Cognitive Biases in Body Dysmorphic Disorder

Studies on Interpretation and Facial Recognition

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To my family

Studien zu Interpretationsstilen und Emotionserkennung

bei Patienten mit einer Körperdysmorphen Störung

<u>Einleitung</u>

Zielsetzung der vorliegenden Studien ist die Untersuchung kognitiver Prozesse bei Patienten mit einer Körperdysmorphen Störung. Dieses Störungsbild gehört zu den Somatoformen Störungen (DSM-IV, American Psychiatric Association [APA], 1994). Hauptmerkmal dieser Störung ist eine übermäßige Beschäftigung mit einem eingebildeten Makel oder Defekt im körperlichen Aussehen. Besteht eine leichte körperliche Anomalie, ist die Beschäftigung mit dem Defekt deutlich übertrieben. Die übermäßige Beschäftigung mit der vermeintlichen Deformierung muß deutliches Leiden oder Einschränkungen in sozialen, beruflichen oder anderen wichtigen Funktionsbereichen verursachen (APA, S. 532). Weiterhin darf die Symptomatik nicht besser durch eine andere psychische Störung (z. B. Anorexia Nervosa) erklärt werden. Am häufigsten beziehen sich die eingebildeten Defekte auf Körperregionen des Gesichtes oder des Kopfes wie z.B. ausdünnendes Haar oder Falten. Aber auch andere Aspekte wie Form oder Größe von Nase, Augen oder Ohren stehen im Mittelpunkt der Besorgnis (APA, S. 532). Assoziierte Merkamle dieses Störungsbildes sind unter anderem eine starke Angst vor negativer Bewertung (Hollander, Neville, Frenkel, Josephson & Liebowitz, 1992) sowie paranoide Vorstellungen, dass andere Personen negativ über den eingebildeten Makel oder Defekt sprechen (Wilhelm & Neziroglu, 2002).

In den letzten 20 Jahren wuchs das Interesse Klinischer Psychologen an der Erforschung der Rolle kognitiver Faktoren bei der Entstehung und Aufrechterhaltung psychischer Störungen. Eine Vielzahl von Studien beschäftigte sich mit der Frage, inwiefern hierbei Verzerrungen in der Informationsverarbeitung von Bedeutung sind. Im Speziellen handelt es sich hierbei um systematische Verzerrungen der Art, wie ein Individuum Informationen wahrnimmt, speichert und wieder aus dem Gedächtnis abruft (Ingram & Kendall, 1986). So konnte gezeigt werden, dass Patienten mit Angststörungen und Depressionen ihre Aufmerksamkeit im Vergleich zu gesunden Kontrollpersonen selektiv bedrohlichen störungstypischen Stimuli zuwenden und mehrdeutige Situationen bevorzugt als negativ oder bedrohlich interpretieren (Überblick bei Williams, Watts, MacLeod & Mathews, 1997).

Eine weitere kognitive Verzerrung bezieht sich auf die Tendenz, mehrdeutige Situationen oder Informationen hinsichtlich der eigenen persönlichen Belange zu interpretieren. Butler und Mathews (1983) zum Beispiel ließen Patienten mit einer Generalisierten Angststörung, ängstliche Depressive sowie gesunde Kontrollpersonen eine Reihe mehrdeutiger Szenarien lesen (z. B.: *Suppose you wake with a start in the middle of the night thinking you heard a noise, but all is quiet. What do you suppose woke you up?*). Anschließend wurden die Versuchspersonen instruiert, aus mehreren Erklärungsmöglichkeiten diejenige auszuwählen, die ihnen am plausibelsten erschien (z. B.: *There is a burglar in your house*.). Beide Patientengruppen schätzten die Wahrscheinlichkeit einer negativen Interpretation im Vergleich zu neutralen Interpretationen und im Vergleich zu gesunden Kontrollpersonen signifikant höher ein.

Es ist jedoch nicht eindeutig, ob die Ergebnisse von Studien, in denen Interpretationsstile mit Hilfe von Fragebögen erfasst wurden, durch systematische Antworttendenzen ("response bias") verzerrt wurden. Es könnte zum Beispiel sein, dass ein Patient, unabhängig von seiner eigentlichen Interpretation, eine Antwort gibt, die im Einklang mit seinem Störungsbild steht.

MacLeod und Cohen (1993) verwendeten ein experimentelles Paradigma, welches das Problem des "response bias" kontrolliert, da die Versuchspersonen in dem Glauben gelassen werden, dass ihr Leseverständnis getestet wird und sie nicht wissen, dass die eigentliche Zielsetzung dieses Paradigmas die Erfassung von Interpretationsstilen ist. Hoch- versus niedrig-ängstliche Studierende lasen auf einem Computerbildschirm mehrere Szenarien, die aus einzelnen Sätzen bestanden. Erfasst wurden die Zeiten, die für das Lesen eines jeden Satzes gebraucht wurden, indem die Versuchspersonen jedes Mal, sobald sie den Sinn des einzelnen Satzes verstanden hatten, die Leertaste drückten. Jedes Szenario bestand aus nur zwei Sätzen, wobei der erste Satz mehrdeutig war: er konnte entweder als neutral oder als bedrohlich interpretiert werden (z. B.: *They completed the service by filling in the hole*.). Vom danach dargebotenen zweiten Satz existierten zwei verschiedene Versionen, von denen die eine Version im Gegensatz zur anderen Version jeweils eine logische Fortsetzung des ersten Satzes darstellt. Das bedeutet, dass den Versuchspersonen entweder die zur neutralen Interpretation passende Version dargeboten wurde (*The repairs finished much sooner than had been expected*.) oder die zur bedrohlichen Interpretation passende Version (*The funeral finished much sooner than had been expected*.). Weiterhin wurde variiert, welche der beiden möglichen Interpretationen des ersten Satzes nahegelegt wurde. Dies geschah durch ein neutrales Hinweiswort

(neutrale Bedingung: *Renovate*) oder bedrohliches Hinweiswort (bedrohliche Bedingung: *Burial*), welches vor dem ersten (mehrdeutigen) Satz dargeboten wurde.

Sollte der zweite Satz keine logische Fortsetzung des ersten (mehrdeutigen) Satzes darstellen, ist grundsätzlich anzunehmen, daß die Versuchsperson mehr Zeit benötigt, um den zweiten Satz zu verstehen und somit die Lesezeiten des zweiten Satzes verlängert sind. Die entscheidende Manipulation von MacLeod und Cohen (1993) bestand in der Darbietung einer Reihe von Fragezeichen ("no cue"-Bedingung: *?????*) anstelle eines Hinweiswortes, womit die Interpretation des ersten Satzes absichtlich offengelassen wurde. MacLeod und Cohen (1993) vermuteten, daß bei niedrig-ängstlichen Versuchspersonen die Lesezeiten des zweiten Satzes unter der "no cue"-Bedingung (*?????*) der neutralen Bedingung (*Renovate*) entsprechen, bei hoch-ängstlichen Personen jedoch der bedrohlichen Bedingung (*Burial*). Wie erwartet fanden MacLeod und Cohen genau dieses Ergebnismuster, was darauf hinweist, daß hoch-ängstliche Personen im Gegensatz zu niedrig-ängstlichen Personen bedrohliche gegenüber neutralen Interpretation bevorzugen.

In den letzten Jahren wurde jedoch diskutiert, inwiefern Wörter als Stimuli in experimentellen Paradigmen eine ökologische Validität besitzen (Lundh & Öst, 1996). Es könnte zum Beispiel sein, dass Wörter nicht in gleicher Weise die persönlichen Ängste oder Belange des Patienten repräsentieren wie es "reelle" Stimuli wie z. B. Bilder tun. So vermuteten Lundh und Öst (1996), dass gerade bei Sozialphobikern, die sich durch eine starke Angst vor negativer Bewertung auszeichnen, Gesichter (z. B. ein Gesicht mit einem ärgerlichen Emotionsausdruck) relevanter sind als Wörter, die ihre Ängste repräsentieren (z.B., *Kritisiert werden*). So konnten sie auch in einer Untersuchung belegen, dass

Sozialphobiker, die mit einer Reihe von Gesichtern unterschiedlicher Emotionsausdrücke konfrontiert wurden, dazu tendierten, kritische Gesichter im Vergleich zu neutralen Gesichtern in einem anschliessenden Wiedererkennungstest häufiger korrekt zu identifizieren.

Generelle Zielsetzung

Generelle Zielsetzung der vorliegenden Dissertation war, Interpretationsstile bei Patienten mit einer Körperdysmorphen Störung zu untersuchen. Bislang gibt es meines Wissens keine Untersuchung, die sich mit dieser Fragestellung befasst. Eine solche Untersuchung scheint jedoch wichtig, da klinische Beobachtungen bereits vermuten lassen, dass viele Patienten dazu tendieren, Äusserungen anderer bezüglich ihres Aussehens in negativer Weise zu interpretieren. In Studie 1 wurden solche Interpretationsstile mit der herkömmlichen Fragebogenmethode untersucht. In Studie 2 hingegen wurden diese Interpretationsstile mit dem von MacLeod und Cohen (1993) angewendeten Paradigma untersucht, das den Vorteil hat, dass es den "response bias" kontrolliert. In Studie 3 wurde untersucht, inwiefern Patienten mit einer Körperdysmorphen Störung Defizite in der Erkennung von Emotionsausdrücken aufweisen. Weiterhin war von Interesse, ob sie sich durch einen negativen Interpretationsstil gegenüber Emotionsausdrücken auszeichnen, d.h., ob sie dazu tendieren, neutrale oder positive Emotionsausdrücke fälschlicherweise als negativ oder bedrohlich zu interpretieren.

