-making is also strongly influence by peers, which might lead them to either making more reckless decisions than they would on their own (Ciranka & van den Bos, 2019). An adolescent might also struggle with their emotion regulation, which during normal development starts developing in early childhood (Dunn & Brown, 1991; Gullone et al., 2010). However, it is still possible for some adolescents and even adults to find it difficult to regulate negative emotions. Compared to other emotions, negative emotions can be more difficult to handle well (Garber et al., 1991). Therefore, some might attempt to distract themselves from negative emotions by considering self-harming, actually self-harming, or consuming hazardous amounts of alcohol. The reasoning why an adolescent may drink hazardously, consider self-harm or actually self-harming, may also be completely different, but how this develops should be investigated, no matter the reasoning for why it happens.

Throughout their development, adolescents will experience many surrounding influences (Bronfenbrenner, 1996). The Ecological System Theory of Bronfenbrenner (1996) explains how the development of a person can be influenced by its surroundings by conceptualizing developmental influences in different systems surrounding the person (Bronfenbrenner, 1996). Although the specifics of this conceptualization are unnecessary for this thesis, it is important to keep the essence of his theory in mind when investigating the association between heavy episodic drinking and self-harm. Therefore, this introduction will attempt to explain some of the surrounding influences that an adolescent may experience, which can lead to self-harm and hazardous drinking, before explaining the unique contributions of the current thesis.

Self-harm and hazardous drinking should be investigated as both can lead to numerous negative outcomes for adolescents. Consuming alcohol and other substances, might negatively impact the adolescents development, compared to peers not consuming it (Hall et al., 2016). Substance use among adolescents is associated with reduced neurogenesis and less gray and white matter in the brain, which can negatively impact their emotional and intellectual development (Feldstein Ewing et al., 2014; Skala & Walter, 2013). Consuming substances during adolescents also increases the risk of poor school performance,

experiencing violence, and being violent (Jones et al., 2020; Singh et al., 2015; Skala & Walter, 2013). While self-harm is associated with an increased risk of mental distress, depression and suicide (Ohlis et al., 2020; Patalay & Fitzsimons, 2021; Tørmoen et al., 2020), it also puts the adolescent at greater risk for becoming unemployed, divorced or widowed in adulthood (Beckman et al., 2019). Moreover, the previously mentioned risk factors for self-harm and hazardous drinking illustrate the seriousness of the topics.

While research investigating the longitudinal association between hazardous drinking and self-harm exists, it is not updated (Rossow & Norström, 2014). This research found a significant association between self-harm and heavy episodic drinking (Rossow & Norström, 2014). The article was published in 2014, which may suggest to readers that results on the topic are fairly recent (Rossow & Norström, 2014). However, the data used were collected in 1994 and 1999, making it more than 20 years old (Rossow & Norström, 2014). Therefore, research based on data collected from today's adolescents, and not the adolescents of the 90's (Rossow & Norström, 2014) is needed, because adolescent alcohol consume (Pape, Rossow, & Brunborg, 2018) and self-harm (Tørmoen et al., 2020) has changed since then.

Some adolescents drink too much, some harm themselves, and some want to harm themselves, but how is this associated over time? Previous research addressing hazardous drinking and self-harm has illustrated how these behaviors can differ based on gender (Madge et al., 2008; Pitkanen et al., 2005). The gender differences in hazardous drinking (Moure-Rodríguez & Caamano-Isorna, 2020; Pitkanen et al., 2005) and self-harm (Madge et al., 2008; Ohlis et al., 2020) have too large of a discrepancy to justify not studying gender differences. For instance, boys consume more alcohol than girls, in addition to having a lower onset drinking age (Pitkanen et al., 2005). Girls do, however, think about self-harm and do the act of it, more frequently than boys (Madge et al., 2011). In addition to there being a lot more girls who self-harm compared to boys (Griffin et al., 2018) Then again, comorbid self-harm and hazardous drinking may not occur in most adolescents, but it is the general trend in which they develop that should be investigated. As this would allow for a better understanding of the potential association between hazardous drinking and self-harm. However, to understand the relationship between hazardous drinking and self-harm, a new longitudinal investigation into this is needed.

Defining Hazardous Drinking and Self-Harm

Before reviewing the literature on combined self-harm and hazardous drinking, both phenomena's will be explained separately. This, however, leads to the following questions: 1) What is hazardous drinking? And 2) What is self-harm?

First, hazardous drinking is a pattern or level of alcohol consumption that may lead to negative health outcomes (Reid et al., 1999). Hazardous drinking includes, but are not limited to, alcohol use disorder, binge drinking, and heavy episodic drinking (Courtney & Polich, 2009; Nadkarni et al., 2021; Saunders et al., 1993). Binge drinking occurs when a woman consumes four standard drinks and when a man consumes five standard drinks, during three hours (Courtney & Polich, 2009; Pearson et al., 2016). Alcohol use disorder is in laymen terms referred to as alcoholism and occurs when a person has a reduced ability to stop consuming alcohol (Grant et al., 2015; Nadkarni et al., 2021). This thesis will focus on heavy episodic drinking [HED], which happens when a person consumes five or more units of alcohol during a day (Danielsson et al., 2012). The reason for choosing HED over binge drinking and alcohol use disorder was that this was what was available in the dataset from the MyLife Study (Brunborg et al., 2019).

Second, what is self-harm? Self-harm is the conscious and purposeful act of causing injury to one's own body (Nock, 2014). This can happen with or without suicidal intentions, meaning that a person doing or considering self-harming can do so with or without wanting to die (Quarshie et al., 2020). It is also possible to have thoughts of self-harm without engaging in self-harm, as thoughts of self-harm do not refer to the actual act but rather to the thought of wanting to harm oneself (Nock, 2014). Therefore, to distinguish between considering self-harm and the act of self-harm, it will from now on refer to it as self-harm thoughts and self-harm behavior. Therefore, heavy episodic drinking, self-harm thoughts, and self-harm behavior will be explained more carefully in the following paragraphs.

There is some disagreement about how much alcohol can be consumed before it is hazardous (Pearson et al., 2016). However, as previously mentioned, this thesis will use heavy episodic drinking to measure alcohol consumption that may result in negative health outcomes. To understand the definition of heavy episodic drinking, which is to consume five or more drinks during a day (Danielsson et al., 2012), one must explain what a drink is. A common measurement for a standard drink is about 10 grams of pure alcohol (Skala & Walter, 2013). However, it is important to note that the alcohol in a standard drink often

differs from nation to nation, e.g., 8 grams in the United Kingdom, 12 grams in Norway, 14 grams in the United States, and 20 grams in Austria (Kerr & Stockwell, 2012; Mongan & Long, 2015). Therefore, while some studies report the number of standard drinks with the attached numbers of grams used, others simply report if heavy episodic drinking occurred.

Some definitions of self-harm do not include suicidal behavior, such as nonsuicidal self-injury and deliberate self-harm (Nock, 2014; Watanabe et al., 2012), but there exists research that studies self-harm without considering if the motive for self-harm is suicidal or not (Quarshie et al., 2020). This thesis will not focus on the motivation behind the self-harm, as Tørmoen et al. (2012) found that suicide attempts and nonsuicidal self-injury are part of the same dimensional construct, in addition to that some adolescents switch between these constructs. This thesis will therefore look at self-harm with and without suicidal intent, which is important, as self-harm among adolescents is an indicator of that they are struggling, as most adolescents experience negative emotions before self-harming (Laye-Gindhu & Schonert-Reichl, 2005).

This thesis will focus on the association between heavy episodic drinking and self-harm thoughts, in addition to heavy episodic drinking and self-harm behavior. The reason for this is that, while previous research has found an association between deliberate self-harm and heavy episodic drinking (Rossow & Norström, 2014), there is no updated research on this association in Norway. As previously stated, while an article on this topic was published in 2014, it is based on data more than 20 years old (Rossow & Norström, 2014). Data from this study were collected in 1994 and 1999 (Rossow & Norström, 2014), which is not ideal if you want to understand which of self-harm and heavy episodic drinking precedes the other in relation to gender. Additionally, having the time measures closer in time and having more of them might be especially important when researching adolescent behavior, as this is a life period with frequent changes. Moreover, during the last 20 years, the drinking pattern among adolescents has changed, (Pape, Rossow, & Brunborg, 2018), as well as the prevalence of self-harm (Griffin et al., 2018; Tørmoen et al., 2020). More specifically, today's adolescents drink less than previous generations (Hall et al., 2016), and self-harm has become more common (Tørmoen et al., 2020).

Adolescent Self-Harm

During adolescence, it is more common for girls to self-harm than it is for boys (Madge et al., 2011; Madge et al., 2008; Patalay & Fitzsimons, 2021; Rahman et al., 2021). The frequency and associated hazards related to self-harm will be discussed in more detail.

The Boundary between Self-Harm and Suicide

Self-harm occurs when a person chooses to inflict harm to their own body, often to cope with horrible feelings (Rossow & Norström, 2014). Unlike suicide, which can be arguably referred to as the ultimate form of self-harm, self-harm does not have to include the intention of death (Ohlis et al., 2020; Quarshie et al., 2020). Research often distinguishes between self-harm with or without suicidal intent (Nock, 2014; Quarshie et al., 2020), but this thesis will look at both self-harm and suicide attempts as they belong to the same dimensional construct (Tørmoen et al., 2012). Self-harm without suicidal intent is when a person chooses to inflict an injury to their own body, without intending for this injury to result in death (Nock, 2014; Watanabe et al., 2012). Such injuries are often inflicted to distract the individual from psychological pain, by physical pain (Nock, 2014). However, when self-harm has suicidal intent, the person is now attempting to make the self-injury so extreme that they may die because of it (Nock, 2014).

Some people who self-harm or think about self-harm may have thoughts that lead them to consider suicide. Such thoughts are referred to as suicidal ideation; thoughts of or plans to harm oneself to the extent of it resulting in death (Lee et al., 2019). Whereas girls and boys may both experience suicidal ideation, the way in which they attempt suicide often differ (Schrijvers et al., 2011). First, while women attempt suicide more frequently than men, it is more common for women to not die from their attempts (Schrijvers et al., 2011). Second, from they initially experience suicidal ideation, it takes less time for a man to attempt suicide, than it does for a woman (Schrijvers et al., 2011). However, this raises the question of why more men die of their suicide attempts and women more frequently survive them?

Part of the explanation can be found in gender differences in the suicidal process, which explains how suicidal ideation gradually shifts from simply being an ideation, a thought, to attempted suicide (Schrijvers et al., 2011). Moreover, the suicidal process is a lot shorter for men than women (Schrijvers et al., 2011). Does this mean that women are choosing less effective suicide methods? To answer this, the gender paradox of suicide must be explained. This paradox addresses how women report a higher number of suicidal thoughts

and suicide attempts, but men still commit suicide more frequently (Cibis et al., 2011). One might assume that this can be due to women choosing less effective methods when attempting suicide, this however not the case, as even when men and women are attempting suicide with the same method, men still have a higher chance of dying (Cibis et al., 2011). For instance, even when a woman attempts suicide by hanging, a more common suicide method for men, the woman is less likely to die from the attempt compared to a man (Cibis et al., 2011). It is hard to understand this gender difference in suicide attempts versus successful attempts, which makes it important to study gender differences in relation to suicide and self-harm.

The Frequency of Self-Harm among Norwegian Adolescents

The percentage of adolescents who are self-harming in Norway has increased drastically from 4.1 percent in 2002 to 16.2 percent in 2018 (Tørmoen et al., 2020). These numbers are based on research with large sample sizes, with the data collected in 2002 having more than 5000 participants and data from 2018 having approximately 29,000 participants (Tørmoen et al., 2020). While, a typical risk factor for self-harm among adolescents, drinking to intoxication, was reported to decrease, another risk factor, depressive symptoms, has increased by 13.2 percent (Tørmoen et al., 2020). The authors of the study claim that changes in risk factors cannot explain the increase in self-harm alone, since depressive symptoms contribute to an increase in self-harm (Tørmoen et al., 2020).

The Consequences and Hazards of Self-Harm in Adolescents

Adolescent self-harm is associated with numerous negative outcomes (Ohlis et al., 2020; Quarshie et al., 2020). Adolescents who self-harmed had a greater chance of developing an alcohol use disorder or a substance use disorder (Ohlis et al., 2020). They were also more likely to commit suicide, do violent and non-violent crimes, use numerous substances, and be admitted to a psychiatric hospital (Ohlis et al., 2020). What is further worrisome is that there are no protective factors for self-harm (Quarshie et al., 2020), and that gender nonconforming individuals have rather high rates of self-harm (Taliaferro et al., 2018). Additionally, self-harm is associated with depression, academic failure, family conflict and emotional-, physical- and sexual abuse (Quarshie et al., 2020).

Heavy Episodic Drinking during Adolescence

Heavy episodic drinking is most common amongst boys, even though there has been a reduction of HED among both genders in Norway, Finland and Sweden (Danielsson et al., 2012; Raitasalo et al., 2021). The reduction of HED is positive, as there are hazards

associated with adolescent heavy episodic drinking (Bellis et al., 2009; Hall et al., 2016; Skala & Walter, 2013; Spear, 2013). Although there had been a reduction in HED, it is still common to consume alcohol during adolescence (Stockings et al., 2016), which is why consequences and factors that influence alcohol consumption will be discussed.

The Consequences and Hazards of Heavy Episodic Drinking during Adolescence

Consuming alcohol during adolescence can lead to several hazards (Hall et al., 2016; Spear, 2013). Studies on adolescent rats show that alcohol consumption during this life stage makes it more likely to become addicted to alcohol (Spear, 2013). The reason for this, is that alcohol consumption this early in life, might weaken the effects which alcohol has on the body, meaning that the rats would need to drink more to get intoxicated (Spear, 2013). However, as this research was conducted on adolescent rats and not humans (Spear, 2013), one should be careful with generalizing this, but it is not impossible that a similar pattern could have been found among human adolescents. Additionally, as the adolescent brain is not completely developed, any form of substance use during adolescence, may impact their social-, emotional- and cognitive- development (Hall et al., 2016).

Adolescents does not have a fully developed impulse control, which makes it harder for them to avoid situations that can be hazardous (Bellis et al., 2009; Skala & Walter, 2013). Thus, it is not ideal that alcohol consumption contributes to a further decrease in impulse control and risk assessment, as adolescent's already are at risk for hazardous situations (Bellis et al., 2009; Skala & Walter, 2013). One example of such a situation is that intoxication may lead to memory loss or reduced impulse control, which again increase the risk of partaking in sexual acts that one might regret in a sober state (Bellis et al., 2009). Additionally, an intoxicated adolescent is more exposed to violence (Bellis et al., 2009; Moan et al., 2021), and the more drinks an adolescent consume, the more likely they are to get violent (Jones et al., 2020). Thus, adolescents who consume alcohol are at greater risk of having sexual interactions they regret, experiencing violence, and being violent (Bellis et al., 2009; Jones et al., 2020; Moan et al., 2021).

