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RESEARCH ARTICLE



The prevalence of body dysmorphic disorder and the acceptance of cosmetic surgery in a nonclinical sample of Hungarian adults

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ABSTRACT

Background: Body dysmorphic disorder (BDD) is a common, often undiagnosed, serious condition. The relationship between body dysmorphic disorder and cosmetic surgery is rather complex, as many patients with body dysmorphic disorder search for cosmetic solutions for the imagined defect in appearance. **Aims:** To assess the prevalence of body dysmorphic disorder and its relationship to the acceptance and use of cosmetic services and body-related variables among Hungarian adults. **Methods:** Body weight and height, body satisfaction, health state, aesthetic intervention-related experiences, and plans were assessed by a self-report online questionnaire that included the Body Dysmorphic Disorder Questionnaire and the Acceptance of Cosmetic Surgery Scale. Six hundred three subjects (94% women, $n = 567$, 6% men, $n = 36$, age $M = 40.16$ years, $SD = 13.32$ years) joined the research on a social media platform. **Results:** The prevalence of BDD is 8.1% ($n = 49$), 8.1% ($n = 46$) in women, and 8.3% ($n = 3$) in men. The BDD-positive group had higher BMI ($U = 9641.5$, $p = 0.028$), more plastic surgeries ($\chi^2(1) = 19.682$, $p = 0.012$), and more acceptance of cosmetic surgery ($U = 6664$, $p < 0.001$). The risk of BDD is significantly higher in those who have a lower education ($OR = 0.424$, $p = 0.031$), accept cosmetic surgery ($OR = 1.031$, $p = 0.025$), plan plastic surgery ($OR = 0.351$, $p = 0.027$) and are more dissatisfied with their body ($OR = 0.397$, $p < 0.001$). Consideration of cosmetic surgery ($U = 7433$, $p = 0.006$) and planning for future plastic surgeries ($\chi^2(1) = 7.943$, $p = 0.019$) are more frequent in females. Sixty-six women (11.6%) have already had some intervention, 26.4% plan, and 10.4% probably plan cosmetic surgery, while these data are 11.1%, 8.3% and 5.6% in males. These symptoms occur more frequently among women according to Body Dysmorphic Disorder Questionnaire: avoidance behavior (33.9% vs. 16.7%, $\chi^2(1) = 4.539$, $p = 0.033$), significant mental suffering caused by the perceived flaw(s) (29.8% vs. 13.9%, $\chi^2(1) = 4.178$, $p = 0.041$). The Acceptance of Cosmetic Surgery Scale total score has a significant positive relationship with BDD caseness ($\beta = 0.100$, $p = 0.011$) and the number of blepharoplasties ($\beta = 0.111$, $p = 0.005$) and significant negative relationship with the planning of cosmetic surgery ($\beta = -0.491$, $p < 0.001$). **Conclusions:** The prevalence of body dysmorphic disorder is high in this non-clinical, unselected Hungarian sample. The risk for body dysmorphic disorder is higher in those interested in cosmetic services; screening for this body image disorder is necessary.

KEYWORDS

body dysmorphic disorder, body satisfaction, cosmetic surgery, Body Dysmorphic Disorder Questionnaire, Acceptance of Cosmetic Surgery Scale

A testdiszormfiás zavar prevalenciája és a kozmetikai sebészet elfogadottsága magyar felnőttek vizsgálati mintáján

ABSZTRAKT

Elméleti háttér: A testdiszormfiás zavar gyakori, amit többnyire nem ismernek fel. A testdiszormfiás zavar és a kozmetikai sebészet kapcsolata meglehetősen összetett, mivel sok páciens keres kozmetikai megoldást a külső megjelenésében észlelt probléma miatt. **Célkitűzés:** Felmérni a testdiszormfiás zavar prevalenciáját, elemezni kapcsolatát a kozmetikai szolgáltatások elfogadottságával, igénybevételével,

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valamint a testtel összefüggő változókkal, magyar felnőttek körében. *Módszerek:* A testtömeget és -magasságot, a testtel való elégedettséget, az egészségi állapotot, az esztétikai beavatkozással kapcsolatos tapasztalatokat és terveket önkitöltő, online kérdőívvel vizsgáltuk, amely tartalmazta a Testdiszmorfiás Zavar Kérdőívet és a Kozmetikai Sebészet Elfogadottsága Skálát is. 567 személy (94% nő, 6% férfi; átlagéletkor = 40,16 év; SD = 13,32 év) töltötte ki a kérdőívet közösségimédia-felületen. *Eredmények:* A testdiszmorfiás zavar prevalenciája 8,1% ($n = 49$) a teljes mintán, 8,1% ($n = 46$) a nőknél és 8,3% ($n = 3$) a férfiaknál. A testdiszmorfiás zavarban érintett csoportban magasabb a testtömegindex ($U = 9641,5$; $p = 0,028$), több plasztikai műtétet végeztek ($\chi^2(1) = 19,682$; $p = 0,012$), és jobban elfogadják a kozmetikai sebészetet ($U = 6664$; $p < 0,001$), mint a testdiszmorfiás zavartól mentes csoportban. A testdiszmorfiás zavar kockázata szignifikánsan nagyobb azoknál, akik alacsonyabb iskolai végzettségűek ($OR = 0,424$, $p = 0,031$), elfogadják a kozmetikai sebészetet ($OR = 1,031$, $p = 0,025$), tervezik a műtėti beavatkozásokat ($OR = 0,351$, $p = 0,027$) és elégedetlenebbek a testükkel ($OR = 0,397$, $p < 0,001$). A nők gyakrabban mérlegelik a kozmetikai sebészet lehetőségét ($U = 7433$; $p = 0,006$), és gyakrabban terveznek műtétet ($\chi^2(1) = 7,943$; $p = 0,019$), mint a férfiak. 66 nőnek (11,6%) már volt esztétikai beavatkozása, 26,4%-uk tervez, 10,4%-uk pedig valószínűleg tervez szépészeti műtétet, míg a férfiaknál alacsonyabbak ezek az értékek (a fenti sorrendben 11,1%; 8,3% és 5,6%). A Testdiszmorfiás Zavar Kérdőív alapján a következő tünetek szignifikánsan gyakoribbak nőknél, mint a férfiaknál: elkerülő magatartás (33,9% vs. 16,7%; $\chi^2(1) = 4,539$; $p = 0,033$), a megjelenés észlelt hibája által okozott jelentős lelki szenvedés (29,8% vs. 13,9%; $\chi^2(1) = 4,178$; $p = 0,041$). A Kozmetikai Sebészet Elfogadottsága Skála összpontszáma szignifikáns pozitív kapcsolatban van a BDD pozitivitással ($\beta = 0,100$; $p = 0,011$) és a szemhéjműtétek ($\beta = 0,111$; $p = 0,005$) számával, míg a műtétek tervezésével ($\beta = -0,491$; $p < 0,001$) szignifikáns negatív kapcsolatban áll. *Következtetések:* A testdiszmorfiás zavar prevalenciája meglepően magas ebben a véletlenszerűen kiválogatott nem-klinikai magyar felnőtt mintában. A kozmetikai szolgáltatások iránt érdeklődőknél nagyobb a testdiszmorfiás zavar kockázata, ezért szükséges náluk ennek a testképzavarnak a szűrése.

KULCSSZAVAK

testdiszmorfiás zavar, testtel való elégedettség, kozmetikai sebészet, Testdiszmorfiás Zavar Kérdőív, Kozmetikai Sebészet Elfogadottsága Skála

1 INTRODUCTION

Body-related attitudes, satisfaction with one's body, and body modification have changed over the past 50 years, especially among adolescents and young women (Abraham & Zuckerman, 2011). The artificial appearance corresponding to the beauty standards is spreading worldwide; cosmetic surgery is nevertheless not accepted by the public. This paradox process motivates unrealistic beauty standards and creates more extremes (Bonell, Barlow, & Griffiths, 2021). Plastic surgery patients report increased satisfaction with their bodies, but the operation is ineffective for body image disorders (Sarwer, 2019). For this reason, the authors detail a particular body image disorder, namely body dysmorphic disorder (BDD), and present the results of prevalence research, focusing on aesthetic surgical interest.

1.1 Body dysmorphic disorder

Body dysmorphic disorder is a relatively little-known and underdiagnosed psychiatric disorder that causes significant suffering to patients who often seek cosmetic services to improve their state (Lai, Lee, Yeh, & Chen, 2010; Sarwer & Spitzer, 2012). The diagnostic criteria for BDD according to DSM-5 (APA, 2013) are presented in Table 1.

Table 1 DSM-5 diagnostic criteria for body dysmorphic disorder (APA, 2013)

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| <p>(a) Preoccupation with one or more perceived defects or flaws in physical appearance that are not observable or appear slight to others.</p> <p>(b) At some point during the course of the disorder, the individual has performed repetitive behaviors (e.g., mirror checking, excessive grooming, skin picking, and reassurance seeking) or mental acts (e.g., comparing his or her appearance with that of others) in response to the appearance concerns.</p> <p>(c) The preoccupation causes clinically significant distress or impairment in social, occupational, or other important areas of functioning.</p> <p>(d) The appearance preoccupation is not better explained by concerns with body fat or weight in an individual whose symptoms meet diagnostic criteria for an eating disorder. Specify if</p> <p>(i) With muscle dysmorphia: the individual is preoccupied with the idea that his or her body build is too small or insufficiently muscular. This specifier is used even if the individual is preoccupied with other body areas, which is often the case.</p> <p>Indicate degree of insight regarding body dysmorphic disorder beliefs (e.g., "I look ugly" or "I look deformed").</p> |
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- (ii) With good or fair insight: the individual recognizes that the body dysmorphic disorder beliefs are definitely or probably not true or that they may or may not be true.
- (iii) With poor insight: the individual thinks that the body dysmorphic disorder beliefs are probably true.
- (iv) With absent insight/delusional beliefs: the individual is completely convinced that the body dysmorphic disorder beliefs are true.