Weiterhin wurde in allen drei Studien untersucht, inwiefern die Effekte störungstypisch für Patienten mit einer Körperdysmorphen Störung oder auch bei anderen Störungsbildern wie der Zwangsstörung vorzufinden sind.

Studie 1

Interpretationsstile bei Patienten mit einer Körperdysmorphen Störung: eine

Fragebogenstudie

Zielsetzung der ersten Studie war die Erfassung von Interpretationsstilen mit Hilfe der herkömmlichen Fragebogenmethode. Speziell sollte untersuchte werden, ob bei Patienten mit einer Körperdysmorphen Störung negative Interpretationsstile nicht nur gegenüber körperbezogenen Situationen, sondern ebenso gegenüber allgemein sozialen und alltagsbezogenen Situationen vorhanden sind.

Methode

An der Studie nahmen 19 Patienten mit einer Körperdysmorphen Störung, 20 Zwangspatienten und 22 gesunde Kontrollpersonen teil. Um die Interpretationsstile zu erfassen, wurde ein Interpretationsfragebogen entwickelt, der aus der Beschreibung von 33 mehrdeutigen Szenarien bestand (11 körperbezogene, 11 allgemein soziale, und 11 alltagsbezogene). Jedes einzelne Item bestand aus einer Kurzbeschreibung des Szenarios, gefolgt von der Frage, welche Gedanken die Versuchspersonen in diesem Szenario haben würden. Weiterhin sollten sie drei mögliche Gedanken (einen bedrohlichen sowie zwei nicht bedrohliche) auf einer Skala von 1 (sehr unwahrscheinlich) bis 4 (sehr wahrscheinlich) hinsichtlich der Wahrscheinlichkeit, dass dieser Gedanke aufkommen würde, einstufen.

Ergebnisse und Diskussion

Die wichtigsten Ergebnisse der vorliegenden Studie lassen sich folgendermaßen zusammenfassen: Patienten mit einer Körperdysmorphen Störung stuften die Wahrscheinlichkeit einer negativen Interpretation bei den körperbezogenen sowie bei den allgemein sozialen Szenarien als signifikant höher ein als Zwangspatienten und Kontrollpersonen. In der Einschätzung der alltagsbezogenen Szenarien hingegen unterschieden sich die beiden Patientengruppen nicht bezüglich der Wahrscheinlichkeit einer negativen Interpretation. Die Kontrollpersonen dagegen stuften die Wahrscheinlichkeit einer negativen Interpretation in den alltagsbezogenen Szenarien signifikant niedriger ein. Demzufolge haben Patienten mit einer Körperdysmorphen Störung im Gegensatz zu Zwangspatienten sowie Kontrollpersonen einen negativen Interpretationsstil nicht nur gegenüber körperbezogenen sondern gegenüber allen Szenarien, während Zwangspatienten einen negativen Interpretationsstil gegenüber alltagsbezogenen Szenarien aufweisen. Obwohl Patienten mit einer Körperdysmorphen Störung die Wahrscheinlichkeit einer negativen Interpretation in den körperbezogenen und sozialen Situationen höher einstuften als Zwangspatienten und Kontrollpersonen, stuften sie jedoch im Gegensatz zu den beiden anderen Gruppen die Wahrscheinlichkeit einer neutralen Interpretation nicht niedriger ein als die einer negativen.

Diese Ergebnisse unterstützen eines der wesentlichen Konzepte kognitiver Verhaltenstherapie, dass sich Individuen mit psychischen Störungen durch negative Interpretationsstile auszeichnen, welche wiederum mit der Entwicklung oder Aufrechterhaltung der störungstypischen Symptome im Zusammenhang stehen. Da insbesondere Patienten mit einer Körperdysmorphen Störung negative Interpretationsstile

gegenüber mehrdeutigen Situationen jeglicher Art aufweisen, könnte dies im Zusammenhang mit Symptomen wie Depressivität und einem geringen Selbstwertgefühl (Biby, 1998) stehen, die bei Patienten mit diesem Störungsbild häufig vorzufinden sind. Mit anderen Worten: je mehr unterschiedliche Situationen als bedrohlich interpretiert werden, desto häufiger empfindet das Individuum Emotionen wie z. B. Angst. Dies wiederum könnte in Zusammenhang mit depressiven Symptomen stehen. Es bleibt jedoch ungeklärt, ob negative Interpretationsstile zu der Entwicklung einer körperdysmorphen Störung führen, oder ob die Entwicklung dieser Störung zu der Entwicklung dieser Verzerrungen in der Informationsverarbeitung führen.

Studie 2

Interpretationsstile bei Patienten mit einer Körperdysmorphen Störung: eine

Leseverständnisstudie

Während in der ersten Studie Interpretationsstile mit der herkömmlichen

Fragebogenmethode untersucht wurden, konzentrierte sich die zweite Studie auf die

Erfassung dieser Interpretationsstilen anhand der von MacLeod und Cohen (1993)

verwendeten Methode, welche Antworttendenzen wie den "response bias" kontrolliert.

Method

Es nahmen jeweils 18 Patienten mit einer Körperdysmorphen Störung, 18

Zwangspatienten sowie 18 gesunde Kontrollpersonen an der Studie teil. Im speziellen

wurden die Interpretationsstile mit Hilfe des von MacLeod und Cohen (1993)

verwendeten Paradigma erfasst, bei dem Versuchspersonen an einem Computer-

bildschirm einzelne Sätze lasen, die entweder körperbezogen, allgemein sozial oder

alltagsbezogen waren (nähere Erklärung des Paradigmas siehe Einleitung).

Ergebnisse und Diskussion

Die erfassten Lesezeiten lassen darauf schließen, dass Patienten mit einer

Körperdysmorphen Störung, im Gegensatz zu den Ergebnissen von Studie 1, nur einen

negativen Interpretationsstil gegenüber körperbezogenen Szenarien aufweisen, während

die Zwangspatienten, im Einklang mit den Ergebnissen von Studie 1, einen negativen

Interpretationsstil gegenüber alltagsbezogenen Szenarien aufweisen. Die gesunden

Kontrollpersonen hingegen weisen im Gegensatz zu den Patientengruppen einen negativen

Interpretationsstil gegenüber sozialen Szenarien auf, was darauf hindeuten könnte, dass

sich gesunde Kontrollpersonen von Patientengruppen durch zusätzliche Faktoren wie z. B.

der subjektiven Wichtigkeit einer negativen Interpretation und nicht der negativen

Interpretation an sich unterscheiden. Dies könnte bedeuten, dass jedes Individuum

gelegentlich eine mehrdeutige soziale Situation negativ bewertet, jedoch im Gegensatz zu

Patienten mit einer psychischen Störung diesem Gedanken keine weitere Bedeutung

beimisst.

Studie 3

Interpretationsstile gegenüber Emotionsausdrücken bei Patienten mit einer

Körperdysmorphen Störung

Die meisten Studien, in denen Interpretationsstile untersucht wurden, verwendeten

Wörter als Stimuli im Gegensatz zu "reellen" Stimuli wie z.B. Gesichter. Ziel dieser

dritten Studie war es zu untersuchen, ob Patienten mit einer Körperdysmorphen Störung

sich durch Defizite in der Erkennung von Emotionsausdrücken sowie durch negative

Interpretationsstile gegenüber Emotionsausdrücken ausweisen.

Methode

Es nahmen jeweils 20 Patienten mit einer Körperdysmorphen Störung, 20

Zwangspatienten sowie 20 gesunde Kontrollpersonen an der Studie teil. Den

Versuchspersonen wurden nacheinander eine Reihe von Fotos gezeigt, auf denen

Gesichter mit unterschiedlichen Emotionsausdrücken abgebildet waren. Nach der

Präsentation jedes einzelnen Fotos wurden sie instruiert, auf einem vorgegebenen

Antwortblatt die jeweilige Emotion (neutral, angewidert, ängstlich, ärgerlich, fröhlich,

traurig, überrascht) zu markieren, die ihrer Meinung nach die dargebotene Emotion am

besten beschreibt. Jede einzelne Emotion wurde insgesamt sechs mal von

unterschiedlichen Darbietern (männlich und weiblich) dargeboten. Anschliessend nahmen

die Versuchspersonen am Benton Facial Recognition Test (Benton, Hamsher, Varney &

Spreen, 1983) teil, mit Hilfe dessen generelle neuropsychologische Defizite in der

Erkennung von Gesichtern erfasst werden.

Ergebnisse und Diskussion

Neuropsychologische Defizite. Die drei Gruppen unterschieden sich nicht

hinsichtlich ihrer Ergebnisse im Benton Facial Recognition Test, was darauf schließen

lässt, dass alle folgenden Ergebnisse nicht durch generelle neuropsychologische Defizite

verursacht wurden.

Emotionserkennung. Die wichtigsten Ergebnisse lassen sich folgendermaßen

zusammenfassen: Patienten mit einer Körperdysmorphen Störung misinterpretierten im

Gegensatz zu den anderen Gruppen Emotionsausdrücke als ärgerlich. Weiterhin waren sie

signifikant schlechter in der Erkennung von Emotionsbildern, in denen Ekel zum

Ausdruck gebracht wurde, im Vergleich zu Zwangspatienten und Kontrollpersonen.

