

Moderating Effect of Psychological Flexibility in the Relationship between Neuroticism and Self-Harm

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Many people seek professional help because of self-harm, signaling a crisis in domestic mental health issues. Neuroticism significantly predicts self-harm through experiential avoidance as a coping strategy in response to negative stimuli. However, despite neurotic tendencies, a person with a high level of psychological flexibility may have the capacity to respond constructively to unpleasant situations or emotions. The current study measured neuroticism (K-IPIP-NEO-120), self-harm (K-SHI), and psychological flexibility (K-AAQ-II) in 551 South Korean adults ($M = 271$, $F = 280$, age range: 20–59 years). Results showed that psychological flexibility moderated the relationship between neuroticism and self-harm. Neuroticism significantly predicted self-harming behaviors when psychological flexibility was low or moderate, whereas high psychological flexibility prevented the risk of a connection between neuroticism and self-harm. Psychological flexibility may need to be addressed in clinical interventions and in self-harm prevention.

Keywords: neuroticism, self-harm, self-injury, psychological flexibility, experiential avoidance model, escape theory

Introduction

Self-harm is a major public health concern worldwide. It refers to damaging or poisoning one's bodily tissues, regardless of suicidal intent or motive (Hawton et al., 2003). Suicidal self-destructive behaviors and nonsuicidal self-injuries (NSSI) are located on the self-harm continuum, when there is uncertainty in categorizing one's intention to die (Zubrick et al., 2017). Self-harm can occur at any age but is most frequently observed between adolescence and early adulthood, especially in females (American Psychiatric Association, 2013; Plener, Schumacher, Munz, & Groschwitz, 2015). In South Korea, the number of teenagers who received psychological counseling due to self-harm tripled in 2018 (Lee, 2019), and the

number of emergency visits due to NSSI and attempted suicide increased by approximately 8% in 2019 (Jung, 2020). Notably, some adolescents continue to engage in self-harming behaviors throughout adulthood (Barrocas, Giletta, Hankin, Prinstein, & Abela, 2015). Long-term consequences such as mental illness, psychiatric hospitalization, and even death by suicide highlight the importance of urgent interventions targeting self-harm in adults (Beckman et al., 2016).

Self-cutting, self-hitting, head-banging, and ingestion of foreign substances are common methods of self-harm. Typically, one engages with multiple behaviors in such episodes because one may try new methods owing to increased pain tolerance, or use different self-harming methods in response to certain types of emotions or circumstances (Nock, 2010). Prior studies indicate that a variety of self-harm methods appear to increase the acquired capability for suicide and thus may be a predictor of lethal suicide attempts (Van Orden et al., 2010; Willoughby, Heffer, & Hamza, 2015). Addressing self-harming experiences is crucial, lest they result in completed suicide (Suominen et al., 2004).

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Research supports a strong association between neuroticism and self-harm (Hafferty et al., 2019; MacLaren & Best, 2010). In the Five-Factor model, neuroticism consists of six sub-factors: anger, depression, anxiety, impulsiveness, vulnerability, and self-consciousness. People with high levels of neuroticism are prone to experiencing negative emotions and are more sensitive to stress (McGrae & John, 1992). They are also known for being vulnerable to criticism and display self-critical attitudes along with a sense of inadequacy (Watson, Clark, & Harkness, 1994). Characterized by emotional instability, affective disorders and self-destructive behaviors are expected to be more prevalent among individuals with neuroticism, than among those with other personality traits (Maulouff, Thorsteinsson, & Schutte, 2005; Suyemoto, 1998). Unsurprisingly, neuroticism is considered a key characteristic of borderline personality disorder (BPD) in which self-harm is frequently observed (Kendler, Myers, & Reichborn-Kjennerud, 2011).

