The relationship between vulnerability factors for depression

History of childhood trauma, cognitive reactivity and rumination

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Sálfræðideild
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HÁSKÓLI ÍSLANDS

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Júní 2018

Prentun: Háskólaprent
Reykjavík, Ísland 2018

Abstract

Traumatic childhood events, especially sexual, emotional and physical trauma, have been thought to induce cognitive vulnerability to major depressive disorder. Previous research has indicated that childhood trauma can affect the interpretation of future events, increase sensitivity to sad mood and thus contribute to the development of unhelpful cognitive processes. The aim of the present study was to examine the relation between two purported vulnerability factors, cognitive reactivity and rumination, to childhood trauma. Additionally, the evaluation of the severity of trauma and its effect on rumination tendencies and cognitive reactivity was examined. In this study, 114 participants were assessed on self-report measures of cognitive reactivity, rumination and specific traumatic childhood events. The hypotheses were partially supported. Individuals with a history of childhood trauma demonstrated more rumination tendencies and cognitive reactivity than those without such trauma. These results differed based on the type of childhood trauma experienced: Those who had been exposed to emotional abuse in childhood demonstrated more cognitive reactivity, but not rumination tendencies. Meanwhile, a history of either sexual or physical trauma was not predictive of increased rumination or cognitive reactivity. Finally, the severity of childhood trauma only predicted rumination tendencies for those who have experienced physical trauma in childhood. The results indicate that history of childhood trauma can induce cognitive reactivity and rumination which have been shown to increase the risk for depression. Longitudinal research is needed to further explore the relationship between cognitive reactivity, rumination and history of emotional abuse.

Acknowledgements

This thesis was written under the guidance of Kristján Helgi Hjartarsson and Ragnar P. Ólafsson. We want to thank them for their assistance, perseverance and excellent guidance. We also want to thank Anna Magnea Hreinsdóttir, Karítas Krisjánsdóttir and Ingólfur Hartvigsson for proof reading. Finally, we would like to thank our family and friends for their support.

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Recent research has focused on specific cognitive processes as vulnerability factors for the development, recurrence and maintenance of depression. Traumatic events have been thought to trigger the development of these cognitive processes and might therefore constitute as a major contributor to the development of depression (Ciesla, Felton & Roberts, 2011). Trauma has been defined as a strong response to traumatic events or stressful experiences that are sudden, unexpected, unbearable for the individual or disruptive of important affiliative bonds (McCann & Pearlman, 1990; Van der Kolk, 2003). If the trauma is caused by another human being, for example physical, emotional, or sexual abuse, the effect is more likely to have serious and long-term effect on the individual. The severity of the trauma is also important, with more serious events leading to more adverse psychological consequences. If essential social bonds are ruptured or threatened (e.g seeing a close relative die, being abused by a parent) an individual is more likely to develop psychological inflictions (Rose and Abramson, 1992; Lindert, von Ehrenstein, Grashow, Gal, Braehler & Weisskopf, 2014). Exposure to traumatic events early in life has been connected to the manifestation of diseases in adulthood, especially to depression, post-traumatic stress disorder and anxiety disorders (Blöndal, 2007; Gibb, 2002; Lindert, et al., 2014). Psychological illness is most probable when the trauma is prolonged and happens repeatedly. For example, in cases of domestic violence, sexual, emotional or physical abuse (Blöndal, 2007; Ingram, 2003).

Most people (about 40 to 70%) experience some kind of trauma in their lifetime. However, people respond to traumatic events in different ways, some in a more resilient way than others. The effects of trauma or stressful life events on psychological and physical health have been extensively debated with regards to the fact that not everyone who experiences trauma inevitably develops psychological or physical problems as a consequence (Beasley, Thompson, Davidsson, 2003; Yull, Williams & Joseph, 1991). Although the direct consequences of childhood trauma on adult functioning is still contested, there is an accord of research that shows a significant contribution of childhood trauma in the development of depression (Ingram, 2003; Lindert et al., 2014; Negele, Kaufhold, Kallenbach & Leuzinger-Bohleber, 2015; Wainwright & Surtees, 2002). Traumatic events in childhood seem to be a much too common experience amongst adults with depression, with one study finding a prevalence of almost 75.6% in chronically depressed adults. In the same study emotional abuse

was the most frequent of childhood trauma followed by sexual abuse (Negele, Kaufhold, Kallenbach & Leuzinger-Bohleber, 2015).

Many pathways between traumatic events and depression have been suggested. Wainwright and Surtees (2002) have pointed out specific childhood experiences that are associated with increased rates of depression in adulthood. These include divorce of one's parents, parental loss (especially the loss of a mother) and physical or sexual abuse. Sexual and physical trauma as well as emotional abuse in childhood have especially been connected to major depression (Gibb, Chelminski & Zimmerman, 2007; Rose & Abramson, 1992). Rose and Abramson (1992) have suggested that if a negative event (e.g physical, sexual or emotional abuse) is repetitive and involves a child's caregiver, it can have crippling effects on a child's self-image and negatively affect optimistic views of the future. Importantly, persistent negative events can also lead to a global negative attributional style which makes the individual see the world in a very negative view. Hopelessness can arise as a consequence and the ability to cope with stressors is undermined which can lead to depression later in life. Furthermore, research has indicated that traumatic events in childhood can undermine an individual's capability to cope with future negative events or stressful situations.