Weitere Analysen wiesen darauf hin, dass Patienten mit einer Körperdysmorphen Störung

im Gegensatz zu den Kontrollpersonen insbesondere solche Emotionsbilder, in denen Ekel

zum Ausdruck gebracht wurde, als ärgerlich misinterpretieren. Die Zwangspatienten

unterschieden sich hingegen weder signifikant von den Patienten mit einer

Körperdysmorphen Störung noch von den Kontrollpersonen. Insgesamt gesehen waren die

Patienten mit einer Körperdysmorphen Störung jedoch ebenso akurat in der Erkennung

von Emotionsbildern, in denen Ärger zum Ausdruck gebracht wurde, wie die beiden

anderen Gruppen. Weiterhin wiesen sie sich im Gegensatz zu den anderen Gruppen

dadurch aus, andere nicht-ärgerliche Emotionsausdrücke fälschlicherweise als ärgerlich zu

interpretieren. Diese Ergebnisse sind von Bedeutung, da sie damit im Zusammenhang

stehen könnten, warum viele Patienten mit einer Körperdysmorphen Störung unter einer starken Angst vor negativer Bewertung durch andere leiden sowie fast schon paranoide Vorstellungen entwickeln, dass andere Personen z. B. ihr Äusseres beobachten oder negative darüber sprechen. Dies könnten die Patienten mit einer körperdysmorphen Störung wiederum als Bestätigung ihrer dysfunktionalen Kognitionen über ihr Körperbild bewerten. So könnte es z. B. sein, dass Patienten mit einer körperdysmorphen Störung Symptome wie Angst vor negativer Bewertung durch andere oder fast "paranoide" Vorstellungen aufweisen, *weil* sie dazu tendieren, Emotionsausdrücke als ärgerlich miszuinterpretieren. Auf der anderen Seite könnte es sein, dass diese Patienten Emotionsausdrücke als ärgerlich misinterpretieren, *weil* sie Angst vor negativer Bewertung durch andere oder fast "paranoide" Vorstellungen aufweisen.

Abstract

The present research examines interpretation in body dysmorphic disorder (BDD) and obsessive-compulsive disorder (OCD). In Study 1, I explored how BDD patients, compared to OCD patients and healthy controls, interpret ambiguous situations when given the opportunity to choose among different interpretations. In Study 2, I further explored interpretive processes using a paradigm that controls for response biases. In Study 3, I examined the ability to accurately recognize emotional expressions and interpretive biases towards these expressions.

Interpretive Bias for Ambiguous Information in Body Dysmorphic Disorder: A
Questionnaire Study

Clinical observations suggest that emotionally disturbed individuals interpret ambiguous information as threatening, especially in favor for disorder-relevant interpretations. To my knowledge, there is no study so far that examines interpretation in BDD. To investigate this issue, I tested patients with BDD ($\underline{n} = 19$) and healthy controls ($\underline{n} = 22$). To examine whether these phenomena were typical for BDD or also characterize a broader spectrum such as anxiety disorders, I also tested patients with OCD ($\underline{n} = 20$). Specifically, I designed an Interpretation Questionnaire which consisted of 33 ambiguous scenarios (11 BDD-related, 11 social, and 11 general scenarios). Each item consisted of a short description of the scenario and was followed by the question "*What thoughts occur to you?*" Moreover, participants were provided with three possible thoughts and were asked to rate each thought on a scale from 0 (very unlikely) to 4 (very likely) in terms of their likelihood of coming to mind. Using this Interpretation Questionnaire, I tested

whether BDD patients, compared to OCD patients and healthy controls, choose

threatening interpretations for ambiguous body-related, ambiguous social, and general

scenarios. As I hypothesized, BDD participants exhibited a negative interpretive bias for

body-related scenarios and for social scenarios, whereas the other groups did not.

Moreover, both clinical groups exhibited a negative interpretive bias for general scenarios.

These findings support one of the basic concepts underlying cognitive therapy, namely

that individuals with emotional disorders have interpretive biases that cause or maintain

anxiety. That is, BDD patients tend to interpret ambiguous everyday events as

threatening, which might be related to symptoms such as depression, low self-esteem, and

distorted beliefs about themselves and their body image. For example, negative

interpretations of everyday situation might confirm their negative beliefs. As a result, this

might lead to even more emotional vulnerability or anxiety in ambiguous situations.

However, it remains unclear whether negative interpretive biases lead to the etiology of

BDD or whether the development of BDD leads to these negative interpretive biases.

Interpretive Bias for Ambiguous Information in Body Dysmorphic Disorder:

A Text Comprehension Study

   Previous findings suggest that BDD patients are characterized by negative

interpretive biases. However, studies on interpretive biases have recently been criticized

because of methodological limitations. Specifically, it was unclear whether results of

studies using questionnaires to measure interpretation reflect an interpretive bias or an

anxiety-linked response-selection bias. It is certainly possible that patients immediately

disambiguate scenarios as threatening, thereby exhibiting an interpretive bias. On the

other hand, they may initially entertain diverse interpretations, not necessarily threatening ones, but then settle on a threatening interpretation as their final answer. Hence, what might appear to be a bias at the early interpretive stage of processing (i.e., automatic schema-driven interpretation) might actually reflect a late-stage response-selection bias.

In the current study, I further investigated interpretive biases in BDD. Specifically, I used a text comprehension paradigm that controls for these response biases. Given that BDD patients share many clinical features with anxious patients, I tested whether BDD participants ($\underline{n} = 18$), compared to OCD participants ($\underline{n} = 18$) and healthy controls ($\underline{n} = 18$), interpret ambiguous social and ambiguous body-related information as threatening. As I hypothesized, BDD participants exhibited a negative interpretive bias for body-related information. However, they did not exhibit an interpretive bias for social and general information. OCD participants exhibited, in contrast to the other groups, a bias for general information. However, controls exhibited, in contrast to the other groups, a bias for social information. Consequently, it might be that healthy individuals differ from patients' groups in terms of additional factors such as subjective costs of a negative interpretation. In other words, everyone might interpret an ambiguous social situation as negative once in a while. However, healthy individuals, compared to patients' groups, may simply not give so much importance to those negative thoughts.

In sum, these findings suggest that previous studies on interpretation that did not control for response biases might indeed be influenced by these biases. The interpretation of a situation is directly related to the way a person feels about himself or herself. For example, a BDD patient might interpret somebody looking in his or her direction in a negative way (e.g., "that person is staring at me because of my horrible nose"), whereas

that person might have looked at the BDD sufferer for diverse reasons. This negative interpretation would cause anxiety and shame. However, the interpretation "that person is looking at me because she is interested in what I have to say" would cause neutral or positive emotions. That is, it is not the situation itself but a person's interpretation of it that causes emotions such as anxiety and shame so often found in BDD. Consequently, interpretive biases should be addressed in clinical settings.

Interpretive Biases for Emotional Expressions in Body Dysmorphic Disorder

Most studies investigating selective processing of threat used words as stimuli. However, there is only little research using "real life" stimuli such as faces. In the current study, I investigated the ability to accurately recognize facial expressions. Given the strong fear of negative evaluation and the frequent presence of ideas of reference, individuals with BDD might be particularly sensitive to facial expressions. Therefore, the ability to recognize facial expressions may play a role in the maintenance or even etiology of disorders that are characterized by a strong fear of negative evaluations such as BDD.

Based on previous findings in social phobia, I hypothesized that BDD patients exhibit an interpretive bias for angry facial expressions. To investigate this issue, I tested patients with BDD ($\underline{n} = 20$), patients with OCD ($\underline{n} = 20$), and healthy controls ($\underline{n} = 20$). Specifically, participants were presented with photographs displaying different emotional expressions, one at a time, and they were asked to identify the correct emotional expression of each photograph. To exclude the possibility that neuropsychological deficits in facial feature processing would cause impairment in facial expression recognition, I also applied a general facial recognition test that measures visual-spatial processes.

First, results of the general facial recognition test indicate that differences in identifying emotional expressions were caused by interpretive biases rather than general neuropsychological deficits. Moreover, the findings suggest that BDD patients, in contrast to OCD patients and healthy controls, exhibit an interpretive bias for angry expressions. That is, they tend to misinterpret other emotional expressions as angry. Furthermore, I found that BDD patients were worse in identifying disgusted expressions, compared to controls. OCD patients did not differ from controls in their ability to identify disgusted expressions, nor did they differ from BDD patients.

BDD patients misinterpreted significantly more disgusted expressions as angry, whereas there was no difference between OCD patients and controls. However, the difference between BDD patients and OCD patients was also nonsignificant.

What are the clinical implications of this study? Overall, BDD patients have more difficulties interpreting facial expressions correctly than OCD patients and controls. Although BDD patients are as accurate as OCD patients and controls in identifying angry expressions, they misinterpret, in contrast to these groups, other facial expressions as angry. Therefore, there might be a relation between symptoms such as fear of negative evaluation by others, poor insight and ideas of reference commonly found in BDD and interpretive bias for angry facial expressions. That is, BDD patient might develop symptoms such as poor insight and ideas of reference because they are characterized by these negative interpretive biases. On the other hand, they might develop these negative interpretive biases because of these symptoms.

1. General Introduction

       Anyone may experience some concerns about his or her appearance. However,

some individuals become so distressed about their appearance that it interferes with their

daily life. Such individuals may qualify for a diagnosis of body dysmorphic disorder

[BDD; DSM-IV, American Psychiatric Association (APA), 1994]. BDD is a psychiatric

disorder in which the individual is preoccupied with a slight or imagined defect in

appearance. Although the "defect" is usually not noticeable to other people, the BDD

sufferer misperceives the "defect" as hideous and repulsive. If the individual has a slight

physical defect, the concern has to be markedly excessive. Moreover, the preoccupation

must cause significant distress or impairment in normal functioning. The concern in

appearance is not better accounted for by another mental disorder (e.g., anorexia

nervosa). Furthermore, the belief in the defect is not delusional, as it is in the delusional

disorder, somatic type, nor is it attributable to anorexia nervosa or gender identity

disorder (APA, 1994).