Based on a meta-analysis of 56 prevalence studies, the point prevalence of BDD is 2.1% in the general population (men 1.6%, women 2.1%; [Veale, Gledhill, Christodoulou, & Hodson, 2016](#)). *Table 2* summarizes the point prevalence of body dysmorphic disorder in unselected samples and the screening tools applied to identify BDD ([Szabó, & Szászi, 2021](#)).

Table 2 The point prevalence of body dysmorphic disorder in unselected samples

Authors	Country, time	Instruments	Participants (n)			Prevalence (%)		
			All	Men	Women	All	Men	Women
Faravelli et al., 1997	Italy, 1990	Personal interview	673	304	369	0.7	–	1.4
Otto et al., 2001	USA, 2000	Structured interview			976			0.8 ^a
Rief et al., 2006	Germany, 2004	DSM-IV criteria	2552	1206	1346	1.7	1.9	1.9
Koran et al., 2008	USA, 2004	Interview	2048	739	1309	2.4	2.2	2.5
Buhlmann et al., 2010	Germany, 2004	DSM-IV criteria	2510	1215	1295	1.8	1.4	2.2
Brohede et al., 2015	Sweden, 2009	BDDQ			2891			2.1
Schieber et al., 2015	Germany, 2011	DSM-5 criteria	2129	976	1153	3.2	1.7	4.4
						2.9	1.3	4.3 ^b
Gieler et al., 2016	Germany, 2002	DCQ	1934	1032	902	0.5	0.1	0.8
	Germany, 2013		2504	1331	1203	1.0	0.8	1.2
Cerea et al., 2018	Italy, 2014–2016	DSM-5 criteria	615	188	427	1.6	0.5	2.1
Enander et al., 2018	Sweden, 2013–2014	DCQ	4671	1764	2907	1.1	0.6	1.3 ^c
Alghamdi et al., 2022	Saudi Arabia, 2021	BDDQ	514	241	273	8.9	5.8	11.7

Note: BDDQ = Body Dysmorphic Disorder Questionnaire; DCQ = Dysmorphic Concern Questionnaire. ^a The age range is limited to 36–44 years. ^b The prevalence was calculated according to DSM-5. ^c The age range is limited to 20–28 years.

The prevalence of BDD is higher in certain groups ([Ribeiro, 2017; Veale et al., 2016](#)): in adult psychiatric inpatients (7.4%); in general cosmetic surgery (13.2%); in rhinoplasty surgery (20.1%); in dermatology outpatients (11.3%); in cosmetic dermatology outpatients (9.2%).

The most commonly affected body areas are skin, hair, nose in both sexes, in addition, many female patients are dissatisfied with their abdomen, breasts, buttock, thighs, legs, hips, their body size or weight, while male patients are often unhappy because of their hair, body build and genitals ([Anderson, 2003; Higgins & Wysong, 2018; Phillips, Menard, & Fay, 2006](#)).

The average onset of the disease is at 16.7 years of age, and its course is typically chronic ([Szabó, & Szászi, 2021](#)). Patients with BDD have, on average, more than two comorbid psychiatric disorders ([Gunstand & Phillips, 2003](#)).

These include social phobia, major depressive disorder, obsessive-compulsive disorder, eating disorders, substance abuse, and personality disorders ([Collins, Gonzalez, Gaudilliere, Shrestha, & Girod, 2014; Gunstand & Phillips, 2003; Phillips, 2005](#)). Among personality disorders, avoidant (22.5%), obsessive-compulsive (12%), borderline (9.5%), and paranoid (8%) types are the most common comorbidities ([Szabó, 2010; Wever, Wever, & Constantian, 2020](#)).

The degree of the conviction of BDD patients about the physical flaw varies along an extensive continuum from mild to severe (delusional) beliefs ([Ribeiro, 2017](#)). It is not worth carrying out the surgery with poor or absent insight. Plastic surgery is contraindicated in most BDD patients because it does not improve their condition, and body dissatisfaction persists ([Saade, de Castro Maymone, & Vashi,](#)



2018). In the preoperative phase, it is recommended for plastic surgeons to use psychological tests and structured interview questions and cooperate with mental health professionals (clinical psychologists, psychiatrists) to screen for BDD and establish psychological suitability (Clarke, Lester, Withey, & Butler, 2005).

1.2 The acceptance of cosmetic surgery

The cosmetic surgery paradox is that its general social acceptance is still low despite its growing popularity (Bonell et al., 2021). Cosmetic surgery impacts the parameters of ideal female beauty standards and the development of extreme, unrealistic beauty standards (Bonell et al., 2021). Aesthetic surgery can also affect the attitude toward the body and its individual and social evaluation. Therefore, it is better to understand the general population's thinking about cosmetic surgery. In this way, the construct and disorders of body image can be better comprehended.

Body image and cosmetic surgery are closely related. On the one hand, body image is a central component of the psychological aspect of cosmetic surgery (Sarwer, 2019). On the other hand, cosmetic surgery determines body image: in Cash's cognitive-behavioral model, aesthetic interventions are mentioned as a factor of cultural socialization (Cash, 2002). Cosmetic surgery provides many solutions to correct body-related defects and increase body satisfaction. It impacts body investment and body objectification from the beginning of adolescence (Abraham & Zuckerman, 2011).

Acceptance of cosmetic surgery has attracted scientific attention for more than 20 years (Henderson-King & Henderson-King, 2005; Stefanile & Nerini, 2014; Swami, Chamorro-Premuzic, Bridges, & Furnham, 2009). This attitude positively correlates with age in women but not in men (Henderson-King & Henderson-King, 2005; Swami et al., 2009). Previously, intrapsychic (better feel) and interpersonal factors (matchmaking, job search) have been identified behind the acceptance of cosmetic surgery (Pruzinsky & Edgerton, 1990). These motivations are enriched by sociocultural and body-related factors (Beos, Kempes, & Prichard, 2021; Bradshaw, Leyva, Nicolas, & Hill, 2019; Callaghan, Lopez, Wong, Nothcross, & Anderson, 2011; Stefanile & Nerini, 2014).

Intrapsychic factors can be attributed to some personality traits (openness, emotional stability; Swami et al., 2009), increased external orientation (Sarwer, Cash, Magee, Williams, & Thompson, 2005), and a problematic coping mechanism, the appearance fixing (Callaghan et al., 2011). High scores for these variables positively correlate with acceptance and consideration of cosmetic surgery procedures.

In the case of interpersonal factors, people accept and plan for cosmetic surgical interventions in order to achieve social goals. Henderson-King and Henderson-King (2005) have found that acceptance of cosmetic surgery negatively correlated with body satisfaction. This attitude is not related to the hope of attractiveness but rather to the fear of not being attractive. Bradshaw et al. (2019) revealed that the more

increased short-term mating effort is, the more the acceptance of expensive appearance-enhancement procedures is in women. Sociocultural factors include the impact of visual media on body image (appearance orientation, body dissatisfaction, internalization of thinness; Callaghan et al., 2011; Sarwer et al., 2005; Stefanile, & Nerini, 2014). Women who modify more of their photos uploaded to social media platforms are more dissatisfied with their faces. Photo manipulation predicted cosmetic surgery attitudes and the intention to choose cosmetic surgery (Beos et al., 2021).

In summary, personality, age, gender, relationship to the body, and appearance fixing are associated with the acceptance of cosmetic surgery. However, most patients choose plastic surgery primarily because of their body dissatisfaction, which improves after surgery in 85–95% of cases. Thus, 5–15% of the patients remain dissatisfied with their bodies and are likely to have body dysmorphic disorder (Sarwer, 2019).

1.3 Body dysmorphic disorder and cosmetic surgery

Generally, patients decide on aesthetic services to improve their physical appearance and satisfy their psychological needs (Clarke et al., 2005; Ricci, Prstojevič, Langley, & Hlavacek, 2010). As a result, patients with mental health problems may also visit elective plastic surgical consultations instead of mental health care (Clarke et al., 2005). The body image disorder that forms the basis of BDD is when the patient perceives non-existing flaws or boosts minor aesthetic problems. To improve this frustrating state, patients often search for external modifying services (plastic surgery, dermatology, cosmetic dentistry, and other cosmetic services; Ribeiro, 2017; Veale et al., 2016).

Numerous research data confirm that most BDD patients (64–68.7%) have already received some form of medical treatment to treat their actual minor or perceived physical defect (Saade et al., 2018). Eighty percent of plastic surgeons reported that they had already operated on at least one patient who was supposed to have had BDD, or the suspicion of BDD arose in the postoperative phase (Sarwer & Spitzer, 2012).

