



How identification with one's own body is related to emotional processes in individuals with alcohol use disorder

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ABSTRACT

Introduction: Research suggests that there is an association between being disconnected from one's body and having problems processing emotions.

Objectives: The objective of the study was to examine whether individual differences in identification with the body are associated with emotion processing, and whether this association differs between individuals with alcohol use disorder (AUDs) and a non-AUD healthy comparison group (HC).

Methods: The study sample included 134 adults who participated in an eight-week inpatient alcohol treatment program and 80 non-AUD healthy controls. Emotion processing was assessed with the Toronto Alexithymia Scale, Difficulties in Emotion Regulation Scale, and the State-Trait Anxiety Inventory. Identification with one's own body was assessed with a novel pictographic scale.

Results: In the serial mediation model ($R^2 = 0.599$; $F[9174] = 28.890$; $p < 0.001$), the effect of identification with one's own body on trait anxiety was found to operate via difficulties in identifying feelings and difficulties in emotion regulation in individuals with AUD, [$ES = -0.19$; $CI(-0.18, -0.03)$] but in not healthy comparison group [$ES = -0.11$; $CI(-0.52, -0.20)$]. Namely, lower identification with one's own body was associated with greater difficulty in identifying feelings, which in turn was associated with increased emotional dysregulation, which in turn was associated with greater trait anxiety only in individuals with AUD.

Conclusions: The results suggest that in individuals with AUD greater disconnection between self and body is related to higher trait anxiety, and that this effect is partially mediated by difficulties in identifying feelings and emotional dysregulation. In clinical populations, disruptions to this embodiment process may lead to more severe emotional dysregulation, whereas in healthy individuals, the absence of such a connection does not necessarily result in dysfunction. Increasing the level of identification with one's own body may represent a future therapeutic target among individuals with AUD.

1. Introduction

1.1. Embodiment and self-identification with the body

In recent years, psychology, cognitive science, and related fields have increasingly endorsed theories of embodiment. Embodiment is a term used to describe the connection between cognitive, emotional

representations, and functions and bodily sensations, processes and actions (Barsalou, 2008, for a review see Wilson, 2002). While research confirms that body sensations influence cognitive and emotional processing, the role of embodiment in conceptualizing the self and self-referenced processes is often overlooked (Rafaeli-Mor and Steinberg, 2002; Symons and Johnson, 1997). If the self is defined by its ability to perceive, think, feel, and act, and these functions are shaped

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and influenced by bodily sensations, then it follows that the self should be fundamentally conceptualized as an embodied self (Bermúdez, 2011).

The distinction between the self as known and the self as knower dates as early as 1890 by James. He proposed that individuals may sometimes disassociate from their bodies, while at other times, they may fully identify with them. This acknowledges a fluctuation in how the physical body is perceived; vacillating between being an object and a subject for the self. Recently, Lundh and Foster (2024) provided a synthesis of phenomenological perspectives by examining them within a psychopathological framework. Namely, Lundh and Foster posit that individuals embody self-identity based on “the combined experience of having a body and being a body” (Lundh and Foster, 2024; page 1–2). Within this conceptualization, individuals differ in their ability, either more (self as subject) or less (self as an object), to connect one’s self with their body. Lundh and Foster postulate that the self as both subject and object (also known as embodiment synthesis) is essential for the experience of each person’s self-identity. Accordingly, a disharmonious synthesis contributes to mental health problems (see Lundh and Foster, 2024 or Fuchs and Schlimme, 2009 for review).

In the present study, we define identification with one’s own body as the extent to which an individual experiences their physical body as an integral and subjective part of the self. This construct reflects an internalized sense of being the body, rather than merely having a body, and captures the degree to which bodily sensations, actions, and physical presence are perceived as central to one’s self-experience. Lower levels of body identification may indicate a sense of disconnection or alienation from the body, whereas higher levels reflect a more unified, embodied perception of the self.

1.2. Body disconnect and body objectification

While to our knowledge no empirical studies specifically examined how the process of self-identification with the body relates to psychiatric conditions, similar theoretical accounts have been proposed in the psychopathology literature to support the rationale of the present study. Research has described and conceptualized the consequences of separating oneself from their body or losing the connection between oneself and the body (body disconnection) and concentrating only on the appearance of the body (self-objectification; Fredrickson and Roberts, 1997). Objectification, a concept that can be traced back to Kant’s philosophical writings (1996), refers to the process whereby a person loses their individuality and subjectivity, and instead becomes a mere object or tool for fulfilling the desires and needs of others (Sartre, 1943; Nussbaum, 1995). Subsequently, through the process of internalization, individuals who are objectified by others may experience self-objectification, leading to a shift from subjective self-awareness to perceiving themselves as objects (e.g., Fredrickson and Roberts, 1997; Nussbaum, 1995). When a person perceives oneself as an object, their experience towards their physical body may be limited to only its appearance and functionality. Authors of self-objectification theory claim that due to the cognitive resources involved in body appearance monitoring (especially in social contexts where the awareness of others evaluating human observers is heightened), fewer perceptual resources are available for a person to observe what is happening internally, including the subjective experience of ‘me in the body’ (Fredrickson and Roberts, 1997). As a result, the person may become less attuned to internal signals from their body (i.e., disconnected from the body). Clinically, data from individuals with anorexia nervosa indicate that the specific interoceptive alterations observed in these patients can be understood as an experience of one’s own body primarily perceived as an object viewed by others, rather than as a body-related sensation (i.e., interoceptive) gleaned from a first-person perspective (Stanghellini, 2019; Stanghellini et al., 2019; Scarpina et al., 2022). A recent meta-analysis of neuroimaging data indicated that hyperconnectivity between subcortical–cortical midline structures represents a neural

correlate of reduced intero-exteroceptive integration, which results in self-objectification (Lucherini, Innocenti et al., 2022). Furthermore, self-objectification can result in negative emotions, such as feelings of inferiority, powerlessness, and intense self-criticism, which can manifest as concern for one’s body, personal traits, or behavior (Andrews et al., 2002). The literature on self-objectification suggests that when individuals focus on their outer body appearance they may be left with fewer cognitive resources to attend to inner body experiences and resulting difficulties with emotion regulation (Fredrickson and Roberts, 1997). Moreover, if emotions arise at least partially from the perception of bodily sensations, then self-objectification may reduce the intensity of felt emotions, thereby diminishing the need for their regulation. Preliminary data support this hypothesis showing that self objectification influences emotional processing neurocircuitry, which may be linked to emotion dysregulation (Monachesi et al., 2024). Similarly, a longitudinal study found that adolescent body objectification predicted difficulties in emotion regulation, which in turn increased the risk of developing depressive symptoms (Duggan et al., 2015).