       Individuals with BDD experience significant distress about their imagined defect

that often compels them to think about it for many hours a day. Consequently, suffering

and impairment in normal functioning occur. Moreover, avoidance of everyday

activities may lead to substantial social isolation, including being housebound for years

(e.g., Phillips, McElroy, Keck, Pope, & Hudson, 1993).

       Most commonly, body parts of concern are the face, skin, and hair. Patients

worry about "hair thinning, acne, wrinkles, scars, vascular markings, paleness or redness

of the complexion, swelling, facial asymmetry or disproportion, or excessive facial hair"

(APA, 1994, p. 466). Furthermore, common preoccupations include the "shape, size, or

some other aspect of the nose, eyes, eyelids, eyebrows, ears, mouth, lips, teeth, jaw, chin,

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cheeks, or head" (p. 466). Although these concerns are most common, any body part

may be the focus of concern.

Associated features are frequent checking in mirrors and other reflecting surfaces

(e.g., store windows). This often co-occurs with excessive grooming behaviors (e.g.,

intense hair combing, makeup application, or skin picking). For example, O'Sullivan

and colleagues found that one patient picked at the imagined defect so deeply that the

artery was almost damaged (O'Sullivan, Phillips, Keuthen, & Wilhelm, 1999).

Some patients, however, avoid mirrors or alternate between episodes of frequent

mirror checking and mirror avoidance (APA, 1994, p. 466). Another associated feature

is the frequent request for reassurance about the imagined defect that, however, produces

only temporary relief (p. 466). Furthermore, individuals with BDD frequently compare

their body parts with others and are often concerned that other people might take special

notice of their imagined defect. Camouflaging the "defect" (e.g., wearing a hat to hide

imagined or slight hair loss) is also very common in BDD. Moreover, some individuals

with BDD experience an intense fear that their "ugly" body part is fragile or may

malfunction.

Individuals with BDD may also experience ideas of reference related to their

imagined defect (APA, 1994). That is, they often believe that others take special notice

of the imagined defect and talk about it or mock it. In other words, delusional BDD

patients are convinced about the existence of the defect and are not able to consider that

the flaw or defect might only exist in their imagination. Those patients may qualify for a

diagnosis of delusional disorder, somatic subtype. However, Phillips and colleagues

suggested that both delusional and nondelusional forms of BDD reflect one single

disorder with different degrees of insight (Phillips, McElroy, Keck, Hudson, & Pope, 1994).

Although the symptoms of BDD were described more than 100 years ago, only recently has the syndrome been studied empirically (e.g., Phillips et al., 1993) and only recently included in the psychiatric nomenclature (APA, 1987).

Furthermore, BDD is often under- or misdiagnosed. One explanation is that individuals with BDD often do not seek psychological help, but consult dermatologists, plastic surgeons, or dentists (Phillips et al., 1993). Interestingly, although both men and women with BDD equally consult cosmetic surgeons, women were more like to receive cosmetic surgeries (Phillips & Diaz, 1997).

The prevalence of BDD may be higher than one might expect. In a recent study, Otto and colleagues investigated the prevalence of BDD in a community sample and found a point prevalence rate of 0.7% in women aged 36-44 (Otto, Wilhelm, Cohen, & Harlow, 2001). Another study on college women suggests higher rates of BDD (5.3%; Bohne et al., 2002). BDD has an equal sex distribution (e.g., Phillips et al., 1993). However, Phillips and Diaz (1997) explored gender differences in 188 patients diagnosed with BDD and found that women were more likely to be concerned about their skin and picked their skin, whereas men were more likely to be concerned about their body build, genitals, and thinning hair. Furthermore, BDD usually begins in adolescence and its course tends to be chronic (e.g., Veale et al., 1996).

The etiology of BDD has received little attention. Some investigators have discussed sociological factors like unrealistic norms of physical beauty that are promoted in our culture. Psychological factors like obsessional or hypochondriacal personality

traits have also been discussed (for a review, see Hollander, Cohen, & Simeon, 1993).

Taken together, little is known about the etiology of BDD.

BDD is currently classified as a somatoform disorder because of the preoccupation with somatic complaints (DSM-IV, APA, 1994). For example, patients with BDD share associated features with patients with hypochondriasis regarding exaggerated beliefs about the body, reassurance seeking and body checking (e.g., Rosen, 1996). However, the beliefs of BDD patients are about their physical appearance, whereas the beliefs of patients with hypochondriasis are about a disease or illness.

However, some researchers discussed whether BDD should be classified as a somatoform disorder or as a mood, psychotic, or anxiety disorder (especially as a subtype of obsessive-compulsive disorder [OCD] or social phobia; Phillips et al., 1993). Major depressive disorder seems to be one that is most often comorbid with BDD. Comorbidity studies provide substantial support for a relationship between BDD and major depressive disorder. For example, Phillips and colleagues found in a series of 130 BDD patients a current prevalence of 59% and a lifetime prevalence of 83% for major depression (Phillips, McElroy, Hudson & Pope, 1995). Suicide attempts are common in BDD. Phillips and colleagues, for example, found a suicide attempt rate of 17% in BDD patients due to their appearance concerns (Phillips et al., 1993).

Moreover, BDD and social phobia share many features. BDD has a high comorbidity with social phobia, and both disorders have a similar age of onset (Phillips et al., 1993). Investigating the prevalence of BDD in patients with anxiety disorders, Wilhelm and colleagues found that social phobia preceded the onset of BDD in all patients who suffered from both disorders (Wilhelm, Otto, Zucker, & Pollack, 1997). These patients also had a significantly earlier age of onset of social phobia than did social

phobic patients who did not suffer from BDD (Wilhelm et al., 1997). Furthermore, both disorders are characterized by a strong fear of negative evaluation in social situations (Hollander, Neville, Frenkel, Josephson, & Liebowitz, 1992).

There is also a link between BDD and OCD. Like OCD, BDD is characterized by recurrent, persistent thoughts that can persist for several hours a day and are difficult to control or resist. Associated features of BDD like frequent checking in mirrors or other reflecting surfaces, excessive grooming behavior, compulsive skin picking, and frequent requests for reassurance about the appearance are ritualistic features that resemble compulsions of OCD (McElroy, Phillips, & Keck, 1994). Moreover, both disorders have a similar age of onset and course, and a high comorbidity (Phillips, Atala, & Albertini., 1995). Finally, both BDD and OCD are secret disorders; individuals who suffer from them are often too ashamed and embarrassed to seek professional help (McElroy et al., 1994). Taken together, major depressive disorder is most comorbid with BDD. However, BDD does share many associated features with social phobia and OCD.

1.1. Information-Processing Theories

Over the last 20 years, researchers started to focus on the role of cognitive factors in psychological disorders for the following reasons. First, the behaviorist approach constrained the generation of explanatory models because it only allowed to focus on overt behaviors. Because many psychologists started to believe that complex mental processes might contribute to the development or maintenance of psychological disorders, the cognitive approach was expected to provide more explanations of psychopathology. Second, the behaviorist approach constrained the use of acceptable methods. That is, only quantitative measures were legitimate, whereas self-report data

regarding subjective feelings or beliefs were not. Therefore, many psychologists wanted to break free from these constraints and started to focus on cognitive factors.

Specifically, information processing refers to the manner in which people perceive, attend to, and retrieve information from the environment (Ingram & Kendall, 1986). The quantity of all information that individuals are confronted with at a time is too much to process at once. Therefore, information processing has to be selective. However, whereas healthy individuals might selectively attend to nonthreatening information, research has shown that psychological disorders have one feature in common: a preoccupation with information that is related to the patient's concern. In other words, emotionally disturbed patients are characterized by selective processing of concern-related threatening material which may, in turn, contribute to the development or maintenance of the disorder (e.g., Beck & Emery, 1985; Williams, Watts, MacLeod & Mathews, 1997). For example, individuals who preferentially remember threatening information might have, as a consequence, increased levels of anxiety, compared to individuals who do not tend to remember threatening information. Moreover, selective attention to threat or a tendency to interpret ambiguous situations as threatening might have the same emotional consequences.

However, the cognitive approach consists of two different ways to understand cognitive biases - the appraisal approach and the experimental information-processing approach. The core assumption of the appraisal approach is that beliefs are important key factors to explain psychopathology. That is, certain beliefs of an OCD patient, for example, may lay the foundation of mistaken appraisals of intrusive thoughts (e.g., Salkovskis, 1999). According to this approach, psychological disorders can be cured if

one changes these dysfunctional beliefs, whereas information-processing biases are only side effects of these beliefs.

The most influential theory incorporating appraisal as an key factor to explain psychopathology is Beck's schema theory (e.g., Beck & Emery, 1985; Beck & Clark, 1988). Beck emphasizes the importance of cognitive structures or "schemas" that are "functional structures of relatively enduring representations of prior knowledge and experience" (Beck & Clark, 1988, p. 24). These schemas or beliefs affect an individual's perception, encoding, storage, and retrieval of information.

The main prediction of schema theory is that "stimuli consistent with existing schemas are elaborated and encoded, while inconsistent or irrelevant information is ignored or forgotten" or distorted until it is consistent with existing schemas (p. 24). Because anxious individuals often have beliefs that they might be confronted with danger or threat, they are, according to Beck's theory, characterized by both selective attention to and selective retrieval of schema-congruent threatening information. Moreover, these negative beliefs lead to a misinterpretation of ambiguous anxiety-related information (Beck & Clark, 1988).