Individuals with neuroticism may use the maladaptive coping strategy of experiential avoidance to control unwanted feelings and thoughts (Kokkonen & Pulkkinen, 2001). As one expends more effort to avoid negative stimuli, such an approach paradoxically becomes disruptive and dominant over one's lifetime. The Experiential Avoidance Model of NSSI (Chapman, Gratz, & Brown, 2006) suggests that self-injury is an attempt to avoid and terminate unwanted emotional arousals. A study using Ecological Momentary Assessment supports this model, reporting that people experience an ease of thought and emotion directly after self-injuring behaviors (Nock, Prinstein, & Sterba, 2009). This may result in repeated self-harm to quickly relieve negative emotions when they feel bad. Along with NSSI, suicidal behaviors serve avoidant functions. Baumeister's (1990) Escape Theory stresses that unpleasant psychological reactions create the motivation to escape. For instance, the feeling of failure is highly correlated with hopelessness; thus, suicide may seem to be the only viable solution to one's problems (Landrault et al., 2020). A recent meta-analysis found that the association between experiential avoidance and suicidal behaviors was moderate to strong (Angelakis & Gooding, 2021).

Unlike experiential avoidance, which links neuroticism and self-harm, psychological flexibility refers to one's capacity to be fully aware of and actively engage in both, internal and external experiences. Flexible attention helps one not to feel bound by one's

thoughts or emotions, but rather commit to productive present attitudes that align with one's values (Hayes, Luoma, Bond, Masuda, & Lillis, 2006). Individuals with low psychological flexibility perceive unpleasant emotions, thoughts, and sensations to be highly negative (Levin et al., 2014). This feature significantly predicts emotional dysregulation and poor quality of life (Lucas & Moore, 2020; Paulus, Vanwoerden, Norton, & Sharp, 2016). A low level of psychological flexibility also correlates with suicidal ideation and self-harm, including suicidal behaviors (Krafft, Hicks, Mack, & Levin, 2019; Nielsen, Sayal, & Townsend, 2016; Tighe, Nicholas, Shand, & Christensen, 2018). In contrast, increased psychological flexibility is known to be a resilience factor that negatively correlates with depression, anxiety, and insomnia (McCracken, Badinlou, Buhman, & Brocki, 2021). As psychological flexibility increased, the levels of emotional regulation and emotional acceptance improved in patients with psychosis and trauma (Spidel, Lecomte, Kealy, & Daigneault, 2018). Indeed, those who ceased to self-injure showed a higher level of psychological flexibility than those who continued self-harming behaviors (Callahan, Stori, & Donahue, 2021).

Neuroticism is a genetic trait that remains relatively stable throughout life (Lahey, 2009), and the rate of self-injury maintained after adolescence has been observed to be considerably high, even up to 50% (Klonsky, 2011). One should not neglect such a high risk of self-harm in adulthood, and a valid intervention strategy should be identified accordingly. Prior studies on self-harm have mainly focused on adolescents, and research on the relationship between psychological flexibility and self-harm remains at an early stage (Callahan et al., 2021). If there are negative influences that derive from a genetic trait and its biological vulnerability, it is vital that researchers explore protective factors that can reduce and prevent such effects. Taken together, we hypothesized that the severity of self-harm in people with neuroticism may differ depending on the degree of psychological flexibility that serves as a moderating factor.

Methods

Procedure

The participants were recruited via EMBRAIN, an online research company. The survey was conducted online from January

28, 2021, to February 1, 2021. On the first page of the survey, we provided basic information regarding the purpose and content of the research. While only those who provided informed consent could continue, the participants could withdraw at any time during the process. Finally, compensation was provided to those who completed the survey. The entire procedure was approved by the Institutional Review Board on January 13, 2021 (No. 1041078-202012-HRSB-354-01) and adhered to the Declaration of Helsinki.

Participants

A total of 551 participants (between 20 to 59 years old) were recruited using stratified sampling; 49.2% were men ($n = 271$) and 50.8% were women ($n = 280$). The mean age was 40.18 ($SD = 10.66$), and participants were evenly recruited among the age subgroups, with 20.3% in their 20s, 25.8% in their 30s, 27.0% in their 40s, and 26.9% in their 50s. Participants' areas of residence were also considered proportional to the size of the national administrative districts.