Ingram (2003) points out that cognitive vulnerabilities can develop from childhood trauma, especially if the trauma is connected to a child's caregiver or a key attachment figure. The trauma makes the child vulnerable to future stressful experiences due to the development of negative cognitive schemas. An individual with a history of childhood trauma might therefore attach a negative meaning to common stressful events, contributing to depressogenic thinking. It has also been suggested that the interpretation of a traumatic event can be distorted and that this can in turn lead to certain dysfunctional cognitive processes or vulnerabilities that give rise to depression (Beasley et al., 2003; Gibb, 2002; Gibb et al., 2007; Ingram, 2003). Thus, research has demonstrated a strong connection between physical and sexual childhood trauma to major depression, though emotional abuse seems to be one of the strongest predictors for cognitive vulnerabilities. (Gibb, Alloy & Marx, 2003; Rose and Abramson, 1992). Two such depressogenic cognitive processes that are thought to develop in response to childhood trauma are cognitive reactivity and rumination (Ciesla et al., 2011; Robinson & Alloy, 2003).

Cognitive reactivity refers to changes in dysfunctional cognition, detailing how negative cognitive factors can be activated by mild dysphoric mood (Lau, Segal & Williams, 2004; Scher, Ingram & Segal, 2005; Teasdale, 1988). Early research indicated that experiencing

episodes of depression might form a connection between negative thinking patterns and sad mood. Thus, when a depressed individual experiences dysphoric mood it can reactivate certain negative thinking patterns that have previously been associated with depressive episodes. Hence, it is thought that cognitive reactivity is a process of thought-affect cycles, provoked by mood changes (Raes, Dewulf, Van Heeringen, & Williams, 2009). Cognitive reactivity is a vulnerability factor that can predict the onset, relapse and recurrence of depression, differentiating between those not suffering from it and those that do (Lau, Segal, & Williams, 2004; Scher, Ingram & Segal, 2005).

Two theories play a leading part in the development of the concept of cognitive reactivity. The former is Beck's cognitive theory which proposes that in early childhood people develop certain interpretations to explain negative events, referred to as schemas (Beck, 1967). If sources of stress are defined by chronic negativity, abuse or stress, maladaptive schemas could be established. Schemas that mainly reflect dysfunctional attitudes about oneself, the world and the future, causing individuals to develop vulnerability to depression (Lau, Segal & Williams, 2004). Initially, research results demonstrated conflicting support for the role of dysfunctional attitudes in depression, until it was found that schemas need to be activated to cause negative generalization about oneself (Scher, Ingram & Segal, 2005). When activated, they cause a recollection that is connected to negative experiences rather than positive, altering event information to fit negative schemas, causing people to develop vulnerability to depression (Reilly, Ciesla, Felton, Weitlauf & Anderson, 2012).

The second one is Teasdale's (1988) theory that was built on Beck's cognitive theory to define cognitive vulnerability to depression. He proposed that in addition to cognitive schemas which may be activated by different situations, cognitive vulnerability can also be caused by differences in thinking patterns, activated in response to a depressed mood state. Thus, a mild or temporary dysphoria can develop a vulnerability to clinical depression if a cycle of reciprocal relationship between a depressed state and negative thinking is established (Moulds, Kandris, Williams, Lang, Yap & Hoffmeister, 2008). The theory assumes that this relationship will be more substantial among individuals with a history of depression rather than no history (Lau, Segal & Williams, 2004). To test his differential activation theory, Teasdale and Dent (1987) conducted a mood-induction procedure using music intended to evoke sadness. A memory test with a list of self-descriptive adjectives was administered before and after the music was played. Those previously suffering from depression remembered more negative

adjectives regarding oneself than the other participants, presumably caused by the activation of negative self schemas after listening to the music. This affirmed the connection between negative mood and dysfunctional attitude in depression. The results suggest that negative schemas are latent, and that individuals are different to the extent to how easily negative mood states activate negative schemas, regarding the present situation and the future (Miranda & Person, 1988; Teasdale, 1988). Research of Teasdale's hypothesis have mainly been supportive (Lau, Segal & Williams, 2004; Miranda & Person, 1988). The connection between depression and negative schemas in the first episode seems to increase the severity of the next episode. Furthermore, individuals that show maladaptive cognition in response to dysphoric mood are longer to recover from depressive episodes and are more prone to relapse, compared to people that lack maladaptive cognition but do suffer from depression (Miranda, Persons & Byers, 1990; Segal, Gemar & Williams, 1999; Segal, Kennedy, Gemar, Hood, Pedersen & Buis, 2006). Additionally, the more frequently a person experiences an episode, the less stressful an event has to be in order to cause a relapse (e.g., Kendler, Thornton & Gardner, 2000).

Two common types of research methods are applied to study cognitive reactivity, experimental mood inductions and self-report measures. Results from these studies have shown a positive correlation between negative mood and manifestation of dysfunctional attitudes in depressed participants when utilizing a mood induction procedure. In comparison, participants not suffering from depression did not show a connection between the two (Miranda, Gross, Person & Hahn, 1998; Miranda & Persons, 1988). The Leiden Index of Depressive Sensitivity Revised (LEIDS-R) self-report questionnaire, is frequently applied in research studying cognitive reactivity. The questionnaire examines individuals habitual pattern of thinking in response to mood declines and is thought to be suitable to predict depression occurrence (Solis, Antypa, Conijn, Kelderman & Van der Does, 2017). LEIDS-R measures have shown to be a predictive value for depression incidence when other related variables are controlled for (Kruijt, Antypa, Booij, de Jong, Glashouwer, Penninx & Van der Does, 2013). Research, using the LEIDS-R, has shown that individuals with a history of one or more depressive episodes have higher cognitive reactivity than individuals with no former depressive history (Elgersma, de Jong, van Rijsbergen, Kok, Burger, Van der Does & Bockting, 2015). Importantly, research studying the connection between childhood negative life events and negative cognitive styles have shown that, for children, these events increase the negativity of cognitive styles (Gibb, 2002). Research about cognitive reactivity has demonstrated a connection between

dysfunctional cognition and depression. That onset, relapse and recurrence of depressive episodes can partly be because of a development of cognitive reactivity. However, it is still unknown whether individuals with history of childhood trauma demonstrate more cognitive reactivity in response to dysphoric mood.