However, the appraisal approach has been strongly critized. MacLeod (1993), for example, critized that this cognitive approach relies on the introspective self-report measures to assess the patient's beliefs. Consequently, it fails to measure cognitive processes that lie outside of awareness. Instead, he emphasized the need for cognitive paradigms that control for response biases and allow to examine cognitive processes that are outside of awareness (MacLeod, 1993).

Williams et al. (1988) proposed a more comprehensive information-processing model of emotional disorders in order to explain different cognitive biases found in

anxiety and depression. For example, whereas memory biases could be found in panic patients (e.g., McNally, Foa, & Donnell, 1989), Mogg and colleagues consistently failed to replicate these biases in patients with generalized anxiety disorder (GAD; e.g., Mogg, Mathews, & Weinman, 1987; Mogg & Mathews, 1990).

The essential assumption of Williams et al.'s (1988) theory is the distinction between integration (or priming) and elaboration. These distinct cognitive processes were originally proposed by Graf and Mandler (1984). According to Williams and colleagues, integration is an automatic process in which a stimulus leads to the activation of the components involved in the representation of that stimulus. As a result, its internal representation is strengthened and the stimulus is more accessible or 'primed'. That is, the primed stimulus (e.g., HORSE) will come to mind even when only some of its components (e.g., HOR_ _) are presented (Williams et al., 1988).

Elaboration is a strategic process that involves processing of information by actively forming new connections between previously unrelated representations or by strengthening previously existing connections between representations. For example, the elaboration of a stimulus (e.g., HORSE) leads to a stronger connection between the internal representation of that stimulus and other associated representations (e.g., RIDE). As a result, the retrieval of that stimulus (e.g., HORSE) is easier in response to the associated stimulus (e.g., RIDE).

In contrast to Beck's (e.g., Beck & Emery, 1985; Beck & Clark, 1988) schema theory that predicts mood-congruent effects in anxiety and depression that are pervasive throughout the cognitive system, Williams and colleagues predict two distinct information-processing biases in anxiety and depression and suggest that "anxiety preferentially affects the passive, automatic aspect of encoding and retrieval, whereas

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depression affects the more active, effortful aspects of encoding and retrieval" (Williams et al., 1988, pp. 173-174). In other words, anxious individuals should show an attentional bias towards threatening stimuli but not a memory bias towards these stimuli, i.e. they should selectively focus their attention to threat-related stimuli but should not preferentially remember these stimuli. Depressive individuals, on the other hand, should show a memory bias but not an attentional bias for threatening information.

Williams et al.'s (1988) cognitive model has been of importance in recent research on cognitive psychopathology. Nevertheless, it has several limitations (Eysenck, 1992). Although Williams et al. (1988) point out that anxious individuals have an attentional bias towards threatening information, other attentional processes associated with anxiety are neglected (Eysenck, 1992). For example, there is some evidence that anxiety also affects attentional scanning and distractibility, even when the anxious individual is not confronted with threatening information (Eysenck, 1992).

Furthermore, Williams et al.'s theory implies that all anxiety disorders share the same cognitive biases, yet there are inconsistent findings across these syndromes. Results of studies on GAD, for example, did not show memory biases for threat (e.g., preferential recall of threatening information, compared to nonthreatening information and to controls; Mogg et al., 1987), whereas research in panic disorder revealed those biases (e.g., McNally et al., 1989; Becker, Rinck, & Margraf, 1994; Cloitre, Shear, Cancienne, & Zeitlin, 1994). Additionally, there is some evidence for memory biases in posttraumatic stress disorder (PTSD; Vrana, Roodman, & Beckham, 1995) and OCD (Wilhelm, McNally, Baer, & Florin, 1996).

Taken together, each of these theories has strongly influenced research in cognitive psychopathology. However, there are essential differences among the theories.

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Beck and Emery (1985) state that maladaptive schemas should influence every process of the cognitive system, that is both attention and memory, whereas Williams et al. (1988) point out that anxiety only affects attention, but not memory. All of these theories have generated a considerable volume of research in information processing in emotional disorders.

1.2. Information-Processing Research

During the past decade, there has been increased interest in cognitive biases in emotional disorders. The underlying assumption is that selective processing of threat leads to increased anxiety. Among the cognitive biases most frequently studied are those of attention and memory (for reviews, see Eysenck, 1992; Williams, Mathews, & MacLeod, 1996), but there has also been an increase of investigation cognitive biases for ambiguity (e.g., Butler & Matthews, 1983; Amir, Foa, & Coles, 1998).

1.2.1. Attentional Bias

Emotional disorders differ in many ways. However, they have one feature in common: a higher sensitivity towards personally threatening stimuli caused by selective attention towards these stimuli. These attentional biases are a core feature of many information processing theories of psychopathology because selective attention to threat leads to increased levels of anxiety (for a review, see Williams et al., 1996).

Two main methods have been used to investigate selective attention. The first method is to show how selective attention can lead to impaired performance on certain tasks. There are several paradigms to investigate this phenomenon. The modified Stroop (1935) task has been used most frequently to assess selective attention. In this procedure,

participants are shown words that are printed in different colors and that vary in their emotional significance, and are instructed to name the color of each word while ignoring its meaning. Attending to the meaning of the word, in spite of the attempt to ignore it, leads to delays in color naming ("Stroop interference"). If patients are characterized by an attentional bias towards threat, they should show delays in color naming threat-related but not threat-unrelated words. In fact, Stroop interference effects have been found in BDD (Buhlmann, McNally, Wilhelm, & Florin, 2002), GAD (Mathews & MacLeod, 1985), OCD (e.g., Foa, Ilai, McCarthy, Shoyer, & Murdock, 1993), panic disorder (e.g., McNally et al., 1994), PTSD (e.g., Foa, Feske, Murdock, Kozak, & McCarthy, 1991; McNally, Kaspi, Riemann, & Zeitlin, 1990), social phobia (e.g., Hope, Rapee, Heimberg, & Dombeck, 1990), and specific (spider) phobia (Watts, McKenna, Sharrock, & Trezise, 1986).

However, the Stroop paradigm has its limitations because several factors other than selective attention to threat might contribute to the color-naming latencies (Mathews, 1990). First, threatening stimuli might lead to emotional distress in general which, in turn, leads to color-naming latencies. Second, these latencies might derive because of the patient's attempt to avoid to process threatening information. Third, as Fox (1993) states, the Stroop paradigm measures selective processing in general rather than selective attention because the latter can only be measured if one separates semantic and color cues spatially to examine whether attention is selectively shifted to threat cues.

The second method is to show how selective attention might facilitate performance on specific tasks. For example, Burgess and colleagues used a dichotic listening paradigm to explore whether agoraphobic and social phobic patients selectively attend to threat words (Burgess, Jones, Robertson, Radcliffe, & Emerson, 1981).

Participants were presented two prose passages, one to each ear, and asked to focus their attention (i.e., repeat aloud) on one passage while ignoring the other one. Moreover, they were instructed to detect fear-related and neutral words that occurred out of context in either passage. As expected, phobic patients detected more fear-related than neutral words in the unattended passage.

However, MacLeod, Mathews, and Tata (1986) critized that it was unclear whether the findings of Burgess et al. (1981) may be due to an attentional bias toward threat or whether it may simply be due to a mood-dependent response bias. That is, anxious participants might simply have reported guesses that were congruent with their current mood. Therefore, they used a different kind of approach to measure selective attention.

Specifically, they used the visual dot-probe paradigm in which both facilitation and disruption due to threatening stimuli can be demonstrated. They presented the GAD patients and control participants with word pairs (threat and neutral words, respectively) that appeared simultaneously either on the top or on the bottom of a computer screen. Participants were asked to name the top word aloud. On some of the trials, a small dot appeared in the place where the word had been before. In this case, participants had to press a button as quickly as possible. On half of the trials on which the dot appeared, it replaced the top word, and on the other half it replaced the bottom word. The detection latency for the small dot probe is a sensitive measure of visual attention because participants ought to reveal longer response times if their attention has been shifted away. MacLeod et al. (1986) found different response pattern for anxious participants and controls. Anxious participants responded quicker if the dot probe replaced a threat word at the top than if the dot probe replaced a neutral word at the top and the threat word had

occurred at the bottom. However, if the dot probe occurred at the bottom after the threat word had occurred at the top, anxious participants were relatively slower in their response. These findings suggest that anxious participants orient towards the location at which the threatening stimulus has been before. Controls, however, showed the opposite response pattern. That is, they orient away from the location at which the threatening stimulus has been before.

An important conclusion from MacLeod et al.'s (1986) study was that anxious individuals were not more 'sensitive' to threatening information at the most peripheral level than nonanxious controls because controls responded as quickly as did anxious individuals to a threat word. However, both groups had different attentional allocation pattern in response to these inputs. That is, if the threat word occurred at the top, controls named the word aloud as quickly as did anxious individuals.

Most studies on selective attention have shown that the effects were specific for the patient's main concern. In other words, the more a stimulus reflected the patient's current concern or anxiety, the more likely it was to produce Stroop interference. For example, McNally and colleagues showed that Vietnam veterans with PTSD exhibited delayed color naming for combat-related stimuli but not for negative OCD-related stimuli (McNally et al., 1990).

Because interest in information-processing research in emotional disorders has been strongly increased in the last several years, attentional biases towards threat were explained by their negative valence (e.g., Beck & Emery, 1985). However, the *threat-relatedness hypothesis* was criticized by Martin, Williams, and Clark (1991) argued that as long as one does not include both negative and positive stimuli in the experiment, one cannot conclude that Stroop interference is specific to threat-related material. However,

a few studies already showed that Stroop interference was specific to threat-related words and not to positive words (McNally et al., 1990).