1.3. Emotionality in alcohol use disorder – anxiety, alexithymia, emotional dysregulation and its relation to the body

The concept of embodiment suggests that one’s emotional state when experiencing the physiological effects of a drug can affect how future internal states are perceived, which in turn modulate emotions to promote drug-seeking behaviors (Garfinkel et al., 2015). Negative affect—defined as emotional distress characterized by unpleasant feelings (e.g., anxiety, fear, irritability, and sadness)—has been identified as a critical factor in both the development and perpetuation of substance use disorders (SUD; Conger, 1956; Khantzian, 1997; Baker et al., 2004). Its role in addiction is highlighted by several negative reinforcement theories suggesting that substances reinforce use by altering emotional experiences. For example, prior work frequently supports anxiety as a significant motivator for alcohol consumption (Dyer et al., 2020). Although alcohol may temporarily relieve anxiety and emotional distress, as well as intensify joy, comfort, and relaxation, its chronic use impairs emotional regulation processes to eventually reinforce negative affect in the long run (Koob, 2015, 2017). Research confirms that among individuals with alcohol use disorder (AUD), both negative affect and related emotional dysregulation fuel the vicious circle of addiction (Petit et al., 2015; Kober, 2014). For example, Koob and Volkow note that alexithymia—difficulties recognizing and describing one’s own emotions (Koob and Volkow, 2016)—is a significant motivational factor in addiction. Namely, alexithymia contributes to cycles of negative affect involving vague and unprocessed feelings, triggering anxiety, irritability, and other distressing emotional states (Koob and Volkow, 2016). Alexithymia has also been strongly associated with negative affect among individuals with AUD (de Timary et al., 2008; Palma-Álvarez et al., 2021). Prior research suggests that individuals with high levels of alexithymia may struggle with emotional dysregulation, increasing their vulnerability to negative emotional states (Linn et al., 2021). Classic theories of emotion posit that various emotional states have a physiological basis, beginning with primary bodily changes (Damasio 1991; Lang, 1994) and that difficulty in accurately perceiving internal bodily signals may lead to abnormal emotional processing. Emerging theories indicate that alexithymia may be linked to abnormalities in sensing and interpretation of signals arising from within the body (interoception) (Brewer et al., 2016; Murphy et al., 2018). Recent research shows that although individuals with AUD may be able to sense physiological stimulation coming from their bodies (e.g., accurate perception of bodily signals), this stimulation may not be processed properly (i.e., interpretation of interoceptive signals is impaired) and therefore not improve their emotion regulation skills. Conversely, their decreased ability to deal with emotionally arousing physiological states may increase the use of alcohol to self-regulate (Wiśniewski et al., 2021). In general, recent research on interoception confirms close associations between the

ability to recognize bodily signals and the ability to regulate emotions and control behavior, as shown also in individuals with AUD (Jakubczyk et al., 2020). Specifically, findings suggest that functional regions involved in interoception (especially the right anterior insula) and their connections to regions within the salience network are also recruited during decision making and emotion regulation (Tan et al., 2022). However, the way one focuses on and recognizes bodily signals is not synonymous to how one identifies themselves with their body. Although both of these aspects (i.e., interoception and identification with one's own body) represent mind-body processes, they should be perceived as distinct concepts. For example, an individual may be intensively focused on and accurate in interpreting internal bodily signals, yet still treat their body as an external object. Importantly, while associations between difficulties in proper processing of bodily sensations and emotional dysregulation have been thoroughly studied in the context of AUD (e.g., Wiśniewski et al., 2021), associations between emotion processing and body disconnection (i.e., how you identify your body as your “self”) have not been investigated in the context of problematic alcohol use.

1.4. Current study

Research so far suggests that there is an association between being disconnected from one's body and having problems recognizing and processing emotions. We argue that the level of identification with one's body might be an important factor in emotional processing, including recognition and regulation of emotions. Arguably, once an individual experiences fewer emotions and repeatedly fails to identify their source (i.e., the body), they will progressively lose their ability to regulate emotions and, consequently, have difficulties managing intense emotional experiences. These, in turn, while disrupted, contribute significantly to alcohol use, as alcohol consumption may be used as a coping strategy for dysregulated emotions. Based on the current AUD research, we consider that, in addition to distorted sensitivity to bodily signals, an important factor associated with emotional processes among individuals with AUD may be their level of identification with their bodies. However, to date no study has empirically tested this hypothesis.

The current study's objective was to examine whether individual differences in identification with the body are associated with emotion processing, and whether this association differs between individuals with alcohol use disorder (AUDs) and a non-AUD healthy comparison group (HC). Specifically, we tested whether lower self-body identification is associated with greater difficulties in identifying feelings, higher emotion dysregulation, and increased negative affect (i.e., trait anxiety)—factors that have been implicated in the development and maintenance of AUD. Based on the embodiment perspective, we hypothesized that lower identification with one's body would be linked to greater emotional processing difficulties and higher trait anxiety, particularly among individuals with AUD.

2. Material and methods

2.1. Study group

The current data comes from a study examining the behavioral and emotional functioning of individuals with AUD. The study sample included 134 (81 % male) individuals aged 43.57 ± 10.8 who participated in an eight-week inpatient alcohol treatment program. The AUD group consisted of individuals receiving treatment for current severe AUD without acute withdrawal symptoms and not receiving any benzodiazepines. In terms of drinking characteristics, participants reported: (1) their first experience of being “drunk” at the age of 17.0 ± 4.3 ; (2) their first experience with drinking problems during early adulthood (26.1 ± 9.1 years of age); (3) the duration of their last drinking period was 143.3 ± 500.1 consecutive days of drinking; and (4) the duration of alcohol abstinence prior to completing the study procedures was $49.2 \pm$

45.1 days. AUD diagnosis was initially determined by a psychiatrist using the International Classification of Diseases and Related Health Problems 10th Revision (WHO, 1993) upon the patient's admission for treatment. This diagnosis was later confirmed through the MINI International Neuropsychiatric Interview (Sheehan et al., 1998). Adults with a history of psychosis, current co-occurring mental health disorders requiring medication, current co-occurring SUD other than nicotine, or a clinically significant cognitive deficit (<25 on the Mini-Mental State Examination) (Folstein et al., 1975) were not eligible. Research procedures were performed during the first two weeks following treatment admission. The study questionnaires were all assessed within the same study visit.