Adolescence: A Common Time to Start Consuming Alcohol

People commonly consume a substance for the first time during adolescence (Stockings et al., 2016). This includes the first encounter with alcohol, as about two thirds of adolescents initiate alcohol consumption during this developmental period (Rossow & Norström, 2014), making this an important time for establishing a low risk consumption

pattern (Stockings et al., 2016). Adolescent substance use is influenced by individual characteristics, the social context and substance availability (Degenhardt et al., 2016). Additionally, adolescents consume less alcohol now, than compared to the early 2000's (Pape, Rossow, & Brunborg, 2018). This decrease in consumption was mainly found in boys, and adolescents under the legal drinking age, but it is important to note that this reduction in alcohol consume was not found among the heaviest users, regardless of gender (Pape, Rossow, & Brunborg, 2018).

Alcohol Consumption during Adolescence: Influencing Factors

Which social relation influence adolescents drinking the most? Is it strict parents, friends, or peers? Although there seems to be a somewhat common assumption that parents must be strict about the alcohol consumption of their children, the amount a Norwegian adolescent drank was not associated with how strict the parents' rules about alcohol were (Adolfson et al., 2017). Moreover, research suggests that having delinquent peers that drink predicts the adolescents' intention to consume alcohol (Trucco et al., 2011). Furthermore, having a friend who consumes alcohol had an impact on the likelihood that an adolescent would consume alcohol (Kelly et al., 2011). As having strict parents did not appear to influence adolescent alcohol consumption (Adolfson et al., 2017), but friends and peers did (MacArthur et al., 2016; Trucco et al., 2011), this thesis will not investigate parents further.

The Unique Contributions of The Current Thesis

To the best of my knowledge, a longitudinal investigation of adolescent gender differences in 1) heavy episodic drinking and self-harm thoughts and 2) heavy episodic drinking and self-harm behavior, has not been done before. Therefore, investigating this would lead to new insights. As both self-harm and heavy episodic drinking are associated with gender (Patalay & Fitzsimons, 2021; Rahman et al., 2021; Raitasalo et al., 2021), it is important to include gender differences. Moreover, it is also important to investigate this in an adolescent population, as many adolescents starts consuming alcohol during this developmental period (Stockings et al., 2016). Additionally, investigating self-harm thoughts, self-harm behavior, and heavy episodic drinking would allow for researching the topics within a new time and context. The findings from this thesis may also support or go against Rossow and Norström's (2014) findings, where they found deliberate self-harm and heavy episodic drinking to be associated, which either way would add to the research, as this thesis is investigating self-harm thoughts and behaviors, and not deliberate self-harm.

Researching adolescent heavy episodic drinking, self-harm thoughts and self-harm behavior is important, as it may help professionals to better help others. The potential associations from this thesis can also be used when developing interventions, or other preventative measures. It would also be useful for parents or other caregivers to know how the potential association between heavy episodic drinking and self-harm develops. Thus, this research is needed to develop a deeper understanding of self-harm thoughts, self-harm behavior, and heavy episodic drinking.

I assume that heavy episodic drinking is the preceding variable in boys, and self-harm thoughts and self-harm behavior are the preceding variables for girls. Mainly based on boys are reporting more hazardous drinking than girls, although this gender difference is decreasing (Dir et al., 2017). Additionally, girls typically self-harm more than boys (Beckman et al., 2019).

Updated research on the concurrent and longitudinal associations between heavy episodic drinking and self-harm and suicide cognitions and behaviors among adolescent boys and girls in Norway is needed. This thesis will contribute with updated research on this association. Leading to the following research questions found below.

Research Questions for Study One: Heavy Episodic Drinking and Self-Harm Thoughts

Research Question One. Is heavy episodic drinking and self-harm thoughts associated: a) within the same time measure? b) longitudinally?

Research Question Two. Are there gender differences in timing of heavy episodic drinking and self-harm thoughts? Specifically: Do heavy episodic drinking precede self-harm thoughts in boys, while self-harm thoughts precede heavy episodic drinking in girls?

Research Questions for Study Two: Heavy Episodic Drinking and Self-Harm Behavior

Research Question One. Is heavy episodic drinking and self-harm behavior associated: a) within the same time measure? b) longitudinally?

Research Question Two. Are there gender differences in timing of heavy episodic drinking and self-harm behavior? Specifically: Do heavy episodic drinking precede self-harm behaviors in boys, while self-harm behaviors precede heavy episodic drinking in girls?

Methods

About the MyLife Project

Participants were recruited through the MyLife Study and the MyLife pilot study, which stands for Monitoring Young LIFEstyles in Norway (Brunborg et al., 2019). This longitudinal research project aims to better understand the use of substances among adolescents (Brunborg et al., 2019). The project collected both quantitative and qualitative data, but this thesis will only use the quantitative parts (Brunborg et al., 2019). The data was collected by The Norwegian Institute for Alcohol and Drug Research [SIRUS], and the Norwegian Institute of Public Health (Brunborg et al., 2019). The MyLife Study was founded by the Norwegian Ministry of Health and Care Services (Brunborg et al., 2019). The data from the MyLife pilot study, include two time measures, collected in 2014 and 2015, with six months between, while the MyLife study's main data collection was collected one year apart from 2017 to 2021 (Brunborg et al., 2019).

Procedure and Participants

Data from both the MyLife pilot and the MyLife main study were used to investigate the association between heavy episodic drinking and self-harm. The association between heavy episodic drinking and self-harm behavior was investigated with data from the MyLife pilot study. Self-harm thoughts and HED were investigated with data from the main data collection. The reasoning for using different datasets for each study is because the main data collection did not have access to self-harm behavior. However, since the main data collection included more participants and time measures, it was preferable to use this dataset when possible. Therefore, study one investigated HED and self-harm thoughts from the main data collection, while study two, investigated self-harm behavior with data from the pilot.

Study one and two were similar, with only minor differences except for investigating heavy episodic drinking's association with different types of self-harm. One of these differences was that the data from study one were collected 12 months apart, while the data for study two were collected six months apart (Brunborg et al., 2019). Additionally, there is a difference in the number of time measures used for each study and the number of age groups participating (Brunborg et al., 2019). The MyLife study's main data collection included eighth, ninth, and 10th grade participants, but the pilot study also had data from 11th and 12th graders (Brunborg et al., 2019). However, to make the studies more similar, the 11th and 12th graders were excluded from study two. As the pilot data only had two time measures available (Brunborg et al., 2019), both were used in study two. The data from the main collection had

five different time measures available for use, but I chose to use only three (Brunborg et al., 2019). The reasoning for choosing only three time measures when five were available was that the two last time measures were collected during the Covid-19 pandemic. As there was no pandemic during the collection of the pilot data and a pandemic is not a natural developmental event, the time measures collected during Covid-19 were excluded.

The participants in both the MyLife pilot study and the MyLife study were representative of the Norwegian adolescent population (Brunborg et al., 2019). As when the data was collected for the MyLife study, considerations such as collecting data from both rural and urban municipalities were taken (Brunborg et al., 2019). The standard of living was also considered, as the districts from which data was collected had both a high and a low standard of living, similar to what would represent the variation of this within the country (Brunborg et al., 2019).

Participants in Study One: Heavy Episodic Drinking and Self-Harm Thoughts

The MyLife study obtained data from 3,512 participants (Brunborg et al., 2019), with 3,398 participants participating in the investigation of heavy episodic drinking and thoughts of self-harm. Most of the participants were girls (see Table 3). In the first time measure, all participants were students at a middle school and in grades eight to ten (Brunborg et al., 2019). This changed as some of the students naturally progressed to high school (Brunborg et al., 2019). Study one is based on data collected in 2017, 2018, and 2019. In Norway, the normative age to attend middle school is 13 to 16 years, and 16 to 19 years for high school. In time measure one, collected in 2017, adolescents were asked if they had consumed alcohol before and if they said yes, they were asked about heavy episodic drinking. During the second and third time measure, data collected in 2018 and 2019, adolescents were only asked about their potential heavy episodic drinking if they answered yes to having consumed alcohol during the past 12 months. Although all participants were not asked about heavy episodic drinking, participants who had never or not consumed alcohol during the past 12 months were still included in the analysis, but were labeled as not partaking in heavy episodic drinking.

Participants in Study Two: Heavy Episodic Drinking and Self-Harm Behavior

The MyLife pilot study had 851 participants (Brunborg et al., 2019), with 447 participants being included for analyzing the association between heavy episodic drinking and self-harm behavior. Data were collected in 2014 and 2015, six months apart (Brunborg et al.,

2019). The same data collection procedure was used in study two as in study one. Similarly, to study one, there were more girls than boys in study two (see Table 4).

Measures

This thesis investigated possible gender differences in longitudinal associations between heavy episodic drinking and self-harm cognitions and behaviors. In study one, longitudinal associations between heavy episodic drinking and thoughts of self-harm were investigated. In study two, longitudinal associations between heavy episodic drinking and self-harm behavior were investigated.

Heavy Episodic Drinking

For both studies, heavy episodic drinking was measured by asking the question 'Think about the last 12 months, how often have you consumed five or more units of alcohol?' (see Appendices A and G). The options were “never”, “less than monthly”, “monthly”, “weekly” and “daily, or almost daily”. The number of days that HED occurred was then calculated and is illustrated in appendix A and G. This is a modification of a standardized epidemiological question, originating from the third item in the Alcohol Use Disorders Identification Test [AUDIT-C] (Bush et al., 1998).

Self-Harm Thoughts

For the first study, participants were asked how often they, during the last two weeks, had “Thoughts that you would be better off dead or of hurting yourself in some way” (Kroenke et al., 2001). This question is part of the nine-item patient health questionnaire, which is a scale used to measure depression during the last two weeks (Kroenke et al., 2001). The question was answered by choosing either not at all, several days, more than half the days, or nearly everyday (Kroenke et al., 2001). Then each option was given a value between 0 and 3, in the same order as mentioned in the previous sentence. For study one, the last item in this scale, item 9, will be used to measure self-harm thoughts (see Appendix B).

Self-Harm Behavior

For the second study, self-harm behavior was computed by combining the frequency of suicide attempts and self-harm without suicidal intent (see Appendix H). They were coded from 0 to 7, with 0 referring to no events and 7 referring to seven or more self-harm events. This was done to better the possibility of comparison between studies one and two.

Gender

To test for gender differences between self-harm and heavy episodic drinking, it was necessary to divide them into boys and girls. Girls were coded as zero, and boys were coded as one. In the MyLife pilot study, an attempt was made to allow participants to express their gender identity and not their biological sex. However, too few participants chose to do so. This made the participants who chose this category identifiable, which made it necessary to remove it. Participants who participated in the main data collection were not given the option of choosing their gender, as this was based on class lists and the national population registry.

Covariates

Age, depressive symptoms, and having a trusted friend were included as covariates (see Figure 2), as they are often associated with self-harm and heavy episodic drinking (Bronfenbrenner, 1996; Danzo et al., 2017; Stockings et al., 2016). Additionally, I intended to also control for immigrant background, religion, and socioeconomic status, but this was not possible as the variables were identifiable, and therefore got removed for the data I had access to.

Age. In this thesis, I used social age instead of biological age. Social age was based on what grade adolescents were in, as this seemed more meaningful than their biological age in the context of this thesis. People at a given grade level are probably more strongly influenced by their peers at their grade level than those with the same biological age, with whom they might have little to no relationship with.

Depression. Depression was measured using the Personal Health Questionnaire Depression Scale (Kroenke et al., 2008), also referred to as the PHQ-8 (see Appendices C and I). Response options were “not at all” coded as zero, “several days” coded as one, “more than half the days” coded as two, and “nearly every day” coded as three (Kroenke et al., 2008). This measure is validated for larger populations (Kroenke et al., 2008). This results in a minimum depression score of zero and a maximum score of 24 (Kroenke et al., 2008). These scores can be divided into different types of depression (Kroenke et al., 2008), but for the purpose of this thesis, depression was measured as a continuous variable.

Trusted Friends. Participants were asked how many friends they had that they could trust (see Appendices D and J): “Do you have one or more friends that you trust and can talk about important things with?” The response options were “no one or not sure”, labeled zero, “one” labeled one, “two” labeled two and “three or more”, labeled three for analyses. When

children transition to adolescence, their social circle expands (Bronfenbrenner, 1996). It is no longer their parents, but their friends, that are their primary source of social interactions (Bronfenbrenner, 1996). Therefore, the adolescent can be influenced by their trusted friend or friends.

Ethics and Approvals

The researchers who worked on the MyLife study followed ethical considerations and obtained the necessary ethical approval. This approval was from the Norwegian Data Protection Authority (Brunborg et al., 2019). The ethical considerations included obtaining informed consent from both the adolescent and a legal guardian (Brunborg et al., 2019). The teacher then read aloud the information needed for adolescents to give their informed consent (Brunborg et al., 2019). Adolescents were also informed that they could have their data deleted after participating (Brunborg et al., 2019). Adolescents who did not want to participate were given the option of doing homework when their classmates participated in the study during a school lesson (Brunborg et al., 2019). Monetary compensation was provided, transferred into the bank accounts of each class that had adolescents participating (Brunborg et al., 2019).

When the data was made accessible for me to write this thesis, the dataset was made fully anonymised. That is, all identifiable information was removed from the dataset I worked with. The data was also stored on a secure digital server through the Norwegian Centre for Research Data. Therefore, variables that directly or indirectly identified students who participated in the MyLife study were not accessible to me, and data were stored securely.