Rumination is another unhelpful cognitive process that is likely to develop following a childhood trauma and is associated with dysphoric mood and risk for depression (Nolen-Hoeksema & Morrow, 1993; Robinson & Alloy, 2003; Wilkinson, Croudace & Goodyer, 2013). According to the response styles theory (RST; Nolen-Hoeksema, 1991) rumination is a process or a style of thought that emerges in response to stressors. Rumination is considered to be a repetitive passive way of thinking about possible causes, results and meaning of one's thoughts independent of their content (Papageorgiou & Wells, 2003). According to the RST, four processes are suggested to explain the development and maintenance of dysphoric mood by rumination. First, rumination prevents the person to develop helpful coping skills that could increase positive mood. Second, rumination makes a person prone to retrieve negative memories, to explain their thoughts, which further enhances depressive affect. Third, rumination hinders a person to show instrumental behaviour that could enhance their mood. Finally, a person who responds by ruminating is more likely to lose social support, which can further induce depression (Papageorgiou & Wells, 2003). Rumination is often measured with the Ruminative Responses Scale (RRS), a self-report measure, that has two subscales that measure brooding and reflective pondering. Brooding entails passively dwelling on one's current emotional state and comparing it to an ideal state. Reflective pondering entails intention of seeking understanding of one's thoughts (Papageorgiou & Wells, 2003).

Substantial amount of research has made evident that emotional, physical and sexual abuse in childhood is associated with unhelpful coping strategies and rumination (Conway, Mendelson, Giannopoulos, Csank & Holm, 2004; Heleniak, Jenness, Vander Stoep, McCauley & McLaughlin, 2016; Paredes & Calvete, 2014). Abused children often express a feeling of having no control over their own lives and thus may be more prone to respond to stressors by ruminating (Papageorgiou & Wells, 2003). Recent research has demonstrated an interaction between negative cognition and rumination, that individuals who have high levels of negative cognition and rumination tendencies are more likely to show depressive symptoms than individuals with low levels of negative cognition in addition to rumination tendencies (Ciesla & Roberts, 2002). Ciesla and colleagues (2011), tested a diathesis-stress model of the

maintenance of depression and found that negative cognitive content, rumination and being exposed to traumatic life events were predictors of depressive symptoms. Thus, previous research has demonstrated a relationship between childhood trauma and both negative cognitive styles and rumination. Meanwhile, there are limited amount of research examining the relationship between childhood trauma and cognitive reactivity and rumination simultaneously.

It has been hypothesised that specific childhood trauma is more likely to induce negative cognitive styles than others. A study conducted by Rose and Abramson looked at different types of childhood maltreatment and found that emotional maltreatment was inclined to induce the development of negative cognitive styles, more so than physical or sexual maltreatment. They hypothesized that when a child experiences emotional abuse, a negative talk is directly imposed upon the child instead of them finding their own explanation for the abuse (Rose & Abramson, 1992). Gibb, Alloy and Marx (2003) conducted a follow-up study on Rose and Abramson's findings for the relationship between emotional trauma and negative cognitive styles. Their results supported the notion that emotional abuse contributes to negative cognitive styles and rumination tendencies. Raes and Hermans (2008) found rumination to play a mediative role in the relationship between emotional abuse in childhood and depression. When they examined brooding and rumination seperetaley, brooding seemed to be a mediator in the relationship between emotional abuse in childhood and depressive symptoms, not reflective pondering. A longitudinal study by Paredes and Calvetes (2014) found that brooding is an important factor explaining the link between emotional abuse in childhood and depressive symptoms as adolescents. Thus, substantial amount of research supports the notion that specifically emotional abuse in childhood might lead to unhelpful cognitive processes that predisposes children to future depression.

Research on possible causes and vulnerability factors for the first onset of depression as well as research on what causes it to be lingering and recurrent are very important, especially for prevention purposes. While rumination and cognitive reactivity have previously been studied in relation to childhood trauma there is a shortage of research examining both vulnerability factors simultaneously. Studying both factors generates information about the interactive relationship between them. The aim of this study is to explore the relation between these vulnerability factors to childhood trauma using self-report measures. Based on previous research, we expect those who have experienced sexual trauma, physical trauma or emotional abuse in childhood to show more rumination tendencies and cognitive reactivity on self report

measures than others. We also expect to replicate the results of previous studies that have demonstrated that those who experience emotional abuse are more likely to develop rumination tendencies and cognitive reactivity than those who experience sexual or physical trauma. Additionally, in accordance with research mentioned previously, we expect that the more severely a person evaluates a trauma they have experienced, the more rumination tendencies and cognitive reactivity a person displays. In addition to the self-report measures discussed in the current thesis, further measures of these factors, using experimental testing, were also administered. These measures can be found in corresponding thesis papers on the study.

Method

Participants

The participants in the study were 114 in total, 27 males and 87 females. The participants were all volunteers that responded to an email sent to all students of the University of Iceland. Students were also recruited from classroom lectures. Inclusion criteria were being a student at the University of Iceland, aged 18 years or older, and access to a smartphone (Android/Iphone) that supported the experience sampling application used in the study. Participants were rewarded for their participation in the study with a monetary reward (value: 4000 isk).

Measures

Beck Depression Inventory-II (BDI-II)

Residual depressive symptoms were assessed with the BDI-II (Beck, Steer & Brown, 1996), a 21 item self-report measure that evaluates the severity of depressive symptoms over the past two weeks. Each item has a four-point scale, from 0 to 3. The total score ranges from 0 to 63 and higher scores indicate more serious symptoms of depression. The questionnaire has demonstrated both good reliability and psychometric properties according to research (Dozois, Dobson & Ahnberg, 1998). The BDI-II was translated by Jón Friðrik Sigurðsson, Ásrún Matthíasdóttir, Anna Kristín Newton and Gísli Guðjónsson. The translated version has also demonstrated similar psychometric properties as the original version, which was supported by Icelandic clinical and student population studies (Arnarson, Ólason, Smári & Sigurðsson, 2008).

