

My Own Worst Enemy: Exploring Factors That Predict Self-Harm

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Received Date: August 21, 2019; Accepted Date: December 03, 2019; Published Date: December 30, 2019.

Citation: Tracy Packiam Alloway, My Own Worst Enemy: Exploring Factors That Predict Self-Harm, J. Psychology and Mental Health Care. Doi: [10.31579/2637-8892.18/045](https://doi.org/10.31579/2637-8892.18/045).

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Abstract

Background/Objective: The aim of the current study was to examine factors that may be related yet independently predict self-harming behaviors. *Method:* Factors discussed include depression, rumination, self-criticism, and working memory. *Results:* The findings indicated that while there was a greater incidence of self-harming behaviors among those who demonstrated higher depressive symptoms, depression scores did not directly predict self-harm. A binary logistic regression found that the only factor that predicted the presence of self-harming behavior was a high level of self-criticism. Further, a Classification and Regression Tree found that the single strongest predictor of self-harming behavior was a belief that love needs to be continually earned from others. *Conclusions:* The findings have implications for improving the efficacy of interventions aimed at preventing self-harm. Treatments incorporating ways to reduce self-criticism, such as a focus on improving self-compassion with Compassionate Mind Training, may address underlying mechanisms that can trigger self-harm behavior.

Keywords: rumination; self-criticism; working memory; self-harm

Introduction

Self-harm is a widespread problem among youth, with an estimated 4% of adolescents in the United States who have self-harmed [1]. Self-harm has many different names, including Non-Suicidal Self Injury, Repetitive Self-Mutilation, Self-Injurious Behavior, and Deliberate Self-harm [2]. Parasuicidal Behavior is a broader classification of self-harm that includes any self-destruction of body tissue, with the clear intent to end one's life, without the intent to end one's life, or an ambivalence about ending one's own life [3]. Common parasuicidal behaviors include cutting, scratching, burning, biting, bruising, and breaking bones. The focus of the present study is on parasuicidal behavior, which will be referred to as self-harm. The aim is to understand the relationship between the underlying mechanisms for self-harm, such as rumination, depression, and self-criticism.

There are different reasons for engaging in self-harming behaviors. Most self-injurers reported that self-harm was used to regulate high levels of emotional distress and negative emotions, caused by anxiety or depression. Self-harming behaviors redirect attention away from the distressing thoughts and emotions toward the act itself [4,5]. Self-harm was also related to maladaptive coping strategies in undergraduate students [6].

To a lesser extent, self-harm may also be used as a form of self-punishment for inappropriate thoughts or actions, a way to reconnect with the self or "feel something" in response to feelings of somatic dissociation, or to communicate sense of pain and desire for relief to others. In young adults, common factors contributing to emotional distress are family arguments, problems with romantic partners, or academic difficulties. Some of these common factors may represent chronic difficulties relating to family, school, and behavior [7].

Rumination, Depression, and Self-Harm

Rumination can be defined as a method of coping with negative mood that involves self-focused attention and self-reflection [8]. This emotional regulation strategy comprises of both positive (reflection) and negative (brooding) components and can increase understanding of one's actions, evaluate their efficacy, and contemplate alternative behaviors for future similar circumstances. Brooding has been associated with increased negative emotions by decreasing mood

stability and increasing the intensity and length of depressive symptoms [9]. It has also been found to predict onsets of major depression across one year [10], as well decreases in positive mood [11]. Those who engage in rumination when depressed or dysphoric have longer and more severe periods of depression than those who do not [12].

Rumination may be an independent predictor of self-harm because it is a maladaptive coping strategy as excessive self-focus results in an increased salience of negative evaluations of one's own thoughts and actions. According to the response styles theory developed by [13], rumination prolongs distress by prompting negative thoughts to interpret one's surroundings, encouraging fatalistic thinking and feelings of powerlessness, and decreasing the likelihood of situation oriented instrumental behavior necessary to change one's circumstances. This increase in negative feelings may be an impetus for the feelings of helplessness that often lead to self-harm.

Self-Criticism, Depression, and Self-harm

Self-criticism is defined as the tendency to react strongly against the self when there is a discrepancy perceived between the actual and ideal self. It is also often described as a risk factor for depression [13], yet it is a unique predictor of self-harm after controlling for depression [14]. According to the Self-Discrepancy [15], when one's actual self does not match their personal ideal self, a feeling of internal dejection may result, which may lead to self-harming behavior. [16] found that self-criticism, along with unrealistically high standards and overgeneralization of failures, are the main factors that cultivate an overall self-punitive attitude. This predictive relationship was found to be unique to self-criticism, and not criticism in general.