Measures

The Korean Version of International Personality Item Pool-NEO-120 (K-IPIP-NEO-120)

The IPIP-NEO-120 is a self-report questionnaire that evaluates personality traits based on the Five-Factor model (extraversion, agreeableness, openness, conscientiousness, and neuroticism). The original scale IPIP-NEO-300 (Goldberg, 1999) was shortened to 120 questions by Johnson (2014), and the Korean version was translated and validated by Jahng (2018). It is measured on a 5-point Likert scale ranging from 1 (not agree at all) to 5 (very agree), and the 24 questions regarding neuroticism were used. Cronbach's α was .91 in the present study.

The Korean Version of Acceptance-Action Questionnaire-II (K-AAQ-II)

The K-AAQ-II is a self-report questionnaire assessing psychological flexibility. Bond et al. (2011) developed a scale comprising seven items. Cho and Seo (2017) translated and validated the Korean version. Responses were rated on a 7-point Likert scale ranging from 1 (not at all) to 7 (always). All questionnaires were inversely coded for the sake of convenience in interpretation; consequently, the higher the total score, the higher the psychological flexibility.

Cronbach's α was .94 in the present study.

The Korean Version of Self-Harm Inventory (K-SHI)

The Self-Harm Inventory (SHI), which was developed by Sansone, Wiederman, and Sansone (1998), evaluates one's self-harming behaviors within the previous six months. The Korean version was translated and validated by Kim, Woo, Koo, and Lee (2019). It comprised 22 dichotomous items to which participants could respond with "yes" (1 point) or "no" (0 points); higher scores indicated a greater range of self-harming behaviors. Six items were excluded to measure bodily inflictions only, and Cronbach's α in the present study was .80.

Data Analysis

No missing data were observed, and the raw data were analyzed using IBM SPSS version 26.0. Correlation analyses were performed for neuroticism and its subscales, psychological flexibility, and self-harm. The internal consistency of each measurement was calculated using Cronbach's α coefficient. The moderating effect of psychological flexibility was examined using Model 1 of SPSS PROCESS Macro (Hayes, 2021), and the significant region within the moderating effect was verified using the Johnson-Neyman method.

Results

Descriptive Statistics

Among the 551 participants, 55.2% were married ($n = 304$), 41.2% were single ($n = 227$), and 3.6% were divorced or bereaved ($n = 20$). Regarding educational level, .2% were below middle school ($n = 1$), 12.3% had graduated high school ($n = 68$), 75.1% were attending or had attended university ($n = 414$), and 12.3% were above university level ($n = 68$).

The mean score for neuroticism was 67.51 ($SD = 13.68$, range: 33-112); for psychological flexibility it was 35.56 ($SD = 9.40$, range: 7-49), and for self-harm it was .44 ($SD = 1.30$, range: 0-12). The skewed distribution of the K-SHI score was log-transformed (Feng et al., 2014), and all the research variables met the normality criteria (Kline, 2015). A total of 117 individuals (21.2%) reported a history of self-harm within the previous 6 months.

Table 1. Means, Standard Deviations, and Correlations between Key Variables

Variable	<i>M</i>	<i>SD</i>	1	1-1	1-2	1-3	1-4	1-5	1-6	2	3
1. Neuroticism	67.51	13.68	-								
1-1. Anger	11.00	3.59	.830***	-							
1-2. Depression	10.01	4.01	.867***	.717***	-						
1-3. Anxiety	12.44	3.03	.867***	.720***	.744***	-					
1-4. Immoderation	10.96	2.68	.565***	.325***	.318***	.322***	-				
1-5. Vulnerability	11.15	2.54	.714***	.402***	.468***	.536***	.503***	-			
1-6. Self-Consciousness	11.94	2.01	.630***	.402***	.489***	.513***	.177***	.462***	-		
2. Psychological Flexibility	35.56	9.40	-.711***	-.587***	-.727***	-.660***	-.290***	-.426***	-.421***	-	
3. Self-harm	.44	1.30	.388***	.333***	.433***	.376***	.130***	.150***	.249***	-.413***	-