The HC group included 80 non-AUD adults (mean age = 43.87 ± 14.33 years) who visited a general practitioner for a routine annual check-up or to seek medical advice (for a more detailed description of the study sample, see Kopera et al., 2021). Alcohol use in this group was assessed using the Alcohol Use Disorders Identification Test (AUDIT; Babor and Higgins-Biddle, 2000) to exclude individuals who reported harmful alcohol consumption.

2.2. Measures

2.2.1. Sociodemographic information

Sociodemographic characteristics (e.g., age, biological sex, education) were measured with a self-report survey.

2.2.2. Difficulties in identifying feelings

The subscale from the Polish version of the Toronto Alexithymia Scale (TAS-20; Bagby et al., 1994; Cedro et al., 2001) was utilized as a self-report measure of difficulty identifying feelings (e.g., “I am often confused about what emotion I am feeling”). Participants rated items on a 4-point Likert scale ranging from 1 (strongly disagree) to 4 (strongly agree), with higher scores indicating greater difficulty identifying feelings. Cronbach's α for the TAS subscale in the current study was 0.85.

2.2.3. Trait anxiety

Trait anxiety was measured with the Polish Version of the Trait Anxiety scale of the State-Trait Anxiety Inventory (STAI-T; Spielberger, 1983; Wrześniewski et al., 2002). This 20-item self-report measure assesses relatively stable individual differences in anxiety proneness. Participants rated items on a 4-point Likert scale ranging from 1 (almost never) to 4 (almost always), with higher scores indicating greater trait anxiety. Cronbach's α for the STAI-T in the current study was 0.90.

2.2.4. Emotion dysregulation

The total score from the Polish version of the Difficulties in Emotion Regulation Scale (DERS) (Gratz and Roemer, 2004; Dragan, 2016) was used to assess emotion dysregulation. Participants rated items on a 5-point Likert scale ranging from 0 (almost never) to 4 (always). A higher score indicates lower emotion regulation abilities. The Cronbach's α for the total DERS score in the current study was 0.92.

2.2.5. Identification with one's own body

To measure the degree of identification with one's body, we created a modified version (Suszek et al., 2025) of a 1-point Inclusion of Other in the Self Scale (Aron et al., 1992). The scale is self-administered, with participants completing it independently and without time constraints or researcher involvement. It is pictographic and consists of 7 pairs of circles: one circle represents the self and the other represents the body (Fig. 1). The circles are positioned in relation to each other from no overlap, to partial overlap, to almost complete overlap. The participant has to choose the pair of circles that, according to her feelings, best defines the association between them and their body. Higher overlap between circles indicates stronger identification with one's own body (body as a subject for the self). In contrast, lower overlap between circles indicates stronger dissociation between the self and the body (body as an

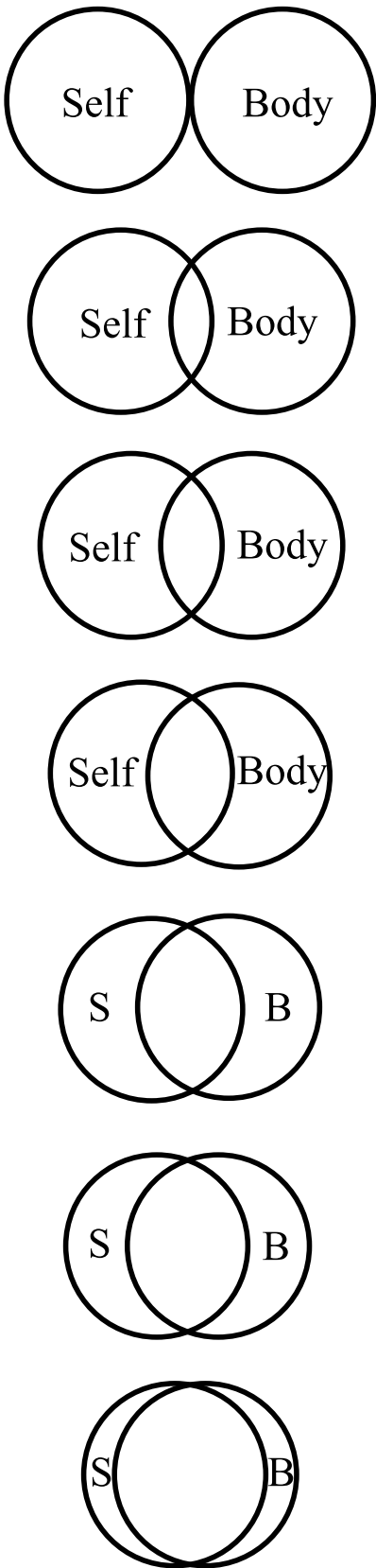


Fig. 1. Please focus for a moment and think about who you are. Consider to what extent your physical body is a part of you. Below, you will find several images. Each pair of circles represents you and your body. Choose and mark the pair that, according to your feelings, best describes the relationship between you and your body.

object for the self). The scale is scored from 1, indicating the lowest level of identification with the body, to 7, indicating the highest level.

2.3. Statistical analyses

Normality of the data distribution was assessed using Kolmogorov-Smirnov tests. Depending on the distribution, between-group comparisons for age, difficulties in emotion regulation, difficulties in identifying feelings, and trait anxiety were conducted using either Student’s t-test or the Mann-Whitney *U* test. Next, to test the associations between our target variables among individuals with AUD and HCs, simple correlations between identification with one’s body, difficulties in emotion regulation, difficulties in identifying feelings, and trait anxiety were calculated. Hayes’ (2013) PROCESS macro for SPSS was used to test a moderated serial mediation model in which difficulties in identifying feelings and difficulties in emotion regulation were included as sequential mediators of the association between identification with one’s body and trait anxiety, with group (AUD vs. HC) moderating all paths in the model, including the direct effect.