Mulkens et al. (2012) demonstrated that patients dissatisfied with the operation result are more likely to have symptoms of BDD. The group with more severe BDD symptoms showed a significant difference from those with no or fewer BDD symptoms. They had lower self-esteem, more psychopathological abnormalities, and were more dissatisfied with the outcome of the surgery.

Lai et al. (2010) studied 817 patients applying for plastic surgery for three years. BDD was found in 7.7% of patients ($n = 63$), of whom 85.7% ($n = 54$) were diagnosed before surgery, and these patients were not operated. A common feature of the patients was that their focus was on a non-existing or mild bodily defect that disturbed them, and they were convinced that their defect attracted the attention of many people. Typically, they demonstrated their expectation



to the physician with photos of models or movie stars and expressed hard critics about the performance of the previous surgeon(s). Similarly, Wever et al. (2020) described BDD patients among facial surgical patients as often arguing, angry, and, aggressive, physically and legally, after surgery. Due to postoperative dissatisfaction, low effectiveness of surgical interventions, and the danger of hetero- and autoaggressivity, it is crucial that BDD patients be screened for cosmetic surgery at the preoperative stage and be referred to psychiatric care (Lai et al., 2010; Mulkens et al., 2012).

Some research examines the relationship between body image disorders and cosmetic surgery choices. Callaghan et al. (2011) examined 544 participants, 55 of whom had BDD. According to the results of logistic regression analysis, higher scores of body image disorder and a problematic coping mechanism (appearance fixing) predict the consideration of cosmetic surgery. Patients with BDD have unrealistic and extreme expectations regarding the outcome of cosmetic surgical operations. In conclusion of the authors, it is important to screen for this mental disorder in the preoperative phase (Callaghan et al., 2011).

On this basis, the present study's authors aim to examine the prevalence of BDD and its relationship with cosmetic surgery services. Besides, the acceptance of cosmetic surgery and some body-related variables (anthropometric data, health status, body satisfaction) are researched among Hungarian women. Genders, age groups, and BMI categories are compared.

The authors' hypotheses were as follows:

1. BDD prevalence is expected to be greater than reported in the average population (2%), without gender difference.
2. BDD scores are positively correlated with the acceptance and the number of cosmetic surgeries and with body dissatisfaction.
3. BDD caseness is higher among operated women.
4. In females, the operated group has higher body satisfaction, greater acceptance of cosmetic surgery, and planning more other cosmetic surgeries.
5. Women are more dissatisfied with their bodies, have had and plan more plastic procedures, have higher BMI and more BDD-positivity.
6. Among females, the acceptance of cosmetic surgery is positively associated with the number of surgeries and negatively associated with body satisfaction scores.

2 METHOD

2.1 Participants and procedure

A total of 603 respondents (94% women, $n = 567$; 6% men, $n = 36$, mean of age 40.16 years, $SD = 13.32$ years, range = 18–78 years) completed the online questionnaire as paid advertisement on a social media platform (Facebook) in 2020 from January to March. The Regional and Institutional

Research Ethics Committee of the University of Debrecen approved the cross-sectional research. The number of ethics licence is DE RKEB/IKEB 4893-2017. A short, self-report online questionnaire was used; Hungarian adults (over 18 years of age) were targeted, independent of their interests. This non-selected convenience sample does not represent the adult Hungarian population. Most participants have secondary and higher education graduates (0.3% unfinished primary school, $n = 2$; 1.5% primary school, $n = 9$, 35.7% secondary school, $n = 215$, 59.5% college or university degree, $n = 359$, 3% postgraduate education, $n = 18$). Due to the small subgroups, two new education groups were created: responders of lower education (unfinished primary school, primary school, and secondary school, $n = 209$, 36.9%) and the group of responders of higher education ($n = 358$, 63.1%). As male participation is low, the data of adult females are in focus. At the end of the results, gender differences are briefly described.

2.2 Measures

The questionnaire contained demographic variables (age, gender, education) and self-reported anthropometric variables (body weight, height, from which body mass index [BMI] was calculated).

Body satisfaction was rated on a 5-point Likert-scale ("How satisfied are you with your body?" ranging from 1 = complete dissatisfaction, 5 = complete satisfaction).

Health state was assessed with one item of the Health Survey (SF-36; Ware & Sherbourne, 1992): "In general, would you say your health is: 1 = excellent, 2 = very good, 3 = good, 4 = fair, 5 = poor".

Body Dysmorphic Disorder Questionnaire (BDDQ; Phillips, 2005) is used to screen for body dysmorphic disorder; diagnosis requires other questionnaires and a structured interview. Questions fit the criteria of the BDD according to DSM-IV (APA, 1994). BDDQ was adapted into Hungarian by the authors, with the back translation of independent translators, in a multi-step process. Finally, the translation was approved by bilingual proofreaders. The questionnaire consists of four main issues; questions to be decided (yes/no) and open questions. The first part (2 items, "Are you worried about how you look?") deals with concerns about the body, and the second part (1 item, "Is your main concern with how you look that you are not thin enough or that you might get too fat?") is about body weight or body shape. The third part (5 items, e.g., "Has it caused you any problems with school, work, or other activities?") examines the effect of perceived flaws on mental health state and life management, and the fourth part (1 item, "On an average day, how much time do you usually spend thinking about how you look?") assesses the time spent on the look. The participant is likely to have BDD if the answer to both questions of the first part is yes, and regarding the third part to any of the questions is yes, and if the fourth part's answer is "b" or "c" (Phillips, 2005). In the present study, BDDQ was a categorical variable, the sample was divided



into two groups (BDD group vs. non-BDD group). The questionnaire showed good validity in the Swedish female population with appropriate sensitivity (94%), specificity (90%), and likelihood ratio (9.4) (Brohede, Wingren, Wijma, & Wijma, 2013).

The *Acceptance of Cosmetic Surgery Scale* (ACSS; Henderson-King & Henderson-King, 2005) measure the attitudes about cosmetic surgery. The process of translation is the same as for BDDQ. A seven-point Likert scale (1 = strongly disagree, 7 = strongly agree) contains three subscales (5 items/subscale). The Intrapersonal subscale refers to the benefits of self-orientated changes due to cosmetic surgery (e.g., “Cosmetic surgery can be a big benefit to people’s self-image.”). The Social subscale measures the social motivations behind choosing cosmetic surgery (e.g., “I would seriously consider having cosmetic surgery if I thought my partner would find me more attractive.”). The Consider subscale assesses the likelihood that the respondent plans to undergo aesthetic surgery in the future (e.g., “I have sometimes thought about having cosmetic surgery.”). ACSS total score is calculated from the addition of scores to the items. Higher scores reflect the greater acceptance of cosmetic surgery. According to the results of previous research, the questionnaire’s internal and test-retest reliability is high, with good convergent and divergent validity (Henderson-King & Henderson-King, 2005; Stefanile & Nerini, 2014). In the present study, the internal reliability of the global measure is excellent (Cronbach’s alpha = 0.928), while Cronbach’s alphas for the three subscales were: Intrapersonal subscale 0.892, Social subscale 0.859, Consider subscale 0.928. The three subscales were strongly inter-correlated.

2.3 Statistical analyses

The data were analyzed with SPSS 25.0 program; first of all, the Shapiro–Wilk test was performed to examine normality. Most variables do not show a normal distribution ($p < 0.05$); therefore, nonparametric tests were used.

For correlation analyses, Spearman’s rank correlation analysis was calculated. Subgroups were created and compared according to age groups, education, BMI categories, BDD caseness and performed operations. The age groups were defined as follows: 18–25, 26–35, 36–45, 46–55, and over 55 years. The Mann–Whitney U -test (applied effect size: rank-biserial r) was used to compare two subgroups, and the Kruskal–Wallis H -test (applied effect size: η^2) was used to compare more than two subgroups. Chi-square tests (applied effect size: Cramér’s V) were performed to investigate gender differences. Multiple binary logistic regression analysis with enter method was performed to determine which factors are associated with suspected BDD cases. Multiple linear regression analysis with enter method has been applied to determine what variables affect body satisfaction and ACSS total score.

3 RESULTS

3.1 Descriptive statistics

Due to the low number of male respondents, most analyses were performed on the sub-sample of women ($n = 567$, mean of age 39.98 years, $SD = 13.36$ years, range = 18–78 years). In terms of health, 36.7% of the women ($n = 208$) had excellent and very good health, 45.5% of them ($n = 258$) reported good health, and 17.8% of them ($n = 101$) had fair or poor health.

Sixty-six women (11.6%) already had invasive or minimally invasive plastic surgery. 26.4% of the participants ($n = 149$) plan to undergo plastic surgery in the future, 10.4% of them ($n = 59$) are uncertain, and 63.1% ($n = 356$) do not want to resort to such treatment at all. Breast plastic surgery was the most commonly performed: 44 operations in 27 women (4.8%). Abdominoplasty for 1.9% of women ($n = 10$), blepharoplasty, facelifting surgery for 2.6% ($n = 15$), ear surgery, thigh lift surgery for 0.5% ($n = 3$), rhinoplasty for 2.5% ($n = 14$); 0.4% of women ($n = 2$) had neckplasty, 0.7% ($n = 4$) had arm lift surgery, 0.2% ($n = 1$) had buttock lift surgery, and 1.6% ($n = 9$) had other plastic surgery. By computing these variables, “the number of plastic surgery per person” variable was created ($M = 0.28$, $SD = 1.46$, range = 0–24). Detailing the minimally invasive interventions, 3.7% of women ($n = 21$) had fillers, 4.6% ($n = 26$) had peeling intervention, 5.8% ($n = 33$) had laser treatment, 1.2% ($n = 7$) had facial rejuvenation with a thread lift, and 3.9% ($n = 22$) had other minimally invasive interventions. By computing these variables, “the number of minimally invasive interventions per person” variable was created ($M = 0.52$, $SD = 2.08$, range = 0–25).