Data Analysis

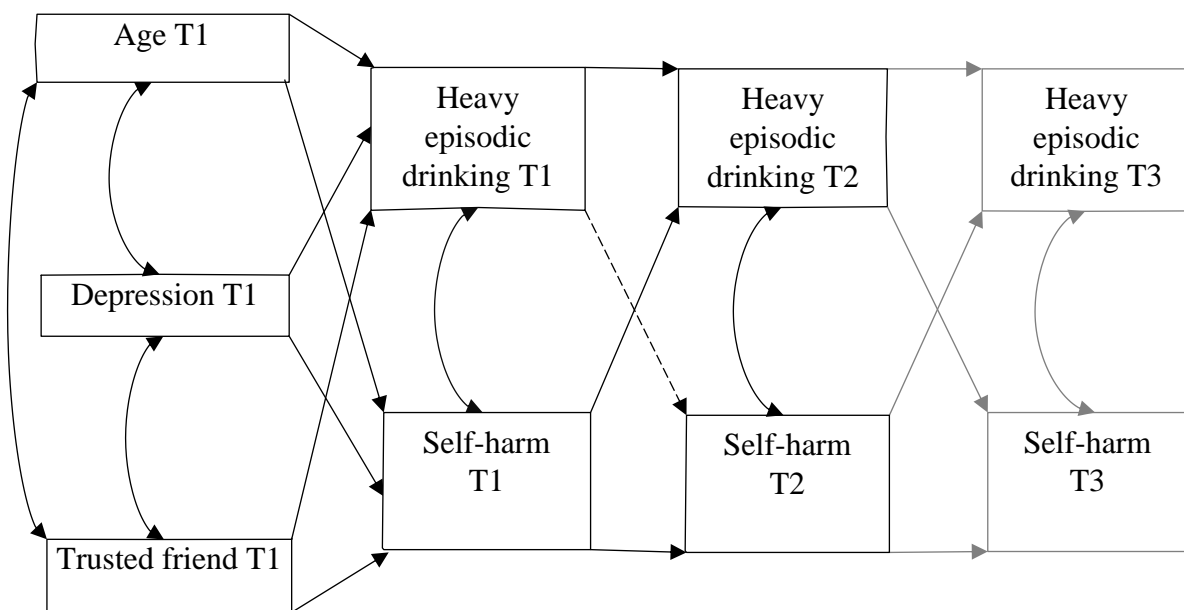
To analyze the data, a cross-lagged panel analysis was performed using a structural equation model framework (Usami, 2021). This type of analysis allows for examining both cross-sectional and longitudinal associations between the studied constructs: heavy episodic drinking, thoughts of self-harm, and self-harm behavior. This was achieved by using the statistical program STATA version 16, which has a function that allows you to draw the model you want to test (StataCorp). To check if there is support for testing this with a cross-lagged panel design, one must check if there are significant correlations between most of the variables, which there were (see Tables 1 and 2 and Appendixes E, F, K, and L). The conceptual models, including covariates, were then drawn in STATA. For both studies, a constrained and an unconstrained model was estimated. The study that had the best model fit

was used in further analysis. Furthermore, all available data was used and participants were not excluded if they had not participated in all time measures. Instead, their answers were estimated by maximum likelihood estimation in STATA.

All data analyzes were conducted with the assistance and under the supervision of my co-supervisor, and as I did not have data access to the pilot study, she did the necessary analysis study two. She then gave me the necessary output to analyzing the data.

Figure 1

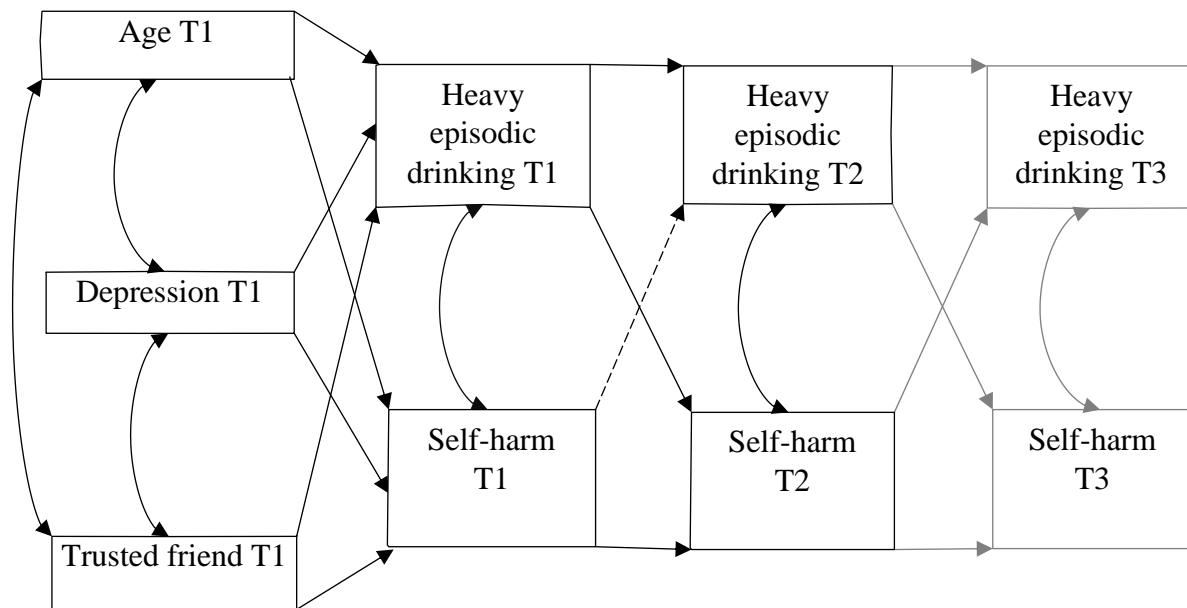
The conceptual model for girls, including covariates



Note. T1 = time measure one. T2 = time measure two. T3 = time measure three. Study one include three time measures, including those drawn in gray lines. Study two includes two time measures, meaning it only includes the black lines. The dotted line is assumed to be non-significant.

Figure 2

The conceptual model for boys, including covariates



Note. T1 = time measure one. T2 = time measure two. T3 = time measure three. Study one include three time measures, including those drawn in gray lines. Study two includes two time measures, meaning it only includes the black lines. The dotted line is assumed to be non-significant.

To test whether self-harm or heavy episodic drinking occurs first, two multigroup comparison models were needed for each study. One of the multicomparison models was divided by gender, where all paths was constrained to be equal for boys and girls. The other multicomparison model was not constrained, allowing them to obtain different numbers for boys and girls. All of these comparisons followed the same modeling as illustrated in figure 1 and figure 2, and was obtained by drawing it STATA's structural equation modeling builder (StataCorp, 2019), then choosing constrained or unconstrained paths. For both studies, the model that obtained the best model fit was then used for further analysis. The research questions were then answered on the basis of the basis of the basis of which paths were significant.

Results

A Structural Equations Modeling (Usami, 2021) was used to examine the association between heavy episodic drinking and thoughts of self-harm and suicide, longitudinally, after controlling for age, depression, and the number of trusted friends. This investigation is

warranted given the significant associations between the studied constructs in study one (see Table 1) and study two (see Table 2).

Table 1

Correlation matrix for all study participants (N = 3,512) in study one: heavy episodic drinking and thoughts of self-harm

| No. | Variable | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|-------|-------------------|---------|---------|--------------------|---------|----------|----------|----------|--------|--------|--------|
| 1. | Grade level T1 | 1 | | | | | | | | | |
| 2. | Trusted friend T1 | -.05* | 1 | | | | | | | | |
| 3. | Gender | .005 | -.01 | 1 | | | | | | | |
| 4. | Depression T1 | 0.14*** | -.22*** | -.26*** | 1 | | | | | | |
| 5. | HED T1 | .08*** | -.03 | .01 | .11*** | 1 | | | | | |
| 6. | HED T2 | .08*** | -.02 | .03 | .05* | .07*** | 1 | | | | |
| 7. | HED T3 | .15*** | .06** | .04 | .09*** | .11*** | .12*** | 1 | | | |
| 8. | SH T1 | .03 | -.19*** | -.16*** | .65*** | .13*** | .03 | .09*** | 1 | | |
| 9. | SH T2 | .04* | -.14*** | -.13*** | .42*** | .06** | .14*** | .08*** | .49*** | 1 | |
| 10. | SH T3 | .02 | -.12*** | -.11*** | .34*** | .02 | .03 | .12*** | .39*** | .50*** | 1 |
| Range | | 8 to 10 | 0 to 3 | 0 to 1 | 0 to 24 | 0 to 288 | 0 to 288 | 0 to 288 | 0 to 3 | 0 to 3 | 0 to 3 |
| N | | 3,512 | 2,959 | 1,526 ^a | 2,741 | 2,975 | 2,857 | 2,651 | 2,685 | 2,698 | 2,555 |
| M | | 8.92 | 2.39 | | 5.70 | .82 | 3.09 | 5.34 | .28 | .37 | .32 |
| SD | | .80 | .97 | | 5.04 | 8.15 | 19.22 | 16.69 | .68 | .77 | .70 |

Note. T1 = time measure one. T2 = time measure two. T3 = time measure three. HED = Heavy episodic drinking. SH = Self-harm. N = number of participants, M = mean, SD = standard deviation. * = 0.05 or less, ** = 0.01 or less, *** = 0.001 or less. N for gender = 3,398. N in the table is for boys, ^a = 55.09%, N for girls = 1,872 (55.09%).

Table 2

Correlation matrix for all study participants (N = 447) in study two: heavy episodic drinking and self-harm behavior

| No. | Variable | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|-----------|-------------------|------------|---------|---------|---------|----------|----------|--------|--------|
| 1. | Gender | 1 | | | | | | | |
| 2. | Grade level T1 | -.02 | 1 | | | | | | |
| 3. | Depression T1 | -.21*** | .17*** | 1 | | | | | |
| 4. | Trusted friend T1 | .00 | -.03 | -.22*** | 1 | | | | |
| 5. | HED T1 | .08 | .09 | .13** | -.20*** | 1 | | | |
| 6. | HED T2 | .05 | .11* | .01 | -.16** | .77*** | 1 | | |
| 7. | SH T1 | -.15** | .17*** | .55*** | -.21*** | .25*** | .19*** | 1 | |
| 8. | SH T2 | -.05 | .06 | .30*** | -.16** | .20*** | .37*** | .55*** | 1 |
| Range | | 0 to 1 | 8 to 10 | 0 to 24 | 0 to 2 | 0 to 182 | 0 to 182 | 0 to 7 | 0 to 7 |
| <i>N</i> | | 201(45.0%) | 447 | 442 | 447 | 447 | 384 | 447 | 384 |
| <i>M</i> | | | 9.0 | 5.38 | 1.72 | 1.03 | .68 | .34 | .35 |
| <i>SD</i> | | | .84 | 4.61 | .60 | 12.22 | 6.91 | .96 | 1.19 |

Note. T1 = time measure one. T2 = time measure two. HED = Heavy episodic drinking. SH = Self-harm. *N* = number of participants, *M* = mean, *SD* = standard deviation. * = 0.05 or less, ** = 0.01 or less, *** = 0.001 or less. *N* for gender = 447. *N* in the table is for boys, *N* for girls = 246 (55.03%).

Tables 3 and 4 show the prevalence of female and male study participants in studies one and two, respectively. In both studies and across grades, the number of female study participants was higher.

Table 3

Study one: Participants grade level, social age and gender at time measure one

| Grade and corresponding social age | <i>N</i> | Girls | Boys |
|------------------------------------|----------------|----------------|----------------|
| <i>N</i> | 2,975 (100%) | 1,668 (56.07%) | 1,307 (43.93%) |
| 8 th = 13 year old | 1,141 (38.35%) | 646 | 495 |
| 9 th = 14 year old | 989 (33.24%) | 567 | 422 |
| 10 th = 15 year old | 854 (28.40%) | 455 | 390 |

Note. *N* = number of participants. The data was collected during the fall semester, meaning that the students corresponding social age would be higher if the data collection took place during the spring semester.

Table 4

Study two: Participants grade level, social age and gender at the time measure one

| Grade and corresponding social age | <i>N</i> | Girls | Boys |
|------------------------------------|--------------|--------------|--------------|
| <i>N</i> | 447 (100%) | 246 (55.00%) | 201 (45.00%) |
| 8 th = 13 year old | 156 (34.90%) | 87 | 69 |
| 9 th = 14 year old | 131 (29.30%) | 66 | 65 |
| 10 th = 15 year old | 160 (35.80%) | 93 | 67 |

Note. *N* = number of participants. The data was collected during the fall semester, meaning that the students corresponding social age would be higher if the data collection took place during the spring semester.

Study One: Analyzing HED and Self-Harm Thoughts with a Cross-Lagged Panel Design

In order to study heavy episodic drinking and self-harm thoughts, a decision about using a constrained or unconstrained systematic equation model was needed. An unconstrained model is obtained by allowing all paths to be unequal, meaning that it is freely estimating the paths for boys and girls. A constrained model forces the paths to be the same

for both genders. However, to decide between using a constrained model and an unconstrained model, one must look at the fit of the model.

The constrained model examined the associations between HED and self-harm thoughts over three study years, while considering gender differences; specifically, by using a multigroup model which assumed that the associations were equal for boys and girls, and fitting a fully unconstrained model. This constrained model had a poor fit, as evident from the fit indices = $\chi^2 = (70, N = 3398) = 2248.15, p = .00, RMSEA = 0.14, AIC = 115363.43, BIC = 115596.40, CFI = .31, TLI = 0.35$.

The unconstrained model examined the associations between HED and self-harm thoughts among adolescents over three years while considering gender differences; specifically, by estimating a multi-group model that assumed that the associations were unequal for boys and girls, and fitting a fully unconstrained model. Except for the chi-square, the fit indices for this model were good; $\chi^2 = (32, N = 3398) = 317.26, p = .00, RMSEA = 0.07, AIC = 113508.54, BIC = 113974.49, CFI = 0.91, TLI = 0.81$, however, chi-square is commonly significant in large samples. The unconstrained model will be used further due to its good fit, and the paths is illustrated in figure 3 for girls and figure 4 for boys.

Girls in Study One: Heavy Episodic Drinking and Self-Harm Thoughts

Covariates on Time Measure One. Heavy episodic drinking at T1 was significantly predicated by all covariates, such that greater HED was reported by older adolescents (age $b = .59, p < .001, 95\% CI [0.25, 0.94]$), by adolescents who reported greater depression symptoms ($b = .11, p < .000, 95\% CI [0.05, 0.16]$) and having greater number of close and trusted friends ($b = .34, p = .023, 95\% CI [0.05, 0.63]$). The covariates for self-harm thoughts were also significant for age ($b = -.08, p < .000, 95\% CI [-0.12, -0.05]$), depression ($b = .10, p < .000, 95\% CI [0.09, 0.10]$) and trusted friend ($b = -.05, p < .002, 95\% CI [-0.08, -0.02]$).