3. Results

3.1. Primary analyses

Between-group comparisons for biological sex, age, difficulties in emotion regulation, difficulties in identifying feelings, and trait anxiety are presented in Table 1. Individuals with AUD reported significantly lower self-body identification, $t(195) = 2.30, p = .02$, greater difficulties in identifying feelings, $U = 7493.5, p < .001$, higher emotion dysregulation, $t(201) = -9.82, p < .001$, and higher trait anxiety, $t(200) = -8.75, p < .001$, compared to HCs. The groups did not differ in age, $t(210) = 0.21, p = .84$. However, a significant difference was observed for biological sex, $\chi^2 = 44.38, p < .001$. Correlations between age, self-body identification, difficulties in identifying feelings, emotion dysregulation, and trait anxiety within each group are presented in Table 2.

Table 1
Comparisons between individuals with alcohol use disorder (AUD) and a healthy comparison group (HC) across biological sex, age, difficulties in emotion regulation, difficulties in identifying feelings, and trait anxiety.

Variable	Group (N)	Mean (SD), Median (IQR) or proportion ^e	p
Age	HC (80) AUD (132)	43.88 ± 14.24 43.52 ± 10.91	0.84
Biological sex (males/females)	HC (76) AUD (130)	28/52 102/24	<0.001 ^f
IWB ^a	HC (76) AUD (113)	4.89 ± 1.43 4.36 ± 1.96	0.03
STAI ^b	HC (75) AUD (113)	39.87 ± 7.66 51.22 ± 8.67	<0.001
DERS ^d	HC (76) AUD (111)	52.78 ± 15.18 79.88 ± 19.76	<0.001
TASdif ^c	HC (76) AUD (113)	14 (10, 20) 23 (18, 25)	<0.001

^a Identification with one’s own body.
^b Trait anxiety severity from the State-Trait Anxiety Inventory.
^c Difficulties in identifying feelings from the Toronto Alexithymia Scale.
^d Emotion dysregulation total score from the Difficulties in Emotion Regulation.
^e The values are presented as means and standard deviations (mean ± SD), median and quartiles (25; 75) or proportions.
^f χ^2 statistic.

Table 2

Correlations between age, identification with the body, trait anxiety, difficulties in identifying feelings, and emotion dysregulation in individuals with alcohol use disorder (AUD) and a healthy comparison group (HC).

Group	Variable	IWB ^a	AGE	STAI ^b	TASdif ^c	DERS ^d
HC	IWB		−0.24 ^e	−0.19	−0.10	−0.16
	AGE	−0.24 ^e		−0.02	0.38 ^f	0.01
	STAI	−0.19	−0.02		0.41 ^f	0.60 ^f
	TASdif	−0.11	0.38 ^f	0.41 ^f		0.56 ^f
	DERS	−0.16	0.02	0.60 ^f	0.56 ^f	
AUD	IWB		0.07	−0.57 ^f	−0.49 ^f	−0.38 ^f
	AGE	0.07		0.03	−0.09	0.02
	STAI	−0.57 ^f	0.03		0.51 ^f	0.46 ^f
	TASdif	−0.49 ^f	−0.09	0.51 ^f		0.53 ^f
	DERS	−0.38 ^f	0.02	0.46 ^f	0.53 ^f	

^a Identification with one's own body.

^b Trait anxiety severity from the State-Trait Anxiety Inventory.

^c Difficulties in identifying feelings from the Toronto Alexithymia Scale.

^d Emotion dysregulation total score from the Difficulties in Emotion Regulation.

^e Significant correlation at the 0.05 level (two-tailed).

^f Significant correlation at the 0.01 level (two-tailed).

3.2. Moderated serial mediation model

Fig. 2 depicts the conceptual diagram of the estimated moderated serial mediation model (Hayes, 2013). AUD status (clinical vs HC group) serves as a moderating variable of each path of the model. Fig. 3 presents the conditional non-standardized estimates of the path parameters for HCs, while Fig. 4 shows the conditional non-standardized estimates of

the path parameters for the AUD group.

The α for all the reported p -values was 0.05. The model explained 41 % of the variance in difficulties identifying feelings, $R^2 = 0.408$; $F[5178] = 24.551$; $p < 0.001$, 54 % of the variance in emotion regulation difficulties, $R^2 = 0.539$; $F[7176] = 29.356$; $p < 0.001$, and 60 % of the variance in trait anxiety, $R^2 = 0.599$; $F[9174] = 28.890$; $p < 0.001$. Identification with one's body was negatively associated with difficulties in identifying feelings and directly associated with trait anxiety among individuals with AUD, but not among HCs. That is, greater self-identification with the body was associated with better identification of feelings and less trait anxiety among individuals with AUD. Difficulties in identifying feelings were positively associated with difficulties in emotion regulation across both groups. Lastly, difficulties in emotion regulation was positively associated with trait anxiety across both groups. As reported in Table 3, analyses offered support for conditional partial serial mediation only among individuals with AUD whereby the effect between identification with one's body and trait anxiety operated via difficulties in identifying feelings and emotion regulation difficulties. The indirect effect was not significant among HCs.

