

## The Beauty and the BIID

Lisa-Lucie Aner, Frederike Schmitt, Erich Kasten

Medical School Hamburg, University of Applied Sciences, Medical University, Am Kaiserkai 1, D-20457 Hamburg, Germany

\*Corresponding Author: Erich Kasten, Medical School Hamburg, University of Applied Sciences, Medical University, Am Kaiserkai 1, D-20457 Hamburg, Germany

### ABSTRACT

Body Integrity Identity Disorder is an intense feeling of a discrepancy between a real intact body and the mental image of a disabled body (e.g. amputation). Current models left several essential questions unanswered: Why do the affected individuals feel “complete” only after amputation? Why can the wish for an amputation change from one side of the body to the other? Why does the wish not follow the anatomical dermatomes, but rather the everyday picture of a typical amputee? Why do many of the affected persons have an erotic preference for an amputated partner? Why does the disturbance exist from early childhood? The authors developed a model to determine whether the cause of BIID may be a disorder of the brain areas which judge the beauty of the human body. From an evolutionary point of view, bi-legged/two-armed people must be judged to be more attractive, as this increases the chance for survival in a hostile environment. Due to genetic changes or ZNS-lesions, damage can occur in this beauty-ideal centre, which may result in the case of BIID, where the brain estimates one-legged or one-armed bodies as an ideal form of attractiveness. Pictures of amputees would then be judged extremely positively. In two pilot studies, the perception of attractiveness and beauty in BIID-affected individuals who have a desire for amputation was examined, concerning (1) their own body in its current physical state as well as after an imagined amputation, and also (2) regarding the body of others (by drawings) in an unimpaired status or with an amputation. The judgments of attractiveness were compared to the ratings of a control group and a group of BIID-affected individuals who have a desire for palsy and those BIID sufferers who had already received an amputation (3). Results: The data of the first pilot-study show that images of disabled people were judged to be significantly more beautiful than a neutral photo. Another comparison showed that photos of amputees were judged as more beautiful, positive, sexually arousing and fascinating than photos of non-amputated photos with erotic content. The photos of amputees were estimated as slightly more positive than other usually positive estimated pictures. The second pilot study showed that BIID sufferers judged drawings of amputees more positively with regard to beauty and attractiveness compared to non-BIID sufferers and those BIID sufferers with the desire to be paralysed. Additionally, the group of BIID-affected individuals who wish to be an amputee assessed their own body in its actual status as less beautiful and attractive than their imagined body with the favoured amputation. Conclusion: The results underline the theoretical consideration that Body Integrity Identity Disorder might be associated with an altered ideal of beauty.

**Keywords:** BIID, Body Integrity Identity Disorder, Body Incongruence Disorder, Apoteimnophilia, Acrotomophilia, Amelotism, Xenomelia, Amputee Identity Disorder, Mental Body Image

### INTRODUCTION

#### BODY INTEGRITY IDENTITY DISORDER

BIID (“Body Integrity Identity Disorder”, also known as “Amputee Identity Disorder”, “Body incongruence Disorder” or “Xenomelia”), is an intense feeling of a discrepancy between a real intact body and the mental image of a disabled body (e.g. amputation). BIID is associated with a strong desire for a severe disability [1, 2]. The afflicted person believes that they will only be “complete” after the amputation of a limb. The interest in disabled people and a curiosity to

play the role of an amputee has often existed since early childhood. Obernolte et al. [20] expected significant differences in experiences with disabled people in childhood and young adulthood between BIID sufferers and control subjects. As a primary reason for the wish for amputation, a feeling of perfection and internal satisfaction was reported [2, 12]. Most persons who successfully achieved the desired operation showed healing from all BIID-symptoms [19]. As a possible cause of BIID, Stirn et al. [23] defined a genetic based pre-pubertal imprinting connected with the identification of an admired

disability on one's own body scheme. Often, a feeling that some parts of the body are alien occurs. In many cases, the affected people perceive a very precisely defined line where the amputation stump should be. However, this line corresponds more to the naive concept of a one-legged person, rather than to the sensory regions of the spinal nerves [13]. Neither MRT nor fMRI-examinations detected extensive neurological lesions in the brain. Due to similarities with neurological disorders such as alien limb syndrome, hemineglect, or asomatognosia, a dysfunction in the upper right parietal lobe is discussed as a possible cause of BIID [1, 3]. McGeoch et al. [16] proposed minimal deficits in the right parietal lobe. In contrast to this neurological explanation, the choice in several patients for amputation of a specific leg changed from one side to the other based on rational reasons, such as the need to drive a car [8, 13, 14], which supports a more psychological based explanation.

In 2005, Michael First [8] pointed to the notable similarities between Body Integrity Identity Disorder and Gender Identity Disorder (GID, transgender). Both groups suffer from feelings of being in the wrong body. In BIID as well GID, the disturbance emerges in childhood and partially involves erotic feelings with regard to the desired body.

In the area of fetishism, a group exists with a preference for people with missing limbs (named "Acrotomophilia", "Mancophilia", "Amelotism", "Deformation Fetishism" or "Devotees"). Some BIID individuals feel sexually aroused by the sight of leg- or arm-stumps, too [21]. In a study by Blom et al. [2], 46% of BIID individuals felt sexual excitement if they saw a person with an amputation similar to the wished disability of the interviewee.

These first results led to a preliminary approach for a model in 2009; Kasten & Spithaler [11] suggested a multi-causal influence of (1) a psychological, (2) a neurological and (3) a sexual component.

### WHAT IS "BEAUTY"?

According to the textbook of Renz [22] the assessment of the "beauty" of a person is based on firm principles, which have outlasted millennia and are also very similar between

cultures. Eibl-Eibesfeldt [6], Liessman [15], and Etcoff [7] gave the opinion that the human sense of beauty has its origins in a genetically-imprinted biological nature, formed by evolution. However, it is also reinforced by the norms of society and culture, and is modelled by individual experiences [5, 10, 22].

One of the most important criteria for the choice of a partner is physical attractiveness. The majority of scientific research is concerned with the beauty of the face of women, while the face of men has been much less frequently investigated [22]. Symmetrical facial features suggest that no genetic defects are present. However, a secondary but significant role is played by the body shape. Here, developed from ages earlier than the Stone Age, specific proportions exist which signalled a higher survival advantage in times when people wandered in small hordes through the steppe and were exposed to a variety of hazards. Thus, women react positively to the muscular V-figure of a man with broad shoulders, well-trained legs and a well-shaped bottom, because in the dawn of humanity this pointed to the fact that the man was a good hunter and could bring sufficient Mammoth-meat for his family. Slimness and long hair in women are seen as signs of virginity, which was important in ancient times for the man to transmit his own genes and not to have to feed the brood of another [6, 18]. In addition, men react to stimuli like big breasts, which point symbolically to the fact that the woman can nourish her babies, because children were the pension for aged people in these earlier days of human history. Even smooth clear skin symbolises youth, which underlines the fact that a woman can still bear a lot of children. That, which we judge as "attractive", therefore, depends on principles which were developed in the evolution of humanity and were genetically anchored in the brain, because they supported the preservation of the human species.

### Symmetry, Asymmetry, BIID and Attractiveness

The symmetry of the body plays a major role in the estimation of health, abilities, and, in a broader view, the genetic quality of a person [22]. In contrast, in BIID-affected individuals, the absence of a limb seems to belong to their ideal image of a perfect body. In personal discussions, almost all BIID-affected individuals

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reported that they generally estimate people with amputated extremities as “nicer”, “more attractive”, “better looking” or “more handsome” than individuals without any handicap; they admire “the beauty of a stump” [12]. The desire for a perfect body is often given as the main motive for the strong demand for an amputation [11, 23]. Blom et al. [2] pointed out that BIID individuals feel sexual excitement, even by mentally imagining their own amputation. Thus, it seems that BIID-affected individuals feel more comfortable in an amputated body and accordingly feel an additional erotic excitement.

### Unsolved Problems and A New Model

Until now there is no comprehensive model which really can explain the cause of BIID. The above-mentioned theories do not explain some essential questions:

- Why do the affected persons regard themselves as “complete” only after an amputation?
- Why can the wish for an amputation change from one side of the body to the other, but practically never from a specific body part to another?
- Why does the wish for an amputation not follow the neuro-anatomical dermatomes, but rather the everyday picture of a typical amputee?
- Why do many of the affected persons have an erotic preference for a partner with a similar impediment?
- Why does the disturbance exist from early childhood?

To solve these problems, we would like to suggest the following theory:

People have an innate beauty ideal which implies not only the attractiveness of the face, but, for reasons of evolutionary survival, also a well-built, intact body (i.e. with two legs, two arms etc.). This beauty ideal must be anchored somewhere in the brain, because it has not only been extremely stable since ancient times, but is also cross-cultural. This brain area (or more likely a system of several parts of the brain) can undergo changes and damage. Thus, there are, e.g., men with preferences for women with

extremely small breasts or with a predilection for very thick women. Other people estimate an extremely athletic body as an ideal, which leads to excessive bodybuilding. Anorexic patients have the ideal of an extremely slender body. People with trans-identity find themselves more attractive if their appearance resembles the desired gender. Most men prefer younger women, but for some men, older women have a greater attraction. These examples show that the ideal of an attractive body is modifiable by genetic defects as well as result of environmental events or, possibly, also by small pre-, peri- or postnatal brain damage of this beauty area in the brain.

