

## **Self-injury – placement in mental disorders classifications, risk factors and primary mechanisms. Review of the literature**

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### **Summary**

Self-injury is a common phenomenon among adolescents and young adults, however its prevalence in clinical population is estimated at 40–80%, especially in regard to patients during puberty. Symptoms usually appear between 12<sup>th</sup> and 14<sup>th</sup> year of age, and their average duration is approx. 2 years.

According to accepted sociocultural norms self-injury can be regarded as a normal behavior. Nevertheless, the prevalence of body art phenomenon in Western culture including professional tattooing, piercing, scarification, burning tattoos and other body modification typical for tribal cultures, has forced the need to redefine the boundaries for normative behavior.

Introduction of a separate nosological unit of Non-Suicidal Self-Injury in the fifth edition of DSM classification proves the validity of discussion, being hold for many years, regarding classification and understanding of the underlying mechanisms of self-harm.

The aim of our study was to present the current state of knowledge regarding self-harm, with an emphasis on issues devoted to their placement in newest mental disorders classifications and mechanisms responsible for their development and maintenance. Databases such as: PubMed, EBSCO (medical and psychological resources) and WEB OF SCIENCE (years 1990–2016) have been screened for the following key words: self-injury, self-harm, self-mutilation, suicide, deliberate self-harm, affect regulation, NSSI, DSH, personality disorders, suicide attempt, neurobiology self-harm, DSM-5, adolescent, adults, stress coping styles, self-mutilation – children, adolescents and adults-prevalence. The analysis indicated 110 articles and 3 textbooks. We have used the following criteria: (1) for the articles presenting the latest research on risk factors for self-harm we have used the criterion of the study group number (>30 people) and meta-analyses have been included, (2) for theories explaining the mechanisms of self-harm criterion of empirical review of the assumptions and the number of the published studies that verify the theory has been applied.

**Key words:** self-injury, personality disorder, adolescents

### Definition and placement in mental disorders classifications

Despite increasing prevalence in the adolescents population [1–3] self-harm (self-mutilation, self-injury) is a phenomenon difficult to unequivocally classify. According to accepted sociocultural norms it can be regarded as a normative or abnormal behavior. According to the first definitions, self-harm was understood as intentional, deliberate, non-life-threatening and socially unacceptable damage or distortion of the body, most often taking form of cutting or burning and in more extreme cases “eye gouging, nose, tongue and genitals mutilation, deep injuring of tissue, auto-cannibalism and self-castration” [4, p. 10]. Along with the spread of body art phenomenon in the Western culture, including professional tattooing, piercing, scarification, burning tattoos and other body modification typical for tribal cultures, the definition of standards for interfering with the body and its mutilation has been extended. The necessity to redefine the boundaries for normative behavior has become the starting point for the research on the mechanisms and risk factors of self-harm, as reflected in the diagnostic classifications.

In the newest classification of the American Psychiatric Association, DSM-5 [5], self-injury is defined as socially unacceptable, intentional body damage, inducing bleeding, bruising or pain, attempted to diminish psychological discomfort. Self-injury is understood as (1) one of the symptoms co-occurring with emotional and developmental disorders with various etiology or personal disorders, or it is being treated as (2) separate nosological entity, so called Non-Suicidal Self-Injury (NSSI). In the previous version of this classification (DSM-IV) [6] as in ICD-10 [7] self-injury constitutes one of the symptoms of borderline personality disorder. This reflects a fairly common position of some researchers and clinicians who believe that self-harm should be primarily understood as a symptom of disorders from Axis II [5, 6, 8], and the argument supporting this idea is that they do not have clear clinical effects beside the context of personality disorders [8]. The results of research conducted during last years, however, do not fully confirm this. It turned out that (1) self-injury occurs in adolescents and young adults with a significantly higher prevalence than borderline personality disorder in the general population [9–12], (2) more than half of youth hospitalized in psychiatric wards due to self-injury does not meet the diagnostic criteria for Axis II disorders [13, 14], and (3) self-injury may coexist with Axis I disorders, suicidal thoughts and suicidal tendencies or it may be a predictor for suicidal attempts [1, 2, 8, 14–16]. Precursors of the approach promoting recognition of self-harm as a separate nosological entity were Kahan and Pattison [17], who created the concept of “deliberate self-harm syndrome”, which is characterized by (a) the inability to resist the impulse to harm oneself, (b) experiencing the tension before the act of self-harm, (c) experiencing relief after self-injury. Establishment of the category of NSSI in DSM-5 [5] is a continuation of the above assumptions, but nevertheless requires further study,

as indicated by the authors of the classification. Following diagnostic criteria for non-suicidal self-injury have been suggested:

- A. In the last year, the individual has, on five or more days, engaged in intentional self-inflicted damage to the surface of his or her body, of a short likely to induce bleeding, bruising or pain (e.g., cutting, burning, stabbing, hitting, excessive rubbing) with the expectation that the injury will only lead to minor or moderate physical harm (i.e., there is no suicidal intent). Note: the absence of suicidal intent is either reported by the patient or can be inferred by reliance on the method that patient knows, by experience or familiarity, not to have lethal potential.
- B. The individual engages in the self-injurious behavior with one of more of the following expectations: (1) to seek relief from a negative feeling or cognitive state, (2) to resolve an interpersonal difficulty, (3) to induce a positive emotional state. Note: the anticipated relief or reaction is experienced either during or immediately after self-injury, a person may present patterns of behavior that suggest dependency on multiple engaging in self-injury.
- C. The behavior must also be associated with 1 of the following criteria: (1) interpersonal difficulty or negative feelings and thoughts, e.g., depression, anxiety, generalized distress or self-criticism immediately prior to the self-injurious act, (2) prior to engaging in the act, a period of reoccupation with the intended behavior that is difficult to control, (3) thinking about self-injury that occurs frequently, even when it is not done.
- D. The behavior is not socially sanctioned (e.g., body piercing, tattooing, religious or cultural ritual) and is not restricted to scab picking or nail biting.
- E. The behavior or its consequences cause clinically significant distress or interference in interpersonal, academic or other important areas of functioning.
- F. The behavior does not occur exclusively during psychotic episodes, delirium, substance intoxication, or substance withdrawal. In individuals with neurodevelopmental disorder, the behavior is not part of a pattern of repetitive stereotypes. The behavior is not better explained by another mental disorder or medical condition (e.g., psychotic disorder, autism spectrum disorder, intellectual disability, Lesch–Nyhan syndrome, stereotypic movement disorders with self-mutilation, trichotillomania, pathological skin picking/scratching).

### Epidemiology and clinical picture

Difficulties related to the assessment of the prevalence of self-harm in the general population are mainly due to the lack of a sufficient number of studies in non-clinical groups [9, 18]. The results of available studies conducted in different countries, allow us to conclude that it is related to a significant extent to adolescents and young adults (approx. 13–42%), and its prevalence decrease with age (approx. 4–6% of adults) [9–12, 15, 18, 19]. This phenomenon is much more common in clinical populations,

wherein the frequency of self-injury is estimated to be approx. 21% for adults [2], and from 40% to up to 80% regarding patients in puberty period [2]. Symptoms usually appear between 12<sup>th</sup> and 14<sup>th</sup> year of age. Behaviors are initiated by an adolescent or under the influence of the environment [1, 3, 16], and their average duration is approx. 2 years [3, 20]. There were no relationships with sex [1, 11, 12], cultural factors [9, 12] and the socio-economic status [3].

The most common form of self-harm is cutting the skin, occurring in 70–90% of people, hitting (21–44%) and burning (15–35%) [2]. Furthermore, scratches, biting, head banging on hard surfaces, hair-pulling and the use of medications are observed [3, 8, 10, 12, 18, 21]. Most self-injuring people use more than one method. In women cutting and scratches are observed more often, whereas in men – burning [12]. Parts of the body most vulnerable to this type of behavior are hands, wrists, forearms, upper arms, thighs and abdomen [2].

### Risk factors

First, large group of risk factors for the emergence of a self-harm behavior is the presence of abnormal personality structure and the presence of mental disorders. Studies in a group of adults with borderline personality disorder show that the occurrence of self-harm acts in the clinical sample concerns 50–78% of patients [22]. Subjects usually date the onset of symptoms back to the period of late childhood and adolescence [22], which is likely a prelude to the presence of abnormal personality traits. What is more, research conducted over the last two decades also indicate the coexistence of self-mutilation with other personality disorders, including antisocial, histrionic, avoidant, dependent, obsessive-compulsive personality [1, 23], as well as externalizing and internalizing disorders of developmental age [1, 3, 11]. It is estimated that approx. 24–63% of adolescents engaged in self harm show oppositional defiant and conduct disorders, wherein from 14 to 60% additionally use psychoactive substances [11, 24]. In addition, adolescents with self-harm behavior had significantly higher percentages of anxiety disorders, affective disorders (especially depression), suicide thoughts and attempts as well as eating disorders (bulimia and bulimic subtype of anorexia nervosa) [1, 3, 8, 11, 24–26].

Among the other risk factors, family factors and factors associated with a traumatic experience play an extremely important role. Based on the results of the available studies it can be argued that the strongest predictors are unstable or traumatic relationships with loved ones, disturbed attachment or premature separation from parents/guardians, parental divorce or death of one of them, excessive parental criticism, lack of support from loved ones, the alcohol problem in family, traumatic experience in childhood, including physical or sexual violence [3, 11, 12, 24–29]. It seems that there is a relationship between the type of negative experiences and gender of people engaged in self-harm. For women, the strongest risk factors are emotional neglect by

their parents, unstable relationship with father and the experience of sexual abuse in childhood, whereas in men, premature separation in childhood, especially with father and the experience of physical violence [28].