4. Discussion

To the best of our knowledge, this is the first study to examine whether individual differences in identification with one's own body is associated with emotional processing and anxiety and whether this association differs across individuals with AUD and non-AUD healthy controls. Although simple between-group comparisons indicated that individuals with AUD reported lower identification with their bodies

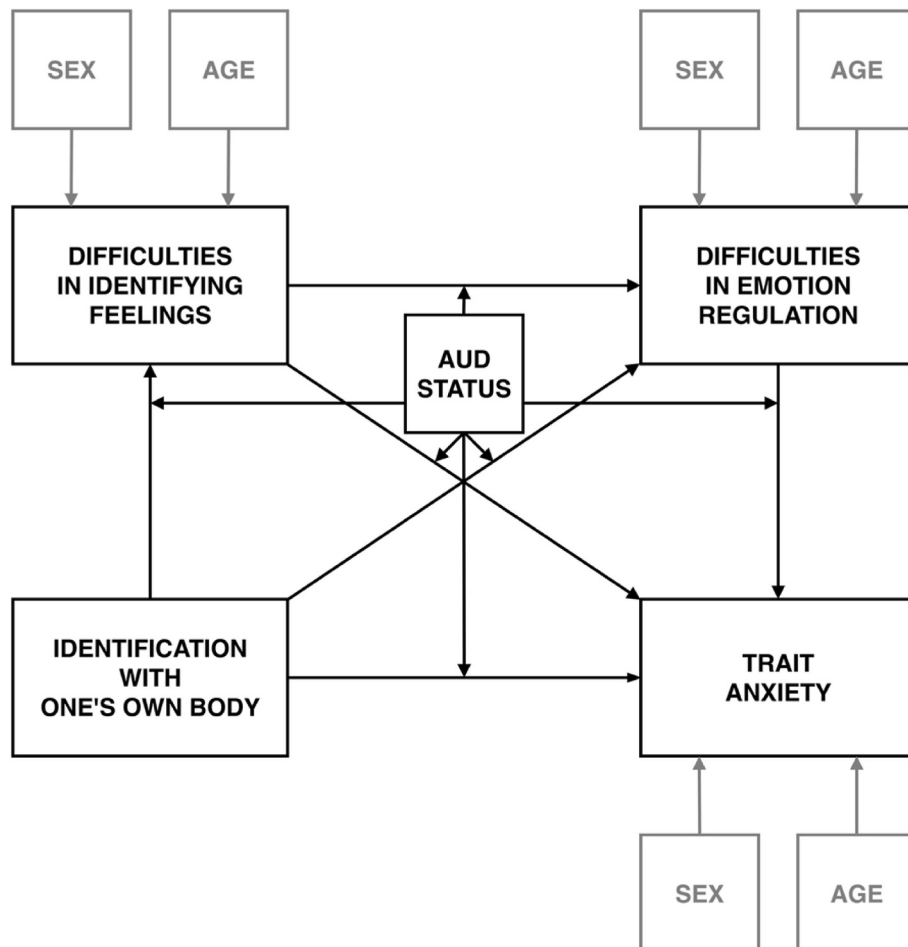


Fig. 2. The conceptual diagram of the estimated moderated serial mediation model.

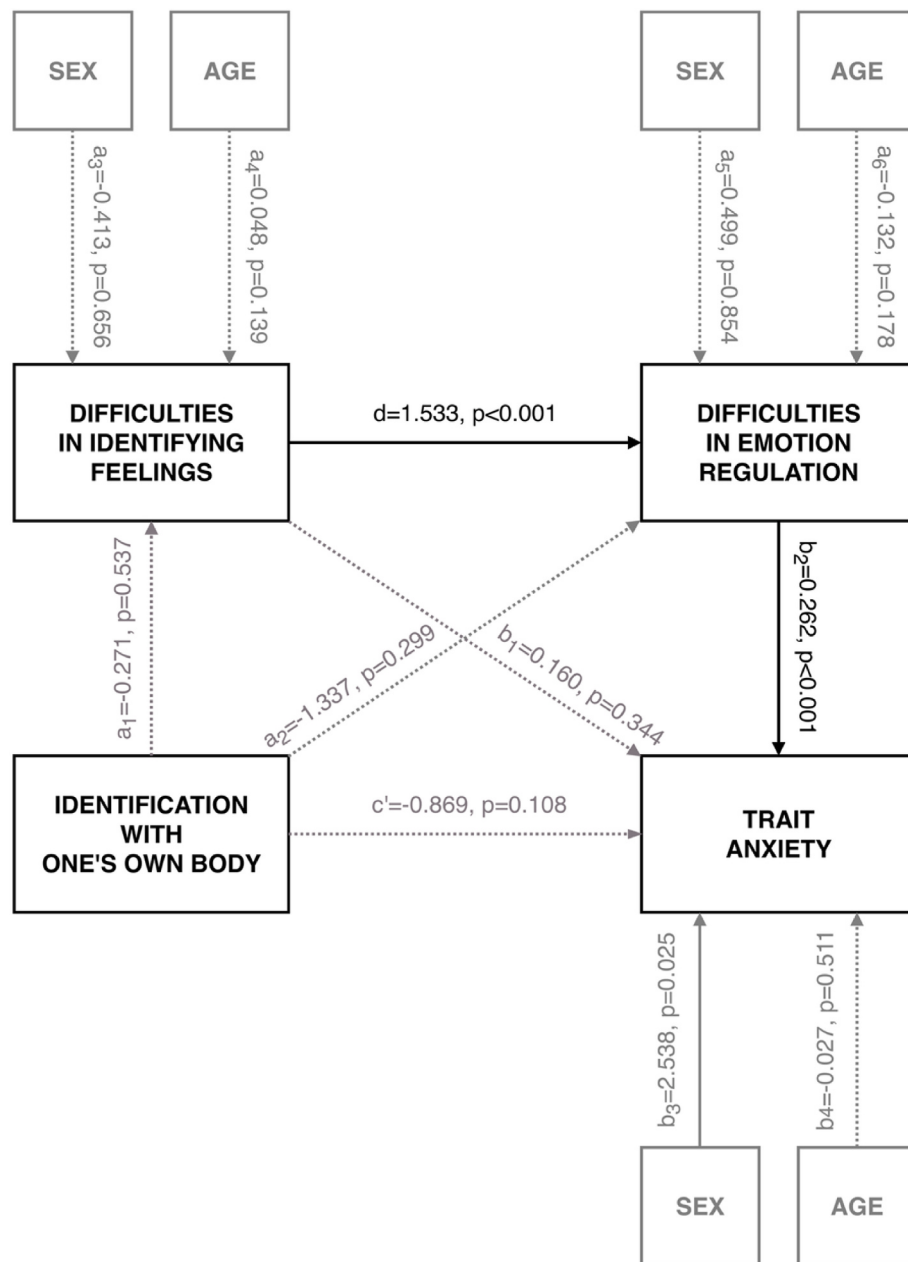


Fig. 3. Conditional non-standardized estimates among the healthy control group.