It is conceivable that a BIID-affected person suffers from a micro-change in one of the brain areas in which the main physical features of human beauty are established. The result can be that the affected person no longer considers the usual two legged body as attractive, but the cerebral area instead gives a one-legged body as an ideal.

The next stage in this chain would be that the BIID affected person cannot classify her or his own body as attractive, because the beauty-ideal gives the scheme of a one-legged body. To compare it with a well-known example: If individuals have the beauty ideal of slimness, they will not feel good when they put on huge amounts of weight. Today, most people have the ideal of a slender, athletic body. Corpulence makes us unhappy, because the external body does not correspond to the mental ideal. Also, BIID-affected persons seem to suffer from the fact that their external two-legged body does not correspond to this ideal of a beautiful one-leggedness.

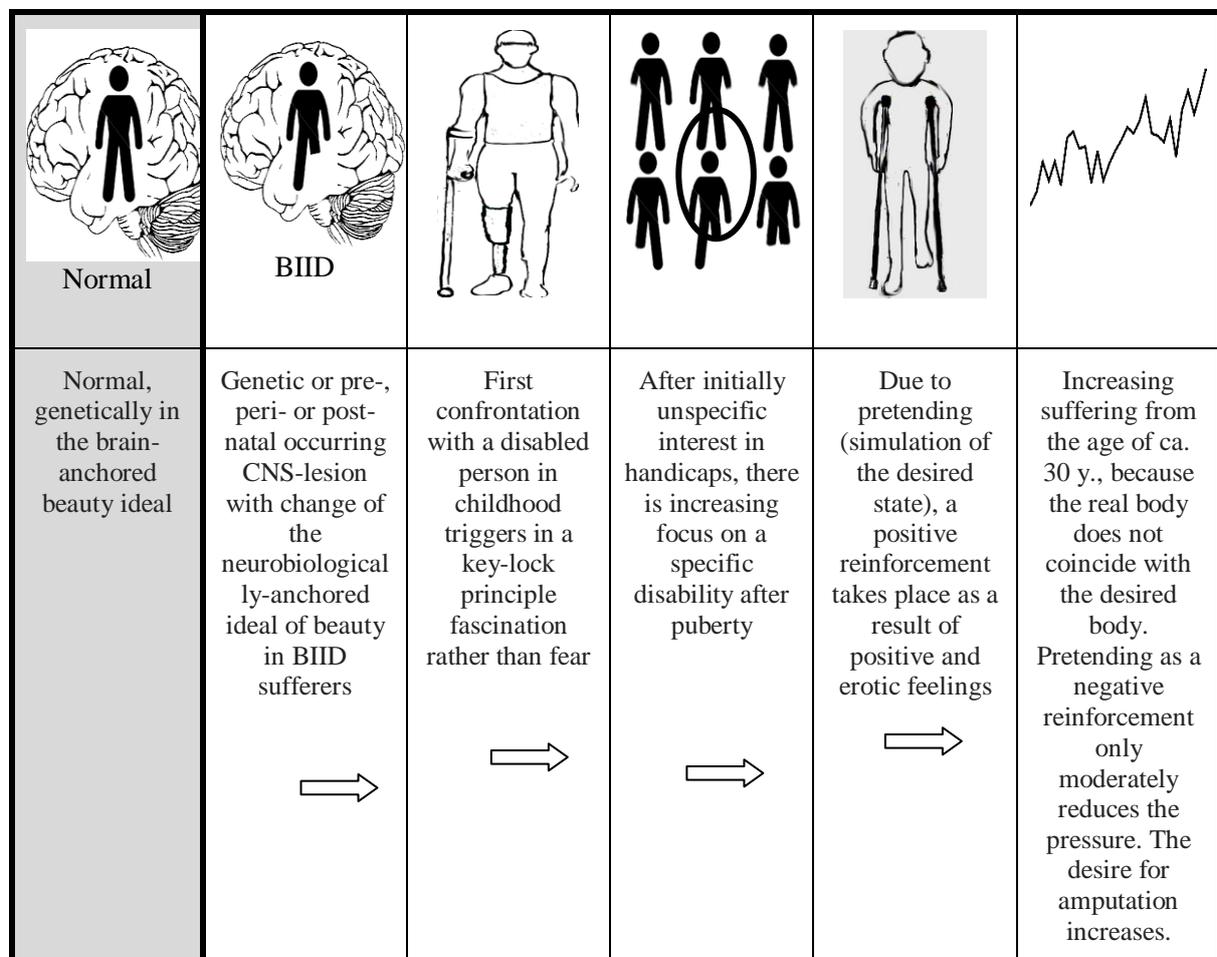
BIID-affected individuals pretend to have the desired impediment e.g. by fixing the lower leg at the thighs and then walking with a pair of crutches. In this state they find mental concord, feel happy, and, because attractiveness always has the biological aim of sexuality, this state also arouses erotic feelings. These pleasant feelings lead to positive reinforcement, i.e. this pretending-behaviour is performed increasingly more often and is used as relief after frustrating life events. In the long-term, it comes to an operant conditioning with a solidification of the wish to be handicapped. At this stage, auto-

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suggestive thinking could also play a role: The more often a person thinks about being disabled, the more real the desire to fulfil this wish becomes. Nevertheless, seen on a continuing basis, these positive effects of pretending-behaviour vanish gradually. The condition of the person changes from positive strengthening to a more negative reinforcement, i.e. the affected individual needs the pretending-behaviour to escape from the pressure of getting an impediment. At this stage, the mental pressure to carry out the operation grows.

This model could explain several of the above-mentioned problems. Only after an amputation does the person feel in harmony with their subjective beauty ideal; comparable e.g. with bodybuilding or liposuction. The beauty ideal gives only the general scheme of having one leg

less, but does not exactly state on which side of the body. Here, which leg is concerned seems relatively unimportant. Therefore, the model explains that the wish for amputation can change from one side to the other in some BIID-sufferers. In addition, the mental beauty ideal seems to be independent of the course of the dermatomes on the skin, so that this model could explain why BIID-affected amputations correspond to the usual picture of amputees. One of the most hotly discussed ambiguities of BIID refers to the sexual aspect and the overlapping with Mancophilia. Here, the model offers an explanation, because people mostly search a partner who corresponds to the ideal of their own body. The judgment of attraction is genetic anchored in the brain, this would explain, why the symptom emerges in early childhood.



**Figure1.** Development of the desire for amputation on the base of a lesion of the cerebrally-anchored beauty ideal.

## AIMS AND METHODS

From personal conversations, the authors learnt that BIID-affected people value impediments

more positively than control subjects. They often feel a fascination of and admiration for people with handicaps. These subjective statements were checked with the help of a

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standardised questionnaire for investigation of the judgment of different pictures. In a first pilot study, the estimation of BIID-affected individuals of neutral photos was compared with the assessment of photos showing people with handicaps. In a second pilot trial, the judgments of drawings of handicapped men or women with different kinds of amputation were compared between BIID-affected individuals and control

subjects. The main question was: Do BIID-affected individuals judge pictures of disabled persons as more positive, attractive, and sexually arousing than photos of non-handicapped people? In both studies, the interviewees should judge different polarities on a multistage rating scale with regard to the attractiveness of the person shown in the picture.

**Table 1.** Judgments (average  $\pm$ S.E.) of 28 BIID-affected persons of 12 photos on a scale from -3 to +3, partially differentiated for hetero- and homosexual participants.