The respondents’ BMI (kg/m^2) ranges from 14.69 to 58.64 ($M = 24.74$, $SD = 5.71$). The applied BMI categories (Figler, 2015) are underweight (below 18.5), normal weight (18.5–24.99), overweight (25–29.99), and obesity (above 30). Thirty women (5.4%) are underweight, 55.3% of them ($n = 309$) have normal weight, 24.5% ($n = 137$) are overweight, and 14.8% ($n = 83$) are obese.

Almost half of the females (43.2%, $n = 245$) are completely satisfied or satisfied with their bodies. Two hundred twenty-nine participants (40.4%) rate their body satisfaction as average/moderate, 9.5% of them are dissatisfied ($n = 54$), and 6.9% of them ($n = 39$) are completely dissatisfied.

3.2 Body Dysmorphic Disorder Questionnaire

In the total sample, descriptive statistics of the items of the Body Dysmorphic Disorder Questionnaire (BDDQ) (Table 3) about body-related thinking and behavior are eloquent. Almost a third of women (32.1%) are very concerned because of some body part, and 48.4% of the subjects’ ($n = 274$) main problem is the weight or shape of the body. The perceived physical defect causes marked mental suffering to 29.8% of the women, interferes with social relationships in 15.2%, 33.9% of female responders apply avoidance behavior, and in 3.7% of the participants, the flaw causes a significant problem in their lifestyle.



Table 3 Descriptive statistics of the items of the Body Dysmorphic Disorder Questionnaire (BDDQ) in females and males

BDDQ items	Answers	Respondents <i>n</i> (%)		$\chi^2(1)$ <i>p</i>
		Females (<i>n</i> = 567)	Males (<i>n</i> = 36)	
1. Are you very concerned about the appearance of part(s) of your body that you consider especially unattractive?	Yes	182 (32.1%)	7 (19.4%)	2.519 0.112
If yes, do these concerns occupy you? That is, you think about them a lot and wish you could think about them less?	Yes	141 (24.9%)	7 (19.4%)	0.104 0.747
2. Is your main concern about your appearance that you are not thin enough or you might become too fat?	Yes	274 (48.4%)	13 (36.1%)	2.052 0.152
3. What effect has your preoccupation with your appearance had on your life?				
Has your defect(s) caused you a lot of distress, torment, or pain?	Yes	169 (29.8%)	5 (13.9%)	4.178 0.041
Has it significantly interfered with your social life?	Yes	86 (15.2%)	5 (13.9%)	0.043 0.835
Has your defect(s) significantly interfered with your school work, your job, or your ability to function in your role (e. g., as a homemaker)?	Yes	21 (3.7%)	2 (5.6%)	0.316 0.574
Are there things you avoid because of your defect(s)?	Yes	192 (33.9%)	6 (16.7%)	4.539 0.033
Have the lives or normal routines of your family or friends been affected by your defect(s)?	Yes	38 (6.7%)	3 (8.3%)	0.142 0.706
4. How much time do you spend thinking about your defect(s) per day on average? (circle one)	Less than 1 hour a day	508 (89.6%)	33 (91.7%)	2.701 0.259
	1–3 hours a day	46 (8.1%)	1 (2.8%)	
	More than 3 hours a day	13 (2.3%)	2 (5.6%)	

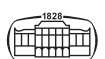
According to BDDQ results, the prevalence of BDD is 8.1 % (*n* = 46) among female responders. The female sample was divided into two subgroups based on the results of the BDDQ, and the data of the BDD group were compared with those of the non-BDD group. The BDD group has

higher BMI, has undergone more plastic surgeries, and scores significantly higher in all subscales of the ACSS in comparison with the non-BDD group (Table 4). For the listed variables, the effect sizes are small.

Table 4 Differences between BDD and non-BDD female groups

Variables	BDD group (<i>n</i> = 46)	Non-BDD group (<i>n</i> = 521)	Mann–Whitney- <i>U</i> χ^2	<i>p</i>	<i>r</i> / Cramér- <i>V</i>
Cosmetic operation % (<i>n</i>)	21.7 (10)	10.9 (57)	$\chi^2(1) = 19.682$	0.012	<i>V</i> = 0.186
BMI <i>M</i> (SD)	27.49 (8.97)	24.49 (5.27)	<i>U</i> = 9641.5	0.028	<i>r</i> = 0.09
ACSS total score <i>M</i> (SD)	74.67 (18.97)	59.29 (20.26)	<i>U</i> = 6664	< 0.001	<i>r</i> = 0.20
ACSS Intrapersonal <i>M</i> (SD)	28.15 (6.01)	24.59 (6.50)	<i>U</i> = 7627	< 0.001	<i>r</i> = 0.16
ACSS Social <i>M</i> (SD)	18.58 (8.85)	14.21 (7.35)	<i>U</i> = 8451.5	0.001	<i>r</i> = 0.14
ACSS Consider <i>M</i> (SD)	28.26 (7.31)	20.54 (9.22)	<i>U</i> = 5910.5	< 0.001	<i>r</i> = 0.24

Note: BDD = Body Dysmorphic Disorder, BMI = Body Mass Index, ACSS = Acceptance of Cosmetic Surgery Scale.



According to the results of multiple binary logistic regression analysis, the risk of BDD is significantly related to education ($OR = 0.424$, $p = 0.031$), ACSS total score ($OR = 1.031$, $p = 0.025$), body satisfaction ($OR = 0.397$, $p < 0.001$). BDD-suspected cases are associated with lower education,

higher acceptance of cosmetic surgery, intensive planning of cosmetic surgery intervention, and higher body dissatisfaction. Age, BMI, health status, and the number of plastic surgery interventions are not related significantly to BDD caseness (Table 5).

Table 5 Risk of Body Dysmorphic Disorder (binary logistic regression analysis)

Variables	B	Wald	p	OR
Age	-0.026	2.549	0.110	0.975
BMI	-0.004	0.011	0.915	0.996
Health state	0.264	1.488	0.223	1.302
Education	-0.859	4.642	0.031	0.424
Number of cosmetic operation per person	-0.011	0.025	0.875	0.989
Number of minimally invasive operation per person	0.078	1.076	0.299	1.081
ACSS total score	0.031	5.058	0.025	1.031
Planning of plastic surgery	-1.046	4.869	0.027	0.351
Body satisfaction	-0.954	19.159	< 0.001	0.397

Note: $n = 505$, dependent variable is BDDQ (categorical variable), ACSS = Acceptance of Cosmetic Surgery Scale, BMI = Body Mass Index.

3.3 Comparisons by subgroups

According to BMI subgroups, differences are found in the body satisfaction. There was no significant difference between the other main variables (Table 6). Based on the pair-

wise comparison results, the BMI groups show a significant difference in body satisfaction, except for the comparison of underweight and normal weight groups. The effect size is large in the case of body satisfaction.

Table 6 Body satisfaction, BDD caseness, number, acceptance, and planning of cosmetic operations by BMI groups in females

BMI (kg/m ²)	<18.5 ($n = 30$)	18.5–24.99 ($n = 309$)	25–29.99 ($n = 137$)	≥29.99 ($n = 83$)	Kruskal–Wallis-H / χ^2 p	η^2 / Cramér-V	
Body satisfaction M (SD)	3.67 (0.80)	3.51 (0.76)	2.99 (0.90)	2.43 (0.94)	$H = 105.918$ $p < 0.001$	$\eta^2 = 0.18$	
BDD caseness % (n)	6.7% (2)	6.5% (20)	10.2% (14)	10.8% (9)	$\chi^2(3) = 2.862$ $p = 0.413$	$V = 0.72$	
ACSS total score M (SD)	62.06 (20.91)	60.27 (19.03)	62.48 (22.03)	58.75 (23.15)	$H = 2.231$ $p = 0.808$	$\eta^2 = 0.00$	
Planning of cosmetic operation % (n)	yes	40% (12)	28.1% (86)	25.5% (35)	$\chi^2(3) = 8.445$ $p = 0.207$	$V = 0.123$	
	maybe	13.3% (4)	9.8% (30)	9.5% (13)			13.3% (11)
	no	46.7% (14)	62.1% (190)	65% (89)			69.9% (58)
Cosmetic operation % (n)	16.7% (5)	12.9% (39)	10.2% (14)	8.4% (7)	$\chi^2(3) = 17.789$ $p = 0.813$	$V = 0.178$	
Minimally invasive operations % (n)	20% (6)	14.9% (46)	10.2% (14)	12% (10)	$\chi^2(3) = 32.718$ $p = 0.847$	$V = 0.140$	

Note: BDD = Body Dysmorphic Disorder, BMI = Body Mass Index, ACSS = Acceptance of Cosmetic Surgery Scale.



All age groups differ significantly in BMI scores, except for the two youngest and two oldest groups, where there is no significant difference in the pairwise comparison results. The effect size is large in these analyses. The score of the

ACSS Consider subscale shows a significant difference between the youngest and the oldest groups ($p = 0.012$) (Table 7). However, for these variables, the effect size is small.