Both self-criticism and self-harm are often linked to early childhood experiences of abuse or neglect [17]. These early experiences can shape a self-critical style of thinking that can ultimately manifest as an internalizing psychological disorder, thus leading to self-harm [18].

Working Memory, Depression, and Self-harm

Working memory is one's ability to process and remember information. It is part of a constellation of executive function skills, including updating and monitoring information, as well as shifting between mental tasks, inhibiting inactive tasks, reasoning, and problem solving [19]. It is linked to a range of cognitive activities from

reasoning tasks to verbal comprehension [29].

Working memory is also associated with various mental health outcomes. Research findings show that individuals with low working memory capacity struggle in regulating both their emotional experiences and expressions, which are essential elements of psychological well-being [21]. In addition, working memory performance has been linked to depression: working memory may be associated with secondary control coping, which is an effort to adapt to a source of stress by cognitive restructuring or distraction [22]. [23] found that depressed participants had greater intrusion effects of emotional stimuli into working memory, than a control group, when memorizing lists of emotional words, indicating that people with depression have a more difficult time removing negative emotional content from working memory.

However, to date, there is very little research investigating working memory and self-harm, and the existing findings are mixed. For example, [24] reported that working memory (backward digit recall) was not a significant predictor of self-harm. In contrast, [25] found that males that performed “high-risk self-harm” made significantly more errors on a test of spatial working memory than males in the control group.

Looking more generally at executive function skills and the link to self-harm, the findings are also mixed. Deficits in some aspects of executive function have been reported in those who engage in self-harm, depending on the frequency and severity of self-harming behavior [24] found that in a young adult population, a global measure of executive function significantly predicted self-harm over and above IQ; a measure of inhibition (Continuous Performance test – errors of commissions) was also predictive of self-harm when controlling for IQ. This suggests that a range of executive function skills, including working memory, inhibition, sustained attention, as well as overall function of executive function, may be important in predicting self-harm. Adolescents who self-harmed were significantly impaired on a decision making task compared to those who did not [26]. Specifically, adolescents that self-harmed in a “low-risk” way performed significantly worse on the Stop Signal Task, used to measure motor inhibition, than those in a control group [27]. This pattern of deficits supports the emotional regulation hypothesis: self-harm is used to regulate emotions by decreasing the negative affective state of the user [27]. Working memory deficits may exist in groups that self-harm because of a difficulty using cognitively demanding tasks to distract from a negative mood for emotional regulation [28].

However, other researchers have found that there are no executive function deficits in among those who engage in self-harming behaviors. In a population of adolescent females, there were no differences in measures of inhibition and planning (as measured by Stroop Task and Wisconsin Card Sorting Test, respectively) in those who self-harmed and those that did not [29].

Present Study

The present study explored the following hypotheses:

- Hypothesis 1: Higher scores of depressive symptoms are linked to greater scores of self-criticism and rumination, and lower working memory.
- Hypothesis 2: Working memory scores are negatively correlated with depression, self-criticism, and rumination.
- Hypothesis 3: Higher scores in rumination and self-criticism are predictive of self-harming behaviors.

Although not a major factor in our analysis, we expected a gender difference in the scores on the self-criticism, rumination, and depression mental health tests, based on the well-established gender differences in depression prevalence and symptom strength (Silverstein et al., 2012).

Methods

Participants

Participants in the study were undergraduates at a British University. Of the 101 participants, 35 were male and 66 were female, whose ages ranged from 17 to 52, with a mean age of 21.76 ($SD = 6.77$). With reference to ethnicity, 93 were white, 2 were black, 2 were Asian and 4 described themselves as “other”. Informed consent was obtained.

Ethical approval was granted by the University of Stirling, UK. Mental Health Measures

Depression. Twenty questions from the Centre for Epidemiological Studies Depression Scale [30] were used to measure each participant’s level of depression. Participants rate statements depending on how strongly they felt the statements applied to them during the past week. There were four options available for each statement: rarely, or none of the time (less than one day); some or a little of the time (1-2 days); occasionally or a moderate amount of time (3-4 days); most or all of the time (5-7 days). Some statements referred to negative feelings (e.g., “I was bothered by things that don’t usually bother me”), while others referred to more positive feelings (e.g., “I felt hopeful about the future”). Higher scores are associated with higher levels of depression (max score = 20), and any score of 16 or higher is considered depressed. The CES-D has been found to have excellent reliability, with an internal consistency of Cronbach’s α ranging from 0.88 to 0.91 and test-retest reliability ICC of 0.87 (Miller, Anton, & Townson, 2008)[30]. The CES-D has a low correlation with perceived pain (Pearson’s $r = 0.27$) and a high correlation with mental health (Pearson’s $r = 0.75$), indicating good validity [31,32].