Factors that reduce the risk of self-harm are stable attachment patterns, extended family and rewarding social support network, good school and professional performance and functioning, sufficient financial resources, cultural and religious background, good management of free time and institutional support [30].

### Theories explaining the development of self-harm

The literature highlights the different functions of self-injury: (1) regulation of affect, particularly to diminish the negative emotions (fear, guilt, loneliness, anger, emotional suffering), (2) desire to regain a sense of reality in response to periods of dissociation and depersonalization, (3) preventing suicide tendencies, (4) influencing the environment, (5) determining the boundaries of self, (6) to punish oneself or others, (7) expressing personal traumatic experience or re-experiencing trauma, and (8) induction of emotions in case of “inner emptiness” [2, 3, 8, 10, 16]. People engaged in self-harm are often characterized with non-adaptive methods of stress management (most often with severe avoidance strategies), low self-esteem, higher levels of impulsivity, more frequent experiencing of negative emotions and dissociative states [2, 23–25].

Discussion regarding the mechanisms of self-harm lasts from three decades. In order to fully understand them, it is necessary to refer to the constructs of theoretical and empirical research, conceptualizing functions of self-harm and their maintenance mechanisms. Selected theories that complement each other and allow to look at the problem comprehensively, will be presented below.

### The Experiential Avoidance Model (EAM)

Assumptions of behavioral theory, including mechanisms of classical and instrumental conditioning, lie in the background of this model [31]. It has been noted that the self-harm is most often carried out to regulate the affect, which leads to the development of non-adaptive method of dealing with tension [2, 23–25]. The self-harm act, undertaken in order to avoid negative emotions is amplified as a consequence of the experience of relief and relaxation. Multiple repetition of behavior leads to habituation and reinforces the strategy of avoidance, which eventually becomes automatic and conditional answer to every emotional arousal. Low tolerance and difficulty in regulating emotions and high excitability favor the development and maintenance of non-adaptive coping methods. An important limitation of this model is the omission of the social context of self-injury.

### Emotional Cascade Model (ECM)

It complements the EAM model with cognitive component [32]. It was originally developed to clarify the relationship between experiencing strong negative emotions and engaging in destructive behavior by individuals with borderline personality disorder, but on the basis of the available studies it can be assumed that the same mechanisms can be applied to patients with other personality disorders [2, 3, 8, 10, 16, 33]. Assumption underlying the ECM model is that the individual shows a strong tendency to ruminate unpleasant events, which leads to the gradual accumulation of negative emotions (sadness, anger, fear). This in turn causes a higher sensitivity to another, not positive stimuli, thus exacerbating rumination and undesirable feelings. Consequently, through the mechanism of positive feedback it will generate, the so-called emotional cascade [32], which remains outside an individual's control and which activation prolong the return to the initial emotional state. In the case of people with personality disorders, particularly borderline personality disorder, almost every adverse event may trigger an emotional cascade that cannot be interrupted by standard coping strategies (e.g., dissipation, distraction, seeking social support), but only through destructive behavior (e.g., self-harming with pain experience and blood view). Repeating experience of incorrect strategy effectiveness in reducing the severity of rumination causes strengthening of destructive behavior in the mechanism of instrumental conditioning. Studies confirm the usefulness of the ECM model in the conceptualization of self-harm [33].

### Nock's Integrated Theoretical Model

This model combines data from different research areas and amplify previously disclosed assumptions [34]. The risk of self-harm, whose main function is to regulate affect and/or social situations, grows in the presence of (1) the so-called distal factors, such as, (a) a genetic predisposition to a strong, reactive emotional arousal, (b) experience of abuse or neglect in childhood, (c) the experience of parental hostility and criticism, and (2) interpersonal factor, i.e., (a) onset of emotional cascade (b) low tolerance for tension experience, (c) deficits in social skills area. Coincidence of above-mentioned factors contributes to the development of non-adaptive strategies. According to Nock, self-harm is caused and sustained by four processes: (1) intrapersonal negative reinforcement (avoidance of undesirable emotional states), (2) intrapersonal positive reinforcement (obtaining the desired emotional state), (3) interpersonal positive reinforcement (facilitating help seeking), (4) interpersonal negative reinforcement (facilitation of the escape from unwanted social situations, which are a response to the deficits caused by distal factors). To sum up, it can be stated that according to the above model, stressful event causes excessive or too weak stimulation and creates public expectations which are difficult to meet. In the face of

the existence of personal deficits and specific cultural or social factors that contribute to self-harm, it leads to the development of destructive behavior. This model requires empirical verification.