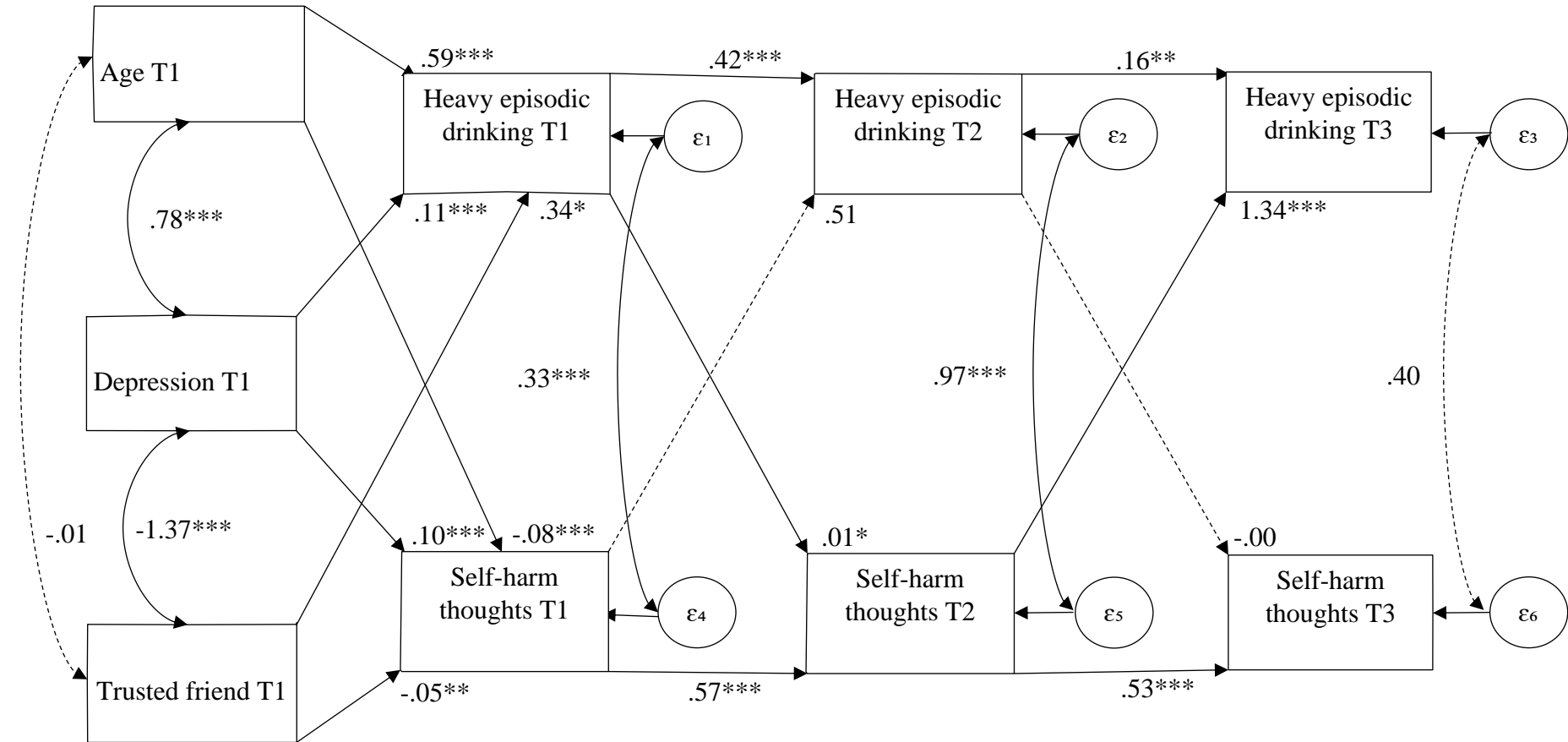
Time Measure One to Time Measure Two. Heavy episodic drinking at time two was significantly associated with heavy episodic drinking at time one ($b = .42, p < .000, 95\% CI [0.29, 0.55]$) but not by thoughts of self-harm at time one ($b = 0.51, p = .325, 95\% CI [-0.50, 1.51]$). Thoughts of self-harm at time two was significantly associated with heavy episodic drinking at time one ($b = .01, p < .024, 95\% CI [0.00, 0.01]$) as well as with thoughts of self-harm at time one ($b = .57, p < .000, 95\% CI [0.53, 0.62]$).

Time Measure Two to Time Measure Three. Heavy episodic drinking at time three was significantly associated with heavy episodic drinking at time two ($b = .16, p < .000, 95\%$

CI [0.11, 0.20]) in addition to thoughts of self-harm at time two ($b = 1.34, p < .001, 95\% \text{ CI } [0.52, 2.16]$). Thoughts of self-harm at time three was not significantly associated with heavy episodic drinking at time two ($b = -.00, p = .462, 95\% \text{ CI } [-0.00, 0.00]$), but by thoughts of self-harm at time two ($b = .53, p = .000, 95\% \text{ CI } [0.49, 0.57]$) was significant.

Figure 3

Study One: Illustration of unstandardized path coefficients for girls documenting heavy episodic drinking's association with self-harm thoughts



Note. T1 = Time one, collected in fall 2017. T2 = Time two, collected in fall 2018. T3 = Time three, collected in fall 2019. Fit indices = RMSEA = 0.07, AIC = 113508.54, BIC = 113974.49, CFI = 0.91, TLI = 0.81. Non-significant paths are illustrated by a dotted line, and significant paths by a solid line. Error variances were also estimated, but not included in the figure, as they are not needed to answer the research questions. The curved arrows between ϵ_1 and ϵ_4 , ϵ_2 and ϵ_5 , and ϵ_3 and ϵ_6 are unadjusted

Boys in Study One: Heavy Episodic Drinking and Self-Harm Thoughts

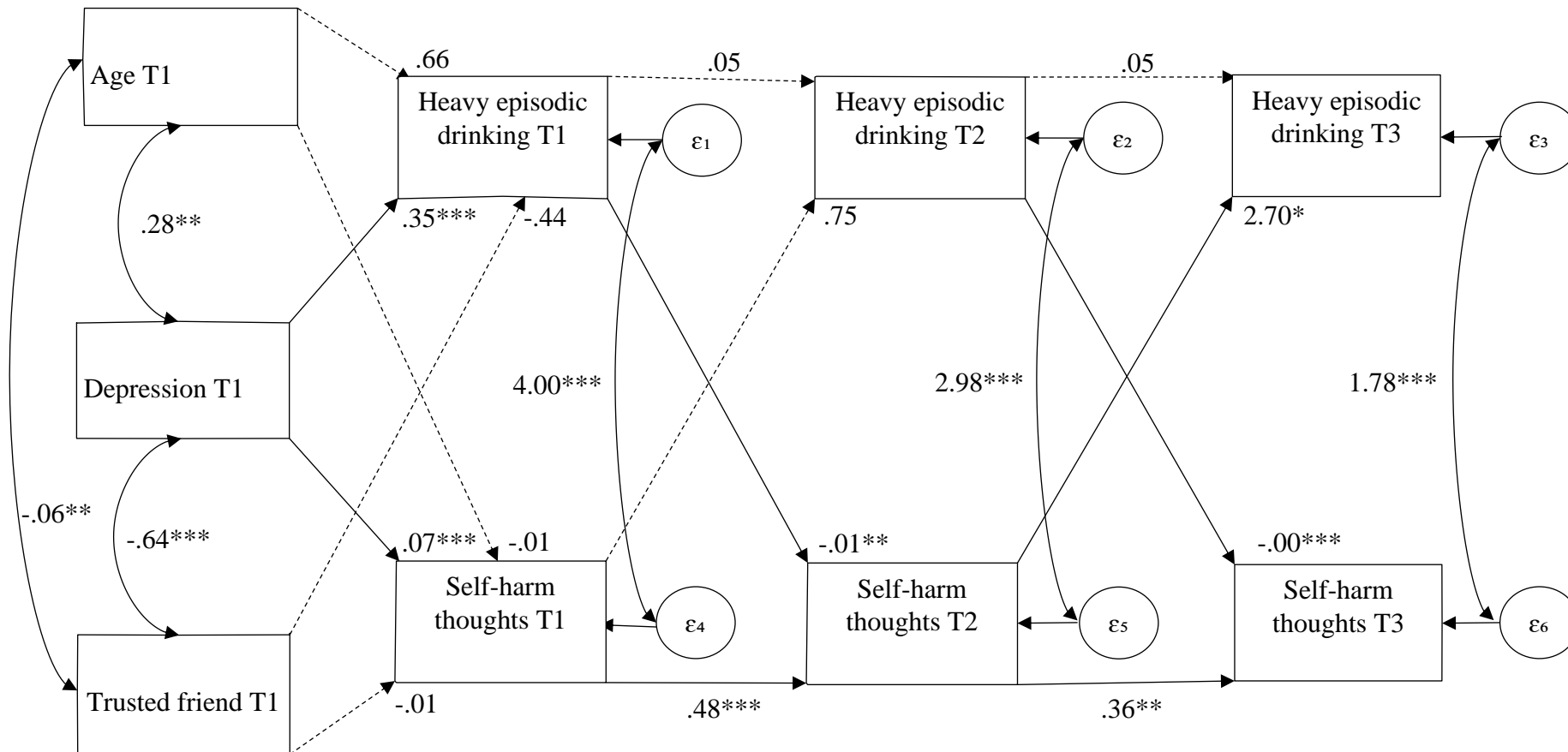
Covariates on Time Measure One. The covariates for heavy episodic drinking were only significant for depression ($b = .35, p < .000, 95\% \text{ CI } [0.21, 0.49]$) and not for age ($b = .66, p = .060, 95\% \text{ CI } [-0.28, 1.35]$) and trusted friend ($b = -.44, p = .139, 95\% \text{ CI } [-1.03, 0.14]$). The covariates for self-harm thoughts were also only significant for depression ($b = .07, p < .000, 95\% \text{ CI } [0.06, 0.07]$) and not for age ($b = -.01, p = .430, 95\% \text{ CI } [-0.04, 0.02]$) and trusted friend ($b = -.01, p = .381, 95\% \text{ CI } [-0.03, 0.01]$).

Time Measure One to Time Measure Two. Heavy episodic drinking at two was not significantly associated with heavy episodic drinking at time one ($b = .05, p = .524, 95\% \text{ CI } [-0.10, 0.19]$) and neither with thoughts of self-harm at time one ($b = .75, p = .600, 95\% \text{ CI } [-2.07, 3.57]$). Thoughts of self-harm at time two was significantly associated with heavy episodic drinking at time one ($b = -.01, p < .003, 95\% \text{ CI } [-0.01, -0.00]$) as well as by thoughts of self-harm at time one ($b = .48, p < .000, 95\% \text{ CI } [0.40, 0.56]$).

Time Measure Two to Time Measure Three. Heavy episodic drinking at time three was not significantly influenced by heavy episodic drinking at time two ($b = .05, p = .115, 95\% \text{ CI } [-0.01, 0.11]$) but it was significantly influenced by thoughts of self-harm at time two ($b = 2.72, p < .019, 95\% \text{ CI } [0.45, 4.99]$). Thoughts of self-harm at time three was significantly influenced by heavy episodic drinking at time two ($b = -.00, p < .004, 95\% \text{ CI } [-0.00, -0.00]$) and by thoughts of self-harm at time two ($b = .36, p = .000, 95\% \text{ CI } [0.30, 0.42]$).

Figure 4

Study one: Illustration of unstandardized path coefficients for boys documenting heavy episodic drinking's association with self-harm thoughts



Note. T1 = Time one, collected in fall 2017. T2 = Time two, collected in fall 2018. T3 = Time three, collected in Fall 2019. Fit indices = RMSEA = 0.07, AIC = 113508.54, BIC = 113974.49, CFI = 0.91, TLI = 0.81. Non-significant paths are illustrated by a dotted line, and significant paths by a solid line. Error variances were also estimated, but not included in the figure, as they are not needed to answer the research questions. The curved arrows between ϵ_1 and ϵ_4 , ϵ_2 and ϵ_5 , and ϵ_3 and ϵ_6 are unadjusted.

Evaluating Research Questions in Study One: HED and Self-Harm Thoughts

Research question one was “Is heavy episodic drinking and self-harm thoughts associated: a) within the same time measure? b) longitudinally?” As evident from the results of the path models (see Figures 3 and 4), there was a positive association between heavy episodic drinking and self-harm within almost all time measures for both genders. For boys, the significant association between self-harm thoughts and heavy episodic drinking was present in time measure one, time measure two, and time measure three. For girls, there was a significant association within time measures one and two; however, the association at time measure three was almost significant, as $p = .054$.

As evident from the results from the path models (see Figures 3 and 4), heavy episodic drinking and self-harm thoughts are somewhat associated longitudinally. For girls, at time measure one, heavy episodic drinking is significantly associated with self-harm thoughts at time two. Self-harm thoughts at time two are significantly associated with heavy episodic drinking at time three. For boys, heavy episodic drinking at time measure one was significantly associated with self-harm thoughts at time measure two. Boys' self-harm thoughts at time measure two were significantly associated with their heavy episodic drinking at time three. Boys heavy episodic drinking was significantly associated with their heavy episodic drinking at time measure three.

Research question two was “Are there gender differences in timing of heavy episodic drinking and self-harm thoughts? Do heavy episodic drinking precede self-harm thoughts in boys, while self-harm thoughts precede heavy episodic drinking in girls?” There were no gender differences in timing, as both girls and boys reported heavy episodic drinking at time measure one being associated with self-harm thoughts at time measure two (see Figures 3 and 4). Self-harm thoughts at time measure two were associated with heavy episodic drinking at time measure three. Boys also had a significant path between heavy episodic drinking at time measure two to self-harm thoughts at time measure three. Which adds up to no gender differences being present.

Study Two: Analyzing HED and Self-Harm Behavior with a Cross-Lagged Panel Design

The model fit was evaluated to ensure an adequate fit, in addition to deciding to use a constrained or unconstrained model. First, we examined the associations between heavy episodic drinking and self-harm behavior among adolescents in two time measures while considering gender differences; specifically, by using a multigroup model that assumed that

the studied associations were equal for boys and girls, and were fitting of a fully constrained model. This constrained model had a poor fit as evident by its fit indices = $\chi^2 = (41, N = 447) = 1655.99, p = .00, RMSEA = .42, AIC = 12327.70, BIC = 12446.68, CFI = .00, TLI = -.92$.