Nevertheless, they proposed to replace the *threat-relatedness hypothesis* by the *emotionality hypothesis*. That is, they argued that attentional biases are not caused by threat-related material but by any emotional material in general, regardless whether it is of positive or negative valence. To test their hypothesis, Mathews and Klug (1993) examined whether anxious patients showed an attentional bias for anxiety-related and anxiety-unrelated positive words, anxiety-related and anxiety-unrelated negative words, and emotionally neutral words. Their results revealed, however, that anxious patients did not selectively attend to emotional material in general, but rather to both negative and positive anxiety-related material. As a result, they suggested a third hypothesis to explain attentional biases for threatening material: the *concern-relatedness hypothesis*. This hypothesis predicts that anxious patients selectively attend to material which is semantically associated with their personal concerns.

Evidence to support this hypothesis has been reported by Riemann and McNally (1995), investigating attentional biases for idiographic information in a nonclinical population. Specifically, they employed idiographically chosen words that varied in their degree of relatedness to each participant's current concerns (high and low) and in valence (positive and negative). As Riemann and McNally predicted, color-naming delays were most increased when the participants were presented with material related to high-negative and high-positive current concern than when presented with low-negative and low-positive and neutral material.

However, some studies have not confirmed the concern-relatedness hypothesis. Investigating attentional processes in OCD, Lavy, van Oppen, and van

den Hout (1994) asked OC checkers, OC washers and healthy control participants to color-name OCD-related and OCD-unrelated negative words, OCD-related and OCD-unrelated positive words, and neutral words. The results of the study provided evidence for the threat-relatedness hypothesis, i.e. OCD participants showed an attentional bias towards OCD-related negative but not OCD-related positive stimuli.

To further explore these hypotheses, we recently used the modified Stroop paradigm to investigated attentional processes in BDD (Buhlmann, McNally et al., 2002). We presented BDD patients and healthy controls with BDD-related negative, BDD-related positive, general negative, general positive, and neutral words. The results revealed that BDD patients, like other anxiety-disordered patients, exhibited longer color-naming latencies for emotional information, regardless of its valence. Unlike most anxiety-disordered patients, BDD patients were even slightly more distracted by disorder-relevant positive information such as beautiful or attractive. In other words, BDD patients may be concerned about both their beauty ideal and their imagined ugliness, which may, in turn, explain why BDD patients often ask for reassurance or compare themselves with others with respect to their appearance.

Vulnerability to anxiety is associated with selective attention to threat because selective attention to threatening information may increase anxiety. However, it still remains unclear whether selective attention to threat may contribute causally to emotional vulnerability. To investigate this, MacLeod and colleagues applied the visual dot-probe paradigm in a nonclinical population (MacLeod, Rutherford, Campbell, Ebsworthy, & Holker, 2002). Specifically, they experimentally induced attentional biases either towards negative information or away from negative information and subsequently had participants complete a standardized stress task. In the training phase, for half of the

participants the dot probe always appeared at the location where the neutral word had occurred. Consequently, these participants ought to exhibit an attentional bias away from threatening stimuli and toward neutral stimuli after the completion of the training phase. For the other half of the participants, the probe always appeared at the location where the threat word had occurred. Those participants were expected to exhibit an attentional bias away from neutral stimuli and toward threat after the completion of the training phase. In the Anagram Stress Task, participants were told that they would be videotaped while completing a series of anagrams on a computerscreen. Each participant was tested individually. After three minutes, they were told that their performance was too poor to go on with the task. Before the experiment and after the completion of the stress task, they were asked to complete an analogue mood scale.

MacLeod et al. (2002) found that those participants who were trained to exhibit an attentional bias towards negative information were more emotional distressed after the stress task than those participants who were trained to exhibit an attentional bias away from negative information. In other words, the results showed induced attentional biases toward threat can indeed modify emotional vulnerability.

In summary, many studies have investigated attentional biases in emotional disorders, and there is strong evidence that individuals with emotional disorders possess a selective attentional bias favoring threatening information. There is also some evidence that people selectively attend to any information related to their personal concerns, regardless of its emotional valence. However, unlike most anxiety patients, BDD patients exhibit an attentional bias especially for BDD-related positive information.

1.2.2. Memory Bias

Individuals with emotional disorders are often characterized by a memory bias for threat. For example, a depressed individual tends to recall negative aspects of the past while ignoring neutral or positive information.

Memory biases in emotional disorders are predicted by Beck's schema theory (Beck & Emery, 1985). The theory states that anxious individuals selectively attend to threat which results in superior encoding and retrieval of these stimuli. Williams et al.'s (1988) also predict memory biases but in contrast to other theories do they only predict such as bias in depressed patients but not in anxious patients.

Memory biases have been well investigated in psychological disorders (e.g., Mathews & MacLeod, 1985; Radomsky & Rachman, 1999; MacLeod & McLaughlin, 1995). According to Williams et al. (1988), memory biases should only be found in depression but not anxiety. Nevertheless, findings vary across different psychological disorders. Findings have been most consistent in panic disorder (e.g., McNally et al., 1989; Becker et al., 1994; Cloitre et al., 1994), whereas findings are inconsistent in GAD (e.g., Mogg et al., 1987; Mogg & Mathews, 1990).

One of the first studies on memory biases for threat in panic disorder was conducted by McNally et al. (1989). They hypothesized that panic patients would exhibit a memory bias for threat and that physiological arousal would enhance this bias. Specifically, they had panic patients and controls rate anxious words and neutral words in terms of how much they would describe themselves (McNally et al., 1989). In one condition, participants were given the task after doing step-ups (arousal condition), whereas in the other condition, participants were given the task after a relaxation procedure (relaxation condition). They found that panic patients in the arousal condition

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showed marginally significant more free recall of threat words than did panic patients in the relaxation condition, whereas both panic groups recalled significantly more threat words than did controls. Accordingly, McNally et al. (1989) showed that, in contrast to Williams et al.'s (1988) predictions, panic patients exhibit a memory bias for anxiety-related information, especially when under a high arousal condition.

To explore further whether memory biases were specific for anxious patients or whether familiarity with panic-related stimuli per se is sufficient enough to produce these biases, Cloitre et al. (1994) tested patients diagnosed with panic disorder, clinicians who were expertise in treating panic patients, and controls. Specifically, they used a cued recall paradigm. In this paradigm, participants are presented with word pairs that are either related or unrelated, and either negative, positive, or neutral (e.g., neutral, unrelated: *cheerful – bureau*; negative, related: *breathless – suffocate*). Participants are instructed to read each word pair aloud and rate their degree of relatedness. After that, they are asked to complete each word pair with the word they had been presented earlier (e.g., *breathless – suf*). Cloitre et al. (1994) found a memory bias for threat in panic patients. They found, however, that only panic patients exhibited these memory biases, whereas clinicians and controls did not.

However, it still remained unclear whether panic patients exhibit a general memory bias for threat or whether they exhibit a specific panic-related memory bias for threat. To address this issue, Becker and colleagues conducted an experiment in which participants first had to learn positive, negative and panic-related words (Becker et al., 1994). Afterwards, participants were given a free recall test. Furthermore, they hypothesized that panic patients would not simply reproduce but also produce more panic-related words, caused by strong associations between panic-related concepts. Thus,

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panic patients were expected to show an enhanced recall for both correct and incorrect (intrusive) panic-related words in a memory test. To analyze the participants' intrusions, Becker and colleagues also told the participants to include the words they were not sure about whether they had seen them before or not. As hypothesized, panic patients recalled more panic-related words than general positive or negative words showing that panic patients are characterized by a specific panic-related memory bias for threat rather than a general, unspecific memory bias for threat. However, inconsistent with Becker's et al. (1994) prediction, panic patients did not recall more incorrect panic-related words (i.e., intrusions) than did control participants.

Some studies failed to demonstrate a memory bias for threat in panic patients (e.g., Otto, McNally, Pollack, Chen, & Rosenbaum, 1994). However, Otto et al. (1994), for example, used nonself-descriptive threat words such as *coronary*, whereas McNally et al. (1989) used self-descriptive threat words such as *fearful*. Therefore, it may be that nonself-descriptive threat words lead to less recall of threat words than did self-descrptive threat words that, in turn, lead to enhanced recall of threat words.

However, findings of memory biases in anxiety disorder are inconsistent. Investigating memory biases in GAD, Mathews and MacLeod (1985) used the modified Stroop task and asked GAD patients and healthy controls to color-name words that were either threatening or nonthreatening. Immediately after the Stroop task, participants' recognition memory was tested. However, Mathews and MacLeod found no memory differences for threatening words between the groups. Furthermore, Mogg and collegues reported a failure to demonstrate memory biases for threat in GAD in several experiments (e.g., Mogg et al., 1987; Mogg & Mathews, 1990).

Taken together, research on memory biases in anxiety disorders reveal inconsistent results. Thus, it might be that different anxiety patient populations not only view different stimuli as threatening but also differ in their reactions to these stimuli. Consequently, different memory biases might be found in the spectrum of anxiety disorders. Further investigations are required to examine memory biases and its underlying mechanisms.

1.2.3. Interpretive Bias

Everyday situations are often somewhat ambiguous. Whether an individual interprets a situation as threatening or not, is associated with experiencing positive or negative emotional states (for a review, see Mathews & MacLeod, 1994). For example, a socially anxious individual who interprets somebody laughing behind him in a negative way (*I must have said something foolish*) may feel confirmed in his negative self-image and consequently have increased levels of anxiety, compared to a nonanxious individual who interprets this situation in a neutral way (*They must be in a funny mood*).

