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Addictive Behaviour Predicts Self-Harm in Adolescents

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ABSTRACT

Self-harm is a growing and high-risk undesirable phenomenon that occurs primarily during adolescence and in young adulthood. It causes serious disruption to the physical and psychological integrity of an individual and can even be life-threatening. The severity and prevalence of this behaviour direct the attention of professionals to help affected individuals as well as to the most effective methods of its prevention. In this context, it is exceptionally important to know the concurrent and especially the risk factors of self-harm. One area that research focuses on is the identification of addictive features of self-harming behaviour as well as the possible connection of self-harm with various other addictions. This work focuses on verification of a relationship between addictive and self-harming behaviour, on exploration of the type of mutual connections as well as on the gender specifics of this relationship. The study was conducted on a sample of 203 participants aged 15 – 19 years (mean age = 16.62 years), 58.6% (N = 119) of whom were women. Spearman's non-parametric correlation demonstrated a statistically significant ($p < 0.001$), moderately strong ($rs = 0.549$) positive correlation between addictive behaviour and self-harm. Linear regression analysis showed that addictive behaviour caused 40.3% of self-harm in the studied research sample of adolescents. The strength of the prediction is notably determined by gender – while for boys $R2 = 0.252$, for girls the coefficient of determination reached double the value at 0.520. It is evident from the results that addictive behaviour significantly influences the occurrence of self-harm, a fact that significantly affects not only the understanding of the typical features of self-harming behaviour, but also indicates the nature of the mechanisms sharing in its emergence and maintenance in the repertoire of maladaptive coping strategies. It is also an important implication for psychological intervention and therapy of self-harming adolescents, especially girls.

1. Self-Harming Behaviour

Self-harm is among the high-risk forms of behaviour in adolescence and early adulthood. It is characterised by actions aimed at intentionally experiencing pain or suffering (physical and/or psychological), which is usually a maladaptive reaction to unmanaged psychological stress (Demuthova 2023). The massive occurrence of self-harm, with a prevalence varying between 20% (Farkas et al. 2023) and 80% (Lurigio et al. 2023) depending on the research sample, points in part to an acute psychological and health problem, but also to the need for

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intensive research aimed at unifying the understanding and assessment of self-harm and explaining the high variability of findings.

Scientific works aimed at identifying key mechanisms of the origin and maintenance of self-harm in the repertoire of problem-solving strategies and coping with psychological stress have brought a number of findings. Considered to be among the potential causes and contributing factors to self-harm are psychological difficulties (depression – Başgöze et al. 2021, anxiety disorders – Shi et al. 2025; eating disorders – Washburn et al. 2014...), personality characteristics (neuroticism – Liao et al. 2022, impulsivity – Cassels et al. 2022, perfectionism – Gyori et al. 2023,...) but also environmental variables (childhood maltreatment – Li et al. 2023, abuse – Wan et al. 2015,...) or specifics of the developmental period (identity problems – Gandhi et al. 2020, body image – Muehlenkamp et al. 2012, self-esteem – Forrester et al. 2017,...). The relationship between addiction and self-harm is one of the areas in which promising research has developed.

2. Addiction and Self-Harming Behaviour

The link between self-harm and addiction can be observed on several levels. In psychological theory, the connection between self-harm and addiction can be noticed in the context of conditioning mechanisms through negative and positive reinforcement. Experiencing physical pain and the possibility of controlling it or effectively coping with psychologically demanding situations that the individual cannot influence or resolve (In-Albon et al. 2013) are the main reasons why self-harm is so widespread. The act of self-harm draws attention away from the problem, transforming psychological pain into physical pain that can be regulated (controlled) (Molaie et al. 2019). It also effectively releases accumulated emotional tension. The removing of strong negative emotions and stress acts as negative reinforcement, while the relief and temporary control over pain acts as a reward (positive reinforcement) (Nock & Prinstein 2004). An important side effect of these mechanisms is the activation of brain reward systems (Kalivas & Nakamura 1999) which share in the reinforcing of self-harming behaviour as a response to stressful situations. Neurobiological components also enter into the clarification of the concept of self-harm as a behaviour with signs of addiction. According to them, the so-called positive valence systems, which in their processes include the phases of seeking a reward, achieving it, fulfilling it and maintaining it, play a major role in the emergence, maintenance and reinforcement of self-harm (Westlund Schreiner et al. 2015). These mechanisms also cause self-harm to become strongly fixed and addictive.