Beck Anxiety Inventory (BAI)

Anxiety symptoms were assessed with the BAI scale (Beck, Epstein, Brown & Steer, 1988), a 21 item self-report scale designed to measure anxiety symptoms and their severity over the past week. It is designed to differentiate between depression and anxiety and is used as a second measure in a diagnosis process (Bardhoshi, Duncan & Erford, 2016). The respondents answer how much each symptom have bothered them, over the past week, on a Likert scale from not at all bothered to severely bothered. The total score can range from 0 to 63, where scores above 26 indicates severe anxiety (Beck, Steer & Brown, 1996). Research regarding the BAI scale demonstrate strong internal consistency and that the scale is a good tool to differentiate between anxiety and depression (Bardhoshi, Duncan & Erford, 2016). The BAI scale was translated to Icelandic by Jón Friðrik Sigurðssona and Gísli Guðjónsson. The psychometric properties of the

translated version have been tested, administered and measured with comparable reliability and validity as the original version (Sæmundsson et al., 2011).

The Leiden Index of Depression Sensitivity Revised (LEIDS-R)

The LEIDS-R (Van der Does & Williams, 2003), a 34 item self-report scale, was administered to assess cognitive reactivity to sadness. The instructions include a scale, ranging from 0 (not at all sad) to 10 (very depressed). The respondents think of an event or circumstance where they last felt somewhat sad (number 3 or 4 on the scale) and are asked to imagine themselves in that particular event or situation. Respondents then rate to what extent they were able to imagine such a situation, from well to not at all. The 34 items on the scale describe certain styles of thinking in response to sadness categorized into six subscales: Hopelessness/Suicidality, Acceptance/Coping, Aggression, Control/Perfectionism, Risk aversion and Rumination (Solis, Antypa, Conijn, Kelderman & Van der Does, 2017). Respondents answer on a Likert scale from 0 (not at all) to 4 (very strongly) how well each item applies to them. The total score can range from 0 to 136, the higher the score the more of an indication for cognitive reactivity (Van der Does & Williams, 2003). The LEIDS-R has been reported to have good psychometric properties, including validity and reliability (Solis, 2015). Research have indicated that the scale can differentiate between people who have experienced depression and those who never have (Van der Does, 2002). The LEIDS-R was translated into Icelandic in 2011 by Sigrún Þ. Sveinsdóttir and Ragnar P. Ólafsson (Sveinsdóttir, 2011). An evaluation of the psychometric properties of the Icelandic version found it to have comparable internal consistency to the original version (Ellertsdóttir, 2015).

The Ruminative Responses scale of the Response Style Questionnaire (RRS)

The RRS (RRS; Nolen-Hoeksema & Morrow, 1993), a 22 item self-report measure, was used to measure tendencies to ruminate in response to depressed mood. The items describe responses to dysphoric mood that are focused on the self, on symptoms and on the possible causes and consequences of their depressed mood. Each item is rated on a scale from 1 (almost never) to 4 (almost always). The total score ranges from 22 to 88 and a high total score indicates a higher tendency to ruminate (Nolen-Hoeksema & Morrow, 1993). The RRS has two rumination subscales, brooding and reflective pondering. Each subscale consists of five questions. The remaining 12 questions measure responses more generally related to depression (Treynor,

Gonzalez & Nolen-Hoeksema, 2003). The RRS has demonstrated good internal consistency and has been found to correlate strongly with an experimental measure of ruminative responses (Nolen-Hoeksema & Morrow, 1993). The RRS was translated into Icelandic by Jakob Smári Pétursson. It has been administered with compatible psychometric properties as the English version (Pálsdóttir & Pálsdóttir, 2008).

The Childhood Traumatic Events Scale – Recent Traumatic Events Scale

Traumatic event history was assessed with a 12 item self-report questionnaire combined from two different scales (Pennebaker & Susman, 1988). Measuring traumatic life events before and after the age of 17 (e.g. death of someone closely related, sexual abuse or violence). The Childhood Traumatic Events Scale was exclusively examined in this thesis. In the scale, the respondent is asked to write down at what age the traumatic event occurred and also asked to rate the seriousness of the trauma from a scale ranging from 0 (not at all) to 7 (extremely traumatic). The questionnaire was translated to Icelandic by Ragnar P. Ólafsson (Pétursson, 2016). The psychometrics properties of the Icelandic version are currently being assessed. An additional question regarding childhood emotional abuse was added to the scale by the investigators: "Prior to the age of 17, did a parent or any other adult curse, belittle or humiliate you frequently?".

Procedure

The study was approved by the Icelandic Science Review Board and the Icelandic Data Protection Authority. The study was conducted in a quiet and well-lit room with only one participant partaking at a time. After giving informed consent the participants provided demographic information. The participants answered 11 questionnaires in a counterbalanced order. Only four of the questionnaires were examined in this thesis (RRS, LEIDS-R, BDI-II, BAI). The participants received 4000 ISK, one week after their visit, for their participation in the study.

Statistical analysis

The statistical analysis was conducted in the Statistical Package for the Social Sciences (SPSS). Single missing values were replaced with the series mean. Missing questionnaires were omitted in the analysis. Pearson correlation was computed between the questionnaires used in the thesis. Analysis of Covariance (ANCOVA) were administered, controlling for BDI-II scores. First, to compare LEIDS-R and RRS scores for individuals who had experienced either sexual trauma, physical trauma or emotional abuse to those who have not. Second, to compare LEIDS-R and RRS scores for each type of trauma separately. Multiple linear regression was computed to form a model predicting BDI-II scores based on RRS, LEIDS-R and trauma history as well to examine the relationship between cognitive reactivity, rumination and history of emotional abuse in childhood. Single linear regression was computed to assess how the individual's evaluation of the severity of the trauma effects the RRS and LEIDS-R scores. Multiple linear regression was used to analyze the effect of the severity of the trauma on RRS and LEIDS-R scores while controlling for BDI-II scores.