Finally, we examined gender differences in the associations between HED and self-harm behavior among adolescents in two time measures, by estimating a multigroup model that was unconstrained; meaning that the associations were assumed unequal for boys and girls. Except for the chi-square, the fit indices for this model were good $\chi^2 = (12, N = 447) = 28.36, p = .00, REMSA = .08, AIC = 10758.08, BIC = 10996.02, CFI = .98, TLI = .93$, however, the chi-square is commonly significant in large samples. The unconstrained model had the best fit. This model will therefore be used further in study two. The results from this model are illustrated in figure 4 for girls and figure 5 for boys.

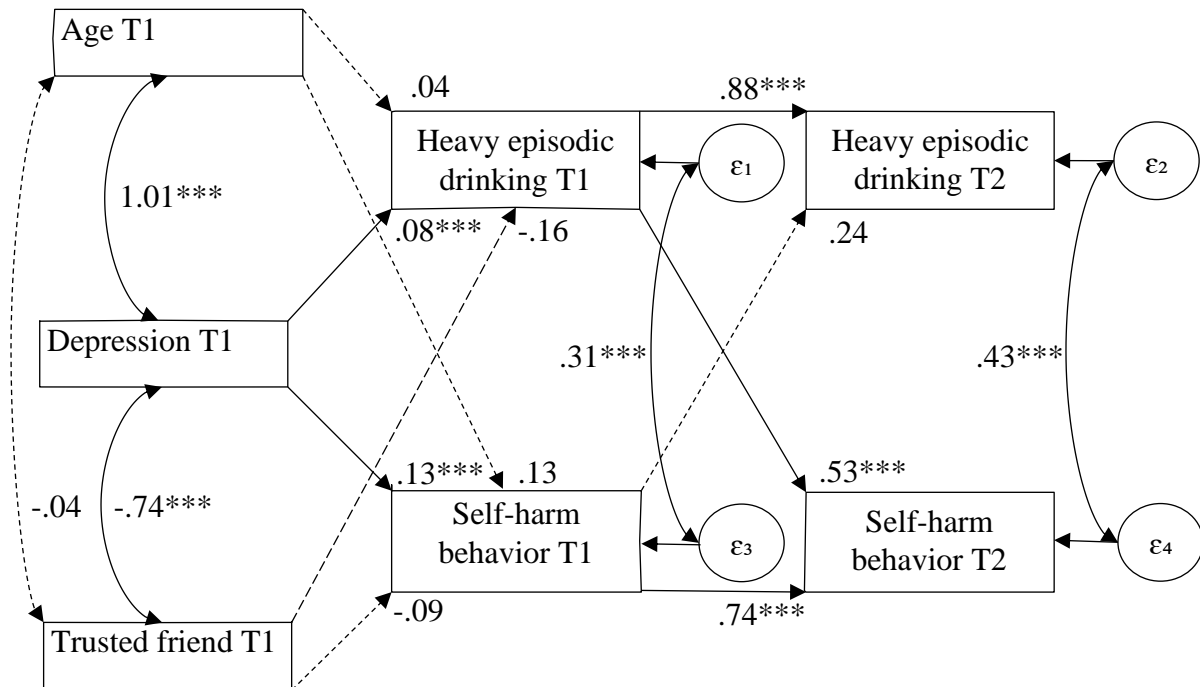
Girls in Study Two: Heavy Episodic Drinking and Self-Harm Behavior

Covariates on Time Measure One. Only depression ($b = .08, p < .000, 95\% \text{ CI } [0.05, 0.11]$) was significantly associated with heavy episodic drinking at time one. With age ($b = .04, p = .610, 95\% \text{ CI } [-0.12, 0.20]$) and trusted friend ($b = -.16, p = .159, 95\% \text{ CI } [-0.39, 0.06]$) not being significantly associated. The covariates for self-harm behavior at time one was significantly associated with depression ($b = .13, p < .000, 95\% \text{ CI } [0.10, 0.15]$) but not with age ($b = .13, p = .054, 95\% \text{ CI } [-0.00, 0.27]$), 0.15] and trusted friend ($b = -.09, p = .327, 95\% \text{ CI } [-0.28, 0.09]$).

Time Measure One to Time Measure Two. Heavy episodic drinking at two was significant by heavy episodic drinking at time one ($b = .88, p < .000, 95\% \text{ CI } [0.51, 1.26]$) and significantly associated with self-harm behavior at time one ($b = .53, p < .000, 95\% \text{ CI } [0.35, 0.72]$). Self-harm behavior at time two was not significantly influenced by heavy episodic drinking at time one ($b = .24, p = .112, 95\% \text{ CI } [-0.05, 0.53]$) but it was significantly associated to self-harm behavior at time one ($b = .74, p < .000, 95\% \text{ CI } [0.60, 0.89]$).

Figure 5

Study two: Illustration of unstandardized path coefficients for girls documenting the association between heavy episodic drinking and self-harm behavior



Note. T1 = Time one, collected in fall 2014. T2 = Time two, collected in spring 2015. Fit indices = RMSEA = .08, AIC = 10758.08, BIC = 10996.02, CFI = .98, TLI = .93. Non-significant paths are illustrated by a dotted line, and significant paths by a solid line. Error variances were also estimated, but not included in the figure, as they are not needed to answer the research questions. The curved arrows between ϵ_1 and ϵ_3 , and ϵ_2 and ϵ_4 are unadjusted.

Boys in Study Two: Heavy Episodic Drinking and Self-Harm Behavior

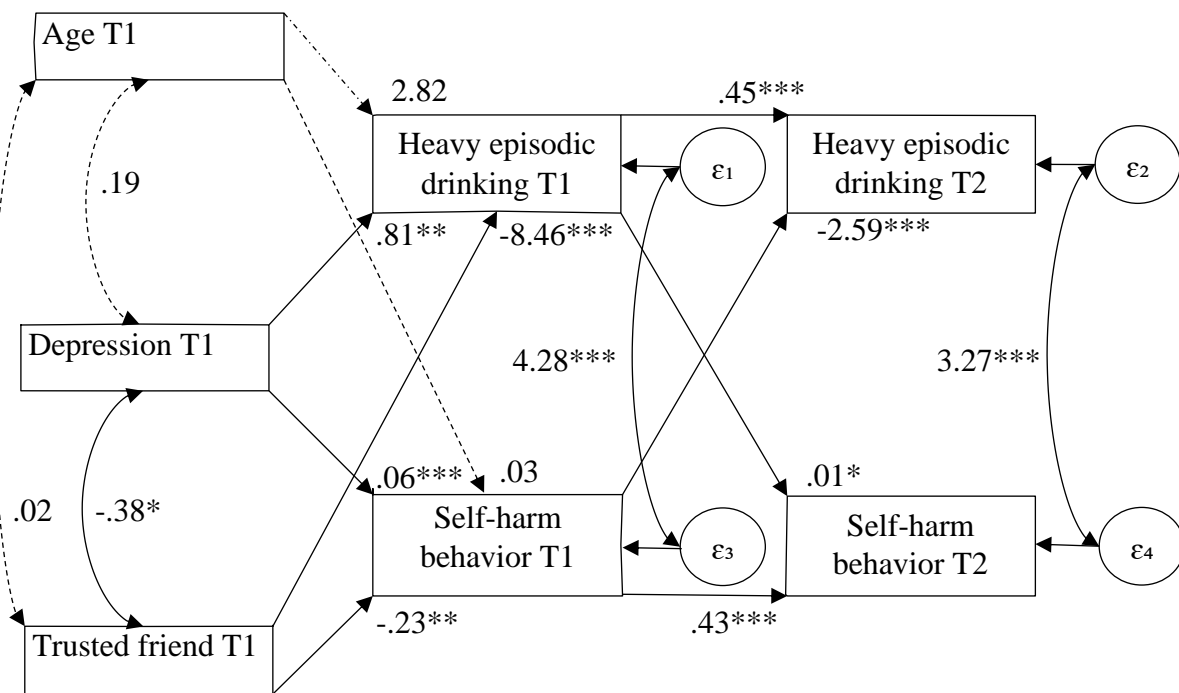
Covariates on Time Measure One. Most of the covariates for heavy episodic drinking were significant, with age ($b = 2.82, p = .052, 95\% \text{ CI } [-0.02, 5.66]$), depression ($b = .81, p < .010, 95\% \text{ CI } [0.20, 1.42]$) and trusted friend ($b = -8.46, p < .000, 95\% \text{ CI } [-12.58, -4.34]$). The covariates for self-harm behavior at time one was significantly associated with depression ($b = .06, p < .000, 95\% \text{ CI } [0.04, 0.08]$) and trusted friend ($b = -.23, p < .003, 95\% \text{ CI } [-0.38, -0.08]$), but not with age ($b = .03, p = .588, 95\% \text{ CI } [-0.07, 0.13]$).

Time Measure One to Time Measure Two. Heavy episodic drinking at two was significantly associated with heavy episodic drinking at time one ($b = .45, p < .000, 95\% \text{ CI } [0.39, 0.51]$) and by self-harm behavior at time one ($b = -2.59, p < .001, 95\% \text{ CI } [-4.15, -1.03]$). Self-harm behavior at time two was significantly associated with heavy episodic

drinking at time one ($b = .01, p < .023, 95\% \text{ CI } [0.00, 0.02]$), and by self-harm behavior at time one ($b = .43, p < .000, 95\% \text{ CI } [0.19, 0.67]$).

Figure 6

Study two: Illustration of unstandardized path coefficients for boys documenting the association between heavy episodic drinking and self-harm behavior



Note. T1 = Time one, collected in fall 2014. T2 = Time two, collected in spring 2015. Fit indices = RMSEA = .08, AIC = 10758.08, BIC = 10996.02, CFI = .98, TLI = .93. Non-significant paths are illustrated by a dotted line, and significant paths by a solid line. Error variances were also estimated, but not included in the figure, as they are not needed to answer the research questions. The curved arrows between ϵ_1 and ϵ_3 , and ϵ_2 and ϵ_4 are unadjusted.

Evaluating Research Questions in Study Two: HED and Self-Harm Thoughts

Research question one was “ Is heavy episodic drinking and self-harm behavior associated: a) within the same time measure? b) longitudinally?” As evident from the results from the path models (see Figures 5 and 6), there was a positive association between heavy episodic drinking and self-harm behavior within all time measures for both genders. As boys and girls, both had a significant association between self-harm behavior at time measure one and heavy episodic drinking at time measure one. In addition, for the association between self-harm behavior at time measure two is associated with heavy episodic drinking at time measure two.

As evident from the results from the path models (see Figures 5 and 6), heavy episodic drinking and self-harm thoughts are somewhat associated longitudinally. There was a significant association between heavy episodic drinking at time measure one and self-harm behavior at time measure two, both for girls and boys. For boys, a significant association between self-harm behavior at time measure one and heavy episodic drinking at time measure two also existed.

Research question two was “Are there gender differences in timing of heavy episodic drinking and self-harm behavior? Specifically: Do heavy episodic drinking precede self-harm thoughts in boys, while self-harm behavior precede heavy episodic drinking in girls?” Girls and boys reported heavy episodic drinking at time measure one being associated with self-harm behavior at time measure two (see Figures 5 and 6). As evident from the path models (see Figures 5 and 6), the only gender difference in timing was that the boys reported self-harm behavior in time measure one, being associated with heavy episodic drinking at time measure two. Which adds up to that none of the expected gender differences was present.

Discussion

This thesis investigated the association between heavy episodic drinking and self-harm thoughts in study one and the association between heavy episodic drinking and self-harm behavior in study two. The studies investigated gender differences, and it was expected that for girls, self-harm thoughts or self-harm behavior would precede HED. In contrast, it was expected HED would precede self-harm thoughts and behaviors for boys. It was also expected that heavy episodic drinking and self-harm thoughts and self-harm behavior, respectively, would be associated longitudinally and within the same time measures.

Main Findings

Study one found heavy episodic drinking and self-harm thoughts to be partially associated within the same time measures, as all paths were significant except for girls' HED and self-harm thoughts at time measure three (see Figures 1, 3 and 4). Heavy episodic drinking and self-harm thoughts were partially longitudinally associated (see Figures 1, 3 and 4). Study one found none of the expected gender differences (see Figures 1, 3 and 4), meaning that self-harm thoughts did not precede HED in girls, nor did HED precede self-harm thoughts in boys.

Study two found heavy episodic drinking and self-harm behavior to be associated within the same time measures and partially associated longitudinally (see Figures 2, 5 and 6).

Study two did not find any of the expected gender differences related to the timing between HED and self-harm behavior (see Figures 2, 5 and 6), meaning that self-harm behavior did not precede HED in girls, nor did HED precede self-harm behavior in boys.

Thesis Findings in Context of Existing Literature

To the best of my knowledge, this is the first study to address longitudinal gender differences between adolescent HED and self-harm thoughts and behavior, respectively. Thus, the findings cannot be discussed in the context of studies that have addressed longitudinal gender differences in the association between HED and both self-harm thoughts and behaviors. However, Rossow and Norström (2014) investigated the association between heavy episodic drinking and deliberate self-harm in Norwegian adolescents, with two time measures that were five years apart. My findings were consistent with theirs, as they found that deliberate self-harm and heavy episodic drinking were longitudinally associated (Rossow & Norström, 2014), even though I measured self-harm thoughts and self-harm behavior.

One possible explanation for not finding the expected gender differences can be that boys and girls interpret self-harm differently. Girls and boys may have a different threshold for what they consider self-harm thoughts and self-harm behavior. With boys possibly finding it harder to report self-harm thoughts and self-harm behaviors. Self-harm can be divided into direct and indirect self-harm, where an example of direct self-harm can be cutting the skin, and indirect self-harm can be excessive dieting or hazardous drinking (Nock, 2014). Thus, it is possible that boys and girls have a different threshold for what they consider self-harm, which might be related to the difference between direct and indirect self-harm. This potential gender difference in the interpretation of self-harm was not considered when designing the studies, but should be considered in future research.

Another possible explanation for not finding gender differences can be due to potential differences in stigma related to self-harm and HED. Moreover, it might be harder for the participant to report self-harm thoughts or self-harm behavior than heavy episodic drinking due to the associated stigma with the former. Children have been shown to recognize the normativity of alcohol consumption (Voogt et al., 2020); this perception of alcohol use likely extends to adolescents. Furthermore, alcohol consumption could have a more positive connotation than self-harm, as alcohol is often consumed in social settings, such as when celebrating. Therefore, it seems plausible that self-harm is perceived as more stigmatized than HED, making participants more reluctant to report self-harm thoughts or self-harm behavior than HED.