The so-called opioid model of self-harm, which works with the assumption that self-harm in affected individuals is based on atypical levels of opioid levels in the CNS, is built on a biological basis. Individuals who exhibit self-harming behaviour have low levels of opioids, and self-harming behaviour specifically causes an increase in these levels, which leads to the establishment of balance (Heilbron et al. 2014). In this context, Stanley et al. (2010) found that patients with a history of self-harm showed lower levels of beta-endorphin and met-enkephalin compared with those who did not self-harm. Low opioid levels can be caused by chronic stress in childhood and adolescence, traumatic experiences, abuse or neglect (Sher & Stanley 2009), which corresponds to the frequent presence of the above events in the history of self-harmers. Exposure to pain through self-harm leads to a response in the organism in the form of an increase in the production of endogenous opioids, and their relaxing and euphoric effects result in the addictiveness (Kosten & George 2002) of this behaviour.

3. Literature Review

Because of the above-stated facts, many experts also consider self-harm to be an addictive behaviour (Victor et al. 2012; Blasco-Fontecilla et al. 2016; Guérin-Marion et al. 2018, Pritchard et al. 2021). When assessing the course of self-harm, symptoms typical of addictions have often been identified in the experiences and behaviour of self-harming individuals (Nixon et al. 2002). For example, parallels can be seen in the states before an "attack" of self-harm, which are similar to withdrawal symptoms in drug addicts (Faye 1995); the desire to harm oneself is thus equivalent to a craving (Washburn et al. 2010). Research focused on the course of self-harm indicates that a large share of individuals tend to increase the frequency and intensity of self-harming acts to achieve the desired effect, which is again a typical sign of addictive behaviour (Himelein-Wachowiak et al. 2022). Also, the threshold for obtaining pleasure after self-harm increases over time, which means that individuals need to increase the frequency or degree of self-harm to obtain the same relief as before (Guo et al. 2023).

A significant area of exploring potential connections between self-harm and addiction is also monitoring the occurrence of addictions as comorbidities of self-harm. Scientific studies point to close correlations between the abuse of nicotine (Giletta et al. 2012), alcohol (Taliaferro et al. 2018), cannabis (Few et al. 2016) and other addictive substances (Moller et al. 2013; Gupta et al. 2019) and self-harm. Some even drew conclusions on causality, either in the direction of addictions as a cause (Richardson et al. 2019) or as a consequence (Moran et al. 2015) of self-harm. Studies following the long-term course of self-harm show (see e.g. Steinhoff et al. 2024) that a decline in non-suicidal self-injury (NSSI) behaviour was paired with a sharp increase in substance use. Increased incidence of self-harm was recorded not only in substance abusers, but also in non-substance addictions (Guo et al. 2023, Tang et al. 2020).

4. Problem and Objectives

The ambiguous results, as well as the wide range of possible mechanisms explaining the link between addiction and self-harm, show that the relationship between these two variables is still unclear. For example, when monitoring the co-occurrence of addictive behaviour and self-harm, Seller et al. found that neither alcohol nor cannabis misuse increased the subsequent likelihood of engaging in self-harm; on the other hand, co-occurrence of alcohol and cannabis use increased the odds of engaging in self-harm on a given day (Seller et al. 2021). Whether addictions promote the occurrence of self-harm or are a consequence of such behaviour is not clear. It is also possible that, like self-harm, addictions are only different consequences of another cause, such as a preference for maladaptive problem-solving strategies or high impulsivity. It is also possible that a tendency towards more general addictive behaviour (whether based on biological, environmental or other foundations) is behind the co-occurrence of addictions and self-harm and manifests itself outwardly in this way.