Previous research has shown that anxious individuals indeed tend to impose threatening interpretations on ambiguous stimuli (e.g., Butler & Mathews, 1983; Eysenck, Mogg, May, Richards, & Mathews, 1991; Hope et al., 1990; Mathews, Richard, & Eysenck, 1989; McNally & Foa 1987). Butler and Mathews (1983), for example, had both anxious and depressed patients read a series of ambiguous scenarios (e.g., *Suppose you wake with a start in the middle of the night thinking you heard a noise, but all is quiet. What do you suppose woke you up?*). First, Butler and Mathews (1983) provided an open-ended response, followed by several possible explanations which the participants had to rank in terms of their likelihood to come to mind. The patients' groups ranked

threatening explanations (e.g., *There is a burglar in your house*) as more likely than did controls.

Investigating interpretive biases in panic disorder, McNally and Foa (1987) modified Butler and Mathews's interpretation questionnaire and examined interpretive biases before and after cognitive behavioral therapy. They found that these biases were absent in those patients who had responded well to cognitive behavioral therapy. This suggests that interpretive biases might indeed be related to the maintenance or even etiology of psychological disorders. Moreover, consistent with these findings, Westing and Öst (1995) found a relationship between clinical improvement and the extent to which these biases changed. In other words, panic disorder patients that were panic-free, in contrast to patients who were not panic-free after cognitive-behavioral treatment, did not exhibit negative interpretive biases.

Research on social phobia, for example, has shown that socially anxious individuals tend to draw negative conclusions about ambiguous social events, which might lead to increased anxiety and consequently to avoidance of those anxiety-provoking events (Amir et al., 1998). Specifically, Amir and colleagues showed that social phobic patients, compared to OCD patients and controls, interpreted ambiguous social situations as threatening, even when the participants could choose between a threatening, neutral, and positive interpretation (Amir et al., 1998). Moreover, this interpretive bias was specific to self-relevant situations (i.e., imagining oneself being in that situation), and did not occur in non-self-relevant situations (i.e., imagining a good friend being in that situation).

However, studies using questionnaires to examine interpretive biases have methodological limitations because they do not control for response biases. For example,

a patient may provide interpretations that they believe are consistent with their experimenter's expectations rather than their real interpretations of the ambiguous scenarios.

The first study that addressed this methodological problem was conducted by Mathews et al. (1989). GAD patients, recovered GAD patients, and controls were instructed to listen to a series of homophones that could be disambiguated in either a threatening (e.g., *die*) or a nonthreatening (e.g., *dye*) way. After listening to each homophone, they had to write down the word they heard. If GAD patients are characterized with an interpretive bias for threat, they ought to write down more threatening spellings than nonthreatening ones, compared to controls. Mathews et al. (1989) indeed found that GAD patients produced more threatening spellings, relative to controls, suggesting that they exhibit an interpretive bias for threat, whereas recovered GAD patients produced less threatening spellings, relative to GAD patients.

However, because whole sentences have a higher ecological validity than single homophones, Eysenck and colleagues further investigated interpretive biases in GAD using ambiguous sentences as stimuli instead of single homophones (Eysenck et al., 1991). Specifically, they tested GAD patients, recovered GAD patients, and controls using a recognition memory test. First, participants heard a series of ambiguous sentences (e.g., *The doctor examined little Emma's growth*). After that, they were presented with both threatening or nonthreatening disambiguations of the previously heard ambiguous sentences. As a result, they found that GAD patients endorsed relatively more of the threatening disambiguations (e.g., *The doctor looked at little Emma's cancer*) than did recovered GAD patients and controls, consisting with the

hypothesis that anxious patients interpreted the previously presented ambiguous sentences as threatening.

Nevertheless, results of studies using ambiguous homophones and sentences might still be biased by response biases. Specifically, it remains unclear whether results of the previously mentioned studies reflect an interpretive bias or an anxiety-linked response-selection bias. It is certainly possible that patients immediately disambiguate scenarios as threatening, thereby exhibiting an interpretive bias. On the other hand, they may initially entertain diverse interpretations, not necessarily threatening ones, but then settle on a threatening interpretation as their final answer. Hence, what might appear to be a bias at the early interpretive stage of processing (i.e., automatic schema-driven interpretation) might actually reflect a late-stage response-selection bias.

MacLeod and Cohen (1993) used the Rapid Serial Visual Presentation (RSVP; Williams & Tarr, 1998) paradigm to distinguish interpretive from response biases in high- and low-trait anxious individuals. The advantage of this paradigm is that it enables researchers to determine the participants' initial interpretive response to ambiguous lexical input. On each trial, the participant views and reads two successive sentences. The first sentence of each pair is ambiguous (*They completed the service by filling in the hole*), and the second sentence is either a plausible continuation for a threatening meaning (threat continuation condition, e.g., *The funeral finished much sooner than had been expected*) or a nonthreatening meaning (nonthreat continuation condition, e.g., *The repairs finished much sooner than had been expected*) of the initial ambiguous sentence. Participants begin a trial by pressing the space bar which presents the first (ambiguous) sentence. After reading it, they press the space bar again to view the second (continuation) sentence which is either a nonthreatening or threatening continuation of

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the first sentence. When the participants press the space bar for the third time, they see a

single question (*Did the service take less time than anticipated?*) which they answer with

either *Yes* or *No* by pressing one of two other keys. The dependent measure is the time

between the second pressing of the space bar (which presents the continuation sentence)

and the following key press that ends the display of the continuation sentence and

replaces it with the question. Accordingly, on each trial the software provides an index of

the comprehension latency for each continuation sentence.

Using this procedure, MacLeod and Cohen (1993) compared the relative

comprehension latencies for the two types of continuation sentences across three

experimental conditions, in which (1) the initial sentence was ambiguous, (2) the initial

sentence was unambiguously threatening, or (3) the initial sentence was unambiguously

nonthreatening. That is, they subtracted, for each experimental condition, the

comprehension latencies for the threat continuation sentences from the nonthreat

continuation sentences. If the participants consistently interpret the initial sentence as

threatening when it is ambiguous, they ought to exhibit the same relative comprehension

latencies for the two types of continuation sentences: when the initial sentence is

ambiguous and when the initial sentence is unambiguously threatening. But they ought to

have disproportionately long comprehension latencies for threat continuations in the third

condition (in which the initial sentence is unambiguously nonthreatening). In other

words, they should respond to ambiguous input as if it were threatening. In contrast, if

the participants impose the less threatening meaning on the initial sentence when it is

ambiguous, they ought to show the same relative comprehension latencies for the two

types of continuation sentence in the first condition (in which the initial sentence is

ambiguous) and in the third condition (in which the initial sentence is unambiguously

nonthreatening), but should exhibit disproportionately long comprehension latencies for nonthreat continuations under the second condition (in which the initial sentence is unambiguously threatening). Therefore, the initial sentence was presented under three "cue" conditions. That is, each sentence pair was proceeded by a single word (cue), which was used to either orient the participant to the meaning of the sentence (*Burial*: threat cue; *Renovate*: nonthreat cue) or to leave it completely ambiguous (*?????*). Participants were told that this cue would provide a hint about the topic of the following passage, and they were instructed to use this hint to develop an anticipation of the sentence's theme.

Testing these hypotheses with high-and low-trait anxious individuals, MacLeod and Cohen (1993) found that the high-trait anxious individuals selectively imposed the threatening interpretations on unconstrained ambiguous sentences. In contrast, the low-trait anxious individuals selectively imposed the nonthreatening interpretations on the ambiguous sentences.

Taken together, given the ambiguity in social situations, interpretation seems to be an important factor of whether a situation is perceived as threatening, and recent studies have shown that anxious individuals tend to impose the more threatening meaning on ambiguous information. Consequently, these biases might be self-reinforcing in the development or maintainance of anxiety. To my knowledge, there is no study investigating interpretive biases in BDD.

1.2.4. Information-Processing Biases for Facial Stimuli

Most studies investigating cognitive processes in psychological disorders used words as stimuli, and there is little research investigating "real life" stimuli such as faces.

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However, recently, researchers discussed whether more ecologically valid stimuli such as faces would be more appropriate to investigate information-processing abnormalities (e.g., Lundh & Öst, 1996). That is, nonvisual or abstract stimuli such as words may not represent the patient's personal concerns such as pictorial stimuli may do, especially for those individuals whose personal concerns are tied to visual cues (e.g., behavioral cues such as approving or disapproving facial expressions in social situations).

Therefore, researchers have started to investigate information-processing biases using pictorial stimuli. Investigating attentional biases in spider phobia, Lavy and Van den Hout (1993), for example, used the modified Stroop paradigm and found that patients with spider phobia, in contrast to controls, exhibit color-naming latencies when presented with pictures of spiders. Furthermore, Constantine and colleagues investigated attentional biases in spider phobic patients and snake phobic patients using pictorial cues (Constantine, McNally, & Hornig, 2001). They also found that phobic patients, in contrast to controls, selectively attended to emotional pictorial cues.

Studying recognition memory for faces in social phobia, Lundh and Öst (1996), for example, argued that facial stimuli may be very relevant for social phobic patients because the patients are especially afraid of negative evaluations by others. That is, facial expressions are an important mean to express negative or positive evaluations, and information-processing biases for these expressions may be a key factor in the maintenance or even etiology of psychological disorders that are characterized by a strong fear of negative evaluations. In their experiment, Lundh and Öst (1996) presented social phobic patients and controls with faces varying in their emotional valence (positive and negative). They found that social phobics, when presented with critical and accepting faces, recognized significantly more of the former than of the latter in a subsequent

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memory task for these faces. Consequently, enhanced recognition memory for critical

faces may contribute to anxiety, especially to fear of negative evaluation. However, it is

unclear whether the results of Lundh and Öst's study were caused by a response bias or

by a memory bias for critical faces.