Self-Criticism. Participants responded to 18 selected items from the Depressive Experiences Questionnaire [16]. An example item is: “I have a difficult time accepting weakness in myself”. Participants rated whether they agreed or disagreed on a 7-point scale (Strongly Disagree = 1 and Strongly Agree = 7). Higher scores are associated with higher levels of self-reported criticism (max score = 126). The internal consistency reliability of the self-criticism factor of the DEQ has been found to be acceptable [13], and test-retest reliability was found to be at acceptable levels over 13 week periods [16]. The internal consistency reliability was also found to be in the high range with a Cronbach’s α of .75 in a college age sample [33]. Considerable evidence supports the validity of the DEQ, such as a positive relationship with depressive affect and dysfunctional attitudes [34]. Construct validity of the DEQ has also been supported by relating to measures of depression such as the Beck Depression Inventory [35].

Rumination. Participants responded to 10 selected items from the Ruminative Response Scale [8]. These 10 items were selected by the researcher to capture both the reflection and brooding components of rumination and to exclude the items assessing depression. Participants rated how often they engage in particular ruminative behaviors on a 4-point scale (Almost Never = 1 and Almost Always = 4). An example of an item measuring reflection is “[how often do you] go someplace alone to think about your feelings”; an example of an item measuring brooding is “[how often do you] think ‘Why can’t I handle things better?’” Higher scores are associated with higher levels of rumination about past events (max score = 40). The RRS has been found to be a reliable and valid measure of rumination [36].

Working Memory. Two working memory measures from the Automated Working Memory Assessment [38] were administered. In the listening recall task, the child verifies a series of sentences by stating ‘true’ or ‘false’ and recalls the final word for each sentence in sequence. In the spatial recall task, the participant views a picture of two arbitrary shapes where the shape on the right has a red dot on it and identifies whether the shape on the right is the same or opposite of the shape on the left. The shape with the red dot may also be rotated. At the end of each trial, the participant recalls the location of each red dot on the shape in sequence by pointing to a picture with three compass points. Test-retest reliability for the listening recall is .88 and for the spatial recall task is .79 (Alloway, Gathercole, & Pickering, 2006[38]; test validity is reported in [39]. Standard scores ($M=100$, $SD=15$) were recorded.

Self-harm and suicidal history. Because there is not a well-established and validated questionnaire to assess self-harm, participants took a self-harm measure developed by the authors of the study, assessing whether or not they had any incidents of self-harm or suicide in their past by indicating yes or no. Specifically, participants were asked “Have you ever deliberately taken an overdose (e.g. pills or medication) or deliberately tried to harm yourself in any other way?” Of the original sample of 101, 19% reported engaging in self-harm and were included in subsequent analysis; Items assessing the intention, frequency, and the method of self-harm were also included, but due to a low response rate, were not included in analysis.

Procedure

This study was conducted in two phases. In Phase 1, participants recruited from a British undergrad psychology class completed the selected questions from the CES-D, DEQ, and RRS online to assess depression, self-criticism, and rumination, respectively. In Phase 2, the same group of participants completed the AWMA in a lab setting. All participants completed both phases of the study, and Phase 2 immediately followed Phase 1.

Results

Descriptive Statistics

The means and standard deviations of the mental health measures are provided in Table 1. The sample mean scores for the working memory (AWMA), self-criticism (DEQ), depression (CES-D), and rumination (RRS) assessments are all in average range for a nonclinical population in this age range. An independent t-test did not show any significant differences between males and females on the depression score [$t(99) < 1, p = .97$], self-criticism score [$t(99) = 1.32, p = .19$], or the RRS brooding component score [$t(99) < 1, p = .58$]. However, there was a significant difference between males and females on the RRS reflection component score [$t(99) = 2.22, p = .028$].

Hypothesis 1: Higher scores of depressive symptoms are linked to greater scores of self-criticism and rumination, and lower working memory.

Participants were divided into two groups based on their depressive symptoms on the CES-D, according to the scoring criteria suggested by the scale's authors: scores of 16 or higher were considered "depressed" and scores of 15 or less were not considered as depressed. An independent t-test confirmed that there was a significant difference in depression scores between these groups: $t(73.32) = -14.27, p < .001$.