### The biopsychosocial model

Taking into account the interconnectedness of different aspects: environmental, cognitive, affective, behavioral and biological, Walsh suggested biopsychosocial approach [30]. As first he focused on the role of personal and family history of the patient (environmental aspect), in particular on the experience of separation from a parent (for any reason), emotional, physical and sexual abuse, invalidating environment and traumatic events in the family, such as presence of violence and/or mental illness, substance abuse, suicide or self-harm done by family members. The current environmental factors, such as conflict or the loss of a loved one, problems at school or observation of self-harming person are trigger factors for self-harm in that model. An important role is also assigned to remaining aspects. It is believed that irrational beliefs about oneself and others, with a clear tendency to blame oneself and building unrealistic expectations in relation to each other (cognitive aspect) are characteristic for self-injuring people. This is the starting point for the behavioral activation (behavioral aspect), among which the following behaviors are listed: (1) behaviors preceding the act of self-destruction (e.g., conflicts, failures, loneliness, substance abuse, planning where and how to make a self-harm), (2) behaviors related to the act, and (3) subsequent behaviors (e.g., taking care of oneself, falling asleep or return to everyday life, which is often associated with the presence of negative opinion and emotions experienced after the act of self-harm – emotional aspect).

### Biological aspect

Although unequivocally, many studies suggest an important role of opioid systems in development of self-harm in patients without suicidal intentions. There are at least two models explaining this relationship. The first assumes that during the act of self-harm endogenous opioids are released which cause anesthesia and decrease stress level [35], whereas in the second one the possibility of higher levels of endogenous opioids in self-harming people, which results in greater tolerance to pain and allows such behavior is considered [36]. A higher level of pain tolerance in people engaged in self-injury has been confirmed in several studies [36–38]. This model also explains the effect of reducing the incidence of self-harm after opioid blockers administration [39]. Contrary to these findings is the study by Nixon et al. [40], in which the decreased incidence of disruptive behaviors in self-harming adolescents with depressive disorder treated with acupuncture was associated with elevated opioids levels. In turn, in the study by Stanley et al. the resting levels of beta-endorphins and enkephalins

in the cerebrospinal fluid (CSF) of self-injuring patients was reduced compared to the control group [41]. Moreover, decreased levels of peripheral endogenous opioids and opioids in CSF are found in some psychiatric disorders with the presence of self-inflicted injuries, for example, in autism spectrum disorders [35]. So far, few studies have focused on the relationship between self-injury and monoamine system, while dysfunctions in the serotonergic and dopaminergic system are observed in people with suicidal behavior [42, 43], people with Prader–Willi and Lesch–Nyhan syndrome, in the course of which self-harm occurs [44]. In the study by Stanley et al. [41], where the level of 5-hydroxyindoleacetic and homovanillic acid in CSF was evaluated, no association between the serotonergic and dopaminergic dysfunction and self-harm was observed. The lower level of peripheral serotonin, in turn, was found in self-injuring girls [45]. In the integrated model of self-harm the endogenous opioids deficit is interpreted as a consequence of experiencing chronic stress during childhood (abuse, neglect, loss) or biological predisposition. This deficit is associated with the inadequate opioid response to stress, which results in self-harm to increase the level of opioids and homeostasis restoration. Some authors also suggest the possibility of abnormalities in the area of the reward system and a different regulation of pain reactions [46, 47]. Another research direction concerns, among others, interaction of environmental and genetic factors (relationship between emotional atmosphere in which a child grows up with a brain-derived neurotrophic factor Val66Met gene polymorphism) [48, 49].

### Recapitulation

Self-injury is a multi-faceted issue, the frequency of which increases in adolescents population (both in general and clinical one). This creates a need to continuously improve the level of knowledge among professionals working with young people, mainly in terms of a better understanding of the risk factors (both psychological and biological) and maintaining mechanisms of above-mentioned behavior. This is the essential basis for the development and implementation of adequate therapeutic interventions and preventive action. An accurate differentiation of normative behavior for age, gender and culture (e.g., piercings, tattoos), which does not function as a catalyst for emotions, from suicidal behavior and self-destructive behaviors that require therapeutic effects, appears to be especially current issue in relation to individuals in developmental age. On the one hand, it can help to reduce psychiatric hospitalizations and negative labeling attached to teenagers, on the other hand, it can help to plan an adequate interaction, including adolescents and their families. Despite the versatility of theories related to the mechanisms determining the development and maintenance of self-harm, in all patients following procedures should be performed (1) identification of individual risk factors, and (2) behavioral analysis (antecedents factors and consequences of undertaken behavior) and cognitive conceptualization of



a problem (beliefs about oneself, others, and the role of self-harm). It seems that such procedure creates the opportunity to reduce the number and severity of complications, mainly in the form of comorbidities and development of abnormal personality traits and personality disorders in adulthood.

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