Results

Demographic information and descriptive statistics

Participants were divided into two groups based on their trauma history, the first group included those who indicated a history of childhood sexual trauma, physical trauma or emotional abuse and the second group indicated none of these experiences in childhood. Table 1 shows the demographic information between the two groups. The gender ratio varies between groups, where the *trauma* group's vast majority (82%) is women meanwhile, in the *no trauma* group women slightly outnumber men (61%). Marital status and education level is nearly equivalent in both groups.

Table 1. Demographic information between groups, with history of trauma or no history of trauma.

	Trauma (*n*=82)	*No trauma* (*n*=31)
Gender, female: *n*	67 (82%)	19 (61%)
Gender, male, *n*	15 (18%)	12 (39%)
Age (in years): *M (Sd)*	23 (22%)	23,5 (2,9)
Marital status: *n*		
Single	37 (45%)	13 (41%)
In a relationship	27 (33%)	12 (39%)
Cohabiting	12 (15%)	4 (13%)
Married	6 (7%)	2 (7%)
Level of education		
Upper secondary school	69 (84%)	26 (84%)
University degree	13 (16%)	5 (16%)

n = number of participants, M = Mean, Sd = Standard deviation, % = percentage per group.

Internal consistency (Cronbach's alpha) was measured for all questionnaires (see table 2). All of the questionnaires had adequate internal consistency. Mean score for BDI-II was relatively low, however, since the sample is a student sample and not a clinical sample it is expected.

Table 2. Means, standard deviations and internal consistency for all questionnaires (RRS, LEIDS-R, BDI-II & BAI).

	Mean	SD	α
RRS	49.1	12.0	.90
Brooding	11.1	3.4	.80
Reflective. pond.	10.0	3.4	.76
LEIDS-R	53.3	17.6	.87
BDI-II	16.4	11.0	.91
BAI	15.7	11.2	.92

Mean= mean, SD=standard deviation, α=alpha, RRS = The Rumination Response Scale (brooding and reflective pondering are subscales), LEIDS-R = The Leiden Index of Depression Sensitivity Revised, BDI-II = The Beck Depression Inventory (2nd edition), BAI = Beck Anxiety Inventory.

Trauma history and correlation between measures of cognitive vulnerability

Measures of cognitive vulnerability and symptoms status were significantly correlated in the majority of cases (see table 3). Notably, the correlation between LEIDS-R and RRS was moderate in both the *trauma* group, $r(80)= .68$, $p < 0.01$, and the *no trauma* group, $r(29)= .65$, $p < 0.01$. In the *trauma* group the brooding subscale showed a stronger correlation to RRS, $r(80)= .82$, $p < 0.01$, than to reflective pondering, $r(80)= .64$, $p < 0.01$. Meanwhile, in the *no trauma* group there was a small difference between the subscales of RRS, though both brooding, $r(29)= .72$, $p < 0.01$, and reflective pondering, $r(29)= .77$, $p < 0.01$, had a strong correlation to RRS.

When comparing the groups, the biggest difference between correlations seemed to be between BDI-II and the RRS scores. In the *trauma group* the correlation between RRS and BDI was strong, $r(80)= .70$, $p < 0.01$ but the correlation was notably weaker in the *no trauma group*, $r(29)= .52$, $p < 0.01$.

Table 3. Correlation matrix between questionnaires based on groups with history of trauma or no history of trauma.

	RRS	Brooding	Refl, pond	LEIDS-R	BDI-II	BAI
Trauma						
RRS	—					
Brooding	.82**	—				
Refl, pond	.64**	.37**	—			
LEIDS-R	.68**	.60**	.34**	—		
BDI-II	.70**	.60**	.28**	.59**	—	
BAI	.48**	.47**	.27**	.54**	.68**	—
No trauma						
RRS	—					
Brooding	.72**	—				
Refl, pond	.77**	.48**	—			
LEIDS-R	.65**	.66**	.26**	—		
BDI-II	.52**	.42**	.17	.67**	—	
BAI	.57**	.38**	.36**	.47**	.50**	—

* = p < .05. ** = p < .01. RRS = The Rumination Response Scale (brooding and reflective pondering are subscales), BDI-II = The Beck Depression Inventory (2nd edition), LEIDS-R = The Leiden Index of Depression Sensitivity Revised (No rum = rumination subscale removed from LEIDS-R), BAI = Beck Anxiety Inventory.

Comparing LEIDS-R and RRS scores between the trauma and no trauma group

ANCOVA was conducted to compare LEIDS-R and RRS scores between the *trauma* and *no trauma* group, controlling for BDI-II scores. As table 4 displays, there was a significant main effect for trauma history on both LEIDS-R scores, $F(1, 110) = 13.78$, $p < 0.01$, and RRS scores, $F(1, 110) = 3.99$, $p < 0.05$. There was also a significant main effect for trauma history on both subscales of the RRS, brooding; $F(1, 110) = 7.27$, $p < 0.01$, and reflective pondering; $F(1, 110) = 3.956$,

$p < 0.05$. Meanwhile there was not a significant main effect for trauma history on the BDI-II scores, $t(112) = 1.9$, $p = 0.057$.

Table 4. Comparison of participants with trauma versus no trauma on self-report measures (LEIDS-R, RRS).