Multiple t-tests comparing these two groups found higher scores in the following associated with the depressed group: self-criticism [$t(98.21) = -7.60, p < .001$], reflection [$t(99) = -3.88, p < .001$], and brooding [$t(99) = -4.52, p < .001$]. An independent t-test did not find any significant difference between the verbal or visual working memory scores in the depressed and non-depressed groups [$t(99) = .496, p = .621$; $t(99) = .454, p = .651$].

Hypothesis 2: Working memory scores are negatively correlated with depression, self-criticism, and rumination.

Correlation coefficients between the scores are shown in Table 2. There was no significant correlation between verbal working memory recall and the mental health scores: depression ($r = .02, p = .88$), self-criticism ($r = .04, p = .726$), reflection ($r = .11, p = .295$), and brooding ($r = .15, p = .139$). Similarly, visuospatial working memory recall was not significantly correlated with depression ($r = -.05, p = .63$), self-criticism, ($r = .05, p = .63$) and brooding ($r = .19, p = .06$). However, visuospatial working memory was significantly correlated with reflection ($r = .28, p = .004$).

The mental health scores were significantly related with each other: depression with self-criticism ($r = .69, p < .001$), as well as with both reflection ($r = .44, p < .001$) and brooding ($r = .43, p < .001$). Self-criticism was also significantly correlated with both reflection ($r = .52, p < .001$) and brooding ($r = .67, p < .001$).

Hypothesis 3: Higher scores of rumination and self-criticism are predictive of self-harming behaviors.

Given the previous research connecting depressive symptoms with self-harming behaviors, the sample was split based on the CES-D scores as described previously: 29.5% of the participants in the CES-D depressed group indicated that they had self-harmed, compared with only 10.5% of the participants in the non-depressed group.

A stepwise binary logistic regression analysis using working memory, depression, self-criticism, and reflection and brooding aspects of rumination to predict self-harm found that only self-criticism significantly predicts self-harm. The B coefficient was $-.087 (p < .001)$. The model predicts 82.2% of the cases accurately. Rumination did not significantly predict self-harm ($\beta = -.052, p = .611$), and neither did verbal working memory performance nor visual spatial working memory performance ($\beta = -.032, p = .580$; $\beta = .057, p = .559$).

Regression Tree. In order to find out which variable would best predict self-harm, we used a Regression Tree model known as the Classification and Regression Tree (CART). This model has been successfully used to make predictions in medical and clinical settings,

and has also been used in psychology for decision-making [40]. This non-parametric procedure is based on a questions-decision-tree model where questions are asked on a sequential basis in order to identify the best set of predictors for a specified outcome.

The present sample was split into two branches based on an initial predictor variable, and subsequent branches are identified until reliable subgroups of self-harm outcomes were represented as nodes. The initial predictor variable identified was an item from the DEQ examining the belief that love must be earned: *One must continually work to gain love from another person, that is, love has to be earned.* If a participant strongly agreed to this item (with a response greater than 5.5), then the tree predicted that 26% of the participants reported inflicting self-harm. Of those who did not strongly concur with this statement, 74% reported not engaging in self-harming behaviors.

Discussion

The aim of this study was to examine mechanisms that predicted self-harm. The main findings were that neither working memory nor rumination predicted self-harming behaviors; however, self-criticism, specifically the notion that love must be earned, was a significant predictor of self-harm in a nonclinical college-aged population.

Looking first at working memory, neither verbal nor visual spatial working memory performance significantly predicted self-harm. This pattern was contrary to the emotional regulation hypothesis, where students with lower executive function overall would likely have poor working memory performance and poor emotional regulation leading to a higher likelihood of self-harm. While past research is mixed on whether or not deficits in inhibition, impulsivity, and executive function exist in those who self-harm, these results support the idea that working memory in those who self-harm did not differ significantly from those who did not self-harm. This pattern may occur because self-injury typically occurs under extreme emotional stress. In contrast, lab studies often do not induce stress, and thus may not capture the complexities of an executive functioning or working memory deficit [41]. Indeed, the working memory group mean scores indicated performance within age-expected levels. It is possible that in circumstances of high stress, the working memory scores of those who self-harm may be more impaired than those who do not.