Table 7 BMI, BDD caseness, ACSS Consider subscale and the number of some cosmetic interventions per person, by age groups in females

Age (years)	18–25 (<i>n</i> = 79)	26–35 (<i>n</i> = 173)	36–45 (<i>n</i> = 143)	46–55 (<i>n</i> = 84)	over 55 (<i>n</i> = 88)	Kruskal–Wallis- <i>H</i> / $\chi^2 p$	η^2 / Cramér- <i>V</i>
BMI <i>M</i> (SD)	22.13 (4.04)	23.02 (4.46)	24.94 (6.40)	27.10 (6.51)	27.85 (4.82)	$H = 96.131$ $p < 0.001$	$\eta^2 = 0.160$
BDD caseness % (<i>n</i>)	16.5% (13)	6.4% (11)	6.3% (9)	8.3% (7)	6.8% (6)	$\chi^2(4) = 8.929$ $p = 0.063$	$V = 0.125$
ACSS Consider <i>M</i> (SD)	22.93 9.86	21.67 8.73	21.8 8.70	20.27 10.14	18.42 9.60	$H = 12.137$ $p = 0.016$	$\eta^2 = 0.014$

Note: BDD = Body Dysmorphic Disorder, BMI = Body Mass Index, ACSS = Acceptance of Cosmetic Surgery Scale.

Comparing cosmetic operated and non-operated groups (Table 8), the average age of operated women is significantly higher than that of non-operated women. The operated group’s scores are significantly higher on each subscale and

the total score of the ACSS. The frequency of BDD caseness is also higher in the operated group. For the listed variables, the effect sizes are small.

Table 8 Age, BMI, BDD caseness, and the scores on the Acceptance of Cosmetic Surgery Scale in the female operated and non-operated subgroups

Variables	operated (<i>n</i> = 66)	non-operated (<i>n</i> = 501)	Mann–Whitney- <i>U p</i> / $\chi^2 p$	<i>r</i> / Cramér- <i>V</i>
Age (year) <i>M</i> (SD)	43.88 (13.14)	39.47 (13.32)	$U = 13132.5$ $p = 0.007$	$r = 0.11$
BMI <i>M</i> (SD)	24.14 (5.79)	24.81 (5.69)	$U = 15241.5$ $p = 0.302$	$r = 0.23$
BDD caseness % (<i>n</i>)	15.2% (10)	7.2% (36)	$\chi^2(1) = 4.964$ $p = 0.026$	$V = 0.09$
ACSS total score <i>M</i> (SD)	74.20 (16.52)	58.73 (20.39)	$U = 9158$ $p < 0.001$	$r = 0.23$
ACSS Intrapersonal <i>M</i> (SD)	28.46 (4.84)	24.41 (6.58)	$U = 9752.5$ $p < 0.001$	$r = 0.22$
ACSS Social <i>M</i> (SD)	18.71 (8.18)	14.02 (7.32)	$U = 10902$ $p < 0.001$	$r = 0.18$
ACSS Consider <i>M</i> (SD)	27.27 (6.40)	20.36 (9.34)	$U = 9387.5$ $p < 0.001$	$r = 0.23$

Note: BDD = Body Dysmorphic Disorder, BMI = Body Mass Index, ACSS = Acceptance of Cosmetic Surgery Scale.

Regarding education, female respondents with lower education have higher BMI scores, worse self-rated health state, and lower body satisfaction compared to respondents with higher education group. Education groups were similar in

accepting cosmetic surgery. The frequency of suspected cases of BDD is higher among those with lower levels of education (Table 9).

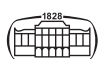


Table 9 Comparison of the female with lower and higher education

Variables	Lower education (<i>n</i> = 209)	Higher education (<i>n</i> = 358)	Mann-Whitney- <i>U</i> <i>p</i> / χ^2 <i>p</i>	<i>r</i> / Cramér- <i>V</i>
BMI <i>M</i> (SD)	25.85 (6.59)	24.09 (5.02)	<i>U</i> = 31474.5 <i>p</i> = 0.002	<i>r</i> = 0.13
Health state <i>M</i> (SD)	2.95 (0.96)	2.66 (0.84)	<i>U</i> = 31129.5 <i>p</i> < 0.001	<i>r</i> = 0.14
Body satisfaction <i>M</i> (SD)	3.03 (0.98)	3.35 (0.86)	<i>U</i> = 30554 <i>p</i> < 0.001	<i>r</i> = 0.16
BDD caseness % (<i>n</i>)	13.4% (28)	5.0% (18)	$\chi^2(1) = 12.399$ <i>p</i> < 0.001	<i>V</i> = 0.138

Note: BDD = Body Dysmorphic Disorder, BMI = Body Mass Index.

3.4 Multivariate analyses

Women's body satisfaction scores (Table 10) are related to BMI, and BDDQ score. In the case of women, body satisfaction is not related to the number of cosmetic operations per person. Neither type of surgery nor age and

education are related to physical satisfaction. According to the results, women with a lower BMI and lower body dysmorphic symptoms are characterized by higher body satisfaction.

Table 10 Female body satisfaction – linear regression analysis

Variables	β	<i>t</i>	<i>p</i>	<i>R</i> ²
Age	0.077	1.889	0.059	0.291
Education	0.055	1.432	0.153	
BMI	-0.456	-11.038	<0.001	
BDDQ score	-0.230	-5.950	<0.001	
Number of cosmetic operations per person	-0.066	-1.742	0.082	
Number of breast surgeries per person	0.123	0.461	0.645	0.040
Number of abdominoplasties per person	0.220	0.077	0.938	
Number of blepharoplasties per person	0.293	-1.083	0.279	
Number of facelifting per person	0.148	0.261	0.794	
Number of nose surgeries per person	0.261	0.071	0.943	
Number of ear surgeries per person	0.550	0.594	0.553	
Number of labiaplasties per person	0.514	0.220	0.826	

Note: Values of education: 1 – lower education, 2 – higher education.

According to the results of linear regression analysis, the total score of acceptance of cosmetic surgery shows significant positive relationship with the BDD caseness and the number of blepharoplasties per person. Besides, ACSS Total score has a significant negative relationship with the planning of cos-

metic surgery (Table 11). With a greater acceptance of cosmetic surgery, women who have more BDD symptoms, plan more cosmetic operations and have been undergoing eyelid surgery more frequently.



Table 11 ACSS total score among females – linear regression analysis

Variables	β (Stand.)	<i>t</i>	<i>p</i>	R^2
Age	0.016	0.379	0.705	0.319
Education	0.030	0.800	0.424	
BDDQ caseness	0.100	2.558	0.011	
Planning of cosmetic surgery	0.491	12.315	<0.001	
BMI	0.019	0.478	0.633	
Number of cosmetic surgery per person	0.009	0.153	0.878	
Number of breast surgery	0.040	0.701	0.484	
Number of blepharoplasty	0.111	2.839	0.005	

Note: $n = 501$. Dependent variable is ACSS Total score, ACSS = Acceptance of Cosmetic Surgery Scale, BMI = Body Mass Index, BDDQ = Body Dysmorphic Disorder. Values of education: 1 – lower education, 2 – higher education. Values of Planning of cosmetic surgery: 1-yes, 2-no.

3.5 Gender differences

In the present study, the number of male respondents was low. However, the authors provide the gender differences and descriptive statistics of men since the data of Hungarian men are currently lacking in this regard. Compared to men, women have lower BMI ($p < 0.001$), are planning more cosmetic surgery ($p = 0.019$), and have higher scores on the ACSS Consider subscale ($p = 0.006$). Significantly more females than males report tension and mental suffering because of the perceived flaw. Avoidance behavior caused by a

perceived physical defect is also higher among women than among men. Regarding the other BDDQ items (Table 3), there was no difference between men and women (concerns about the body, body weight or body shape concern, disturbed social relationships, daily activities, impact on the social environment, and the amount of time they spent with their appearance).

There are no gender differences in the other variables examined (age, education, health state, body dissatisfaction, cosmetic surgical procedures, and BDDQ status) (Table 12).