Therefore, it is evident that research focused on the association between self-harming behaviour and addictions is still relevant and has the potential to bring new data clarifying the mutual interactions of these phenomena. In the context of the above uncertainties, the aim of this study was to focus on investigating the co-occurrence of self-harm and behaviour that shows tendencies towards addictions (so-called "addictive behaviour"). Addictive behaviour is a set of outwardly manifested activities in which a person uses or abuses legal or illegal substances or performs activities to which psychological and/or physical dependence can

arise. In addition to exploring the common occurrence, we will also try to identify the mutual relationship between these variables. The aim of the study will be:

- to verify the connection between self-harm and addictive behaviour in adolescents
- to determine whether addictive behaviour can predict the occurrence of self-harm and to what extent.

Studies focused on both self-harm and addictions point to the need to take into consideration the aspect of sex in their results. Self-harm in most countries (with the exception of Asian countries – Moloney et al. 2024) occurs more commonly in girls (the prevalence ratio is reported to be 1:3 to 1:4; APA 2013), while in addictions (especially in adolescence) the male sex predominates, both in substance (Lev-Ran et al. 2013) and non-substance addictions (see e.g., Welte et al. 2015). Therefore, when monitoring mutual connections and causality, it is appropriate to take the sex aspect into account in the analyses.

With respect to the set objectives and previous research findings, a hypothesis was formulated assuming the existence of a close relationship between self-harm and addictive behaviour:

H1: We assume a statistically significant positive correlation between self-harm and addictive behaviour.

Given the absence of unambiguous data, for further exploration of the causal relationships between self-harm and addictive behaviour as well as for exploring sex specificities of possible causality, the following research questions (RQ) were formulated:

- RQ1: Does addictive behaviour predict self-harm and to what extent?
- RQ2: What is the relationship between addictive behaviour and self-harm in girls and in boys?

5. Method

5.1 Participants

A total of 203 participants aged 15 – 19 years were included in the data analysis, 58.6% (N = 119) of whom were female. The average age was 16.62 years (16.60 for girls, 16.63 for boys). Most participants (N = 139; 68.5%) attended grammar school; the remaining participants (N = 64; 31.5%) were from secondary vocational schools.

5.2 Procedure

Participants were contacted at various types of secondary schools in Slovakia. They were informed about the purpose and conditions of data collection; participation in the research was anonymous and voluntary, and participants had the opportunity to withdraw from the research at any stage without any consequences. Data collection was carried out by intentional and occasional sampling. The inclusion criteria for the research group were age 15 – 19 years and a willingness to take part in the research declared by informed consent. To increase anonymity, willing participants were subsequently sent a link to an online questionnaire.

5.3 Measures

Self-Harm. The values of the scale variable "self-harm" were obtained from respondents through use of a self-assessment questionnaire, the SHI (Self-Harm Inventory) (Sansone & Sansone 2010) adapted for the Slovak adolescent population (for more details, see Demuth & Demuthova 2020). The questionnaire contains twenty questions monitoring the occurrence and intensity of various forms of self-harming behaviour (example item: *"Have you ever intentionally done any of the following to harm yourself?: ... scratched myself on purpose")* with the option of indicating the intensity (0 = never, 1 = rarely, 2 = sometimes and 3 = often). The raw score ranges from 0 to 60 points. The internal consistency of this version of the questionnaire reaches a satisfactory value – Cronbach's $\alpha = 0.809$ (Demuthova & Doktorova 2019).

Addictive Behaviour. Addictive behaviour is a cardinal variable monitoring the occurrence of activities during which adolescents use or abuse legal or illegal substances or perform activities that can lead to psychological and/or physical dependence. For capturing addictive behaviour, the addictive behaviour scale of the questionnaire "Prevalence of risky behaviour in adolescents" by M. Ceresnik was used (Veresova & Tomsik 2019). The scale captures the presence of both substance and non-substance addictions and monitors their intensity (an example of an item: *"How much time do you spend per day in classes on the following activities?: a) Sending messages via social networks")*. The raw score ranges from 0 to 38 points. The internal consistency of the scale items on the research sample achieved a value of $\alpha = 0.764$.

Sex. The variable sex is a nominal variable and reflected the biological sex of the adolescent (male/female).

5.4 Statistical Processing

The data were processed in SPSS, version 29. The variables self-harm and addictive behaviour did not have a normal distribution (in both Shapiro-Wilk $p \leq 0.001$); therefore, the correlation relationships were examined using the non-parametric Spearman coefficient. Linear regression analysis was used to determine the predictive power of addictive behaviour. For all tests performed, the statistical significance threshold (α) was set at a level of 0.05.