	Trauma		No trauma	
	M	Sd	M	Sd
BDI-II	17.6	11.2	13.2	10.2
LEIDS-R	57.4 **	17.6	42.8**	12.8
RRS	50.9*	11.8	44*	11.2
Brooding	11.7**	3.6	9.4**	2.3
Reflective pondering	10.6*	3.4	8.8*	3.4

M = Mean, Sd = standard deviation. ** = $p < .01$ * = $p < .05$.

A multiple linear regression was computed to predict BDI-II scores based on RRS score, LEIDS-R score and trauma history. A model with all three factors was significant $F(3, 109) = 35.8$, $p < 0.01$, $R^2 = 0.49$. When examining each partial effect, LEIDS-R score, $\beta = 0.32$, $t(109) = 3.26$, $p < 0.01$, was a significant predictor, as well as RRS score, $\beta = 0.46$, $t(109) = 4.88$, $p < 0.01$, whereas trauma history, $\beta = 0.06$, $t(109) = 0.77$, $p = 0.44$, was not a significant predictor.

Next, the effects of emotional, sexual and physical trauma were examined separately (see table 5). A one-way ANCOVA was conducted to compare LEIDS-R and RRS scores for those who have experienced a specific type of trauma to those who have not, controlling for BDI-II score. When comparing LEIDS-R and RRS scores for those who have experienced emotional abuse to those who have not, there was a significant main effect for history of emotional abuse on LEIDS-R; $F(1, 110) = 5.5$, $p < 0.05$. However there was not a significant main effect for history of emotional abuse on RRS; $F(1, 110) = 0.79$, $p = 0.38$. When comparing those who have experienced sexual trauma to those who have not, there was not a significant main effect for sexual trauma on LEIDS-R scores, $F(1, 110) = 3.09$, $p = 0.08$, nor RRS scores, $F(1, 110) = 0.03$, $p = 0.86$. Additionally, when comparing those who have experienced physical trauma to those who have not there was not a significant main effect for history of physical trauma on LEIDS-R scores, $F(1, 110) = 0.13$, $p = 0.715$, nor RRS scores, $F(1, 110) = 0.22$, $p = 0.64$.

Table 5. Comparison of LEIDS-R and RRS scores for those who have experienced emotional abuse, sexual or physical trauma.

	Yes			No		
	n	LEIDS-R (*m)*	RRS (*m*)	*n*	LEIDS-R (*m*)	RRS (*m*)
Emotional abuse	27	57.3*	51.9	86	47*	44.4
Sexual trauma	24	58.5	49.9	89	51,9	48.8
Physical trauma	21	59.1	51.7	92	51,9	48.4

n = number of participants, *m* = Mean, * = $p < .05$.

Next, logistic regression was conducted to examine if rumination or cognitive reactivity affect the likelihood that participants have a history of childhood trauma. The logistic regression model for sexual trauma was not statistically significant, $X^2(2) = 3.65$, $p = 0.161$. The results showed that neither LEIDS-R scores, $\beta = 0.03$, OR = 1.04, $p = 0.07$, nor RRS scores, $\beta = -0.03$, OR = 0.97, $p = 0.29$, were predictors of whether someone has experienced sexual trauma in childhood. When predicting experience of physical abuse, the logistic regression was not statistically significant $X^2(2) = 2.65$, $p = 0.27$. Neither LEIDS-R scores, $\beta = 0.02$, OR = 1.02, $p = 0.24$, nor RRS scores, $\beta = -0.01$, OR = 0.99, $p = 0.97$, were significant predictors. Meanwhile, when predicting whether a person has experienced emotional abuse in childhood, the model was statistically significant, $X^2(2) = 6.45$, $p < 0.05$. The model explained 83% (Nagelkerke R^2) of the variance in history of childhood trauma and correctly classified 74.3% of cases. LEIDS-R was a significant predictor, $\beta = 0.04$, OR = 1.04, $p < 0.05$, but RRS was not, $\beta = -0.01$, OR = 0.99, $p = 0.616$.

Examining the relation between rumination, cognitive reactivity and emotional abuse in childhood

Since the logistic regression indicated that cognitive reactivity increases the likelihood of whether a person has experienced emotional abuse whereas rumination does not, a multiple linear regressions models were used to further examine the relation between cognitive reactivity, rumination and emotional abuse in childhood. A model predicting RRS scores from LEIDS-R score and history of emotional abuse was significant $R^2 = 0.48$, $F(2, 110) = 51.4$, $p <$

0.01). LEIDS-R score $\beta = 0.48$, $t(110) = 9.95$, $p < 0.01$, was a significant predictor meanwhile history of emotional abuse was not, $\beta = -0.92$, $t(110) = -0.46$, $p = 0.64$. A model predicting LEIDS-R scores based on RRS and history of emotional abuse was also significant, $R^2 = 0.50$, $F(2, 110) = 51.2$, $p < 0.01$. Both RRS scores, $\beta = 0.98$, $t(110) = 9.95$, $p < 0.01$, and history of emotional abuse, $\beta = 6.0$, $t(110) = 2.15$, $p < 0.05$ were significant predictors. Next, a model predicting LEIDS-R from brooding, reflective pondering and emotional abuse was examined to see if both subscales were significant predictors. The model was significant as expected, $R^2 = 0.46$, $F(3, 109) = 31.6$, $p < 0.01$. Brooding, $\beta = 3.1$, $t(109) = 7.74$, $p < 0.01$, and emotional abuse, $\beta = 3.1$, $t(109) = 2.56$, $p < 0.05$, were significant predictors meanwhile reflective pondering was not, $\beta = 0.45$, $t(109) = 1.14$, $p = 0.26$. In summary, both rumination, especially the brooding subscale, and history of emotional abuse predicted cognitive reactivity. However, only cognitive reactivity, not history of emotional abuse, predicted rumination tendencies.