*** $p < .001$.

Table 2. The Moderating Effect of Psychological Flexibility

Variable	Coefficient	<i>SE</i>	<i>t</i>	95% CI	ΔR^2
Constant	.9395	.4799	1.9577	(-.0032, 1.8822)	
Neuroticism (A)	.0110	.0053	2.0663*	(.0005, .0215)	
Psychological Flexibility (B)	-.0355	.0076	-4.6704***	(-.0504, -.0205)	
Interaction (A*B)	-.0017	.0003	-5.3887***	(-.0024, -.0011)	.0416
Psychological Flexibility	<i>B</i>	<i>SE</i>	<i>t</i>	LLCI	ULCI
-1 <i>SD</i> (-9.40)	.0275	.0060	4.5811***	.0157	.0392
<i>M</i> (.00)	.0110	.0053	2.0663*	.0005	.0215
+1 <i>SD</i> (9.40)	-.0054	.0063	-.8615	-.0178	.0069

Note. *SE* = standard error; *CI* = confidence interval; *LLCI* = lower limit confidence interval; *ULCI* = upper limit confidence interval.

* $p < .05$; *** $p < .001$.

Correlations

The Pearson's correlation results are shown in Table 1. The correlations between neuroticism and its subscales, psychological flexibility, and self-harm were all significant ($p < .001$).

Moderation Analysis

The neuroticism and psychological flexibility scores were mean-centered before the analysis. Age, sex, and educational status were entered as covariates. The study model had 22% explanatory power and showed statistically significant results [$r^2 = .22$, $F(6, 544) = 25.62$, $p < .001$]. The interaction effect of neuroticism and psychological flexibility further described 4.2% self-harm. A Johnson-Neyman analysis was performed to determine which domains of psychological flexibility have significant moderating effects. The results of the moderation analysis are shown in Table 2 and Figure 1.

The slopes at low (-1 *SD*) and intermediate (*M*) levels of psychological flexibility were significant ($B = .0275$, $t = 4.5811$, $p < .001$; $B = .0110$, $t = 2.0663$, $p < .05$). However, the slope at high levels of

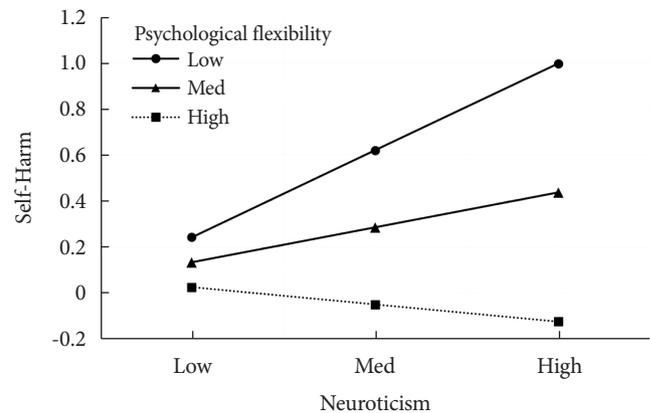


Figure 1. The Moderating Effect of Psychological Flexibility in the Relationship between Neuroticism and Self-Harm.

psychological flexibility (+1 *SD*) was not significant ($B = -.0054$, $t = -.8615$, $p = .3894$) (Table 2). Johnson-Neyman analysis indicated that the boundary score of the significant interval was 35.86, which means that for those with a psychological flexibility score of 35.86 or higher, neuroticism does not significantly predict increased self-harm.

Discussion

This study examined whether psychological flexibility moderates the effect of neuroticism on self-harm among 551 adults in South Korea. PROCESS Macro (Hayes, 2021) was used to conduct moderation analysis. As hypothesized, the moderating effect of psychological flexibility was significant.

First, neuroticism was positively correlated with a variety of self-harm methods; higher levels of neuroticism were associated with higher engagement in self-harm methods. Prior research states that as the method of self-injury diversifies, the severity level increases (Favaro et al., 2008). This implies that higher levels of neuroticism may lead to higher severity of self-harm. Neuroticism is characterized by unstable emotions, sensitivity to stress, and an emotion-oriented approach to problems (Hafferty et al., 2019). Such characteristics make it difficult for individuals with high neuroticism to accommodate or manage the emotions and thoughts caused by negative stimuli. Consistent with our results, many studies suggest that individuals with high neuroticism employ maladaptive coping strategies to control themselves, and self-harm is one such strategy (Boyes & French, 2009; Suls & Martin, 2005; Nock et al., 2009).