6. Results

6.1 Hypothesis 1

H1: We assume a statistically significant correlation between self-harm and addictive behaviour.

Hypothesis H1 was verified using Spearman's non-parametric correlation. The correlation coefficient with a value of 0.549 and a significance < 0.001 indicates a statistically significant positive correlation. Hypothesis H1 was thus confirmed.

6.2 Research Question 1

RQ1: Does addictive behaviour predict self-harm and to what extent?

The statistically significant correlation between self-harm (dependent variable) and addictive behaviour (predictor) indicates the justification for using the proposed linear regression analysis. The results of the statistical analysis carried out (see Table 1) showed that the

calculated regression model is suitable for predicting self-harm. The F value at the level of statistical significance (p <.001) indicates the existence of a relationship between self-harm and addictive behaviour, and the coefficient of determination has a value of 40.3. Therefore, it can be stated that 40.3% of self-harm in the studied sample of adolescents is caused by addictive behaviour.

Table 1. Summary model of the linear regression analysis (addictive behaviour predicts self-harm)

	Unstandardized Coefficients		**Standardized Coefficients**		
	B	Std. Error	Beta	t	Sig.
(Constant)	-0.710	1.025		-0.693	0.489
Addictive behaviour	1.302	0.112	0.635	11.657	<0.001

Notes: Dependent Variable: Self-harm
F = 135.894; sig. <0.001; R^2=0.403

6.3 Research Question 2

RQ2: What is the relationship between addictive behaviour and self-harm in girls and in boys?

For revealing what the relationship is between addictive behaviour and self-harm in girls and in boys and whether there are sex differences in the predictive power of addictive behaviour on the occurrence of self-harm, a separate linear regression analysis was done for the groups of girls and boys. The results are presented in Tables 2 and 3.

Table 2. Model Summary of the linear regression analysis (addictive behaviour predicts self-harm) for boys

	Unstandardized Coefficients		**Standardized Coefficients**		
	B	Std. Error	Beta	t	Sig.
(Constant)	1.539	1.174		1.311	0.194
Addictive behaviour	0.691	0.132	0.502	5.249	<0.001

Notes: Dependent Variable: Self-harm
F = 27.553; sig. <0.001; R^2=0.252

Table 3. Model Summary of the linear regression analysis (addictive behaviour predicts self-harm) for girls

	Unstandardized Coefficients		**Standardized Coefficients**		
	B	Std. Error	Beta	t	Sig.
(Constant)	-1.510	1.380		-1.094	0.276
Addictive behaviour	1.626	0.147	0.714	11.028	<0.001

Notes: Dependent Variable: Self-harm
F =121.610; sig. <0.001; R^2=0.510

Tables 2 and 3 show that the regression model calculated separately for both boys and girls is suitable for predicting self-harm. In both cases, the value of statistical significance was p <.001. However, comparing the coefficients of determination showed that while addictive behaviour accounts for 25.2% of the variability in the incidence of self-harm in boys, in girls, up to 51% of self-harm is caused by addictive behaviour. It is evident that the proposed model better explains self-harm in females than in males.

7. Discussion

The results of the correlation analysis showed that addictive behaviours and self-harm are very closely related. Several studies that monitored this relationship from different

perspectives, in addition to meta-analyses based on the results of previously conducted studies, confirmed this relationship (see, for example, Blasco-Fontecilla et al. 2016). Adolescents themselves describe self-harm as being an addiction for them (Pritchard et al. 2021). Nixon et al. (2002) conducted intensive research in this regard, monitoring the occurrence of seven signs of addiction in self-harmers: 1/ whether this behaviour occurs more frequently and/or its severity increases; 2/ whether the individual continues the behaviour despite being aware that it is harmful; 3/ whether tension occurs if the individual interrupts self-harm; 4/ whether the urge to self-harm is unsettling, but not enough for the individual to stop; 5/ whether the self-harming behaviour causes social problems for the individual; 6/ whether the individual has to increase the frequency and/or intensity of self-harm to achieve the same effect; and 7/ whether this behaviour is time-consuming. The results show that up to 97.6% of self-harmers showed three or more and up to 81% showed five or more of these signs of addiction (Nixon et al. 2002).