	<b>Ugly-beautiful</b>	<b>Negative-positive</b>	<b>Sexually neutral - arousing</b>	<b>Boring-fascinating</b>
<b>1. Hand</b> (all participants)	<b>0.30</b> $\pm$ 0.23	<b>0.37</b> $\pm$ 0.23	<b>-1.13</b> $\pm$ 0.26	<b>-0.50</b> $\pm$ 0.23
<b>2. Empty wheelchair</b> (all)	<b>0.80</b> $\pm$ 0.32	<b>1.00</b> $\pm$ 0.33	<b>-0.53</b> $\pm$ 0.32	<b>0.80</b> $\pm$ 0.29
<b>3. Woman on beach</b> (only heterosexual men)	<b>2.11</b> $\pm$ 0.26	<b>2.21</b> $\pm$ 0.24	<b>2.11</b> $\pm$ 0.19	<b>1.42</b> $\pm$ 0.22
<b>3. Woman on beach</b> (only homosexual men)	<b>0.29</b> $\pm$ 0.18	<b>0.57</b> $\pm$ 0.30	<b>-1.29</b> $\pm$ 0.61	<b>-0.29</b> $\pm$ 0.18
<b>4. Arm amputated man</b> (all)	<b>1.71</b> $\pm$ 0.27	<b>1.83</b> $\pm$ 0.26	<b>0.17</b> $\pm$ 0.44	<b>1.50</b> $\pm$ 0.34
<b>4. Arm amputated Man</b> (homo-men)	<b>2.20</b> $\pm$ 0.37	<b>2.00</b> $\pm$ 0.63	<b>1.60</b> $\pm$ 0.51	<b>2.40</b> $\pm$ 0.40
<b>5. Baby</b> (all)	<b>1.31</b> $\pm$ 0.33	<b>1.52</b> $\pm$ 0.32	<b>-2.24</b> $\pm$ 0.24	<b>1.00</b> $\pm$ 0.31
<b>6. Beach with palm</b> (all)	<b>2.24</b> $\pm$ 0.15	<b>2.17</b> $\pm$ 0.18	<b>-1.69</b> $\pm$ 0.31	<b>0.89</b> $\pm$ 0.31
<b>7. Leg amputated runner with prosthesis</b> (all)	<b>1.45</b> $\pm$ 0.21	<b>1.72</b> $\pm$ 0.24	<b>-0.03</b> $\pm$ 0.40	<b>1.90</b> $\pm$ 0.23
<b>7. Leg amputated runner with prosthesis</b> (hetero-men)	<b>1.17</b> $\pm$ 0.25	<b>1.33</b> $\pm$ 0.31	<b>-0.83</b> $\pm$ 0.47	<b>1.61</b> $\pm$ 0.30
<b>7. Leg amputated runner with prosthesis</b> (homo-men)	<b>2.00</b> $\pm$ 0.44	<b>2.28</b> $\pm$ 0.42	<b>0.71</b> $\pm$ 0.7	<b>2.29</b> $\pm$ 0.47
<b>8. Amputee. woman legs in fishnet stockings</b> (hetero-men)	<b>2.22</b> $\pm$ 0.22	<b>2.06</b> $\pm$ 0.26	<b>1.67</b> $\pm$ 0.35	<b>2.11</b> $\pm$ 0.27
<b>8. Amput. woman legs in fishnet stockings</b> (homo-men)	<b>1.00</b> $\pm$ 0.44	<b>0.86</b> $\pm$ 0.63	<b>-1.29</b> $\pm$ 0.89	<b>1.29</b> $\pm$ 0.57
<b>9. Face of Einstein</b> (all)	<b>0.18</b> $\pm$ 0.33	<b>1.31</b> $\pm$ 0.31	<b>-1.79</b> $\pm$ 0.27	<b>0.90</b> $\pm$ 0.32
<b>10. Two sitting amputees</b> (all)	<b>2.03</b> $\pm$ 0.18	<b>2.03</b> $\pm$ 0.19	<b>0.00</b> $\pm$ 0.35	<b>1.79</b> $\pm$ 0.23
<b>11. Amputated wheelchair driver</b> (all)	<b>1.38</b> $\pm$ 0.27	<b>1.48</b> $\pm$ 0.30	<b>-0.21</b> $\pm$ 0.44	<b>1.76</b> $\pm$ 0.27
<b>11. Amputated wheelchair driver</b> (hetero-men)	<b>0.89</b> $\pm$ 0.35	<b>0.83</b> $\pm$ 0.38	<b>-1.28</b> $\pm$ 0.49	<b>1.33</b> $\pm$ 0.36
<b>11. Amputated wheelchair driver</b> (homo-men)	<b>2.29</b> $\pm$ 0.42	<b>2.29</b> $\pm$ 0.42	<b>1.00</b> $\pm$ 0.79	<b>2.14</b> $\pm$ 0.46
<b>12. Male torso with muscles</b> (hetero-men)	<b>0.83</b> $\pm$ 0.34	<b>0.67</b> $\pm$ 0.36	<b>-0.94</b> $\pm$ 0.39	<b>0.11</b> $\pm$ 0.39
<b>12. Male torso with muscles</b> (homo-men)	<b>2.43</b> $\pm$ 0.37	<b>2.43</b> $\pm$ 0.29	<b>2.00</b> $\pm$ 0.31	<b>1.71</b> $\pm$ 0.29

### Methods of the First Pilot Study

A total of n = 31 BIID sufferers participated in this first pilot study. The study included 3 women (9.1%) and 28 men (84.9%); since the group of women was so small, female participants were excluded from further data analysis. In total, 18 (57.6%) of the participants

were heterosexual and 7 (28.8%) were homosexual, with 3 (10.8%) stating that they were bisexual; the latter group was excluded from further data analysis, because it was unclear how they generally assess the attractiveness of men/women. Age final 25 participants was: 20-30 years: n=4 (16.0%), 31-

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40 years: n=7 (28.0%), 41-50 years: n=6 (24.0%), 51-60 years: n=5 (20.0%), and 61-70 years: n=3 (12.0%). BIID desires were: amputation of the left leg: n=11 (44.0 %); amputation of the right leg: n=3 (12.0%), amputation of both legs: n=4 (16.0%), amputation of the left foot: n=1 (4.0%), amputation of left arm/hand: n=2 (8.0%), paraplegia: n=2 (8.0%), palsy of the right leg: n=1 (4.0%), and palsy of both legs: n=1 (4.0%).

For the judgment of beauty, 12 photos were used: 1. Right hand, 2. Empty wheelchair, 3. Half-naked woman on a beach, 4. Man with an amputated arm, 5. Sleeping baby, 6. Beach with a palm, 7. Double amputee runner with prostheses, 8. One-legged woman in fishnet stockings, 9. Face of Albert Einstein, 10. Sitting female and male with leg-amputations and prostheses, 11. Double leg-amputated man in a wheelchair, and 12. Upper muscular torso of an unclothed man. For the judgments, a 7-

stepped scale (from -3 to +3) was used with the bipolar adjectives: ugly – beautiful, negative – positive, sexually neutral – sexually arousing, boring – fascinating. Averages and standard errors are shown in Tab. 1.

In this first study, there was no comparison group of non-affected participants; here, how BIID-affected persons judge photos was studied exclusively. The following hypotheses were tested:

H1: BIID sufferers judge photos of people with disabilities significantly more positively than neutral pictures.

H2: BIID sufferers judge erotic photos of disabled persons significantly more positively than erotic photos of people without disabilities.

H3: BIID sufferers judge photos of people with disabilities more positive than photos which are commonly considered positively.

**Table 2.** Wilcoxon differences between the photo of a hand (as a neutral body part) and the handicap-images. As the level of significance was fixed at  $p < 0.05$ , due to the repeated Wilcoxon tests, a Bonferroni correction was carried out; i.e. significant values apply only under  $p < 0.002$  (marked with a star).

	Empty wheelchair	Arm amputated Man	Leg amputated runner with prosthesis	Amput. woman legs in fishnet stockings	Two sitting amputees	Amputated wheelchair driver
Ugly : beautiful	p=0.1920 Z=-1.29	p=0.0005* Z=-3.49	p=0.0005* Z=-3.46	p=0.0002* Z=-3.68	p=0.0000* Z=-4.13	p=0.0086 Z=-2.63
Negative:positive	p=0.1004 Z=-1.64	p=0.0004* Z=-3.51	p=0.0003* Z=-3.65	p=0.0018* Z=-3.12	p=0.0004* Z=-3.54	p=0.0111 Z=-2.54
Sexually arousing	p=0.0420 Z=-2.03	p=0.0395 Z=-2.06	p=0.0150 Z=-2.43	p=0.0010* Z=-3.30	p=0.020 Z=-2.33	p=0.0418 Z=-2.04
Boring:fascinating	p=0.0007* Z=-3.39	p=0.0004* Z=-3.56	p=0.0000* Z=-4.46	p=0.0000* Z=-4.29	p=0.0000* Z=-4.46	p=0.0000* Z=-4.29

## RESULTS OF THE FIRST PILOT STUDY

Table 2 shows the results of the non-parametric Wilcoxon-test of differences between the photo of a hand (as a neutral body part) and the handicap-images. Even after a Bonferroni correction of the level of significance, nearly all comparisons show significant differences, i.e. in contrast to the neutral photo of a “hand”, all images of amputees were estimated as more beautiful, more positive, more sexually arousing and more fascinating.

The results of the Wilcoxon-test for the differences between the photos of usually sexual

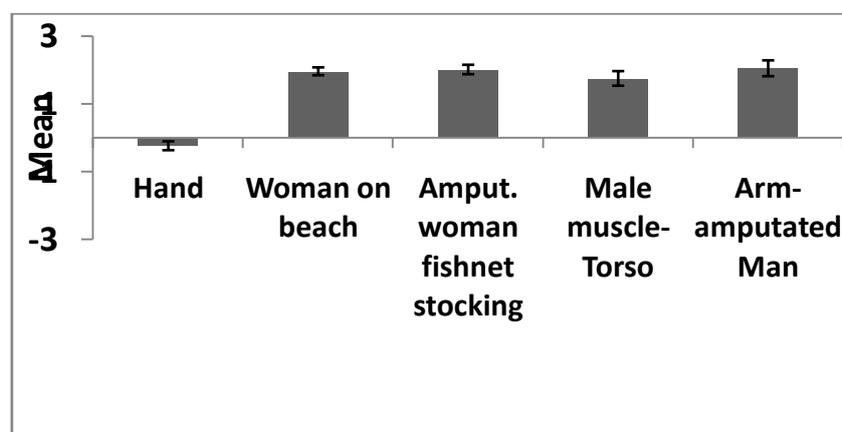
arousing pictures and the handicap-images are shown in Table 3. Here, after Bonferroni correction, no significant differences were found. This shows that photos of amputees were judged as positively as erotic images of non-amputated persons (see Fig. 2). Another Wilcoxon-test was carried out between the judgments of photos which are commonly positively estimated (sleeping baby, beach with palm, Albert Einstein), and all photos showing amputees. On average, the amputated pictures ( $M=1.76 \pm 0.22$ ) were judged slightly more positively than the usually positively-estimated photos ( $M=1.67 \pm 0.16$ ). A Wilcoxon-test

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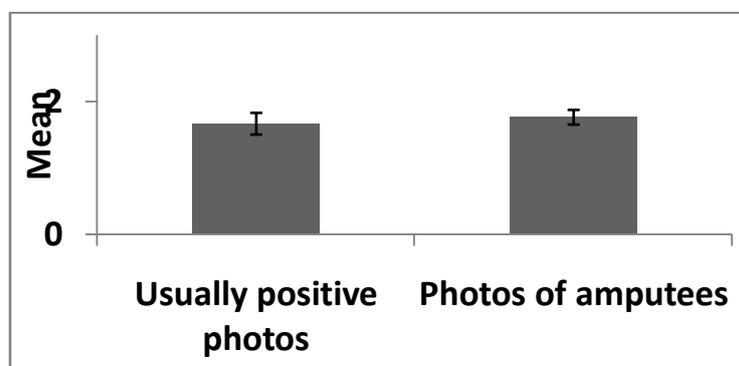
revealed no significant difference ( $Z=-0.68$ ;  $p=0.495$ ).