Norwegian adolescents live in a gender-egalitarian society. This may be a possible explanation for why both genders reported heavy episodic drinking before self-harm. As gender stereotypical behavior is not as prominent in Norway, because most parents are involved in household chores and work outside the home. Furthermore, Norway is a country with high gender equality and liberal laws regarding child-rearing (Endendijk et al., 2016), it is plausible that this is somewhat decreasing gender differences among Norwegian adolescents. Even compared to other western countries, such as England, Norwegian parenting is more progressive (Endendijk et al., 2016). There are fewer differences between men and women in Norway, since masculinity is not as highly valued as in many other countries (Hofstede et al., 2010), which could contribute to fewer gender differences in general.

Even though research suggests that self-harm and suicide attempts belong to the same dimensional construct (Tørmoen et al., 2012), it could appear as if I did not consider suicide to be more common among men (Schrijvers et al., 2011). However, the definition of self-harm used in this thesis included suicidal thoughts and suicide attempts, not successful suicides. As the frequency of suicide attempts is higher among women than among men (Schrijvers et al., 2011), and suicidal ideation is higher among girls than boys (Zhang et al., 2019), the self-harm measures used in this thesis are probably not the reason why we did not find the expected gender differences.

Implications

The findings from these studies offer new insight into the association between heavy episodic drinking and self-harm thoughts and behaviors amongst adolescent boys and girls. As today's adolescents are different from previous generations concerning alcohol consumption (Pape, Rossow, & Brunborg, 2018) and self-harm (Tørmoen et al., 2020), it was important to examine if the association between heavy episodic drinking and self-harm (Rossow & Norström, 2014) still existed. This research offers valuable information to the adults interacting with adolescents, as it allows them to be informed about the development of self-harm and heavy episodic drinking's association. This research can be used to inform parents, caregivers, and people working with adolescents about the need to pay attention to potential warning signs of self-harm thoughts or behaviors, if the adolescent is drinking hazardously.

This research can be used in primary, secondary, and tertiary prevention. Primary prevention, which in this case would be to intervene before self-harm and heavy episodic

drinking occur (Westefeld, 2019), can be used to make parents, other caregivers, and people working with adolescents aware of the potential risk the adolescent may be at, given their gender. Secondary prevention can target adolescents, especially those at risk of developing such behaviors (Westefeld, 2019), by looking at the associated factors putting them at greater risk. In addition to tertiary prevention, prevention of relapse or decreasing the frequency (Westefeld, 2019) of heavy episodic drinking, self-harm thoughts, or self-harm behavior after it has occurred.

Strengths and Limitations

Key strengths include that the research was longitudinal and that both studies had many participants. This is a strength because the high number of participants makes the research more generalizable. It is also a strength to use longitudinal data when investigating adolescent behavior, as behaviors change more rapidly during adolescence than in older age groups. Moreover, a longitudinal research design allows for a more holistic study of a given behavior, since behavior can be tracked over time, making it possible to obtain more information about the development of behaviors over time.

Another strength is that both studies obtained similar findings. While I did not anticipate a difference in pathways across the studies (see Figures 1 and 2), it is logical that self-harm thoughts and self-harm behavior would lead to some path differences. However, as the concepts of self-harm thoughts and self-harm behavior are somewhat similar, it is positive that the results in both studies show similarities.

This thesis also has several limitations which should be considered when interpreting the findings. One of them is that a modified version of the AUDIT-C scale was used (Bush et al., 1998). However, as the revised scale considers consuming five instead of six units of alcohol as heavy episodic drinking, the modified version fits better with the definition of heavy episodic drinking than the original measure (Bush et al., 1998). Another limitation is the measurement of self-harm behaviors. Instead of having options ranging from not at all to nearly every day, as when measuring self-harm thoughts (see Appendix B), self-harm behavior was measured by frequency, but stopped at seven (see Appendix H). This is a limitation, as the participants that reported seven might, in reality, have self-harmed a lot more than seven times. Furthermore, the unequal number of time measures in study one and two is a limitation. As study one had three time measures and study two had two time measures, unequal amounts of information are obtained between self-harm behavior and self-harm thoughts association with heavy episodic drinking. It is however, better to have an

unequal number of time measures, than excluding an additional time measure from study one, but I acknowledge that having different numbers of time measures in the studies is not ideal. Another limitation is that the data used in this thesis were collected by self-report (Brunborg et al., 2019). Therefore, it is possible that the participants were not truthful when answering questions and could have been influenced by social desirability (Davis et al., 2009). Furthermore, it would have been better for the studies in this thesis to have included more than two gender categories, as gender non-conforming individuals generally report higher frequencies of self-harm (Taliaferro et al., 2018) and heavy episodic drinking (Azagba et al., 2019).

Ethics

Although this thesis has investigated sensitive topics, the necessary ethical concerns were taken into account. Both parents and adolescents had to consent to the adolescents participation and had the opportunity to withdraw their participation (Brunborg et al., 2019). However, I acknowledge that some of the questions may have caused distress for some participants, but they were able to skip questions if they wanted to (Brunborg et al., 2019). The participant data to which I had access was also completely anonymized and stored securely, making it impossible for me to create a situation that negatively impacted them.

Future Research

Based on the studies conducted in this thesis, it would be good to use validated scales that offer more information on self-harm and alcohol consumption. It would be interesting to have more information about the different types of unhealthy alcohol consumption and self-harm. Especially for self-harm, which was not measured using a validated scale, it would be advisable to do so in the future. It would also be interesting to differentiate between different types of self-harm, such as non-suicidal self-harm and self-harm with suicidal intent. Moreover, it would be interesting to see if the same results can be obtained by research that makes these adaptations and if similar results can be obtained in other countries.

Future research should include more than two gender categories. This was attempted in this thesis, but it was not possible, as the number of participants choosing the gender category “other”, made them identifiable. Therefore, this information was not included in the dataset to which I had access. Future research should include this information, as gender-non-conforming individuals report higher levels of both self-harm (Taliaferro et al., 2018) and hazardous drinking (Azagba et al., 2019); thus, information about individuals identifying as “other” may provide important nuance.

Ideally, socioeconomic status, immigrant background, and religion should have been controlled for. Socioeconomic status should be included as a covariate as previous research has found it to be associated with alcohol consumption and self-harm (Lodebo et al., 2017; Pape et al., 2017; Pape et al., 2018). Having an immigrant background should be controlled for, as it is associated with self-harm (Latina & Bayram Özdemir, 2020) and alcohol consumption (Creemers et al., 2017). Religion is also associated with alcohol consumption (Michalak et al., 2006) and self-harm (Borrill et al., 2011). However, as the version of the data I had access to was stripped of identifiable data, it was impossible to control socioeconomic status, immigrant background, and religion. They should, however, be included in future research. Future research should also control for how stigmatized adolescents find self-harm and heavy episodic drinking, in addition to gender-egalitarian upbringing. While it might be a lot to control for all these variables in a single study, future research should select the covariates that fit their specific research.

Conclusion

This thesis examined the association between heavy episodic drinking and self-harm thoughts and behaviors, focusing on gender differences in the timing of these behaviors. The assumptions were that among girls, self-harm thoughts and self-harm behaviors would precede HED, and that among boys, HED would precede self-harm thoughts and behaviors. The thesis findings showed an association between adolescent heavy episodic drinking and both self-harm thoughts, and self-harm behaviors. However, the assumption that self-harm thoughts and behaviors preceded HED in girls and that HED preceded self-harm thoughts and behaviors in boys was not supported. The findings suggest that the gender differences for HED and associations with self-harm thoughts and behaviors are more complex than anticipated. To the best of my knowledge, this is the first longitudinal study of gender differences in the association between HED and self-harm thoughts and behaviors. The findings contribute to a better understanding of the association between self-harm and heavy episodic drinking, especially concerning longitudinal gender differences. However, as this is the first study of its kind, more research is necessary to examine if the findings are the same in different contexts, e.g., across cultural settings with different levels of gender equality, and for adolescents not identifying as boys or girls.

References

- Adolfson, F., Strøm, H. K., Martinussen, M., Handegård, B. H., Natvig, H., Eisemann, M., & Kuposov, R. (2017). Parent participation in alcohol prevention. *Nordisk alkohol- & narkotikatidskrift*, *34*(6), 456-470. <https://doi.org/10.1177/1455072517732276>
- Azagba, S., Latham, K., & Shan, L. (2019). Cigarette, smokeless tobacco, and alcohol use among transgender adults in the United States. *International Journal of Drug Policy*, *73*, 163-169. <https://doi.org/10.1016/j.drugpo.2019.07.024>
- Beckman, K., Lysell, H., Haglund, A., & Dahlin, M. (2019). Prognoses after self-harm in youth: exploring the gender factor. *Social Psychiatry and Psychiatric Epidemiology*, *54*(4), 437-444. <https://doi.org/10.1007/s00127-018-1618-7>
- Bellis, M. A., Phillips-Howard, P. A., Hughes, K., Hughes, S., Cook, P. A., Morleo, M., Hannon, K., Smallthwaite, L., & Jones, L. (2009). Teenage drinking, alcohol availability and pricing: A cross-sectional study of risk and protective factors for alcohol-related harms in school children. *BMC Public Health*, *9*(1), 380-380. <https://doi.org/10.1186/1471-2458-9-380>
- Borrill, J., Fox, P., & Roger, D. (2011). Religion, ethnicity, coping style, and self-reported self-harm in a diverse non-clinical UK population. *Mental health, religion & culture*, *14*(3), 259-269. <https://doi.org/10.1080/13674670903485629>
- Bronfenbrenner, U. (1996). *The ecology of human development: experiments by nature and design*. Harvard University Press.
- Brunborg, G. S., Scheffels, J., Tokle, R., Buvik, K., Kvaavik, E., & Burdzovic Andreas, J. (2019). Monitoring young lifestyles (MyLife) - a prospective longitudinal quantitative and qualitative study of youth development and substance use in Norway. *BMJ Open*, *9*(10), 1-13. <https://doi.org/10.1136/bmjopen-2019-031084>
- Bush, K., Kivlahan, D. R., McDonell, M. B., Fihn, S. D., & Bradley, K. A. (1998). The AUDIT alcohol consumption questions (AUDIT-C): An effective brief screening test for problem drinking. *Archives of internal medicine (1960)*, *158*(16), 1789-1795. <https://doi.org/10.1001/archinte.158.16.1789>
- Cibis, A., Mergl, R., Bramesfeld, A., Althaus, D., Niklewski, G., Schmidtke, A., & Hegerl, U. (2011). Preference of lethal methods is not the only cause for higher suicide rates in males. *Journal of affective disorders*, *136*(1), 9-16. <https://doi.org/10.1016/j.jad.2011.08.032>

- Ciranka, S., & van den Bos, W. (2019). Social influence in adolescent decision-making: a formal framework. *Frontiers in psychology, 10*, 1915-1915.
<https://doi.org/10.3389/fpsyg.2019.01915>
- Courtney, K. E., & Polich, J. (2009). Binge drinking in young adults: data, definitions, and determinants. *Psychological bulletin, 135*(1), 142-156.
<https://doi.org/10.1037/a0014414>
- Creemers, H. E., Spanakis, P., Delforterie, M. J., & Huizink, A. C. (2017). Alcohol use of immigrant youths in The Netherlands: The roles of parents and peers across different ethnic backgrounds: Alcohol use of immigrant youths. *Drug and alcohol review, 36*(6), 761-768. <https://doi.org/10.1111/dar.12555>
- Danielsson, A.-K., Wennberg, P., Hibell, B., & Romelsjö, A. (2012). Alcohol use, heavy episodic drinking and subsequent problems among adolescents in 23 European countries: does the prevention paradox apply? *Addiction, 107*(1), 71-80.
<https://doi.org/10.1111/j.1360-0443.2011.03537.x>
- Danzo, S., Connell, A. M., & Stormshak, E. A. (2017). Associations between alcohol-use and depression symptoms in adolescence: Examining gender differences and pathways over time. *Journal of adolescence, 56*, 64-74.
<https://doi.org/10.1016/j.adolescence.2017.01.007>
- Davis, C. G., Thake, J., & Vilhena, N. (2009). Social desirability biases in self-reported alcohol consumption and harms. *Addictive behaviors, 35*(4), 302-311.
<https://doi.org/10.1016/j.addbeh.2009.11.001>
- Defoe, I. N., Dubas, J. S., Figner, B., & van Aken, M. A. G. (2015). A meta-analysis on age differences in risky decision making: Adolescents versus children and adults. *Psychological bulletin, 141*(1), 48-84. <https://doi.org/10.1037/a0038088>
- Degenhardt, L. P., Stockings, E. P., Patton, G. P., Hall, W. D. P., & Lynskey, M. P. (2016). The increasing global health priority of substance use in young people. *Lancet Psychiatry, 3*(3), 251-264. [https://doi.org/10.1016/S2215-0366\(15\)00508-8](https://doi.org/10.1016/S2215-0366(15)00508-8)
- Dir, A. L., Bell, R. L., Adams, Z. W., & Hulvershorn, L. A. (2017). Gender differences in risk factors for adolescent binge drinking and implications for intervention and prevention. *Frontiers in Psychiatry, 8*, 289-289. <https://doi.org/10.3389/fpsyg.2017.00289>
- Dunn, J., & Brown, J. (1991). Relationships, talk about feelings, and the development of affect regulation in early childhood. In *The Development of emotion regulation and dysregulation* (pp. 89-108). Cambridge University Press.
<https://doi.org/10.1017/CBO9780511663963.006>