The next finding relates to rumination -- even though rumination is a predictor of depression, it was not a significant predictor of self-harm in the present study. This is consistent with Nolen-Hoeksema's conceptualization that rumination is not necessarily a negative behavior because it

can eventually lead to adaptive behavior. Rumination may be used as a pleasant reflection on past events, which may improve a person's mood and result in a more lucid thought process and better problem-solving ability [12,42] presents multiple possible constructive consequences of repetitive thoughts, including adaptive preparation and anticipatory planning of similar events by preparing a concrete strategy, and the ability to process and recover from upsetting events by viewing them as an experience that provides an opportunity for learning and future growth.

Only self-criticism predicted self-harm (in 82.2% of the cases), which is consistent with findings from adult populations (Sachs-Ericsson, Verona, Joiner, & Preacher, 2006). This pattern is also consistent with [14] study with adolescents -- the link between childhood maltreatment and NSSI was mediated by self-criticism [14]. Many children who are abused have a difficult time developing a sense of worthiness. The results from the regression tree highlighted the importance of a belief that love must be earned. Those who feel that love must be earned may use self-harm as a mechanism to relieve feelings of pressure that they have not done enough to earn love from another. The choice to self-harm may stem from experiencing physical abuse or trauma in their childhood.

Mixed results have been found on whether depression predicts self-harm [4], with some studies citing elevated levels of depression in self-harmers [43], but others finding no link [44]. In the present study, there was a greater incidence of self-harming behaviors among those who demonstrated higher depressive symptoms; however, depression scores did not directly predict these behaviors. There are

two possible explanations for this pattern. The first is that we recruited a nonclinical sample, so participants' depression levels were lower compared to a clinically depressed population. As such, it might be difficult to explore the predictive nature of depression to self-harm. The second possible explanation is that self-criticism may mediate the relationship between depressions and self-harm, where higher levels of self-criticism may be the root cause of elevated levels of both depression as well as self-harm.

Traditional inpatient and outpatient treatments for those who engage in self-harming behaviors are typically education- and resource-based and are generally not highly effective [45,46]. One application of these findings is to improve the efficacy of self-harm interventions, by lowering levels of self-criticism and improving one's ability to express self-compassion. Self-compassion, specifically self-kindness, emphasizes being kind and understanding toward oneself in instances of pain or failure rather than self-critical [47, 48, 49]. By allowing oneself to fail and not believe it is indicative of an unworthiness to be loved, a person may not feel the need to use dysfunctional strategies to regulate one's emotional state. These treatments may significantly reduce the amount of self-harm performed if administered to high-risk groups, such as victims of abuse, adolescents, or individuals diagnosed with borderline personality disorder [49-51].

As an exploratory study, several limitations exist that could be addressed in future studies. A validated assessment to measure self-harm is a necessary foundation for more accurate study of antecedents of self-harming behavior. Also, as this study was limited to a subsample of the original sample size, a larger sample of participants would lend more power to the analysis. Future research could explore differences in self-criticism between those that self-harm with and without suicidal intent. Finally, a longitudinal future study would be helpful to examine if self-

critical attitude precedes self-harm[52-56].

In summary, the present study found that high levels of self-criticism were predictive of self-harming behaviors. Exploring the antecedents of self-harm is critical to improve the efficacy of current treatments, as insight into specific predictors and an increased overall understanding of the mechanisms responsible for self-harm can lead to more targeted interventions [57-59].

Key points

- There was a greater incidence of self-harming behaviors among those who demonstrated higher depressive symptoms, but depression scores did not directly predict self-harm.
- Only self-criticism predicted self-harm behaviors (in 82.2% of the cases), specifically the belief that love needs to be continually earned from others.
- One application of these findings is to improve the efficacy of self-harm interventions, by lowering levels of self-criticism and improving one's ability to express self-compassion.

	N = 101
Verbal Working Memory	100.23 (12.93)
Visual Spatial Working Memory	97.61 (14.22)
Self-Criticism (DEQ)	67.97(19.06)
Depression (CES-D)	14.91(9.50)
Reflection (RRS)	9.55 (3.13)
Brooding (RRS)	10.55 (3.19)

Table 1: Descriptive statistics of working memory scores and mental health scores

	Verbal WM	Visual Spatial WM	Self-Criticism (DEQ)	Depression (CES-D)	Reflection (RRS)	Brooding (RRS)
Verbal WM	1					
Visual Spatial WM	.42*	1				
Self-Criticism (DEQ)	0.04	0.05	1			
Depression (CES-D)	0.02	-0.05	.69*	1		
Reflection (RRS)	0.11	.28*	.52*	.44*	1	
Brooding (RRS)	0.15	0.19	.67*	.43*	.56*	1

Note: WM = Working Memory

Table 2: Correlation coefficients between working memory and mental health scores

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