**Table3.** Wilcoxon differences between the photos of usually sexually arousing pictures and the handicap-images. As the level of significance was fixed at  $p < 0.05$ , due to the repeated Wilcoxon tests, a Bonferroni correction was carried out ( $M$  = average,  $p$  = significance,  $Z$  = result of Wilcoxon).

	1. Woman on beach / 2. amput. woman legs in fishnet stockings (only heterosex. men)	1. Male torso with muscles / 2. arm amputated man (only homosex. men)
Ugly:beautiful	M1=2.11 : M2=2.22 p=0.7896 Z=-0.27	M1=2.43 : M2=2.20 p=0.4226 Z=-0.80
Negative:positive	M1=2.21 : M2=2.06 p=0.6566 Z=-0.45	M1=2.43 : M2=2.00 p=0.4226 Z=-0.80
Sex.arousing	M1=2.11 : M2=1.67 p=0.3505 Z=-0.93	M1=2.00 : M2=1.60 p=0.4652 Z=-0.73
Boring:fascinating	M1=1.42 : M2=2.11 <b>p=0.050</b> Z=-1.96	M1=1.71 : M2=2.40 p=0.1775 Z=-1.35



**Figure2.** Means and standard-error on a -3 to +3 scale for all four bi-polar items of the estimation of the neutral picture (hand, all participants), and 1. comparison between the half-naked woman on a beach with the amputated woman with fishnet stockings (only heterosexual BIID-men) and 2. comparison between the male torso with the photo of an arm-amputated athlete (only homosexual BIID-men). On average, the amputated persons were judged slightly more positively than the non-amputated erotic photos.



**Figure3.** Means and standard-error on a -3 to +3 scale about the bipolar item negative--positive of the estimation of usually positively estimated photos (baby, beach, Einstein  $M=1.67 \pm 0.16$ ), and all photos of amputees ( $M=1.76 \pm 0.22$ ). On average, the amputated persons were judged slightly more positively than the usually positively-estimated photos.

### Methods of the Second Pilot Study

In this second pilot study, the data of a BIID-group were compared with the results of an

unaffected control group. The following hypotheses were tested:

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- H1a: BIID-affected individuals with a wish for amputation perceive their own body as more attractive by having an (imagined) desired amputation than in an unimpaired condition.
- H1b: BIID-affected individuals with a wish for amputation perceive their own body in its actual state as less beautiful and attractive than non-affected subjects perceive their own bodies.
- H2: BIID-affected individuals with a wish for amputation perceive drawings of amputees as more beautiful and more attractive than drawings of intact persons.
- H3a: BIID-affected individuals rate drawings featuring their own desired amputation as the most positive.
- H3b: Corresponding to their sexual orientation BIID-affected individuals regard the drawing showing the desired amputation as more positive than the same drawing without amputation.
- H4a: BIID-affected individuals with a desire for amputation rate drawings featuring amputations more positively than non-affected subjects.
- H4b: BIID-affected individuals with a desire for paralysis rate drawings with amputations as beautiful as BIID-affected individuals with a desire for amputation.

Besides these hypotheses, one finding, quoted multiple times in the literature, shall be replicated. Among others, Kasten [11] and Stirn et al. [23] reported that BIID sufferers do not perceive the part of their own body affected by their wish for an amputation to be hideous.

To answer the hypotheses, a questionnaire was developed. The main items consisted of an evaluation of depicted drawings showing bodies of human beings and allowed a response along a 7 point Likert-scale from -3 (“I strongly disagree”) to 0 (“neutral”) to +3 (“I strongly agree”). The participants had to judge the drawings in respect of some body-related attributes (“hideous” – “beautiful”; “unattractive” – “good-looking”; “imperfect” – “unflawed”; “unerotical” – “erotic”; “repulsive” – “attractive”). Even though the terms “Beauty” and “Attractiveness” are often used synonymously in the literature, in this survey, the evaluation regarding the adjectives “hideous

– beautiful” and “unattractive – good-looking” was requested separately because the terminologies seem to have a slightly different meaning. Altogether, 23 drawings of human bodies were presented. Among these, 8 male and 8 female drawings displayed amputations of a limb. Those individual drawings differentiated regarding the respective body’s side and location of the limb’s amputation. Because it is shown in the literature that most BIID sufferers wish for the amputation of only one limb [8, 11, 14, 17], no drawings with bilateral amputations were displayed. In addition to the drawings of amputees, 4 male and 3 female drawings with a different body shape (from average proportioned, rather mesomorphic, less mesomorphic and thick respectively thin) were shown. Those drawings also had to be judged concerning their beauty and attractiveness. Influence of the beauty of the face on the evaluation were ruled out by always using the same face. Some drawings are shown in figure 4. Demographic data (i.e. age, gender, sexual orientation) were recorded at the beginning of the questionnaire. To identify whether the participants in fact suffered from BIID, the “Inventory for the assessment of severity” by Fischer et al. (2015) was used.

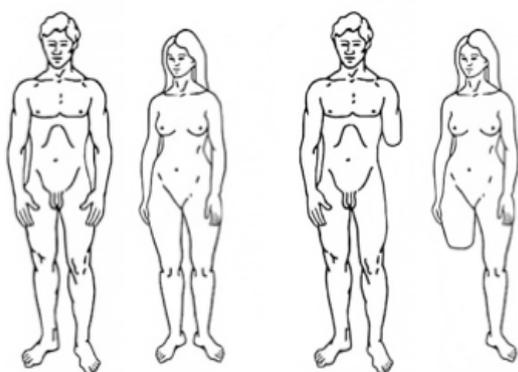
Because the BIID-participants of this study are spread over the whole world, an internet-based questionnaire was used, generated with the survey software “Questback EFS Survey”. To recruit BIID sufferers, the link to the questionnaire was provided to potential participants by e-mail. Furthermore, the link to the questionnaire was placed on the website [www.forum.biid.ch](http://www.forum.biid.ch), which contains a member’s area for BIID sufferers with 615 registered members at that corresponding period.

The control group, including non-BIID sufferers, corresponded with the BIID-group by gender, age and sexual orientation as closely as possible. Likewise, participants for the control group of this study were recruited via e-mail as well as from social networks.

Due to the small sample size of each group, the statistical analysis was implemented using non-parametric-tests. Hypotheses 1a, 2, 3a and 3b were verified using the Wilcoxon-test for paired samples. The Mann-Whitney-U-test for

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independent samples was used for the statistical analysis of hypotheses 1b, 4a and 4b.



**Figure 4.** Selection of male and female line drawings.

(Based on line drawings of source: Carl Sagan; <https://upload.wikimedia.org/wikipedia/commons/9/93/Human.svg>)

First, respective mean scores of the five items measuring beauty, attractiveness and the perception of eroticism, attractiveness and perfection of one's own body and figures of other persons were created. Each of the items was rated on a seven-level Likert-scale and ranged from "very hideous, hideous, rather hideous" to "neutral" to "rather beautiful, beautiful, very beautiful", using the example of "Beauty". The other items assessed the appraisal regarding the line drawings and one's own body from "very unerotic" to "very erotic", "very unattractive" to "very good-looking", "imperfect" to "unflawed" and "very repulsive" to "very attractive". Thus, a mean score for all five items could be established which is labelled as "Overall attractiveness score" hereafter. Cronbach's Alpha was calculated to examine the scale's individual items. Possible values for the scales range from 1 to 7, with a neutral pole of 4. Accordingly, values from 1 to 3 include the respective adjective's negative form, while values from 5 to 7 cover the positive manifestation of the particular attribute. Cohen's *d* was calculated for those hypotheses requiring a Wilcoxon-Test for dependent samples. Below, the effect size *d* according to Cohen is always denoted in its absolute amount.

### Results of the Second Pilot Study

Forty-one BIID sufferers took part in the investigation, with 22 subjects used as controls (non-BIID sufferers). The group of 41 BIID sufferers was divided into 22 subjects who

reported the need to amputate a healthy limb and 19 subjects who stated having a desire for being paralysed; furthermore, there was a small sample of 6 subjects who had already undergone an amputation. The parts of the body reported by the group feeling the need for an amputation were: right leg above the knee  $n=10$  males; left leg above the knee  $n = 6$  males + 2 females; both legs above the knee  $n = 2$  males; and others (e.g. one arm, one leg + one arm)  $n = 2$  males.