To examine if the relationship between RRS and LEIDS-R, for individuals with a history of emotional abuse, is determined by specific subscales, correlations between subscales of each measure was computed (see table 6). All subscales of LEIDS-R showed a significant correlation to RRS except for the Acceptance subscale, $r(25) = .21$, $p = 0.29$. Reflective pondering did not show a significant correlation with any of the LEIDS-R subscales. Meanwhile, brooding showed a significant correlation with the Hopelessness $r(25) = .63$, $p < 0.01$, Aggression $r(25) = .47$, $p < 0.05$, Risk/Aversion $r(25) = .55$, $p < 0.01$, and Rumination $r(25) = .48$, $p < 0.05$, subscales. Thus, it confirms the results of the multiple linear regression that brooding has a strong relation to rumination tendencies and cognitive reactivity, for individuals with history of emotional abuse in childhood, but not reflective pondering.

Table 6. Correlation between RRS and LEIDS-R subscales for individual with history of emotional abuse.

	RRS	Brood-ing	Refl, pond	LEIDS-R	Hope-less	Accept	Aggre-ssion	Con-trol	Risk avers.	Rumi-nation
RRS	—									
Brooding	.86**	—								
Refl, pond	.76**	.50**	—							
LEIDS-R	.75**	.69**	.46*	—						
Hopeless	.57**	.63**	.18	.78**	—					
Acceptance	.21	.09	.30	.39*	.15	—				
Aggression	.45*	.47*	.35	.67**	.51**	.41*	—			
Control	.40*	.27	.31	.61**	.30	.31	.33	—		
Risk avers.	.58**	.55**	.35	.58**	.43*	-.11	.03	.14	—	
Rumination	.54**	.48*	.29	.68**	.42*	.06	.26	.25	.56**	—

* = p < .05. ** = p < .01. RRS = The Rumination Response Scale (Brooding and Reflective pondering are subscales), LEIDS-R = The Leiden Index of Depression Sensitivity Revised (Hopeless, Acceptance, Aggression, Control, Risk aversion and Rumination are subscales).

Effect of self-reported evaluation of the severity of childhood trauma on RRS and LEIDS-R scores

A simple linear regression was computed to predict RRS and LEIDS-R scores based on how much the participants rated the severity of their trauma from 1-7 ("How traumatic was this for you?"). First, the results of the regression indicated that the self-reported severity of emotional abuse explained 23,6% of the RRS score variance, $F(1, 25) = 7.7$, $p = 0.01$, $R^2 = 0.24$, and explained 15,3% of the LEIDS-R score variance, $F(1, 25) = 4.5$, $p = 0.04$, $R^2 = 0.153$. Second, the severity of physical trauma explained 50.5% of the RRS score variance, $F(1, 19) = 19.4$, $p < 0.01$, $R^2 = 0.51$, and 27% of the LEIDS-R score variance, $F(1, 19) = 7.03$, $p = 0.02$, $R^2 = 0.27$. Third, the severity of sexual trauma did not explain a significant portion of the RRS score

variance, $R^2 = 0.02$, $F(1, 23) = 0.47$, $p = 0.5$, nor the LEIDS-R score variance, $R^2 = 0.02$, $F(1, 23) = 0.47$, $p = 0.49$, and thus didn't have a significant effect.

Next, a multiple linear regression was computed to see if controlling for BDI-II scores would affect the relationship between the evaluation of severity and RRS and LEIDS-R scores. When controlling for BDI-II score, the predicting factor of self reported severity on RRS and LEIDS-R score ceased to exist for emotional abuse LEIDS-R; $\beta = 1.28$, $t(24) = 1.14$, $p = 0.26$, RRS; $\beta = 2.18$, $t(24) = 2.04$, $p = 0.05$. For sexual trauma the severity remained a non-predictor as before, LEIDS-R; $\beta = 0.00$, $t(22) = -0.19$, $p = 0.84$, RRS; $\beta = 0.00$, $t(22) = 0.09$, $p = 0.92$. Meanwhile, for those with history of physical trauma, evaluation of the severity of the trauma was a significant predictor for RRS scores; $\beta = 2.92$, $t(18) = 3.05$, $p < 0.01$ but not LEIDS-R scores; $\beta = 2.76$, $t(18) = 1.45$, $p = 0.16$.

Discussion

The primary aim of this study was to examine the relation between cognitive reactivity and rumination to childhood trauma. The results partly supported the hypotheses of the study. First it was expected that those who have experienced sexual trauma, physical trauma or emotional abuse in childhood would show more rumination tendencies as well as cognitive reactivity than those without such trauma. This hypothesis was supported, where individuals who had experienced these types of trauma or abuse as mentioned previously, demonstrated more cognitive reactivity and rumination than those without such trauma. This is in coherence with previous studies on the matter, that demonstrate that negative life events in childhood increase negative cognitive processes, such as cognitive reactivity and rumination (see e.g. Gibb, 2002; Gibb, Chelminski & Zimmerman, 2007; Nolen-Hoeksema & Morrow, 1993; Robinson & Alloy, 2003; Rose & Abramson, 1992; Wilkinson, Croudace & Goodyer, 2013). To further broaden the information about the interaction between cognitive reactivity and rumination these factors were examined simultaneously in relation to childhood trauma. The results demonstrated a correlation between cognitive reactivity and rumination for those who have experienced sexual trauma, physical trauma or emotional abuse and for those who have not experienced these kinds of trauma. This implies that those who show a tendency to ruminate about the causes, meanings and implications of their thoughts are also more likely to show a maladaptive cognitive style that includes hopelessness, suicidal thoughts etc. This seems to be indifferent to whether an individual has experienced trauma or not. All the same, brooding correlated more strongly to cognitive reactivity than reflective pondering in both groups. Brooding entails comparing your current state to an ideal state, so a possible interpretation may be that those who show high cognitive reactivity may be prone to look at their current state in a more negative light than others. These results are consistent with previous research (e.g, Conway, Mendelson, Giannopoulos, Csank & Holm, 2004; Heleniak, Jenness, Vander Stoep, McCauley & McLaughlin, 2016; Papageorgiou & Wells, 2003; Paredes & Calvete, 2014).