than healthy controls, our hypotheses went beyond group-level differences. The study examined how self-body identification may relate to emotional functioning, and whether this association operates differently in individuals with and without AUD. The results of the moderated serial mediation analysis support the hypothesis that the association between identification with the body and trait anxiety is partially explained by emotion processing mechanisms—namely, alexithymia and emotion dysregulation. Importantly, this indirect effect was observed only in individuals with severe AUD and not in the healthy comparison group. The absence of a significant sequential mediation effect in the healthy control group can be attributed to the lack of a significant association between body–self-identification and difficulties in identifying feelings. While the subsequent paths—from difficulties in identifying feelings to emotional dysregulation, and from emotional dysregulation to trait anxiety—were significant in both groups. We found that among individuals with AUD greater disconnection between self and body was related to greater trait anxiety, and that this effect was partially

mediated by difficulties in identifying feelings and emotional dysregulation. Specifically, lower identification with the body was associated with greater difficulty in identifying feelings, which in turn was associated with increased emotional dysregulation, which in turn was associated with greater trait anxiety.

Individuals differ in the extent to which they are aware and connected with their bodies (e.g., Mehling et al., 2009; Miller et al., 1981), as well as in how they process information about their bodies at both conscious and unconscious levels. Studies have also shown that people differ in the extent to which they use their bodies when processing information (Meier et al., 2007; Moeller et al., 2008; Roberts and Arefi-Afshar, 2007; Schnall et al., 2008). Much less is known about the process of identification with one's own body, with most findings stemming from phenomenological analyses (e.g., Lundh and Foster, 2024; Fuchs and Schlimme, 2009) rather than experimental studies. The experience of being a physical entity—unified, solid, real, and distinct from the world while exerting control over one's movements—not only

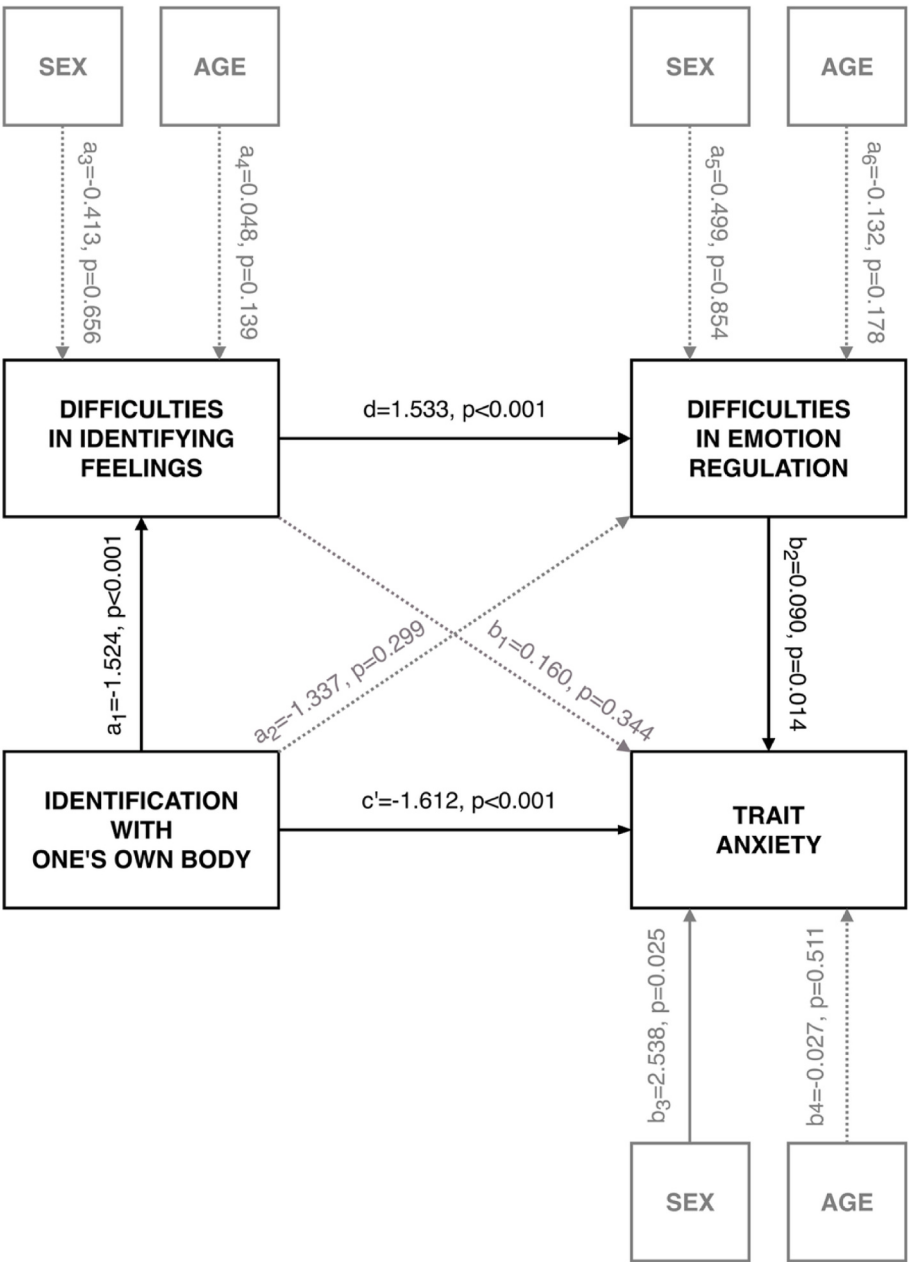


Fig. 4. Conditional non-standardized estimates among individuals with alcohol use disorder.

Table 3
Conditional serial mediation effects in the estimated moderated serial mediation model. Non-standardized path estimates are reported.

Group	Conditional effect	Effect size	Bootstrap LLCI	Bootstrap ULCI
Healthy controls	a_1db_2	-0.109	-0.518	0.201
Clinical	a_1db_2	-0.189	-0.420	-0.028

The letter and number designations of the effects match those shown in Figs. 3 and 4; a_1db_2 = the effect of identification with one's body on trait anxiety via serial mediation.

shapes the psychological experience of oneself as a *subject*, but also fosters the perception of oneself as an *object*: coherent, continuous, authentic, and autonomous. This suggests that the perception of the body as an object becomes part of the overall experience, but in a way that is deeply intertwined with the internal, felt experience of the body.