The entire sample age ranged from 23 to 64 years. The subgroups' mean age was: control group  $M=47.68 (\pm 9.05)$ ; BIID – desire for amputation  $M=50.14 (\pm 8.55)$ ; BIID – desire for paralysis  $M=41.11 (\pm 12.46)$ ; and BIID – already an amputee  $M=50.50 (\pm 8.07)$ . The Kruskal-Wallis-Test shows a tendentious significant difference ( $p=0.065$ ) concerning the age between all groups. The gender distribution within the samples was heterogeneous: 90.9% ( $n=20$ ) of the BIID sufferers wanting an amputation and the parallel control group were male and 9.1% ( $n=2$ ) were female. The group of BIID sufferers with a desire for palsy contained 68.4% ( $n=13$ ) male and 31.6% ( $n=6$ ) female participants, while the group of BIID-affected individuals who already received an amputation amounted to 66.7% ( $n=4$ ) male and 33.3% ( $n=2$ ) female subjects. Due to the sexual orientation among the BIID sufferers with a desire for amputation, there were 15 (68.2%) heterosexuals, 6 (27.3%) homosexuals and 1 (4.5%) participant who stated another sexual orientation. Within the controls there were 16 (72.7%) heterosexuals and 6 (27.3%) homosexual participants. Fourteen (73.7%) of the BIID-affected individuals with a desire for palsy stated that they were heterosexual, 1 (5.3%) was homosexual, 2 (10.5%) were bisexual and 2 (10.5%) participants stated another sexual orientation. Within the third BIID-group, those BIID sufferers who had already undergone an amputation, there were 4 (66.7%) heterosexuals, 1 (16.7%) homosexual and 1 (16.7%) participant who stated that they were bisexual.

The applied questionnaire of Fischer et al. [9], to determine the severity of BIID, showed a mild form of BIID for 2 (9.1%), a medium form of BIID for 9 (40.9%) and a severe BIID for 11 (50.0%) of the BIID sufferers with a desire for

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amputation. The group of BIID-affected individuals with a desire for palsy included one sufferer (5.3%) with a very mild form and also one (5.3%) with a mild form of BIID; furthermore, 12 sufferers (63.2%) had a medium and 5 (26.3%) a severe form of BIID. Additional sociodemographic data of the sample are shown in Table 4. First of all, all scales were examined separately concerning their internal consistency. Attractiveness-scales for every

drawing displayed and relevant for the analysis were examined, as well as ratings with regard to one's own body. High Cronbach's Alpha values were found for all attractiveness-scales across all investigation groups; the values are within a range from 0.76 to 0.99. Merely the scale "Overall score attractiveness" showed a weak Cronbach's Alpha of 0.57 within the group of BIID-affected individuals who had already undergone an amputation.

**Table 4.** Socio demographic characteristics.

	Control group n = 22		BIID_amp. n = 22		BIID_palsy n = 19		BIID_already-amp.n = 6		P <sup>1,2</sup>
	n	%	n	%	n	%	n	%	
<b>Age</b>									0.065
(M, SD; Range)	47.68 (9.05; 23-61)		50.14 (8.55;30 64)		41.11(12.46;18-61)		50.50 (8.07;39-63)		
<b>Gender</b>									0.101
male	20	90.9	20	90.9	13	68.4	4	66.7	
female	2	9.1	2	9.1	6	31.6	2	33.3	
<b>Nationality</b>									0.256
German	22	100	19	86.4	17	89.5	5	83.3	
other	0	0.0	3	13.6	2	10.5	1	16.7	
<b>BMI</b>									0.715
(M, SD; Range)	26.63(5.4;20.8-40.8)		26.82(3.9;19.6-33.6)		27.08(6.8;19.6-45.0)		27.78(4.6;22.6-27.8)		
<b>Sexual orientation</b>									0.155
heterosexual	16	72.7	15	68.2	14	73.7	4	66.7	
homosexual	6	27.3	6	27.3	1	5.3	1	16.7	
bisexual	0	0.0	0	0.0	2	10.5	1	16.7	
other orientation	0	0.0	1	4.5	2	10.5	0	0.0	
<b>Marital status</b>									0.060
unmarried	8	36.4	9	40.9	13	68.4	0	0.0	
married	11	50.0	9	40.9	5	26.3	4	66.7	
divorced	2	9.1	4	18.2	1	5.3	1	16.7	
widowed	1	4.5	0	0.0	0	0.0	1	16.7	
<b>Partnership</b>									0.218
yes	15	68.2	19	86.4	11	57.9	4	66.7	
no	7	31.8	3	13.6	8	42.1	2	33.3	
partner with amputation	1	6.7	1	5.3	0	0.0	0	0.0	
<b>Graduation</b>									0.012
lower secondary education	1	4.5	0	0.0	3	15.8	0	0.0	
middle school	4	18.2	7	31.8	1	5.3	0	0.0	
Advanced school	7	31.8	2	9.1	9	47.4	1	16.7	
university degree	8	36.4	13	59.1	5	26.3	5	83.3	
another	0	0.0	0	0.0	1	5.3	0	0.0	
<b>Vocational education</b>									0.096
none	0	0.0	0	0.0	3	15.8	0	0.0	
apprenticeship	9	40.9	7	31.8	5	26.3	0	0.0	
professional school	4	18.2	2	9.1	1	5.3	0	0.0	
college	1	4.5	1	4.5	2	10.5	1	16.7	
university	8	36.4	12	54.5	5	26.3	5	83.3	
other	0	0.0	0	0.0	3	15.8	0	0.0	
<b>Occupation</b>									0.003
not employed	0	0.0	5	22.7	8	42.1	3	50.0	
part-time employed	2	9.1	1	4.5	3	15.8	0	0.0	
full-time employed	20	90.9	16	72.7	8	42.1	3	50.0	

<sup>1</sup> Kruskal-Wallis-test.

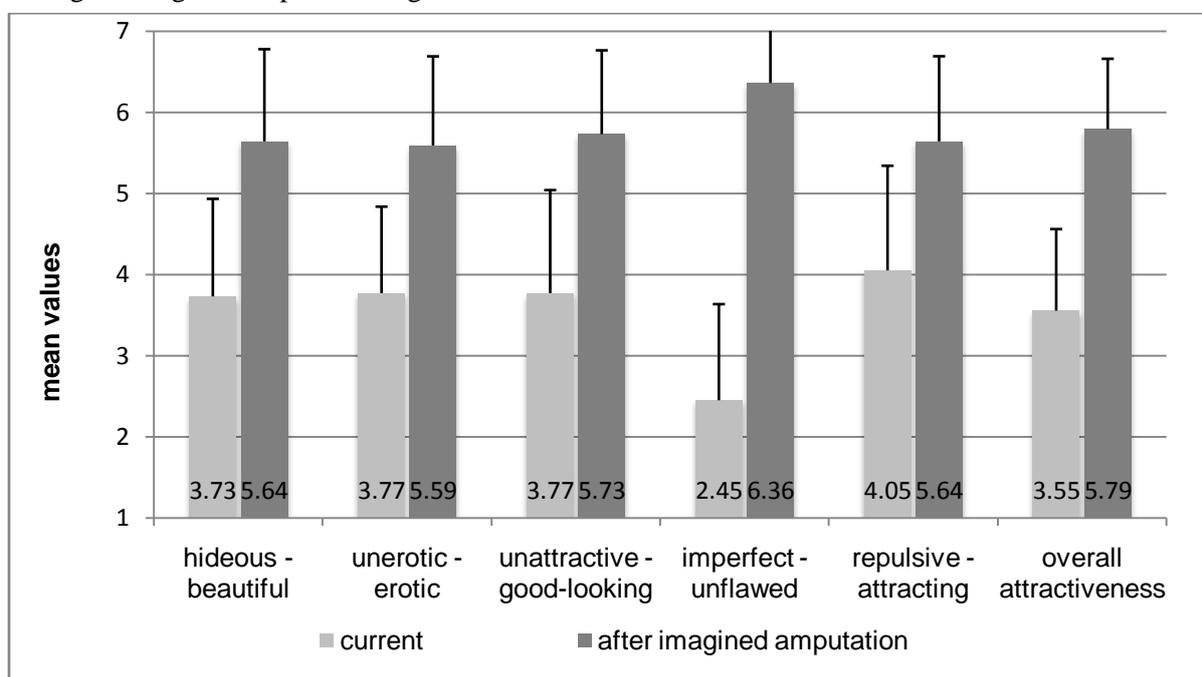
<sup>2</sup> Fisher's exact test.

**Hypothesis H1a**

BIID-affected individuals with a wish for amputation perceive their own body as more attractive by having an (imagined) desired amputation than in an unimpaired condition. As appears from figure 5, BIID-affected individuals with a desire for amputation rated all items concerning the attractiveness of their own body having an imagined amputation higher than their

own body in its current, unimpaired condition.

The Wilcoxon-test for dependent samples proved significant differences (all  $p < 0.001$ ) and high effects between all items. The strongest effect was found for the item “imperfect to unflawed” ( $d = 2.32$ ), the smallest effect was recorded for the item “very repulsive to very attractive” ( $d = 0.88$ ); however, according to Cohen (1988), even this effect is large.



**Figure 5.** Perception of attractiveness of one’s body in its current physical state compared to the own body after an imagined amputation for the group of BIID-affected individuals with a desire for amputation (mean and standard deviation). 4 is the neutral value, 1 to 3 are in the direction of the first adjective (e.g. “hideous”) and 5 to 7 are in the direction of the second adjective (e.g. “beautiful”).