Second, we expected those who have experienced emotional abuse to be more likely to develop rumination tendencies and cognitive reactivity than individuals who have experienced sexual or physical trauma. The hypothesis was partially supported. Participants who had experienced emotional abuse in childhood demonstrated more cognitive reactivity than those without a history of emotional abuse. However, a history of emotional abuse was not associated with greater rumination tendencies as expected. Neither sexual nor physical trauma were

associated with greater levels of rumination and cognitive reactivity. These results are consistent with the findings of Rose and Abramson (1992) that emotional abuse induces negative cognitive processes but is not in accordance the findings of Gibb, Alloy and Marx (2003) that emotional abuse is associated with greater levels of rumination tendencies. Interpretation of the connection between emotional abuse in childhood and cognitive reactivity can vary. The most prevalent hypothesis is that children who experience emotional abuse do not conceive their own ideas about the reason for the abuse and thus are more likely to develop a negative cognitive pattern. The limited influence of emotional abuse on rumination tendencies, demonstrated in this study, is not in coherence with previous research. Longitudinal research has found rumination to play a mediative role in the relationship between emotional abuse in childhood and depression (Raes and Hermans, 2008). Since the current study is retrospective and cross-sectional it is inadvisable to infer about such mediation relationships. This might be a reason for why emotional abuse in childhood did not associate with higher levels of rumination tendencies. Interestingly, both rumination, cognitive reactivity and history of emotional abuse predicted cognitive reactivity, whereas cognitive reactivity, but not history of emotional abuse, predicted rumination tendencies. These results can be an indication that emotional abuse leads to cognitive reactivity which induces rumination tendencies. Nonetheless, since these results are only exploratory and cross-sectional in nature, the interpretation of directionality and causation is limited.

The third hypothesis was not supported, since the results demonstrated that that severity of the trauma seems to be dependent on the measure of depressive symptoms at the time of answering the self-report questionnaires. When controlling for depressive symptoms, the severity of the trauma was only predictive for rumination tendencies for those who have experienced physical trauma. Thus, it implies a retrospective bias when interpreting the severity of the trauma. These results are not in accordance with research suggesting that an interpretation of the severity of a traumatic event affects dysfunctional cognitive processes that give rise to depression (Beasley et al., 2003; Gibb, 2002; Gibb et al., 2007; Ingram, 2003).

As with all research, the results from this study should be interpreted with regard to its limitations. The cross-sectional design of the study limits the ability to infer about causal interactions between cognitive reactivity, rumination and trauma history. For that reason, the interpretation of how emotional abuse affects rumination tendencies and cognitive reactivity in this text is only suggestive, not causative. A more applicable research design would be

longitudinal, as Raes and Hermans (2008) used in their study of the effect of emotional abuse in childhood on depression. The sample of this study is a homogeneous sample with exclusively University Students who all volunteered to participate. Females are also over represented in the sample which makes the sample unlikely to be representative of the general population, which limits the generalizability of the study. Nonetheless, limitations can expand the possibilities of further research. It would be interesting to examine the mediation relationship between the factors examined in this study, with a research design that allows interpretations of such relationships. Since this study consist of a non-clinical sample it would be interesting to research a clinical sample with an equal sex ratio. Longitudinal research within a clinical sample about the impact of childhood trauma on cognitive reactivity and rumination could be examined in a broader coherence, with the mediation relationship mentioned above in mind.

As already stated, it is essential to bear in mind that most people experience trauma in their lifetime. To struggle with negative events is usually an unavoidable part of people's lives. Not everyone who goes through such experiences as children grow up to be depressed adults (Yule, Williams & Joseph, 1999). Still, there is increasing evidence for a causal relationship between childhood trauma and the development of depression. Even though the results of the present study do not support the second hypothesis in full, the findings replicate previous research indicating that cognitive vulnerabilities to depression, such as rumination and cognitive reactivity, might develop as a consequence of childhood emotional, sexual or physical trauma. The results of the present study indicate a strong relationship between cognitive reactivity and rumination. Cognitive reactivity and rumination tendencies have not been studied concurrently in a wide range of research. This shortage of information about the relation between two vulnerability factors which are both considered influential contributors to depression, urge for further research. Preceding research has suggested an interaction between negative cognition and rumination tendencies. Individuals with high levels of negative cognition and rumination tendencies are more likely to show depressive symptoms than other individuals (Ciesla & Roberts, 2002). Considering that the results of the present study suggest a strong relationship between cognitive reactivity and rumination, it can serve as paramount guidance for forthcoming research.

The findings demonstrate the importance of psychological therapy for children that experience trauma. Early interventions might prevent negative, unhelpful cognitive styles from developing and having a long-term impact on a child’s life. Most frequently used

psychotherapies, such as cognitive behavioural therapy, do not focus explicitly on rumination so these tendencies can still be lingering after therapy which can lead to relapse (Michalak, Hölz & Teismann, 2011). Recent research has shown that mindfulness based cognitive behavioural therapy (MCBT) can reduce rumination tendencies and cognitive reactivity (Chesin et al., 2016). Yet, longitudinal research on MCBT measuring rumination and cognitive reactivity are scarce. Thus, it is still to be studied if the relapse rate diminishes when the manifestation of these vulnerability factors decreases. Assuming that future studies are in line with these predictions, individuals with depression who have a history of childhood trauma should receive a treatment that addresses these factors specifically. Further studies on these vulnerability factors are not only interesting to this field of research, but essential.

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