Table 12 Gender differences

Variables		Females ($n = 567$)	Males ($n = 36$)	Mann-Whitney- <i>U</i> $p / \chi^2 p$	<i>r</i> / Cramér- <i>V</i>
Age <i>M</i> (SD)		39.98 (13.36)	42.89 (12.51)	$U = 8577$ $p = 0.108$	$r = 0.06$
Education % (<i>n</i>)	lower education	36.9 (209)	47.2 (17)	$\chi^2(1) = 1.551$ $p = 0.213$	$V = 0.051$
	higher education	63.1 (358)	52.8 (19)		
Body satisfaction <i>M</i> (SD)		3.23 (0.92)	3.5 (1.08)	$U = 8609$ $p = 0.092$	$r = 0.158$
Health state <i>M</i> (SD)		2.77 (0.89)	2.86 (1.04)	$U = 9594$ $p = 0.520$	$r = 0.063=$
BMI <i>M</i> (SD)		24.74 (5.71)	26.97 (3.9)	$U = 6505$ $p < 0.001$	$r = 0.157$
BDD caseness % (<i>n</i>)		8.1% (46)	8.3% (3)	$\chi^2(1) = 0.002$ $p = 0.963$	$V = 0.002$
ACSS total score <i>M</i> (SD)		60.53 (20.57)	55.45 (23.74)	$U = 8353$ $p = 0.138$	$r = 0.06$
ACSS interpersonal <i>M</i> (SD)		24.88 (6.53)	24.8 (8.14)	$U = 9485.5$ $p = 0.686$	$r = 0.01$

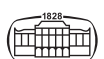


Table 12 (continued)

Variables		Females (<i>n</i> = 567)	Males (<i>n</i> = 36)	Mann–Whitney- <i>U</i> <i>p</i> / $\chi^2 p$	<i>r</i> / Cramér- <i>V</i>
ACSS social <i>M</i> (SD)		14.57 (7.57)	13.61 (8.16)	<i>U</i> = 9138 <i>p</i> = 0.330	<i>r</i> = 0.03
ACSS Consider <i>M</i> (SD)		21.16 (9.31)	16.63 (9.88)	<i>U</i> = 7433 <i>p</i> = 0.006	<i>r</i> = 0.11
Cosmetic operation % (<i>n</i>)		11.2% (67)	11.1% (4)	$\chi^2(1) = 7.104$ <i>p</i> = 0.525	<i>V</i> = 0.109
Planning of cosmetic operation % (<i>n</i>)	yes	26.4% (149)	8.3% (3)	$\chi^2(1) = 7.943$ <i>p</i> = 0.019	<i>V</i> = 0.115
	no	63.1% (356)	86.1% (31)		
	maybe	10.5% (59)	5.6% (2)		

Note: BDD = Body Dysmorphic Disorder, BMI = Body Mass Index, ACSS = Acceptance of Cosmetic Surgery Scale.

4 DISCUSSION

While the rise of cosmetic services (plastic surgery, dermatology, aesthetic dentistry) is increasing, body dysmorphic disorder (BDD) is becoming more frequent. BDD patients are often interested in cosmetic interventions because of concerns about their perceived physical defects. The present study aimed to establish BDD's prevalence and to assess the acceptance of cosmetic surgery among Hungarian adults. However, the authors emphasize that the sample does not consist of randomly selected applicants, therefore, does not represent the adult Hungarian population.

The prevalence of BDD is 8.1 (for women, 8.1%, and for men, 8.3%), which is higher in both sexes compared to the results of most non-selected and general population studies (0.5–8.9%; see Table 2). Hypothesis 1 is confirmed, however, the selection of the participants' results may have been influenced by the title of our research. Probably more subjects were dissatisfied with their appearance and wanted to change their bodies than the responders with no cosmetic interest. Hence their attitude towards cosmetic surgery may also be more accepting. These relationships may also explain higher prevalence rates and low male participation. By comparison, the prevalence of BDD is about 15% in plastic surgery and cosmetic clinics (Ribeiro, 2017). Lai et al. (2010) found BDD in 7.7% of the applicants for plastic surgery care. Our results are similar to those of a Saudi Arabian cross-sectional study where 514 adults (241 males and 273 females) were examined with Body Dysmorphic Disorder Questionnaire (BDDQ), and the prevalence of BDD was 8.9% (5.8% in males, 11.7% in females; Alghamdi et al. 2022). In a multicentre study by Corazza et al. (2019), the results of British, Italian, Dutch, and Hungarian fitness room attendants were compared. BDD risk was assessed with the Appearance Anxiety Inventory (Veale et al., 2014). The risk of BDD was 38.5% in the overall sample (47.2% in women

and 21.4% in men). The risk was the highest among the Hungarian respondents (51.5%), and that in the Dutch, British, and Italian samples were 38.1%, 30%, and 29.3%.

Based on the result of multiple binary logistic regression analysis, BDD caseness is associated with the level of education, the acceptance of cosmetic surgery, planning of plastic surgery and body satisfaction scores. Regarding educational attainment, there is more BDD positivity in respondents with lower education. They probably are not aware of having psychiatric symptoms and, therefore, cannot ask for adequate help. Body dissatisfaction is the main symptom of BDD. Therefore, it is evident that lower body satisfaction scores accompany BDD caseness. The BDDQ score has no significant relationship with the number of plastic surgery; thus, this part of hypothesis 2 needs to be verified. However, the planning of plastic surgery is related to BDD scores. These patients usually seek aesthetic interventions to cure their bodily flaw(s). Cosmetic treatments are ineffective, the patient's condition usually impairs, and conflicts with the therapists generally arise due to dissatisfaction (Lai et al., 2010; Sarwer & Spitzer, 2012). The positive correlation between body dissatisfaction and BDD caseness has been certified. In an Arabic sample, Alghamdi et al. (2022) found higher BDD prevalence among respondents under 40, women, and non-married respondents, where education did not affect BDD positivity. Present results show higher BDD scores with lower levels of education and higher body dissatisfaction. In the case of unrealistic expectations of surgery (higher Acceptance of Cosmetic Surgery Scale [ACSS] scores, high body dissatisfaction), it is worth providing sufficient oral and written information to the patients about the course of surgery, their risks, healing, and scarring (Clarke et al., 2005; Hirsch & Stier, 2009). This preparation also includes educating the patient and stabilizing the doctor–patient relationship (Beynet, Greco, & Soriano, 2009).



BDD patients are intensively interested in plastic interventions (Callaghan et al., 2011; Higgins & Wysong, 2018). For specialists, a summary of surgically contraindicated mental disorders is a starting point: psychosis, bipolar disorder, major depression, eating disorders, and body image disorders (Veale, 2004). It may be helpful to consider other aspects as well. According to the present results, the BDD-positive group had higher BMI, more plastic surgeries, and more acceptance of cosmetic surgery. However, the effect sizes were small.

The results of the pairwise comparison indicate that BMI categories differ in body satisfaction scores. A significant positive correlation exists between BMI and body dissatisfaction. No significant differences were found among the most important variables (ACSS, BDD status, number of cosmetic procedures).

BDD caseness is higher among operated women, this confirms hypothesis 3, and plastic surgery is more accepted in BDD-positive persons/subjects. However, this group is similar to non-operated women in terms of body satisfaction, planning of cosmetic intervention, or health status. Due to the lack of significant difference, hypothesis (4) is not confirmed. The mean age of the operated group is higher, and older women had the opportunity to undergo these kinds of interventions because of their circumstances (financial causes, decisions). The popularity of interventions may be explained by increased family income, greater media exposure, and decreasing stigma associated with plastic surgery (Swami et al., 2008). The older the respondents are the more cosmetic intervention is used. The US data show that most cosmetic surgery patients (41%) are aged 36–50 (ASPS, 2022), similar to the present result. The results showed a significant difference between the age of the operated and non-operated females, but the effect size was small. The women planning the surgeries are younger, have already had some aesthetic interventions (operation, fillers), are more accepting of plastic surgery, or have more BDD symptoms. This result can be explained by the number of BDD and reconstructive patients among women planning the surgery. According to screening tools, reconstructive patients usually have more BDD symptoms because of a physical defect. Therefore, a structured interview and examination of the bodily defect are essential for diagnosing BDD (APA, 2013, 2022).

Females (94%) are overrepresented in the present study and are generally more interested in plastic surgery. This fact is also confirmed by the American Society of Plastic Surgeons' annual report (2022), where men's proportion in the field of plastic surgery was 6%. Frederick, Lever, and Peplau (2007) also indicate the gender difference in interest in plastic surgery. American adults were asked if they would resort to aesthetic surgery if adequate funding were available. According to their results, many women were interested (48%) or likely to be interested (23%), while fewer men were interested (23%) or likely to be interested (17%) in aesthetic surgery. This popularity is lower in the present Hungarian sample: 26.4% of women plan, 10.4% are likely to plan cosmetic surgery, while 8.3% of men plan, and 5.5% are likely

to plan the intervention. More than one-third of women think about some body modification to reach the ideal appearance because 56.8% are unsatisfied with their body. Cosmetic surgery was used by 11.6% of the respondents (4.8% of them had breast surgery, and 3.7% had some minimally invasive interventions.) The feeling of being very concerned because of some body part is frequent (32.1%). Compared to men, there is more avoidance behavior and mental suffering in women due to the perceived physical defects.

About the body, the comparison of education groups gave exciting results. Women with a lower level of education have a higher BMI, worse perceived health, less satisfaction with their bodies, and more BDD positivity.

The acceptance of cosmetic surgery in women is higher than in men, as supported by several other studies (Henderson-King & Henderson-King, 2005; Swami et al., 2009). Contrary to this, according to the present results, men and women differ significantly only in the Consider subscale of ACSS, with no gender differences in other subscales and total scores. The ACSS score positively correlates with the number of eyelid surgeries and the BDD-positivity. According to these results, the first part of hypothesis 6 was verified. At the same time, it is essential to emphasize that blepharoplasty patients greatly accept cosmetic surgery services.

There are gender differences in body satisfaction, attitudes, and behaviors about the body: women's dissatisfaction is higher (Murnen & Don, 2012). According to Feingold and Mazzella (1998), body satisfaction in gender comparison has shown a significant difference since the 1980s that increased by the 1990s. Among women, poor body image has risen dramatically; nevertheless, men are also affected by body dissatisfaction (Feingold & Mazzella, 1998). Men with vulnerable body image show a similar prevalence of body-related behavior as women (Murnen & Don, 2012). Metrosexuality from the 1990s (Murnen & Don, 2012) directs men's attention to more intense occupation and investigation of the body. In our study, men differed from women in BMI, in the Consider subscale of ACSS, and planning plastic surgery. Women have lower BMI, plan more cosmetic operations, and have higher scores on Consider subscale. In women, appearance is more significant in achieving well-being (Murnen & Don, 2012); their self-esteem is more closely related to body evaluation than that of men (Myers & Crowther, 2009). These data are also reinforced by the results obtained in the women's group: more frequent avoidance behavior, significant mental suffering caused by the actual or perceived flaw(s). Women with greater body dissatisfaction who have more BDD symptoms and positivity, greater BMI, and planning for future plastic surgeries. These results confirm hypothesis (5).