Looking at the Item “Rating from very hideous to very beautiful”, the average comparison showed a significant difference ( $p < 0.001$ ) between the rating of one’s current beauty ( $M = 3.73$ ,  $SD = 1.20$ ) and the rating of the body’s beauty featuring the imagined desired amputation ( $M = 5.64$ ,  $SD = 1.14$ ) with a large effect of  $d = 1.05$ .

Likewise, the analysis of the scale “overall score attractiveness”, which summarized the previously quoted items, showed a significant difference ( $p < 0.001$ ) for the ratings of the body in its “current state” ( $M = 3.55$ ,  $SD = 1.01$ ) compared to “having an imagined amputation” ( $M = 5.79$ ,  $SD = 0.87$ ) with a large effect of  $d = 1.44$  for the group with the need for amputation.

**Hypothesis H1b**

BIID-affected individuals with a wish for amputation perceive their own body in its actual

state as less beautiful and attractive than non-affected subjects perceive their own bodies.

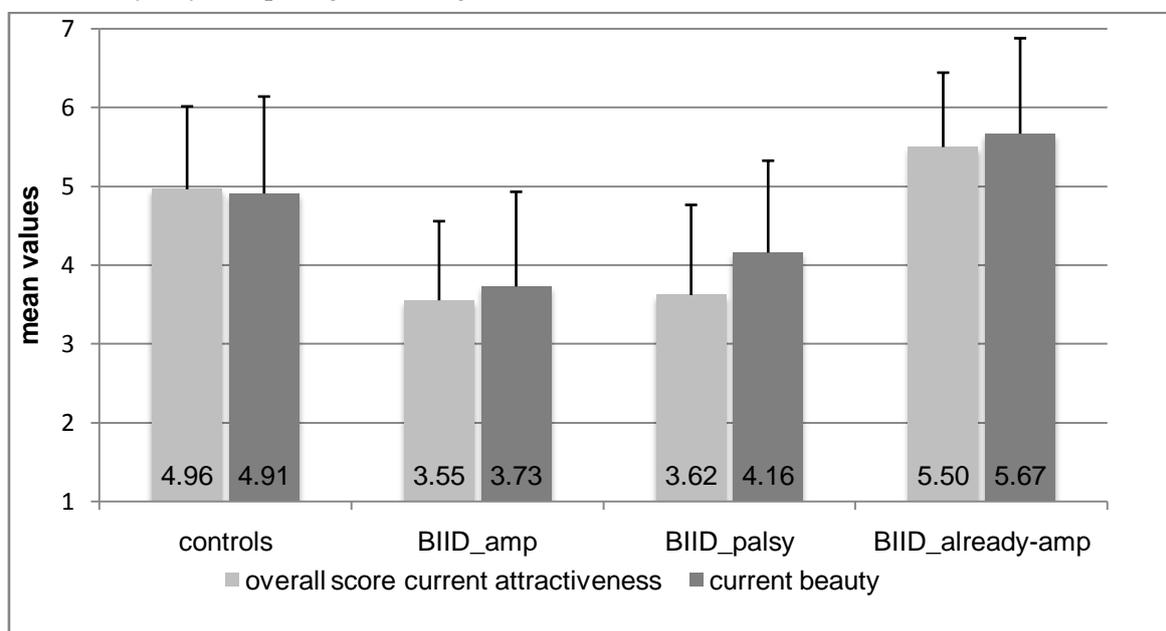
As shown in Figure 6, BIID-affected individuals with a desire for amputation rated their own body in its current (unimpaired) condition on average as less beautiful than the group of controls. The Mann-Whitney-U-test for independent samples showed considerably significant differences ( $p < 0.001$ ). Furthermore, large effects were found ( $d = 1.37$  for the scale “Overall score attractiveness” and  $d = 0.97$  for the item “Beauty”).

At this point, examining the assessment regarding the attractiveness of one’s own body in its current condition between the group “BIID wish for amputation” and the other groups of BIID-affected individuals seemed to be of interest. Comparing the ratings regarding the

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own body in its current state, the Mann-Whitney-U-test showed no significant differences ( $p>0.05$ ) with small effects ( $d=0.06$  respectively  $d=0.36$ ) for the BIID-affected individuals with a need for amputation and the BIID-affected individuals with a desire for paralysis. Significant differences and large effects ( $d=1.61$ ) were found for the scale "Overall score attractiveness" ( $p<0.001$ ) and the item "Beauty" by comparing the ratings of the

group who wished an amputation and the group who already had achieved the one-leggedness. The group of BIID-affected participants who already had an amputation estimated the "Overall score attractiveness" of their own body in its current condition ( $M=5.50$ ,  $SD=0.94$ ) as more positive than the BIID-affected individuals with a desire for amputation regarding their own body in its current (unimpaired) state ( $M=3.55$ ,  $SD=1.00$ ).



**Figure 6.** Perception of attractiveness of one's body in its current physical state. Comparison of all groups. 4 is the neutral value, 1 to 3 are in the direction of less beautiful and 5 to 7 are in the direction beautiful (Error bar = standard deviation; Controls = group of non-BIID-affected individuals; BIID\_amp. = group of BIID-affected individuals with a desire for amputation; BIID\_palsy = group of BIID-affected individuals with a desire for paralysis; BIID\_already-amp. = group of BIID-affected individuals who had already undergone an amputation).

### Hypothesis 2

BIID-affected individuals with a wish for amputation perceive drawings of amputees as more beautiful and more attractive than drawings of intact individuals.

First, finding possible differences caused by gender or sexual orientation regarding the rating of the drawings within the group of BIID-affected individuals with a desire for amputation was of interest.

Results of the Mann-Whitney-U-tests displayed in Table 5 with regard to the ratings of attractiveness revealed no significant differences between the genders ( $p>0.05$ ). Therefore, the responses of BIID-affected males with a desire for amputation cannot be differentiated from female affected participants in view of their

perception of attractiveness concerning drawings with and without amputations. In addition to the item "Beauty" and the scale "Overall score attractiveness", the item "Ideal image" is relevant for this hypothesis as well, indicating to what extent the presented drawing is equivalent to the ideal image of a beautiful body for the respective subject. A mean score over all participant's ratings, separated by amputated and not amputated drawings, was also calculated. For this item, the results indicated no significant difference ( $p>0.05$ ) in the drawing's rating for male and female subjects.

Based on these results, the collective group of BIID-affected individuals with a desire for amputation was included ( $n=22$ ) for the following calculations regarding hypothesis 2.

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As displayed in Table 6, the group of BIID sufferers with a desire for amputation rated drawings of amputees ( $M=4.85$ ,  $SD=0.93$ ) as more attractive ( $p<0.05$ ) than drawings without an amputation ( $M=4.33$ ,  $SD=0.81$ ). However, regarding only the item "Beauty", no significant difference ( $p>0.05$ ) between the drawing's rating of attractiveness with and without amputation was found, even though a slightly higher response behaviour was detected for the ratings of drawings with an amputation when comparing mean values. Only a small effect was

found here (Cohen's  $d=0.27$ ). The item "Ideal Image", however, directly asked to what extent the respective drawing is equivalent to one's ideal image of a beautiful body; there was a significant difference ( $p<0.05$ ) in the drawing's rating to that effect that line drawings with amputation. On average, these were more consistent with the ideal image of a beautiful body ( $M=4.48$ ,  $SD=1.05$ ) than those drawings without amputation ( $M=3.80$ ,  $SD=0.97$ ) with a mean effect of  $d=0.53$ .

**Table 5.** Perception of attractiveness of line drawings with and without amputation by male and female BIID-affected individuals who have a desire for amputation ( $n=22$ ).

	group	n	M±SD	z	Mann-Whitney-U-test
Overall score attractiveness of all line drawings with an amputation	male	20	4.89 ± 0.96	-0.69	p = 0.554
	female	2	4.48 ± 0.65		
Overall score attractiveness of all line drawings without an amputation	male	20	4.33 ± 0.84	-0.11	p = 0.952
	female	2	4.35 ± 0.64		
Beauty of all line drawings with an amputation	male	20	4.93 ± 0.91	-0.80	p = 0.485
	female	2	4.44 ± 0.62		
Beauty of all line drawings without an amputation	male	20	4.60 ± 1.34	-0.87	p = 0.424
	female	2	4.44 ± 0.62		
Ideal image of all line drawings with an amputation	male	20	4.48 ± 1.11	-0.23	p = 0.866
	female	2	4.50 ± 0.27		
Ideal image of all line drawings without an amputation	male	20	3.83 ± 0.96	-0.29	p = 0.779
	female	2	3.50 ± 1.41		

**Table 6.** Perception of attractiveness of drawings with and without amputation by all BIID-affected individuals who have a desire for amputation ( $n=22$ ).

	Group BIID-desire for amputation			d
	M±SD	z	Wilcoxon-test	
Overall score attractiveness of all line drawings with an amputation	4.85 ± 0.93	-1.96	p = 0.049	0.47
Overall score attractiveness of all line drawings without an amputation	4.33 ± 0.81			
Ideal image of all line drawings with an amputation	4.48 ± 1.05	-2.26	p = 0.024	0.53
Ideal image of all line drawings without an amputation	3.80 ± 0.97			
Beauty of all line drawings with an amputation	4.88 ± 0.89	-1.07	p = 0.283	0.27
Beauty of all line drawings without an amputation	4.57 ± 0.98			

### Hypothesis 3a

H3a: BIID-affected individuals rate drawings featuring their own desired amputation as most positive.