There may be several reasons why self-harm and addiction are related. Both types of behaviour (addictive as well as self-harming) may arise from specific predispositions. For example, self-harming adolescents have been shown to have the addiction-related genes *SLC14A1*, *RPS6*, and *RPS3A* differentially expressed. The genes have the potential to become biological markers for a diagnosis of NSSI (Guo et al. 2023) and other addictions. The neurodevelopmental specificities of adolescence, which offer additional clues for explaining the mutual relationships between self-harm and addiction, can also be considered. Sensitivity to reward increases during adolescence (Cservenka et al. 2013), and this significantly increases the risk of fixing inappropriate behaviour in this period (be it addictive or self-harming as a maladaptive strategy for reducing emotional tension). Such reactions to stress or strain are fixed not only by negative reinforcement (reward in the form of removal/alleviation) of negative emotions, tension, anxiety, etc., but also by positive conditioning (induction of pleasant states, gaining control, etc.). In this context, M. K. Nock presents a four-functional model of self-harm in adolescents (see Nock & Prinstein 2004; 2005), which proposes four primary functions of self-harming behaviour based on a combination of automatic vs. social and positive vs. negative reinforcement. The engagement of adolescents in self-harming behaviour could be the result of 1/ automatic negative reinforcement (e.g., addictive behaviour, “To stop bad feelings”), 2/ automatic positive reinforcement (e.g., “To feel something, even if it is pain”), 3/ social negative reinforcement (e.g., “To avoid doing something unpleasant you do not want to do”) and 4/ social positive reinforcement (e.g., “To get attention”) (Nock & Prinstein 2005). Similar functions can also be found in addictive behaviour – e.g., alcohol can reduce anxiety (automatic negative reinforcement), induce a good mood (automatic positive reinforcement), remove barriers to interpersonal communication (social negative reinforcement) or facilitate the establishment of contact with others (social positive reinforcement). It is clear that rewards play an important role in shaping and reinforcing addictive as well as self-harming behaviour.

Another developmental specific that may contribute to the increased incidence of addictive and self-harming behaviours is increased impulsivity. This is the tendency to act without thinking about consequences (impulsive action) or to choose small, immediate rewards over larger, delayed rewards (impulsive choice) (Romer et al. 2017). Such impulsive action can lead to the selection of suboptimal problem-solving strategies and the choice of maladaptive forms of behaviour or stress responses, such as self-harm. Increased sensitivity to rewards in combination with increased impulsivity may therefore contribute together to the emergence of both addictions and self-harming behaviours.

One important finding of the linear regression analysis, however, is the fact that a causal relationship between self-harm and addictive behaviour was revealed. The regression model

showed that in the studied research sample of adolescents addictive behaviour accounted for 40% of self-harm. In psychology, where most phenomena are multifactorial, this is a relatively strong prediction. What's more, self-harm is known to be demonstrably associated with a wide range of variables, which are assumed to have a possible predictive effect. From a long-term point of view, for example, maternal depression (Wilcox et al. 2012), parenting stress, or parental negativity/hostility (Wichstrøm et al., 2024), self-harmer's non-heterosexual orientation, affective dysregulation, or depression (Wilcox et al. 2012) have been shown to be risk factors. If our results could be generalised, it becomes clear that addictive variables need to be given special attention in relation to self-harm. This is not only the fact that self-harm is connected with other addictions, but also the fact that it, too, has an addictive nature. This information is important not only for understanding the emergence and maintenance of self-harming behaviour in the repertoire of undesirable, maladaptive and high-risk reactions to psychological stress, but also for psychological intervention – processes of treatment and professional assistance for self-harming individuals must also work with the addiction aspect of this behaviour.