There is a considerable need for Hungarian epidemiological data to help specialists screen BDD more effectively and understand the relationship between interest in cosmetic surgery and BDD. Like the US sample, it would be necessary to have central statistics in cosmetic surgery care (e.g., number of interventions, the demographic data of participants). These factors would be a starting point for screening mental disorders and implementing interventions.



This paper analyzed a non-selected study sample, which does not qualify as a sample representing the Hungarian population. In order to determine the valid prevalence of BDD, it would be necessary to use a structured interview and the test, which confirms the diagnosis. BDDQ is a screening questionnaire that has limited diagnostic value. However, several other studies also used it to establish BDD prevalence (Alghamdi et al., 2022; Brohede et al., 2013; Weingarden, Curley, Renshaw, & Wilhelm, 2017). The generalization of results is limited; however, the following findings can be summarized. Those who already had eyelid surgery are more likely to accept cosmetic surgery. This procedure can therefore be a milestone to further interventions. Body satisfaction of operated and non-operated women does not differ, so cosmetic interventions probably do not affect body satisfaction after surgery. The number of invasive surgeries (breast, abdomen, eyelid, face, nose, ear, labia) does not correlate with body satisfaction among women. It is possible that these surgeries only im-

prove satisfaction with the body part rather than overall body satisfaction. The present results show that BDD case-ness, the planning of cosmetic surgery, and the number of blepharoplasties are associated with women's acceptance of cosmetic surgery. The prevalence of BDD is higher among those interested in cosmetic surgery. Therefore, professionals performing cosmetic interventions must pay special attention to screening for BDD.

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REFERENCES

- Abraham, A., & Zuckerman, D. (2011). Adolescents, celebrity worship, and cosmetic surgery. *Journal of Adolescent Health, 49*(5), 453–454. <https://doi.org/10.1016/j.jadohealth.2011.08.014>
- Aesthetic Plastic Surgery National Databank Statistics 2020. (2021) *Aesthetic Surgical Journal, 18*, 41(Suppl 2), 1–16. <https://doi.org/10.1093/asj/sjab178>
- Alghamdi, W. A., Subki, A. H., Khatib, H. A., Butt, N. S., Alghamdi, R. A., Alsallum, M. S., ... & Koenig, H. G. (2022). Body dysmorphic disorder symptoms: Prevalence and risk factors in an Arab middle eastern population. *International Journal of General Medicine, 15*, 2905–2912. <https://doi.org/10.2147/IJGM.S329942>
- American Psychiatric Association. (1994). *Diagnostic and statistical manual of mental disorders* (4th ed.). American Psychiatric Publishing, Inc.
- American Psychiatric Association (APA). (2013). *Diagnostic and statistical manual of mental disorders*. 5th edition. American Psychiatric Association.
- American Psychiatric Association. (2022). *Diagnostic and statistical manual of mental disorders* (5th ed., text rev.). <https://doi.org/10.1176/appi.books.9780890425787>
- Anderson, R. C. (2003). Body dysmorphic disorder: Recognition and treatment. *Plastic Surgical Nursing, 23*, 125–128. <https://doi.org/10.1097/00006527-200323030-00007>
- American Society of Plastic Surgeons. (ASPS). (2022). Inaugural ASPS Insights and Trends Report: Cosmetic Surgery 2022. American Society of Plastic Surgeons. <https://www.plasticsurgery.org/documents/News/Trends/2022/trends-report-cosmetic-surgery-2022.pdf> [Letöltve: 2023.07.18.]
- Beos, N., Kemps, E., & Prichard, I. (2021). Photo manipulation as a predictor of facial dissatisfaction and cosmetic procedure attitudes. *Body Image, 39*, 194–201. <https://doi.org/10.1016/j.bodyim.2021.08.008>
- Beynet, D., Greco, J., & Soriano, T. (2006) Approach to the cosmetic patient. In M. Alam, H.B. Gladstone, R. C. Tung (Eds.), *Cosmetic dermatology* (pp. 1–6). Saunders Ltd.
- Bonell, S., Barlow, F. K., & Griffiths, S. (2021). The cosmetic surgery paradox: Toward a contemporary understanding of cosmetic surgery popularisation and attitudes. *Body Image, 38*, 230–240. <https://doi.org/10.1016/j.bodyim.2021.04.010>
- Bradshaw, H. K., Leyva, R. P., Nicolas, S. C. A., & Hill, S. E. (2019). Costly female appearance-enhancement provides cues of short-term mating effort: The case of cosmetic surgery. *Personality and Individual Differences, 138*, 48–55. <https://doi.org/10.1016/j.paid.2018.09.019>
- Brohede, S., Wingren, G., Wijma, B., & Wijma, K. (2013). Validation of the body dysmorphic disorder questionnaire in a community sample of Swedish women. *Psychiatry Research, 15*, 210(2), 647–652. <https://doi.org/10.1016/j.psychres.2013.07.019>
- Brohede, S., Wingren, G., Wijma, B., & Wijma, K. (2015). Prevalence of body dysmorphic disorder among Swedish women: A population-based study. *Comprehensive Psychiatry, 58*, 108–115. <https://doi.org/10.1016/j.psychres.2013.07.019>
- Buhlmann, U., Glaesmer, H., Mewes, R., Fama, J. M., Wilhelm, S., Brähler, E., & Rief, W. (2010). Updates on the prevalence of body dysmorphic disorder: A population-based survey. *Psychiatry Research, 178*, 171–175. <https://doi.org/10.1016/j.psychres.2009.05.002>
- Callaghan, G. M., Lopez, A., Wong, L., Northcross, J., & Anderson, K. R. (2011). Predicting consideration of cosmetic surgery in a college population: A continuum of body image disturbance and the importance of coping strategies. *Body Image, 8*(3), 267–274. <https://doi.org/10.1016/j.bodyim.2011.04.002>
- Cash, T. F. (2002). Cognitive-behavioral perspectives on body image. In T. F. Cash, T. Pruzinsky (Eds.), *Body Image. A handbook of theory, research and clinical practice* (pp. 478–486). The Guilford Press.