In Table 7, each subject of the group "BIID need for amputation" was initially grouped by the body part affected by their amputation's wish as well as their gender. Mean scores of the ratings

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regarding attractiveness ("overall score attractiveness") and the value of the item "Beauty" concerning the drawings of the desired body were displayed and confronted with the summarised mean scores of the ratings concerning all line drawings featuring other amputations ("Overall score attractiveness all other line drawings with amputation" and "Beauty of all other line drawings with amputation").

Those four individuals who reported a bilateral wish for amputation or desiring the amputation of multiple limbs could not be included in further analysis regarding hypothesis 3, since no line drawings showing multiple amputations were presented for the purpose of this study, which would represent exactly those participant's desired bodies.

Looking at the mean scores of the scale "overall score attractiveness" for the ratings of attractiveness regarding line drawings with the desired amputations, higher scores than for the overall score of attractiveness of all other drawings with amputations were found for 17 of the remaining 18 subjects. Only one male BIID-affected individual rated drawings featuring other amputations as slightly more positive (M=4.74) than those showing his desired body (M=3.60). Looking exclusively at the item "Beauty", BIID-affected individuals regarded those drawings corresponding to their own desired amputation as more beautiful on average than those featuring other amputations. A statement made by one of the female individuals with a desire for amputation of the left leg above the knee was an exception here.

**Table 7.** Exposition of the mean values regarding the perception of attractiveness of the drawings featuring the individual desired amputation compared to all other drawings with an amputation. Group of BIID-desire for amputation (n=18).

Case	Overall score attractiveness of line drawings with the desired amputation	Overall score attractiveness of all other line drawings with an amputation	Beauty of line drawings with the desired amputation	Beauty of all other line drawings with an amputation
	M	M	M	M
Right leg, above the knee (n=10, male)				
1	6.20	3.43	7.00	3.43
2	4.60	4.43	7.00	4.00
3	7.00	6.09	6.00	6.14
4	7.00	4.66	7.00	5.00
5	6.20	2.71	4.00	2.71
6	7.00	5.14	7.00	5.14
7	5.20	4.09	7.00	4.00
8	7.00	4.54	7.00	4.57
9	3.60	4.74	7.00	5.00
10	7.00	5.46	5.00	5.43
Mean ±SD	6.08 ± 1.22	4.53 ± .97	6.40 ± 1.08	4.54 ± 1.02
Left leg, above the knee (n=6, male)				
1	6.60	5.49	6.60	5.57
2	6.00	4.31	6.00	4.43
3	7.00	5.63	7.00	5.29
4	7.00	5.06	7.00	4.86
5	7.00	4.43	7.00	4.43
6	7.00	5.03	7.00	5.00
Mean ±SD	6.77 ± .41	4.99 ± .54	6.83 ± .41	4.93 ± .70
Left leg, above the knee (n=2, female)				
1	4.40	4.23	4.00	4.00
2	7.00	4.57	7.00	4.57
Mean ±SD	5.70 ± 1.84	4.40 ± .24	5.50 ± 2.12	4.29 ± .40

For her, no difference was found regarding her beauty's rating of the compared drawings (each

M=4.00). Additionally, two male individuals with a desire for amputation regarding the right

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leg above the knee perceived the drawings showing amputations of other than their own desired body parts as slightly more beautiful ( $M_1=6.14$ ;  $M_2=5.43$ ) than those displaying their own wished amputation ( $M_1=6.00$ ;  $M_2=5.00$ ).

With regard to the male subjects desiring amputation of their "right leg, above the knee" ( $n=10$ ) as well as "left leg, above the knee" ( $n=6$ ), tests for significance regarding the difference of their desired body's rating compared to all other same-gender bodies with amputations were conducted, since those subjects could be seen as two separate samples. All of the other subjects were not integrated into the following analysis of hypothesis 3. The

Wilcoxon-test indicated significant results ( $p<0.05$ ) for the respective groups of male BIID sufferers with a desire for amputation of their "right leg, above the knee" and "left leg, above the knee" with the effect that drawings with the desired amputation were rated as more attractive and beautiful than those drawings featuring a different amputation. Concerning the item "Ideal image", a significant difference at the significance level of  $p<0.01$  was shown for the

group of male affected subjects with a desire for amputation of their right leg above the knee. Overall, large effects were found for all scales and items (from  $d=1.14$  to  $d=4.52$ ) (see Table 8)

**Table 8.** Comparison between the perceptions of attractiveness of the drawings featuring the individual desired amputation and all other drawings with an amputation corresponding to their own gender. Calculated by groups.

	Group BIID-desire for amputation			
	M±SD	z	Wilcoxon-test	d
<b>Right leg, above the knee (n=10, male)</b>				
Overall score of attractiveness of line drawings with the desired amputation	6.08 ± 1.22	-2.40	p = 0.017	1.14
Overall score of attractiveness of all other line drawings with an amputation	4.53 ± 0.97			
Beauty of drawing with the desired amputation	6.40 ± 1.08	-2.20	p = 0.028	1.43
Beauty of all other line drawings with an amputation	4.54 ± 1.02			
Ideal image – line drawings with the desired amputation	6.60 ± 0.70	-2.81	p = 0.005	3.00
Ideal image – all other line drawings with an amputation	3.77 ± 1.16			
<b>Left leg, above the knee (n=6, male)</b>				
Overall score of attractiveness of line drawings with the desired amputation	6.77 ± 0.41	-2.20	p = 0.028	3.48
Overall score of attractiveness of all other line drawings with an amputation	4.99 ± 0.54			
Beauty of line drawings with the desired amputation	6.83 ± 0.41	-2.20	p = 0.028	4.52
Beauty of all other line drawings with an amputation	4.93 ± 0.70			
Ideal image – line drawings with the desired amputation	7.00 ± 0.00	-2.20	p = 0.028	2.72
Ideal image – all other line drawings with an amputation	4.57 ± 0.89			

### Hypothesis 3b

Corresponding to their sexual orientation, BIID-affected individuals regard the drawing showing the desired amputation as more positive than the same drawing without an amputation.

Table 9 shows significant differences for the group of male BIID-affected individuals with the amputation desire "right leg, above the knee"

( $n=10$ ) regarding their estimation of the drawing showing the desired amputation compared to the rating of the male drawing without amputation for the item "Beauty" and the scale "Overall score attractiveness" ( $p<0.05$ ), as well as for the item "Ideal image" ( $p<0.01$ ). Also, the Wilcoxon-test indicates significant differences ( $p<0.05$ ) for the group of male BIID-affected individuals with the desire for an amputation of

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the left leg above the knee (n=6) regarding beauty, the ideal image and the overall score for attractiveness. On average, those individuals perceived the drawings showing their desired amputations as more beautiful and more attractive than the same-gender drawing without an amputation. Here, large effects from  $d=1.01$  to  $d=2.33$  were found for all scales and items.

### Hypothesis 4a

BIID-affected individuals with a desire for amputation rate drawings featuring amputations more positively than non-affected subjects.

As shown in Table 10, significant differences regarding the response behaviour ( $p<0.001$ )

were found for all scales and items between the groups of BIID sufferers and the control group. On average, BIID-affected individuals with a desire for amputation rated drawings featuring amputations as more attractive, more beautiful and more consistent with their ideal image of a beautiful body than the control group. Large effects (from  $d=1.23$  to  $d=1.94$ ) were found for all scales and items. Also, the scale "Difference between the drawing's attractiveness with and without amputation" showed that the control group rated line drawings without an amputation as more attractive on average than drawings with an amputation. For subjects affected by BIID, the opposing applies.

**Table9.** Comparison between the perception of attractiveness of the line drawings featuring the individual desired amputation and all same-gender line drawings without an amputation. Calculated by groups.

Right leg, above the knee (n=10, male)	Group BIID-desire for amputation			
	M±SD	z	Wilcoxon-test	d
Overall score for attractiveness of line drawings with the desired amputation	6.08 ± 1.22	-2.30	p = 0.021	1.01
Overall score for attractiveness of male line drawings without an amputation	4.54 ± 1.14			
Beauty of line drawings with the desired amputation	6.40 ± 1.08	-2.56	p = 0.011	1.06
Beauty of male line drawings without an amputation	4.80 ± 1.40			
Ideal image – line drawings with the desired amputation	6.60 ± 0.70	-2.92	p = 0.007	1.46
Ideal image – male line drawings without an amputation	4.00 ± 1.56			
Left leg, above the knee (n=6, male)	M±SD	z	Wilcoxon-test	d
Overall score for attractiveness of line drawings with the desired amputation	6.77 ± 0.41	-2.21	p = 0.027	1.63
Overall score for attractiveness of male line drawings without an amputation	3.47 ± 1.88			
Beauty of line drawings with the desired amputation	6.83 ± 0.41	-2.23	p = 0.026	1.42
Beauty of male line drawings without an amputation	3.67 ± 2.16			
Ideal image – line drawing with the desired amputation	7.00 ± 0.00	-2.23	p = 0.026	2.33
Ideal image – male line drawings without an amputation	2.67 ± 1.86			

### Hypothesis 4b

BIID-affected individuals with a desire for paralysis rate drawings with amputations as

beautiful as BIID-affected individuals with a desire for an amputation.