A stable sense of identity is maintained through the familiarity of one's objectively perceivable body (e.g., hands, legs, face seen in a mirror, voice, or sensations [e.g., tension in specific body parts]). Unlike the fluctuating nature of subjective sensations, the experience of the body as an object tends to remain relatively stable over time. Lundh and Foster (2024) propose that the harmonious synthesis of embodiment—combining the experience of having a body and being a body—is a fundamental component of an individual's self-identity. The degree of coherence in the synthesis process plays a significant role in psychopathology.

In the current study, we assessed whether the extent to which individuals identify their self with their body influences their emotional processing. Consistent with our hypothesis, greater self-identification with the body (being the body; body as a subject) was associated with less difficulty in identifying feelings, lower emotional dysregulation, and lower trait anxiety only among individuals with AUD. Future research might examine other clinical populations to assess whether the

self-body relationship should be stable and highly overlapping, or variable and flexible depending on the context (e.g., in cases of chronic illness, bodily deformity, or persistent pain). Further investigation is also warranted into the association between self-body identification and difficulties in identifying feelings, as this association appears to be a key factor underlying between-group differences observed in the present study.

Studies on another relevant body-mind construct (i.e., interoception) show that both atypically high and low interoceptive accuracy is associated with greater severity of psychopathology (Murphy et al., 2017); this may also be the case in the context of self-identification with the body. Recent findings support the idea that greater accuracy in recognizing one's bodily state may facilitate the regulation of emotional responses, as ongoing bodily changes can be detected more accurately (e.g., Fustos et al., 2013). Prior work also indicates that although individuals with AUD self-report high sensitivity to signals from within the body, this is not confirmed by their detection accuracy (Jakubczyk et al., 2019). Data from studies on individuals with psychosomatic symptoms revealed similar associations (Domschke et al., 2010, Ewing et al., 2017). We argue that the current results further enhance our understanding of these associations. Even when an individual with AUD strongly focuses on bodily signals, these signals may not be managed effectively if the body is not treated as part of the self, but rather as an object. When lack of identification with the body prevents these signals from being integrated into the psychosomatic system responsible for maintaining allostasis, individuals may resort to constant conscious monitoring and develop oversensitivity to bodily states (e.g., heart rate, bowel movements) as a way of responding to perceived self-related dangers (e.g., in patients with psychosomatic symptoms). Conversely, the more closely the body is identified with the self, the greater the accuracy in detecting signals that reflect physiological arousal consistent with the biopsychosocial context (e.g., stress). The literature on self-objectification suggests that when individuals fail to view their existence from a first-person perspective and instead perceive themselves as objects influenced by external factors, they may struggle with negative emotions (Andrews et al., 2002). It is possible that when the self distances itself from the body, the body becomes an observed object, similar to other object-bodies. The body is then perceived not as the self but as a bodily object, more or less connected to the self. This may create a conflict between the self and the body, potentially reinforced by culture (usually promoting one very specific pattern of ideal body beauty) and other internalized psychological constructs, leading to the dissociation of the body from the entirety of existence. The embodied self may then be more susceptible to criticism and internalization of beliefs about it; if something is external, originating from outside, it is harder to control and manage.

There are several possible explanations regarding the lack of a significant mediated effect in the healthy comparison group due to a non-significant association between self-body identification and difficulties in identifying feelings—an association that was present among individuals with AUD. From a theoretical perspective, the absence of a mediated effect in healthy individuals may reflect the operation of homeostatic mechanisms that support emotional processing. Healthy individuals may be better equipped to compensate for diminished identification with their bodies through alternative resources (e.g., executive functioning). Therefore, in this population, the association between identification with the body and emotional functioning may be less rigid or buffered by protective factors, such as stronger cognitive regulation, mentalization, or more flexible emotion regulation strategies. As a result, even healthy controls with lower levels of identification with the body may not experience emotional difficulties, as their regulatory systems function effectively. On the other hand, individuals with AUD, despite generally reporting lower levels of identification with their bodies, appear to have a closer emotional bond with their soma, as evidenced by a significant association between self-body identification and difficulties in identifying feelings. This may be consistent with the

discrepancy between interoceptive accuracy and sensitivity previously observed in AUD populations (Jakubczyk et al., 2019). Also, it should be noted that our control group had a relatively small sample size and was significantly overrepresented by females compared to the AUD sample. Finally, the lack of clinical burden in this group may account for the absence of mediation. We speculate that mediational processes may emerge only under conditions of chronic stress or psychopathology—such as AUD—suggesting that, in healthy individuals, the pathway from identification with the body to anxiety may not be activated or may lack statistical significance. Importantly, the AUD group was characterized by significantly higher levels of emotional dysregulation, alexithymia, and anxiety compared to the healthy control group. We believe that the level of identification with the body in individuals with AUD should be further investigated in larger samples and with more carefully selected control groups. Interestingly, lower levels of self-body identification in the AUD group may be perceived as a risk factor for problematic drinking, but may also be considered an effect of the pathological processes involved in the development of alcohol dependence symptoms—particularly those associated with withdrawal, which are characterized by uncontrolled and involuntary somatic symptoms such as tremors, sweating, or hyperalgesia.

Results from the current study can lead to improvements in treatment programs for AUD and inform alcohol use prevention programs. Given the confirmed utility of psychotherapeutic interventions that focus specifically on the body-mind relation or emotion regulation (e.g., mentalization, emotion-focused therapy, dialectical behavior therapy) in other psychiatric conditions with poor interoception and/or high emotion dysregulation, confirmation of similar deficits among individuals with AUD could encourage health care providers to include similar interventions in AUD treatment programs. Yet, the present results should be considered preliminary and in need of replication. Moreover, interventions aimed at restoring a healthy and functional relationship with the body need not be psychotherapeutic. Approaches that engage the physical body directly, such as structured physical activity, yoga or body-oriented mindfulness, may enhance body awareness, promote embodiment, and facilitate emotion regulation through non-verbal channels. Integrating such modalities into AUD treatment programs could support recovery by strengthening body-self connection.