- Endendijk, J. J., info:eu, r. d. n., Groeneveld, M. G., Bakermans-Kranenburg, M. J., Mesman, J., Leerstoel, B., Development, & Treatment of Psychosocial, P. (2016). Gender-differentiated parenting revisited: Meta-analysis reveals very few differences in parental control of boys and girls. *PLoS One*, *11*(7), e0159193-e0159193. <https://doi.org/10.1371/journal.pone.0159193>
- Feldstein Ewing, S. W., Sakhardande, A., & Blakemore, S.-J. (2014). The effect of alcohol consumption on the adolescent brain: A systematic review of MRI and fMRI studies of alcohol-using youth. *NeuroImage clinical*, *5*(C), 420-437. <https://doi.org/10.1016/j.nicl.2014.06.011>
- Garber, J., Braafladt, N., & Zeman, J. (1991). The regulation of sad affect: An information-processing perspective. In *The Development of emotion regulation and dysregulation* (pp. 208-240). Cambridge University Press. <https://doi.org/10.1017/CBO9780511663963.011>
- Grant, B. F., Goldstein, R. B., Saha, T. D., Chou, S. P., Jung, J., Zhang, H., Pickering, R. P., Ruan, W. J., Smith, S. M., Huang, B., & Hasin, D. S. (2015). Epidemiology of DSM-5 alcohol use disorder: Results from the national epidemiologic survey on alcohol and related conditions III. *JAMA Psychiatry*, *72*(8), 757-766. <https://doi.org/10.1001/jamapsychiatry.2015.0584>
- Griffin, E., McMahon, E., McNicholas, F., Corcoran, P., Perry, I. J., & Arensman, E. (2018). Increasing rates of self-harm among children, adolescents and young adults: a 10-year national registry study 2007–2016. *Social Psychiatry and Psychiatric Epidemiology*, *53*(7), 663-671. <https://doi.org/10.1007/s00127-018-1522-1>
- Gullone, E., Hughes, E. K., King, N. J., & Tonge, B. (2010). The normative development of emotion regulation strategy use in children and adolescents: a 2-year follow-up study. *Journal of Child Psychology and Psychiatry*, *51*(5), 567-574. <https://doi.org/10.1111/j.1469-7610.2009.02183.x>
- Hall, W. D. P., Patton, G. P., Stockings, E. P., Weier, M. B., Lynskey, M. P., Morley, K. I. P., & Degenhardt, L. P. (2016). Why young people's substance use matters for global health. *Lancet Psychiatry*, *3*(3), 265-279. [https://doi.org/10.1016/S2215-0366\(16\)00013-4](https://doi.org/10.1016/S2215-0366(16)00013-4)
- Halpern-Felsher, B. L., & Cauffman, E. (2001). Costs and benefits of a decision: Decision-making competence in adolescents and adults. *Journal of applied developmental psychology*, *22*(3), 257-273. [https://doi.org/10.1016/S0193-3973\(01\)00083-1](https://doi.org/10.1016/S0193-3973(01)00083-1)

- Hofstede, G., Hofstede, G. J., & Minkov, M. (2010). *Cultures and organizations: software of the mind - intercultural cooperation and its importance for survival*.
- Jones, R. M., Van Den Bree, M., Zammit, S., & Taylor, P. J. (2020). Change in the relationship between drinking alcohol and risk of violence among adolescents and young adults: A nationally representative longitudinal study. *Alcohol and alcoholism*, 55(4), 439-447. <https://doi.org/10.1093/alcalc/agaa020>
- Kelly, A. B., Chan, G. C. K., Toumbourou, J. W., O'Flaherty, M., Homel, R., Patton, G. C., & Williams, J. (2011). Very young adolescents and alcohol: Evidence of a unique susceptibility to peer alcohol use. *Addict Behaviors*, 37(4), 414-419. <https://doi.org/10.1016/j.addbeh.2011.11.038>
- Kerr, W. C., & Stockwell, T. I. M. (2012). Understanding standard drinks and drinking guidelines. *Drug and alcohol review*, 31(2), 200-205. <https://doi.org/10.1111/j.1465-3362.2011.00374.x>
- Kroenke, K., Spitzer, R. L., & Williams, J. B. W. (2001). The PHQ-9: Validity of a brief depression severity measure. *Journal of General Internal Medicine*, 16(9), 606-613. <https://doi.org/10.1046/j.1525-1497.2001.016009606.x>
- Kroenke, K., Strine, T. W., Spitzer, R. L., Williams, J. B. W., Berry, J. T., & Mokdad, A. H. (2008). The PHQ-8 as a measure of current depression in the general population. *Journal of affective disorders*, 114(1), 163-173. <https://doi.org/10.1016/j.jad.2008.06.026>
- Latina, D., & Bayram Özdemir, S. (2020). Ethnic harassment and self-harm among immigrant adolescents. *Psychology of Violence*, 11(2), 164-174. <https://doi.org/10.1037/vio0000371>
- Laye-Gindhu, A., & Schonert-Reichl, K. A. (2005). Nonsuicidal self-harm among community adolescents: Understanding the “whats” and “whys” of self-harm. *Journal of youth and adolescence*, 34(5), 447-457. <https://doi.org/10.1007/s10964-005-7262-z>
- Lee, Y. J., Lee, S. I., & Han, K. (2019). Influence of parental stress, depressed mood, and suicidal ideation on adolescents' suicidal ideation: The 2008–2013 Korean national health and nutrition examination survey. *Journal of affective disorders*, 246, 571-577. <https://doi.org/10.1016/j.jad.2018.12.097>
- Lodebo, B. T., Möller, J., Larsson, J.-O., & Engström, K. (2017). Socioeconomic position and self-harm among adolescents: A population-based cohort study in Stockholm, Sweden. *Child and Adolescent Psychiatry and Mental Health*, 11(1), 46-46. <https://doi.org/10.1186/s13034-017-0184-1>

- MacArthur, G. J., Harrison, S., Caldwell, D. M., Hickman, M., & Campbell, R. (2016). Peer-led interventions to prevent tobacco, alcohol and/or drug use among young people aged 11-21 years: a systematic review and meta-analysis. *Addiction, 111*(3), 391-407. <https://doi.org/10.1111/add.13224>
- Madge, N., Hawton, K., McMahon, E. M., Corcoran, P., De Leo, D., de Wilde, E. J., Fekete, S., van Heeringen, K., Ystgaard, M., & Arensman, E. (2011). Psychological characteristics, stressful life events and deliberate self-harm: findings from the child & adolescent self-harm in Europe (CASE) study. *European Child & Adolescent Psychiatry, 20*(10), 499-508. <https://doi.org/10.1007/s00787-011-0210-4>
- Madge, N., Hewitt, A., Hawton, K., Wilde, E. J. d., Corcoran, P., Fekete, S., Heeringen, K. v., Leo, D. D., & Ystgaard, M. (2008). Deliberate self-harm within an international community sample of young people: comparative findings from the Child & Adolescent Self-harm in Europe (CASE) Study. *Journal of Child Psychology and Psychiatry, 49*(6), 667-677. <https://doi.org/10.1111/j.1469-7610.2008.01879.x>
- Michalak, L., Trocki, K., & Bond, J. (2006). Religion and alcohol in the U.S. national alcohol survey: How important is religion for abstention and drinking? *Drug and alcohol dependence, 87*(2), 268-280. <https://doi.org/10.1016/j.drugalcdep.2006.07.013>
- Moan, I. S., Bye, E. K., & Rossow, I. (2021). Stronger alcohol-violence association when adolescents drink less? Evidence from three Nordic countries. *European journal of public health, 31*(4), 866-872. <https://doi.org/10.1093/eurpub/ckab124>
- Mongan, D., & Long, J. (2015). Standard drink measures throughout Europe; peoples' understanding of standard drinks. *RARHA: Joint Actional on Reducing Alcohol Related Harm*.
- Moure-Rodríguez, L., & Caamano-Isorna, F. (2020). We need to delay the age of onset of alcohol consumption. *International Journal of Environmental Research and Public Health, 17*(8), 2739. <https://doi.org/10.3390/ijerph17082739>
- Nadkarni, A., Costa, S., Gupta, D., Fernandes, D., Catalano, A., Velleman, R., Sambari, S., Pednekar, S., Hussain, F., D'Souza, E., Houde, A., Chaudhuri, N., & Heath, A. (2021). The systematic development of a mobile phone-delivered brief intervention for hazardous drinking in India. *Journal of substance abuse treatment, 126*, 108331. <https://doi.org/10.1016/j.jsat.2021.108331>
- Nock, M. (2014). *The Oxford handbook of suicide and self-injury*. Oxford University Press.
- Ohlis, A., Bjureberg, J., Lichtenstein, P., D'Onofrio, B. M., Fruzzetti, A. E., Cederlöf, M., & Hellner, C. (2020). Comparison of suicide risk and other outcomes among boys and

- girls who self-harm. *European Child & Adolescent Psychiatry*, 29(12), 1741-1746.
<https://doi.org/10.1007/s00787-020-01490-y>
- Pape, H., Norström, T., & Rossow, I. (2017). Adolescent drinking - a touch of social class? *Addiction*, 112(5), 792-800. <https://doi.org/10.1111/add.13721>
- Pape, H., Rossow, I., Andreas, J. B., & Norstrøm, T.-A. (2018). Social class and alcohol use by youth: Different drinking behaviors, different associations? *Journal of Studies on Alcohol and Drugs*, 79(1), 132-136.
<https://doi.org/https://doi.org/10.15288/jsad.2018.79.132>
- Pape, H., Rossow, I., & Brunborg, G. S. (2018). Adolescents drink less: How, who and why? A review of the recent research literature. *Drug and alcohol review*, 37(S1), 98-114.
<https://doi.org/10.1111/dar.12695>
- Patalay, P., & Fitzsimons, E. (2021). Psychological distress, self-harm and attempted suicide in UK 17-year olds: prevalence and sociodemographic inequalities. *British Journal of Psychiatry*, 219(2), 437-439. <https://doi.org/10.1192/bjp.2020.258>
- Pearson, M. R., Kirouac, M., & Witkiewitz, K. (2016). Questioning the validity of the 4+/5+ binge or heavy drinking criterion in college and clinical populations. *Addiction*, 111(10), 1720-1726. <https://doi.org/10.1111/add.13210>
- Pitkanen, T., Lyyra, A.-L., & Pulkkinen, L. (2005). Age of onset of drinking and the use of alcohol in adulthood: a follow-up study from age 8-42 for females and males. *Addiction*, 100(5), 652-661. <https://doi.org/10.1111/j.1360-0443.2005.01053.x>
- Quarshie, E. N. B., Waterman, M. G., & House, A. O. (2020). Self-harm with suicidal and non-suicidal intent in young people in sub-Saharan Africa: A systematic review. *BMC Psychiatry*, 20(1), 234-234. <https://doi.org/10.1186/s12888-020-02587-z>
- Rahman, F., Webb, R. T., & Wittkowski, A. (2021). Risk factors for self-harm repetition in adolescents: A systematic review. *Clinical psychology review*, 88, 102048-102048.
<https://doi.org/10.1016/j.cpr.2021.102048>
- Raitasalo, K., Kraus, L., Bye, E. K., Karlsson, P., Tigerstedt, C., Törrönen, J., & Raninen, J. (2021). Similar countries, similar factors? Studying the decline of heavy episodic drinking in adolescents in Finland, Norway and Sweden. *Addiction*, 116(1), 62-71.
<https://doi.org/10.1111/add.15089>
- Reid, M. C., Fiellin, D. A., & O'Connor, P. G. (1999). Hazardous and harmful alcohol consumption in primary care. *JAMA Internal Medicine*, 159(15), 1681-1689.
<https://doi.org/10.1001/archinte.159.15.1681>

- Rossow, I., & Norström, T. (2014). Heavy episodic drinking and deliberate self-harm in young people: a longitudinal cohort study. *Addiction, 109*(6), 930-936. <https://doi.org/10.1111/add.12527>
- Saunders, J. B., Aasland, O. G., Babor, T. F., De La Fuente, J. R., & Grant, M. (1993). Development of the alcohol use disorders Identification test (AUDIT): WHO collaborative project on early detection of persons with harmful alcohol consumption - II. *Addiction, 88*(6), 791-804. <https://doi.org/10.1111/j.1360-0443.1993.tb02093.x>
- Schrijvers, D. L., Bollen, J., & Sabbe, B. G. C. (2011). The gender paradox in suicidal behavior and its impact on the suicidal process. *Journal of affective disorders, 138*(1), 19-26. <https://doi.org/10.1016/j.jad.2011.03.050>
- Singh, V., Epstein-Ngo, Q., Cunningham, R. M., Stoddard, S. A., Chermack, S. T., & Walton, M. A. (2015). Physical dating violence among adolescents and young adults with alcohol misuse. *Drug and alcohol dependence, 153*, 364-368. <https://doi.org/10.1016/j.drugalcdep.2015.05.003>
- Skala, K., & Walter, H. (2013). Adolescence and alcohol: a review of the literature. *Neuropsychiatrie, 27*(4), 202-211. <https://doi.org/10.1007/s40211-013-0066-6>
- Spear, L. (2013). The teenage brain: Adolescents and alcohol. *Current Directions in Psychological Science, 22*(2), 152-157. <https://doi.org/10.1177/0963721412472192>
- StataCorp. (2019). *Stata statistical software: Release 16*. College Station, TX: StataCorp LLC. In
- Stockings, E. D., Hall, W. D. P., Lynskey, M. P., Morley, K. I. P., Reavley, N. P., Strang, J. P., Patton, G. P., & Degenhardt, L. P. (2016). Prevention, early intervention, harm reduction, and treatment of substance use in young people. *Lancet Psychiatry, 3*(3), 280-296. [https://doi.org/10.1016/S2215-0366\(16\)00002-X](https://doi.org/10.1016/S2215-0366(16)00002-X)
- Taliaferro, L. A., McMorris, B. J., & Eisenberg, M. E. (2018). Connections that moderate risk of non-suicidal self-injury among transgender and gender non-conforming youth. *Psychiatry Research, 268*, 65-67. <https://doi.org/10.1016/j.psychres.2018.06.068>
- Trucco, E. M., Colder, C. R., & Wieczorek, W. F. (2011). Vulnerability to peer influence: A moderated mediation study of early adolescent alcohol use initiation. *Addictive behaviors, 36*(7), 729-736. <https://doi.org/10.1016/j.addbeh.2011.02.008>
- Tørmoen, A. J., Myhre, M., Walby, F. A., Grøholt, B., & Rossow, I. (2020). Change in prevalence of self-harm from 2002 to 2018 among Norwegian adolescents. *European journal of public health, 30*(4), 688-692. <https://doi.org/10.1093/eurpub/ckaa042>

- Tørmoen, A. J., Rossow, I., Larsson, B., & Mehlum, L. (2012). Nonsuicidal self-harm and suicide attempts in adolescents: differences in kind or in degree? *Social Psychiatry and Psychiatric Epidemiology*, *48*(9), 1447-1455. <https://doi.org/10.1007/s00127-012-0646-y>
- Usami, S. (2021). On the differences between general cross-lagged panel model and random-intercept cross-lagged panel model: Interpretation of cross-lagged parameters and model choice. *Structural equation modeling*, *28*(3), 331-344. <https://doi.org/10.1080/10705511.2020.1821690>
- Voogt, C. V., Smit, K., Kleinjan, M., Otten, R., Scheffers-van Schayck, M. T. E., & Kuntsche, E. N. (2020). From age 4 to 8, children become increasingly aware about normative situations for adults to consume alcohol. *Alcohol and alcoholism*, *55*(1), 104-111. <https://doi.org/10.1093/alcalc/agz093>
- Watanabe, N., Nishida, A., Shimodera, S., Inoue, K., Oshima, N., Sasaki, T., Inoue, S., Akechi, T., Furukawa, T. A., & Okazaki, Y. (2012). Deliberate self-harm in adolescents aged 12-18: A cross-sectional survey of 18,104 students: deliberate self-harm in adolescents. *Suicide & life-threatening behavior*, *42*(5), 550-560. <https://doi.org/10.1111/j.1943-278X.2012.00111.x>
- Westefeld, J. S. (2019). Suicide prevention and psychology: A call to action. *Professional psychology: research and practice*, *50*(1), 1-10. <https://doi.org/10.1037/pro0000209>
- Zhang, Y.-Y., Lei, Y.-T., Song, Y., Lu, R.-R., Duan, J.-L., & Prochaska, J. J. (2019). Gender differences in suicidal ideation and health-risk behaviors among high school students in Beijing, China. *Journal of Global Health*, *9*(1), 010604-010604. <https://doi.org/10.7189/jogh.09.010604>