The Mann-Whitney-U-test revealed significant differences for all scales ( $p<0.05$ ) with medium

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to large (from  $d=0.73$  to  $d=0.81$ ) effect sizes regarding the responses of BIID-affected individuals with a desire for paralysis in comparison to BIID-affected individuals with a desire for amputation. On average, BIID-affected individuals with a wish for paralysis regarded the drawings with amputations as less good-looking, beautiful, unflawed, attractive and erotic than BIID-affected individuals with a

wish for amputation. Also, the item "Difference between attractiveness of the line drawings with and without amputations" indicated that BIID-affected individuals with a desire for paralysis found the drawings without amputations to be more attractive on average than the drawings with an amputation ( $M= -0.40$ ,  $SD=1.17$ ) (see Table 11).

**Table10.** Perception of attractiveness of line drawings by BIID-affected individuals who have a desire for amputation and the control group of non-BIID-affected individuals.

	Group BIID-desire for amputation vs. control group				
	BIID_amp. (n = 22)M±SD	KG (n = 22)M±SD	z	Mann-Whitney-U-test	D
Overall score for attractiveness of all line drawings with an amputation	4.85 ± 0.93	3.30 ± 1.08	-4.25	p < 0.001	1.54
Difference between the attractiveness of line drawings with and without an amputation	0.53 ± 1.13	-1.57 ± 1.03	-4.92	p < 0.001	1.94
Beauty of all line drawings with an amputation	4.88 ± 0.89	3.70 ± 1.03	-3.62	p < 0.001	1.23
Ideal image - all line drawings with an amputation	4.48 ± 1.05	2.74 ± 1.42	-3.98	p < 0.001	1.39

**Table11.** Perception of attractiveness of line drawings by BIID-affected individuals who have a desire for amputation and BIID-affected individuals who have a desire for palsy.

	Group BIID-desire for amputation vs. Group BIID-desire for paralysis				
	BIID_amp.(n = 22) M±SD	BIID_palsy(n = 19) M±SD	Z	Mann-Whitney-U-test	D
Overall score for attractiveness of all line drawings with an amputation	4.85 ± .93	3.93 ± 1.28	-2.41	p = 0.016	0.81
Difference between attractiveness of line drawings with and without an amputation	0.53 ± 1.13	-0.40 ± 1.17	-2.18	p = 0.029	0.75
Beauty of all line drawings with an amputation	4.88 ± 0.89	4.09 ± 1.26	-2.14	p = 0.033	0.73
Ideal image - all line drawings with an amputation	4.48 ± 1.05	3.46 ± 1.68	-2.05	p = 0.040	0.74

### Additional question

Do BIID-affected individuals perceive the body part affected by their desire for amputation as hideous, unattractive, imperfect and repulsive while it's still intact?

The descriptive analysis regarding the rating of the body part affected by the desire for amputation shown in Table 12 indicates mean

scores close to the mean of the possible rank of the used Likert-scale from 1 to 7 for individual

items, as well as the scale "Overall score attractiveness". Midpoints are at 3.27 ( $SD=1.42$ ) for the item "very unerotic to very erotic" up to 3.50 ( $SD=1.37$ ) for the item "very repulsive to very attractive". Altogether, the item as well as the scale midpoints are very close to each other and display standard deviations of similar sizes.

### DISCUSSION

The aim of the study was to prove whether BIID-sufferers judge pictures of amputees as

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beautiful, attractive and sexually arousing. This work should be a first investigation of the model, and whether the cause of BIID may be a disorder of the brain areas which assess the beauty of the human body. From an evolutionary point of view, bi-legged/two-armed people must be judged to be more beautiful, because this increases the chance of survival in

a hostile environment. Due to genetic changes or ZNS-lesions, damage can occur in this beauty-ideal, which may result in the case of BIID, where the brain estimates a one-legged or one-armed body as the ideal attractiveness. Pictures of amputees would then be judged extremely positively.

**Table 12.** Perception of beauty regarding to the own body part affected by the desire of amputation evaluated by BIID-affected individuals with a desire for amputation (n=22).

Group BIID-desire for amputation	
Perception of attractiveness	Overall score attractiveness of the affected part of the body M±SD
Rating from very hideous to very beautiful	3.45 ± 1.41
Rating from very unerotic to very erotic	3.45 ± 1.41
Rating from very unattractive to very good-looking	3.45 ± 1.34
Rating from imperfect to unflawed	3.32 ± 1.56
Rating from very repulsive to very attractive	3.50 ± 1.37
Overall score attractiveness of the body part affected by the desire for amputation	3.40 ± 1.33

The data from the first pilot-study show that images of disabled people were judged to be significantly more beautiful, positive, and fascinating than the neutral photo (hand). Of the 24 Wilcoxon tests, all were significant at the 5% level; after Bonferroni correction, there were only 15 significant differences. However, the assumption that images of people with disabilities from BIID sufferers are judged more positively than a neutral photo is accepted. It is interesting that the picture of an empty wheelchair was already judged to be clearly positive (it was still not judged as sexually arousing).

The comparison of photos with erotic content and photos of disabled people showed virtually no differences at the 5% level; these differences disappear completely after a Bonferroni correction. The comparison of averages showed that erotic photos of amputees were judged to be as beautiful, positive, sexually arousing and fascinating as photos with erotic content (half-naked woman on the beach for heterosexual men or muscular male torso for homosexual men and heterosexual women). This confirms that images of handicapped persons have an erotic effect for BIID affected individuals.

A statistical test between the judgments of commonly positive estimated photos (sleeping baby, beach with palm, Albert Einstein), and all

photos showing amputees revealed no significant difference. The photos of amputees were estimated to be slightly more positive in comparison with the photos of other emotional positive things.

Within the second pilot study, BIID-affected individuals with a desire for amputation were of special interest. Concluding the second pilot study, it can be said that there is a strong difference between the perception of beauty of BIID-affected individuals with a desire for amputation compared to the subject group without BIID, and even to those suffering from BIID with a desire for paralysis. Subjects affected by BIID perceived drawings displaying amputations as more beautiful, more attractive and more consistent with their ideal image than those not suffering from BIID.

In addition, the findings indicate that BIID-affected individuals with a desire for amputation perceived the amputated drawings as more attractive and more consistent with their ideal image of a beautiful body; however, they did not find them to be significantly more beautiful than the drawings without amputations. This could be related to the fact that the ideal of beauty is always influenced by society, as well as by a genetic component [10, 22]; hence, individuals with intact extremities might not necessarily be

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viewed as less attractive by people suffering from BIID and having a desire for amputation.

However, when comparing only the one drawing showing an image of the individual's desired body, thus featuring the respective desired amputation, to all of the other amputated line drawings, significant differences regarding the rating of the average attractiveness and beauty as well as the assessment in regard to the ideal image were found. Line drawings with the desired amputation were consistently rated more positively (see Hyp.3a). This was also evident in the comparison between drawings with amputated, desired bodies and those drawings who are not amputated. The drawings of the desired body were rated as more beautiful, more attractive and more consistent with the ideal image on average (see Hyp.3b). These findings imply that BIID-affected individuals have internalised a very accurate image of their desired body and will display the most positive reaction when perceiving it.

For some affected people, the literature suggests a shift of the desired amputation from one limb to another [14]. At this point, how the perception of beauty is changing for BIID-affected people along with the shift in the desired amputation should be examined in greater detail.

As already stated by Kasten [12] and Stirn et al. [23], this study's participants also did not rate the body part affected by their desire for amputation as particularly hideous, unattractive or repulsive. They rather seem to have a more neutral attitude towards the concerned limb. As a result, BIID-affected individuals are not focused on one part of their body being perceived as hideous, but rather on their whole body, which is viewed by the affected as more beautiful and attractive after being amputated [14].

Results further indicate a more negative self-rating regarding the beauty and attractiveness of one's body for the group of BIID-affected individuals with a desire for amputation compared to the control group, and those affected by BIID who have already undergone an amputation. It should be noted that the rating

regarding the perception of beauty and attractiveness concerning one's own body resulted in much higher scores for BIID-participants who already have an amputation than for participants with a desire for amputation. When asked how beautiful, good-looking, erotic, attractive and unflawed they perceive their own body to be after an imagined amputation, the reports of BIID-affected participants with a desire for amputation were distinctly more positive compared to those regarding their current physical state. These findings are supported by evidence displayed in the literature. According to the literature, BIID-sufferers do not experience regret after a successful amputation, but rather feel satisfied in their striving towards the ideal image of their own body [19].

## CONCLUSION

The results of these two pilot studies indicate a perception of beauty by BIID-affected individuals with a desire for amputation that is divergent from non-affected persons. In order to be able to make differentiated statements regarding the perception of beauty concerning one's own body and those of others, further research should undertake evaluations by using modified (amputated and not amputated) photographs of the respective participant as well as of a different person. Assessing photographs instead of line drawings would allow for a more realistic estimation of the perception of beauty.

Because at this point no statement can be made of to what extent an altered neuronal structure in those brain areas involved in the rating of beauty and attractiveness is responsible for the differing evaluation of BIID-affected individuals compared to control subjects without BIID, and what causal conclusion should be drawn, for the time being, the shifted ideal of beauty can be seen as a symptom of BIID. Conducting fMRT-studies in further research is suggested in order to enable more precise statements to be made about this perception of beauty indeed being rooted in the neuronal structure.

Because there are significant differences concerning the ratings of beauty between the

results of BIID-sufferers with a desire for amputation and those with a wish for paralysis, further research focused on BIID-affected individuals with a desire for paralysis makes sense, as well as reviewing to what extent this desire is connected with the person's ideal of beauty. Thereby, generalised or more differentiated statements regarding the group of BIID-sufferers as a whole would be possible.

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