Both self-harming and addictive behaviour are characterised by gender specificities. Self-harm is known in most countries to occur more often in females (Sornberger et al. 2012; Bresin & Schoenleber 2015; Moloney et al. 2024). On the other hand, addictive behaviour is more typical for males (Greenfield et al. 2010; McHugh et al. 2018). In adolescence in particular, the prevalence of addiction is higher in boys than in girls – this difference is thought to be caused by differences in the development of addictions. In women, they appear later in ontogenesis, but addiction develops faster and has a more complicated clinical picture – this is the so-called telescoping (accelerated progression from the initiation of substance use to the onset of dependence and first admission to treatment – Greenfield et al. 2010). As Brady and Randall state, women usually start suffering from addictions later than men; they are strongly influenced by their husbands or boyfriends when using and give different reasons why their addiction persists. Aside from the fact that escalation of the addiction is more rapid for women than for men, in the "stabilisation" phase of the addiction females stabilise at higher doses of drugs, and the side effects of drug use are greater (Becker et al. 2017). Women also have a significantly higher prevalence of comorbid psychiatric disorders (e.g. depression, anxiety) than men (Brady & Randall 1999). The stronger connection between addictive behaviour and comorbidities in women also manifested in our research group – while addictive behaviour predicted self-harm at 25.2% in men, this was twice as high in women ($R^2 = 0.510$).

The more complicated clinical picture and the closer connection between self-harm and addictive behaviour in women can be interpreted on several levels. In the view of several authors, faster telescoping in substance addictions in women is a consequence of, for example, biological (hormonal, metabolic or functional) specificities of the female organism. These specifics mean a higher sensitivity of the female organism to addictive substances (due particularly to higher oestradiol levels and low progesterone), a faster origin of addiction as a consequence of more frequent hypothalamic-pituitary-adrenocortical dysregulation (causing higher vulnerability to relapse in response to negative affect) (Greenfield et al. 2010) or an overall more subtle bodily adaptation of the female organism, which reacts more intensely than the male organism to the same amount of a substance (whether delivered to the body from outside or produced by the body due to circumstances). Addiction can thus manifest itself in women more rapidly and more intensely, which applies not only to addictive substances, but also to non-substance addictions. The mentioned mechanisms also cause the development of addictive signs of self-harm (self-harm is characterised by typical signs of

addiction – Nixon et al. 2002) and may thus explain the higher incidence of addiction and self-harm in women than in men.

Another level of explanation for the stronger link between self-harm and addictive behaviour in women than in men is the area of motivation. Motivation towards addiction is gender-specific; while men tend to show externalisation in addictive behaviour (they are mostly encouraged to use drugs by their friends or by peer pressure), women are much more likely to have internalisation reasons (solving psychological problems, relieving pain) (Zolala et al. 2016). Internalisation is on the whole more typical for women, and is also supported by gender stereotypes that tolerate outwardly expressed aggression and externalised forms of coping with difficulties in men, but create pressure on women to be more restrained and controlled in their expressions. Sociocultural conceptions of masculinity and femininity which are activated and applied most strongly in adolescence contribute to the development of externalising and internalising behaviours (Rosenfield 2012). Several studies have shown a higher prevalence of internalised behaviour in girls compared to externalised behaviour (see, e.g., Hicks et al. 2007; Eme 2016; Zhou et al. 2024). Self-harm itself is a prime example of an internalised behaviour – harming oneself instead of outwardly venting aggression, frustration and negative emotions leads not only to self-harm (in its physical but also psychological forms – Sansone & Sansone 2010) but also to the development of other psychological problems – most often depressive or anxiety disorders. Therefore, these tendencies towards internalisation may represent another explanation for the close connection between self-harm and addictive behaviours in women.

8. Conclusion

For understanding, preventing and successfully treating self-harm as a high-risk and prevalent behaviour, especially in adolescence, the key factors sharing in its emergence and maintenance in the repertoire of maladaptive reactions to psychological stress need to be identified. A growing body of research points to common intersections between self-harm and addictive behaviour – whether in the area of high prevalence of addictions in self-harming individuals or in the area of identifying signs of addiction in self-harming behaviour itself. Research carried out on a population of individuals in late adolescence (15 – 19 years) showed that addictive and self-harming behaviour are not only correlated with each other with statistical significance, but that addictive behaviour significantly predicts the occurrence of self-harm. These findings are especially important for the female gender, as the power of prediction of self-harm by addictive behaviour was twice as high in women as in men. Addictive features, especially in females, should therefore be significantly taken into account when working with self-harming teenagers.

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