Appendix A**Study One: Number of Days of Reported Heavy Episodic Drinking**

| Number of days | Number of participants | Percentage |
|----------------|------------------------|------------|
| Time 1 | | |
| 0 | 2,816 | 94.66 |
| 2 | 92 | 3.09 |
| 12 | 35 | 1.18 |
| 30 | 19 | 0.64 |
| 72 | 11 | 0.37 |
| 192 | 1 | 0.03 |
| 288 | 1 | 0.03 |
| Time 2 | | |
| 0 | 2,454 | 85.89 |
| 2 | 184 | 6.44 |
| 12 | 105 | 3.68 |
| 30 | 78 | 2.73 |
| 72 | 25 | 0.88 |
| 192 | 1 | 0.04 |
| 288 | 10 | 0.35 |
| Time 3 | | |
| 0 | 1,863 | 70.28 |
| 2 | 299 | 11.28 |
| 12 | 242 | 9.13 |
| 30 | 194 | 7.32 |
| 72 | 47 | 1.77 |
| 192 | 3 | 0.11 |
| 288 | 3 | 0.11 |

Note. During the past 12 months. Time measure 1: number of participants = 2,975, mean = .82, standard deviation = 8.15. Time measure 2: number of participants = 2,857, mean = 3.09, standard deviation = 19.22. Time measure 3: number of participants = 2,651, mean = 5.34, standard deviation = 16.69.

Appendix B**Study One: Distribution of Answers Related to Thoughts of Self-Harm**

| Thoughts of self-harm | Number of participants | Percentage |
|----------------------------|------------------------|------------|
| Time 1 | | |
| Not at all | 2,204 | 82.09 |
| Several days | 313 | 11.66 |
| More than half of the days | 76 | 2.83 |
| Nearly everyday | 92 | 3.43 |
| Time 2 | | |
| Not at all | 2,056 | 76.20 |
| Several days | 415 | 15.38 |
| More than half of the days | 102 | 3.78 |
| Nearly everyday | 125 | 4.63 |
| Time 3 | | |
| Not at all | 1,991 | 77.93 |
| Several days | 393 | 15.38 |
| More than half of the days | 87 | 3.41 |
| Nearly everyday | 84 | 3.29 |

Note. Time measure 1: number of participants = 2,685, mean = .28, standard deviation = .68.

Time measure 2: number of participants = 2,698, mean = .37, standard deviation = .77. Time

measure 3: number of participants = 2,555, mean = .32, standard deviation = .70.

Appendix C

Study One: Depression at Time Measure One

| Types of depression | Score range | Number of participants | Percentage |
|---------------------|-------------|------------------------|------------|
| No depression | 0 – 4 | 1348 | 49.18 |
| Mild | 5 – 9 | 892 | 31.54 |
| Moderate | 10 – 14 | 312 | 11.38 |
| Moderately severe | 15 – 19 | 118 | 4.31 |
| Severe | 20 - 24 | 71 | 2.59 |

Note. Depression was measured using the PHQ8. Number of participants = 2,741, mean = 5.70, standard deviation = 5.04, min = 0, max = 24. Types of depression were not accounted for during the analysis of the data. During analysis, depression was used as a string variable. Dividing into types of depression here is for illustration purposes only.

Appendix D

Study One: Trusted Friends at Time Measure One

| Number of friends the participant trust | Number of participants | Percentage |
|---|------------------------|------------|
| None or not sure | 254 | 8.58 |
| One | 272 | 9.19 |
| Two | 490 | 16.56 |
| Three or more | 1,943 | 65.66 |

Note. Number of participants = 2,959, mean = 2.39, standard deviation = .97, min = 0, max = 3.

Appendix E
Study One: Correlation Matrix for Girls

| No. | Variable | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|-----------|-------------------|---------|----------|---------|----------|----------|----------|--------|--------|--------|
| 1. | Grade level T1 | 1 | | | | | | | | |
| 2. | Trusted friend T1 | -.02 | 1 | | | | | | | |
| 3. | Depression T1 | .18*** | -0.26*** | 1 | | | | | | |
| 4. | HED T1 | .10*** | .03 | .10*** | 1 | | | | | |
| 5. | HED T2 | .13*** | -.03 | .07** | .16*** | 1 | | | | |
| 6. | HED T3 | .19*** | .05* | .15*** | .23*** | .20*** | 1 | | | |
| 7. | SH T1 | .04 | -.23*** | .67*** | .14*** | .06* | .13*** | 1 | | |
| 8. | SH T2 | .00 | -.18*** | .46*** | .13*** | .11*** | .11*** | .53*** | 1 | |
| 9. | SH T3 | -.01 | -.14*** | .36*** | .02 | .06* | .10*** | .40*** | .56*** | 1 |
| Range | | 8 to 10 | 0 to 3 | 0 to 24 | 0 to 288 | 0 to 288 | 0 to 288 | 0 to 3 | 0 to 3 | 0 to 3 |
| <i>N</i> | | 1,872 | 1661 | 1,563 | 1,668 | 1,601 | 1,511 | 1,532 | 1,556 | 1,470 |
| <i>M</i> | | 8.91 | 2.40 | 6.82 | .73 | 2.58 | 4.81 | .37 | .45 | .79 |
| <i>SD</i> | | .80 | .96 | 5.41 | 5.69 | 14.81 | 13.15 | .79 | .84 | .75 |

Note. T1 = time measure one. T2 = time measure two. T3 = time measure three. HED = Heavy episodic drinking. SH = Self-harm. *N* = number of participants, *M* = mean, *SD* = standard deviation. *N* = 1,872. * = 0.05 or less, ** = 0.01 or less, *** = 0.001 or less.

Appendix F
Study One: Correlation Matrix for Boys

| No. | Variable | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|-------|-------------------|---------|---------|---------|----------|----------|----------|---------|--------|--------|
| 1. | Grade level T1 | 1 | | | | | | | | |
| 2. | Trusted friend T1 | -.08** | 1 | | | | | | | |
| 3. | Depression T1 | .09** | -.17*** | 1 | | | | | | |
| 4. | HED T1 | .07* | -.07* | .15*** | 1 | | | | | |
| 5. | HED T2 | .05 | -.01 | .06 | .02 | 1 | | | | |
| 6. | HED T3 | .13*** | .06 | .05 | .04 | .07* | 1 | | | |
| 7. | SH T1 | .04 | -.12*** | .57*** | .18*** | .02 | .06 | 1 | | |
| 8. | SH T2 | .10*** | -.063* | .266*** | -.005 | .213*** | .074* | .319*** | 1 | |
| 9. | SH T3 | .064* | -.09** | .25*** | .01 | -.01 | .18*** | .31*** | .33*** | 1 |
| Range | | 8 to 10 | 0 to 3 | 0 to 24 | 0 to 288 | 0 to 288 | 0 to 288 | 0 to 3 | 0 to 3 | 0 to 3 |
| N | | 1,526 | 1298 | 1,178 | 1,307 | 1,256 | 1,140 | 1,153 | 1,142 | 1,085 |
| M | | 8.92 | 2.38 | 4.22 | .93 | 3.75 | 6.04 | .15 | .25 | .23 |
| SD | | .80 | .97 | 4.05 | 10.48 | 23.66 | 20.45 | .47 | .64 | .60 |

Note. T1 = time measure one. T2 = time measure two. T3 = time measure three. HED = Heavy episodic drinking. SH = Self-harm. *N* = number of participants, *M* = mean, *SD* = standard deviation. *N* = 1,526. * = 0.05 or less, ** = 0.01 or less, *** = 0.001 or less.

Appendix G

Study Two: Number of Days of Reported Heavy Episodic Drinking

| Number of days | Number of participants | Percentage |
|----------------|------------------------|------------|
| Time 1 | | |
| 0 | 421 | 94.18 |
| 1 | 5 | 1.12 |
| 2 | 11 | 2.46 |
| 4 | 3 | 0.67 |
| 6 | 2 | 0.47 |
| 15 | 3 | .067 |
| 182 | 2 | 0.45 |
| Time 2 | | |
| 0 | 355 | 79.42 |
| 1 | 8 | 1.79 |
| 4 | 13 | 2.91 |
| 6 | 4 | 0.89 |
| 15 | 3 | 0.67 |
| 132 | 1 | 0.22 |
| Missing | 63 | 14.09 |

Note. During the past 6 months. Time measure 1: Number of participants = 447, mean = 1.03, standard deviation = 12.22. Time measure 2: Number of participants = 384, mean = .68, standard deviation = 6.91.

Appendix H**Study Two: Distribution of Answers Related to Self-Harm Behavior**

| | Self-harm | Number of participants | Percentage |
|--------|-----------|------------------------|------------|
| Time 1 | 0 | 373 | 83.45 |
| | 1 | 37 | 8.28 |
| | 2 | 16 | 3.58 |
| | 3 | 8 | 1.79 |
| | 4 | 4 | 0.89 |
| | 5 | 9 | 2.01 |
| | 6 | 0 | 0.00 |
| | 7 | 0 | 0.00 |
| Time 2 | 0 | 337 | 75.39 |
| | 1 | 19 | 4.25 |
| | 2 | 9 | 2.01 |
| | 3 | 5 | 1.12 |
| | 4 | 0 | 0.00 |
| | 5 | 7 | 1.57 |
| | 6 | 2 | 0.45 |
| | 7 | 5 | 1.12 |
| | Missing | 63 | 14.09 |

Note. Time measure 1: Number of participants = 447, mean = .34, standard deviation = .35.

Time measure 2: Number of participants = 447, mean = .96, standard deviation = 1.19.

Appendix I

Study Two: Depression at Time Measure One.

| Types of depression | Score range | Number of participants | Percentage |
|---------------------|-------------|------------------------|------------|
| No depression | 0 – 4 | 224 | 50.12 |
| Mild | 5 – 9 | 157 | 35.13 |
| Moderate | 10 – 14 | 37 | 8.28 |
| Moderately severe | 15 – 19 | 16 | 3.57 |
| Severe | 20 - 27 | 13 | 2.90 |

Note. Depression was measured using the PHQ8. Number of participants = 447, mean = 5.38, standard deviation = 4.61, min = 0, max = 24. Types of depression were not accounted for during the analysis of the data. During analysis, depression was used as a string variable. The division into types of depression are for illustration purposes only.

Appendix J

Study Two: Trusted Friends at Time Measure One.

| Number of friends the participant trust | Number of participants | Percentage |
|---|------------------------|------------|
| None or not sure | 35 | 7.83 |
| One | 55 | 12.30 |
| Two or more | 357 | 79.87 |

Note. Number of participants = 447, mean = 1.72, standard deviation = .60, min = 0, max = 2.

Appendix K
Study Two: Correlation Matrix for Girls

| No. | Variable | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|-----------|-------------------|---------|---------|--------|----------|----------|--------|--------|
| 1. | Grade level T1 | 1 | | | | | | |
| 2. | Depression T1 | .24*** | 1 | | | | | |
| 3. | Trusted friend T1 | -.07 | -.24*** | 1 | | | | |
| 4. | HED T1 | .12 | .37*** | -.17** | 1 | | | |
| 5. | HED T2 | .22** | .33*** | -.07 | .44*** | 1 | | |
| 6. | SH T1 | .24*** | .60*** | -.20** | .44*** | .48*** | 1 | |
| 7. | SH T2 | .11 | .40*** | -.17* | .34*** | .54*** | .62*** | 1 |
| Range | | 8 to 10 | 0 to 24 | 0 to 2 | 0 to 182 | 0 to 182 | 0 to 7 | 0 to 7 |
| <i>N</i> | | 246 | 245 | 246 | 246 | 217 | 246 | 217 |
| <i>M</i> | | 9.02 | 6.27 | 1.72 | .20 | .37 | .48 | .40 |
| <i>SD</i> | | .86 | 4.96 | .62 | 1.16 | 1.50 | 1.12 | 1.27 |

Note. T1 = time measure one. T2 = time measure two. T3 = time measure three. HED = Heavy episodic drinking. SH = Self-harm. *N* = number of participants, *M* = mean, *SD* = standard deviation. *N* = 246. * = 0.05 or less, ** = 0.01 or less, *** = 0.001 or less.

Appendix L
Study Two: Correlation Matrix for Boys

| No. | Variable | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|-----------|-------------------|---------|---------|---------|----------|----------|--------|--------|
| 1. | Grade level T1 | 1 | | | | | | |
| 2. | Depression T1 | .06 | 1 | | | | | |
| 3. | Trusted friend T1 | .04 | -.18* | 1 | | | | |
| 4. | HED T1 | .13 | .23** | -.29*** | 1 | | | |
| 5. | HED T2 | .13 | -.04 | -.23** | .77*** | 1 | | |
| 6. | SH T1 | .05 | .39*** | -.25*** | .50*** | .26*** | 1 | |
| 7. | SH T2 | -.01 | .12 | -.15 | .33*** | .51*** | .38*** | 1 |
| Range | | 8 to 10 | 0 to 24 | 0 to 2 | 0 to 182 | 0 to 182 | 0 to 7 | 0 to 7 |
| <i>N</i> | | 201 | 197 | 201 | 201 | 167 | 201 | 167 |
| <i>M</i> | | 8.99 | 4.28 | 1.72 | 2.04 | 1.08 | .18 | .28 |
| <i>SD</i> | | .83 | 3.90 | .58 | 18.15 | 10.34 | .67 | 1.08 |

Note. T1 = time measure one. T2 = time measure two. T3 = time measure three. HED = Heavy episodic drinking. SH = Self-harm. *N* = number of participants, *M* = mean, *SD* = standard deviation. *N* = 201. * = 0.05 or less, ** = 0.01 or less, *** = 0.001 or less.