- Cerea, S., Bottesi, G., Grisham, J. S., & Ghisi, M. (2018). Body dysmorphic disorder and its associated psychological and psychopathological features in an Italian community sample. *International Journal of Psychiatry in Clinical Practice*, 22, 206–214. <https://doi.org/10.1080/13651501.2017.1393545>
- Clarke, A., Lester, K. J., Withey, P. E., & Butler, P. E. M. (2005). A funding model for a psychological service to plastic and reconstructive surgery in UK practice. *British Journal of Plastic Surgery*, 58(5), 708–713. <https://doi.org/10.1016/j.bjps.2005.02.005>
- Collins, B., Gonzalez, D., Gaudilliere, D. K., Shrestha, P., & Girod, S. (2014). Body dysmorphic disorder and psychological distress in orthognathic surgery patients. *Journal of Oral and Maxillofacial Surgery*, 72(8), 1553–1558. <https://doi.org/10.1016/j.joms.2014.01.011>
- Cook, S. A., Rosser, R., & Salmon, P. (2006). The psychological and social characteristics of patients referred for NHS cosmetic surgery: Quantifying clinical need. *Journal of Plastic, Reconstructive & Aesthetic Surgery*, 59(11), 1133–1151. <https://doi.org/10.1016/j.bjps.2006.03.047>
- Corazza, O., Simonato, P., Demetrovics, Z., Mooney, R., van de Ven, K., Roman-Urrestarazu, A., ... & Martinotti, G. (2019). The emergence of exercise addiction, body dysmorphic disorder, and other image-related psychopathological correlates in fitness settings: A cross sectional study. *PloS one*, 14(4), e0213060. <https://doi.org/10.1371/journal.pone.0213060>
- Enander, J., Ivanov, V. Z., Mataix-Cols, D., Kujala-Halkola, R., Ljótsson, B., Lundström, S., ... & Rück, C. (2018). Prevalence and heritability of body dysmorphic symptoms in adolescents and young adults: A population-based nationwide twin study. *Psychological Medicine*, 48(16), 2740–2747. <https://doi.org/10.1017/S0033291718000375>
- Faravelli, C., Salvatory, S., Galassi, F., Aiazzi, L., Drei, C., & Cabras, P. (1997). Epidemiology of somatoform disorders: A community survey in Florence. *Social Psychiatry and Psychiatric Epidemiology*, 32, 24–29. <https://doi.org/10.1007/BF00800664>
- Feingold, A., & Mazzella, R. (1998). Gender differences in body image are increasing. *Psychological Science*, 9(3), 190–195. <https://doi.org/10.1111/1467-9280.00036>
- Figler, M. (2015). *Klinikai és gyakorlati dietetika*. Medicina Könyvkiadó Zrt. Retrieved on 24.04.2023 from: https://www.etk.pte.hu/public/upload/files/Palyazati_iroda/elnyert/Klinikai_es_gyakorlati_dietetika.pdf
- Frederick, D. A., Lever, J., & Peplau, L. A. (2007). Interest in cosmetic surgery and body image: Views of men and women across the lifespan. *Plastic and Reconstructive Surgery*, 120, 1407–1415. <https://doi.org/10.1097/01.prs.0000279375.26157.64>
- Gieler, T., Schmutzer, G., Braehler, E., Shut, C., Peters, E., & Kupfer, J. (2016). Shadows of beauty – Prevalence of body dysmorphic concerns in Germany is increasing: Data from two representative samples from 2002 and 2013. *Acta Dermato-Venereologica*, 96(217), 83–90. <https://doi.org/10.2340/00015555-2375>
- Gunstand, J., & Phillips, K. A. (2003). Axis I comorbidity in body dysmorphic disorder. *Comprehensive Psychiatry*, 44, 270–276. [https://doi.org/10.1016/S0010-440X\(03\)00088-9](https://doi.org/10.1016/S0010-440X(03)00088-9)
- Henderson-King, D., & Henderson-King, E. (2005). Acceptance of cosmetic surgery: Scale development and validation. *Body Image*, 2, 137–149. <https://doi.org/10.1016/j.bodyim.2005.03.003>
- Higgins, S., & Wysong, A. (2018). Cosmetic surgery and body dysmorphic disorder – An update. *International Journal of Womens Dermatology*, 4(1), 43–48. <https://doi.org/10.1016/j.ijwd.2017.09.007>
- Hirsch, R., & Stier, M. (2009). Complications and their management in cosmetic dermatology. *Dermatologic Clinics*, 27(4), 507–520. <https://doi.org/10.1016/j.det.2009.08.013>
- Koran, L. M., Abujaoude, E., Large, M. D., & Serpe, R. T. (2008). The prevalence of body dysmorphic disorder in the United States adult population. *CNS Spectrums*, 13(4), 316–322. <https://doi.org/10.1017/S1092852900016436>
- Lai, C.-S., Lee, S.-S., Yeh, Y.-C., & Chen, C.-S. (2010). Body dysmorphic disorder in patients with cosmetic surgery. *The Kaohsiung Journal of Medical Science*, 26(9), 478–482. [https://doi.org/10.1016/S1607-551X\(10\)70075-9](https://doi.org/10.1016/S1607-551X(10)70075-9)
- Mulkens, S., Bos, A.E.R., Uleman, R., Muris, P., Mayer, B., & Velthuis, P. (2012). Psychopathology symptoms in a sample of female cosmetic surgery patients. *Journal of Plastic, Reconstructive and Aesthetic Surgery*, 65(3), 321–327. <https://doi.org/10.1016/j.bjps.2011.09.038>
- Murnen, S. K., & Don, B. (2012). Body image and gender roles. In T. F. Cash (Ed.), *Encyclopedia of body image and human appearance*. (128–134). Oxford Elsevier
- Myers, T. A., & Crowther, J. H. (2009). Social comparison as a predictor of body dissatisfaction: A meta-analytic review. *Journal of Abnormal Psychology*, 118(4), 683–698. <https://doi.org/10.1037/a0016763>
- Otto, M. W., Wilhelm, S., Cohen, L. S., & Harlow, B. L. (2001). Prevalence of body dysmorphic disorder in a community sample of women. *American Journal of Psychiatry*, 158, 2061–2063. <https://doi.org/10.1176/appi.ajp.158.12.2061>
- Phillips, K. A. (2005). *The broken mirror: Understanding and treating body dysmorphic disorder* (40–43). New York: Oxford University Press
- Phillips, K. A., Menard, W., & Fay, C. (2006). Gender similarities and differences in 200 individuals with body dysmorphic disorder. *Comprehensive Psychiatry* 47(2), 77–87. <https://doi.org/10.1016/j.comppsy.2005.07.002>
- Pruzinsky, T., & Edgerton, M. T. (1990). Body-image change through bodily change. In T. F. Cash, T. Pruzinsky (Eds.), *Body images: Development, deviance, and change* (pp. 217–236). The Guilford Press.
- Ribeiro, R. V. E. (2017). Prevalence of body dysmorphic disorder in plastic surgery and dermatology patients: A systematic review with meta-analysis. *Aesthetic Plastic Surgery*, 41, 964–970. <https://doi.org/10.1007/s00266-017-0869-0>
- Ricci, W. F., Prstojevich, S. J., Langley, H. S., & Hlavacek, M. R. (2010). Psychological risks associated with appearance-altering procedures: Issues “facing” cosmetic surgery. *Oral and Maxillofacial Surgery Clinics of North America*, 22(4), 439–444.
- Rief, W., Buhlmann, U., Wilhelm, S., Borkenhagen, A., & Brähler, E. (2006). The prevalence of body dysmorphic disorder: A population-based survey. *Psychological Medicine*, 36(6), 877–885. <https://doi.org/10.1017/S0033291706007264>



- Saade, D.S., de Castro Maymone, M. B., & Vashi, N. A. (2018). The ethics of the cosmetic consult: Performing procedures on the body dysmorphic patient. *International Journal of Women's Dermatology*, 4(3), 185–187. <https://doi.org/10.1016/j.ijwd.2018.04.002>
- Sarwer, D.B. (2019). Body image, cosmetic surgery, and minimally invasive treatments. *Body image*, 31, 302–308. <https://doi.org/10.1016/j.bodyim.2019.01.009>
- Sarwer, D.B., Cash, T.F., Magee, L., Williams, E.F., Thompson, J.K., Roehrig, M., ... & Romanofski, M. (2005). Female college students and cosmetic surgery: An investigation of experiences, attitudes, and body image. *Plastic and Reconstructive Surgery*, 115(3), 931–938. <https://doi.org/10.1097/01.PRS.0000153204.37065.D3>
- Sarwer, D. B., & Spitzer, J. C. (2012). Body image dysmorphic disorder in persons who undergo aesthetic medical treatments. *Aesthetic Surgery Journal*, 32(8), 999–1009. <https://doi.org/10.1177/1090820X12462715>
- Schieber, K., Kolley, I., de Zwaan, M., & Martina, A. (2015). Classification of body dysmorphic disorder – what is the advantage of the new DSM–5 criteria? *Journal of Psychosomatic Research*, 78(3), 223–227. <https://doi.org/10.1016/j.jpsychores.2015.01.002>
- Stefanile, C., Nerini, A., & Mater, C. (2014). The factor structure and psychometric properties of the Italian version of the acceptance of cosmetic surgery scale. *Body Image*, 11(4), 370–379. <https://doi.org/10.1016/j.bodyim.2014.06.005>
- Swami, V., Arteché, A., Chamorro–Premuzic, T., Furnham, A., Stieger, S., Haubner, T., & Voracek, M. (2008). Looking good: factors affecting the likelihood of having cosmetic surgery. *European Journal of Plastic Surgery*, 30(5), 211–218. <https://doi.org/10.1007/s00238-007-0185-z>
- Swami, V., Chamorro–Premuzic, T., Bridges, S., & Furnham, A. (2009). Acceptance of cosmetic surgery: Personality and individual difference predictors. *Body Image*, 6(1), 7–13. <https://doi.org/10.1016/j.bodyim.2008.09.004>
- Szabó, P. (2010). Egy régi „új” betegség: a testdiszmorfiás zavar (dysmorphophobia). *Orvosi Hetilap*, 151, 1805–1815. <https://doi.org/10.1556/oh.2010.28971>
- Szabó, P., & Szászi, B. (2021). Testdiszmorfiás zavar: Száz év magány. *Psychiatria Hungarica*, 36(2), 143–161.
- Veale, D. (2004). Advances in a cognitive behavioural model of body dysmorphic disorder. *Body Image*, 1(1), 113–125. [https://doi.org/10.1016/S1740-1445\(03\)00009-3](https://doi.org/10.1016/S1740-1445(03)00009-3)
- Veale, D., Eshkevari, E., Kanakam, N., Ellison, N., Costa, A., & Werner, T. (2014). The Appearance Anxiety Inventory: Validation of a process measure in the treatment of body dysmorphic disorder. *Behavioural and Cognitive Psychotherapy*, 42(5), 605–616. <https://doi.org/10.1017/S1352465813000556>
- Veale, D., Gledhill, L. J., Christodoulou, P., & Hodsoll, J. (2016). Body dysmorphic disorder in different settings: A systematic review and estimated weighted prevalence. *Body Image*, 18, 168–186. <https://doi.org/10.1016/j.bodyim.2016.07.003>
- Ware, J. E., & Sherbourne, C. D. (1992). The MOS 36–item short–form health survey (SF–36). I. Conceptual framework and item selection. *Medical Care*, 30(6), 473–483.
- Weingarden, H., Curley, E.E., Renshaw, K.D., & Wilhelm, S. (2017). Patient–identified events implicated in the development of body dysmorphic disorder. *Body Image*, 21, 19–25. <https://doi.org/10.1016/j.bodyim.2017.02.003>
- Wever, C. C. C., Wever, A.M.E.A., & Constantian, M. (2020). Psychiatric disorders in facial plastic surgery. *Facial Plastic Surgery Clinics of North America*, 28(4), 451–460. <https://doi.org/10.1016/j.fsc.2020.06.003>