The second major finding of this study was that psychological flexibility moderated the relationship between neuroticism and self-harm. The significance of each relationship differed, depending on the degree of psychological flexibility. For those with high psychological flexibility, neuroticism did not significantly explain self-harm. In other words, high psychological flexibility functions as a protective factor against emotional instability and does not increase the severity of self-harm. According to Hayes et al. (2006), people with high psychological flexibility do not avoid negative emotions; rather, they interact with the internal and external environments in an accepting and active manner. Such people may not choose self-harm as a coping response because they can adjust their moods or behaviors in beneficial ways that align with their values. The current study demonstrates that an individual with neurotic tendencies, who is inherently sensitive to stimuli, can utilize constructive coping mechanisms through psychological flexibility, which can be acquired and learned during one's lifetime.

In contrast, low or moderate levels of psychological flexibility

significantly predicted increased severity of self-harm among individuals with neuroticism. For low or moderate levels of psychological flexibility, neuroticism appears to activate experiential avoidance behavior without any safety filter, namely, self-harm. Our result is consistent with previous research showing that those with self-harm experiences have lower levels of emotional acceptance and higher levels of experiential avoidance than the control group (Anderson & Crowther, 2012). Similarly, low or moderate levels of psychological flexibility in individuals with PTSD symptoms predict an increase in negative urgency and aggression; whereas a high level of psychological flexibility appears to mitigate this effect (Dutra & Sadeh, 2018).

To reduce avoidant responses that manifest as self-harm, more scholarly attention to the role of psychological flexibility in clinical intervention is needed. Acceptance and Commitment Therapy (ACT) is a third-wave cognitive behavioral therapy that aims to improve psychological flexibility, which allows living a life aligned with one's values amid a constantly changing environment (Hayes et al., 2006). Research on adolescents states that one's need for self-change by wound recognition, life goals, self-restoration through acceptance, social support, and connection serve as protective factors against self-injury (Kim, 2017). Notably, these protective factors are consistent with the core concepts of ACT. If such factors are unsatisfactory, they may persist into adulthood.

The limitations of the current study and future suggestions are as follows: First, the questionnaire was conducted online and was accessible via desktops and mobile phones only. Those who were unfamiliar with online surveys may have been excluded from the sample; thus, a generalization of the results should be considered. Second, the scale used to assess self-harm does not measure frequency or context; thus, the analysis of specific self-harm patterns is limited. While the SHI is the most widely used measurement for assessing self-harm, more delicate tools may be beneficial for future studies. Third, self-harm is the end product of complex interactions between biological, psychological, and social factors across one's lifespan. Our study mainly addressed internal factors such as personal traits and psychological vulnerabilities. In future studies, the effects of environmental factors should be investigated to understand self-harm comprehensively.

Despite these limitations, the results of this study highlight the

risks of neuroticism and the significance of psychological flexibility. Neuroticism is a biological antecedent that predicts maladaptive coping mechanisms, including self-harm (Boyes & French, 2009; Gunthert, Cohen, & Armeli, 1999). Furthermore, psychological flexibility can be considered a buffer. The results of this study suggest that even those who are likely to be exposed to self-destructive behaviors because of their innate personality traits can prevent and mitigate their symptoms through psychological flexibility. Providing appropriate resources and teaching acceptance-based coping mechanisms may be helpful to people with neuroticism. This finding may provide foundational evidence for designing programs that promote psychological flexibility and prevent or alleviate self-harming behaviors. Additionally, the Experiential Avoidance Model and the Escape Theory were validated empirically. Further research on the efficacy of such programs, in addition to further research on contextual issues that may vary according to one's age, are needed.

Author contributions statement

CP, a graduate student at Chung-Ang University, conceptualized the research, collected and analyzed the data, and wrote the draft of the manuscript. MHH, professor at Chung-Ang University, supervised the research process and reviewed the manuscript. All the authors provided critical feedback, participated in the revision of the manuscript, and approved the final submission.

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