Beyond AUD, the way individuals relate to their bodies—whether as subject or object—may play a significant role in various forms of psychopathology. Based on existing theoretical and clinical observations, it is plausible that distinct patterns within the body-self relationship contribute differently to psychological dysfunction. First, low identification with the body (i.e., diminished embodiment) may be relevant in conditions, such as depersonalization, post-traumatic stress disorder (PTSD), and severe depression, where individuals report feeling estranged from their physical bodies. Second, excessive identification with the body may underlie symptoms in panic disorder, somatic symptom disorder, and health anxiety, where physiological arousal is intensely monitored and interpreted as self-relevant threat. Third, excessive objectification of the body, as observed in body dysmorphic disorder, eating disorders, and potentially in some forms of gender dysphoria, may reflect a focus on external appearance at the expense of embodied self-awareness. Lastly, insufficient objectification, in which the body fails to be experienced as a coherent object, may occur in schizophrenia spectrum disorders or autism spectrum conditions, where bodily boundaries, agency, or spatial integration are disrupted.

While these associations remain to be empirically validated, this typology supports the hypothesis that both the form and the flexibility of body-self integration could serve as important transdiagnostic markers of mental health and promising therapeutic targets across disorders. An important direction for future research involves the concept of flexibility in body-self-identification as a potentially adaptive trait. Analogous to findings in the field of emotion regulation—where flexibility in the use of regulatory strategies is linked to better psychological adjustment

(Aldao et al., 2015)—it can be hypothesized that the ability to modulate the degree of identification with one's body according to situational demands may be more adaptive than maintaining a chronically high level of identification. For instance, in contexts such as chronic illness, acute pain, or physical disability, a certain degree of disidentification from the body may serve a protective function by shielding the self from overwhelming somatic distress (Osborn and Smith, 2006). Lindstra and Macran (2004) observed that individuals living with chronic pain who were able to temporarily distance themselves from their bodily experience reported better psychological functioning. We suggest that the notion of body–self-identification flexibility corresponds to what Lundh and Foster (2024) describe as embodiment synthesis—a dynamic process that involves integrating the subjective experience of having a body with the sense of being a body. From this perspective, the flexibility hypothesis may provide an additional explanation for the lack of association between body–self-identification and emotional processes observed in the healthy comparison group. We believe that future studies should be replicated in larger and more representative (i.e., non-clinical samples) and assess not only the level of body identification but also its flexibility across contexts and situations. It is possible that it is not the low level of identification per se, but rather the loss of flexibility in modulating this association, that constitutes a key factor in the development and maintenance of AUD.

This study has some limitations. To our knowledge, the current study represents the first measure of a person's identification with the body. Further assessment of its psychometric qualities – construct, content and criterion validity – should be performed.

The task is conceptual in nature, as the respondent must understand and reflect on the overlap between the body and the self—both of which are complex concepts that may not be well-suited for patients with cognitive difficulties. Future studies should investigate whether and how this measure relates to other subjective or objective measures of interoception, body objectification, body awareness, body connection, or body consciousness. Additionally, future work should assess the stability of this measure and determine whether it captures a state, a trait, or both. Although our findings indicate that lower identification with the body is associated with greater emotional dysregulation and anxiety in individuals with AUD, the cross-sectional nature of the study precludes any definitive conclusions regarding causality. It is therefore equally plausible that low body–self-identification may not only contribute to emotional difficulties, but it may also emerge as a consequence of them. For instance, chronic anxiety may lead individuals to avoid internal bodily signals or to dissociate from their bodily experiences in order to reduce perceived threat or discomfort. Similarly, individuals with high levels of alexithymia, who demonstrate difficulties in interpreting and labeling emotional states, may also experience reduced integration of bodily signals into their self-concept, thereby weakening identification with their body. This bidirectionality suggests a potential feedback loop, in which poor emotion processing diminishes embodiment, which in turn further impairs emotion regulation. Longitudinal studies are needed to clarify the temporal dynamics of this association and to test alternative explanatory models, including mediating and moderating variables such as interoceptive accuracy, self-objectification, or trauma history. The present study involved participants from an inpatient treatment program for AUD, characterized by a severe progression of the disorder and significant negative consequences of alcohol consumption. Therefore, the findings may not be generalizable to individuals with less severe cases of AUD and also those who do not present for treatment. In addition, males comprise the majority of the study sample. Future work should include a larger sample of females in order to test for possible biological sex differences across the study variables (e.g., identification with one's own body, emotion dysregulation, and alexithymia).

4.1. Conclusions

The current study indicated that lower self-identification with the body among individuals with AUD is associated with differences in emotional processing and trait anxiety. Importantly, the mediation pathway from self-body identification to anxiety was only present in individuals with AUD, primarily due to the absence of a significant association between self-body identification and alexithymia in the healthy comparison group. Namely, greater disconnection between self and body, was associated with greater difficulty in identifying feelings, which in turn was associated with increased emotional dysregulation, which in turn was associated with greater trait anxiety. It is plausible that increasing identification with the body in this clinical group might be an effective therapeutic approach.

During the preparation of this work the author(s) used ChatGPT in order to improve language and readability. After using this tool, the author(s) reviewed and edited the content as needed and takes full responsibility for the content of the publication.

CRedit authorship contribution statement

M. Kopera: Writing – original draft, Supervision, Resources, Methodology, Formal analysis, Conceptualization. **P. Maurage:** Writing – original draft, Methodology, Conceptualization. **H. Suszek:** Writing – review & editing, Resources, Methodology, Conceptualization. **P. Kobyliński:** Writing – review & editing, Visualization, Methodology, Formal analysis. **M. Rydzewska:** Writing – review & editing, Project administration, Investigation, Data curation. **J. Zaorska:** Writing – review & editing, Project administration, Investigation, Data curation. **E. M. Trucco:** Writing – review & editing, Methodology, Conceptualization. **I. Zawislak:** Writing – review & editing, Project administration, Investigation, Data curation. **W. Caban:** Writing – review & editing, Project administration, Investigation. **A. Jakubczyk:** Writing – original draft, Supervision, Project administration, Funding acquisition, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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