To further address this issue, Foa and colleagues also studied the ability to

recognize facial expressions in social phobia (Foa, Gilboa-Schechtman, Amir, &

Freshman, 2000). They found that social phobics are better in recognizing negative

emotions (e.g., anger, disgust), compared to non-negative emotions (e.g., neutral, happy)

and compared to nonanxious controls. To examine whether the enhanced memory of

social phobics for negative expressions was a result of a response bias, Foa et al. (2000)

submitted the data to a signal detection analysis and found that the enhanced recognition

of negative expressions was caused by a memory bias rather than by a response bias.

Moreover, selective attention to negative facial expressions was also found in

studies (e.g., Bradley et al., 1997; Mansell, Clark, Ehlers, & Chen, 1999; Yuen, 1994).

Using the visual dot probe paradigm, Bradley and colleagues, for example, investigated

attentional biases for negative facial expressions in a nonclinical population (Bradley et

al., 1997). Specifically, they presented high and low socially anxious participants with

neutral-happy and neutral-angry face pairs. Although they did not find a social anxiety-

related attentional bias, post hoc correlational analyses indicated that nondysphoric

participants avoided angry facial expressions less than did dysphoric participants. Yuen

(1994) also used the visual dot probe paradigm in a nonclinical population and found a

significant relation between social anxiety and an attentional bias away from negative

faces. Specifically, social anxiety was induced by telling participants that they would

have to give a public presentation immediately after the completion of the dot probe task.

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To further clarify this, Mansell and colleagues used the dot probe paradigm and presented high and low socially anxious participants with face pairs (Mansell et al., 1999). Moreover, half of the participants performed the task under social-evaluative threat (by telling participants that their skills to give a speech would be evaluated after the completion of the task) and half of the participants performed the task under no threat. The main finding of Mansell et al.'s (1999) study was that high socially anxious participants exhibited an attentional biases away from both positive and negative emotional faces. However, this effect was only observed under the condition of social-evaluative threat. In the no threat condition, high and low socially anxious participants did not differ in their attention to facial expressions. The latter result is consistent with Bradley et al.'s (1997) study which did not include a social-evaluative threat condition and also found no differences in attention between high and low socially anxious participants. However, findings of recent studies using words to investigate selective attention in social anxiety showed that high socially anxious participants show an attentional bias towards socially threatening words if they were tested under a no threat condition (Hope, Rapee, Heimberg, & Dombeck, 1990; Mattia, Heimberg, & Hope, 1993), whereas this effect is not observed under conditions of social-evaluative threat (Amir et al., 1996). These findings are inconsistent with the recent findings of studies in which faces were used instead of verbal stimuli (e.g., Mansell et al., 1999). Consequently, results of studies obtained with emotionally valenced words do not necessarily generalize to "real-life" stimuli such as faces.

Why do spider phobic patients exhibit an attentional bias towards the threatening stimuli, whereas socially anxious individuals who are under social-evaluative threat exhibit an attentional bias away from pictures of other people's emotional expression? In

contrast to individuals with social anxiety, a spider phobic's anxiety will not decrease if he or she avoids to look at the threatening stimulus. Instead, the anxiety may increase because if the spider phobic avoids to look at the spider, he or she will not be able to see if the spider moves closer. On the other hand, avoiding to look at other people's faces and avoiding eye contact may reduce the anxiety of a high socially anxious individual because it makes it more difficult for other people to engage the anxious individual in a conversation (Mansell et al., 1999). Consistent with this hypothesis, Thorpe and Salkovskis (1998) found that spider phobics that were presented with a spider in a room showed greater attention to the spider if the spider was near the exit door than if the spider was more far away from the exit door.

Researchers have also investigated the ability to recognize facial expressions in individuals with psychological disorders. So far, these phenomena have been mostly studied in schizophrenia (e.g., Addington & Addington, 1998; Mueser et al., 1996, Kerr & Neale, 1993). Kerr and Neale (1993), for example, presented schizophrenic patients and healthy controls with faces varying in emotional expressions and found that schizophrenics, in contrast to controls, exhibited a generalized performance deficit to recognize emotions.

Studying the relation between emotion recognition and social competence in schizophrenia, Mueser and colleagues also found that schizophrenic patients, unlike controls, exhibited a generalized deficit to recognize emotional expressions (Mueser et al., 1996). Moreover, they found that the ability to recognize emotions was related to social competence and concluded that deficits in emotion recognition might affect the ability to behave in social situations in an appropriate way. Further support for the

hypothesis that schizophrenic patients exhibit a generalized emotion recognition deficit was found by Addington and Addington (1998) and Salem, Kring, and Kerr (1996).

Investigating recognition of facial expressions in mania, Lembke and Ketter (2002) found that manic patients, in contrast to euthymic patients with bipolar I or bipolar II and to controls, showed worse overall recognition of facial expressions, especially of fear and disgust. The authors concluded that impaired perception of facial expressions may contribute to behaviors associated with mania such as inappropriate approach when withdrawal would be more adaptive.

Given the strong fear of negative evaluation and the frequent presence of ideas of reference, individuals with BDD, like social phobics and delusional patients, might be particularly sensitive to facial expressions. For example, they might interpret a person's facial expression as negative although that person might have a neutral facial expression instead. Therefore, the ability to recognize facial expressions may play a role in the maintenance or even etiology of disorders that are characterized by a strong fear of negative evaluations such as social phobia and BDD. For example, studying recognition of facial expressions in children with social phobia, Simonian and colleagues found that clinically socially anxious children had significantly poorer facial expression recognition skills than had children with no psychiatric disorder (Simonian, Beidel, Turner, Berkes, & Long, 2001). Especially, socially anxious children performed poorer when presented with happy, sad and disgusted facial expressions. However, Simonian et al. (2001) failed to report the emotions to which the socially anxious children incorrectly misclassified the happy, sad, and disgusted facial expressions.

Taken together, information-processing biases for threatening facial expressions might play an important role why clinically anxious patients, especially those with an

excessive fear of negative evaluation such as social phobics and BDD patients, develop

or maintain these fears and consequently tend to avoid social situations.

2. General Aims of Study 1, Study 2, and Study 3

I intended to examine whether BDD patients are characterized by a tendency to interpret ambiguous information as threatening. To the extent that BDD shares core phenomenological features with social phobia and OCD, it may also resemble these anxiety disorders in terms of information-processing biases.

In Study 1, I explored whether BDD patients are characterized by a negative BDD-related interpretive bias. Given the similarity of BDD and social phobia, I further examined whether BDD patients are not only characterized by a negative BDD-related interpretive bias, but also by a negative bias for social information – a bias one would expect in social phobic patients. To address these hypotheses, I applied an Interpretation Questionnaire which was modeled after Butler and Mathews (1983).

In Study 2, I further examined interpretive biases in BDD using the RSVP paradigm (Williams & Tarr, 1998). The purpose of this study was to directly compare the results of Study 1 and Study 2 to examine whether interpretive biases would still be found if one controls for response biases such as the experimenter demand effect.

In Study 3, I examined the ability to recognize facial expressions in BDD. Given the strong fear of negative evaluation and the frequent presence of ideas of reference, individuals with BDD might be particularly sensitive to facial expressions. Based on previous findings in social phobia, I hypothesized that BDD patients exhibit an interpretive bias for angry facial expressions.

Furthermore, I explored in all studies whether these phenomena are typical for BDD or characterize a broader spectrum of psychological disorders such as OCD as well.

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3. Interpretive Biases for Ambiguous Information in Body Dysmorphic Disorder

(Study 1)

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3.1. Abstract

Anxiety-disordered patients and high trait anxious individuals tend to interpret ambiguous information as threatening. The purpose of this study was to investigate whether interpretive biases would also occur in body dysmorphic disorder (BDD). BDD is characterized by a preoccupation with imagined defects in one's appearance. We tested whether BDD participants, compared to OCD participants and healthy controls, choose threatening interpretations for ambiguous body-related, ambiguous social, and general scenarios. As we hypothesized, BDD participants exhibited a negative interpretive bias for body-related scenarios and for social scenarios, whereas the other groups did not. Moreover, both clinical groups exhibited a negative interpretive bias for general scenarios.

3.2. Introduction

Individuals with body dysmorphic disorder (BDD) are preoccupied with an imagined or slight defect in appearance (e.g., that the nose is too big). If the individual has a slight physical defect, the concern has to be extreme to qualify for a diagnosis of BDD.

Although currently classified as a somatoform disorder (American Psychiatric Association [APA], 1994), BDD shares many features with anxiety disorders. For example, both individuals with BDD and social phobia are characterized by a fear of negative evaluation in social situations (Hollander, Neville, Frenkel, Josephson, & Liebowitz, 1992). However, unlike BDD patients, concerns of individuals with social phobia are unrelated to their appearance.

There is also a link between BDD and OCD. Like OCD, BDD is characterized by intrusive thoughts that are difficult to control or resist. In addition, about 90% of individuals with BDD suffer from ritualistic, repetitive behaviors (Neziroglu, Anderson, & Yaryura-Tobias, 1999), including checking one's appearance in mirrors, skin picking, or frequent asking for reassurance. Moreover, both disorders have a similar age of onset and course, and a high comorbidity (Phillips, Atala, & Albertini, 1995).

Anxiety-disordered patients and individuals with high trait anxiety tend to selectively process threatening information, a bias that might contribute to the development or maintenance of emotional disorders (e.g., Williams, Watts, MacLeod, & Mathews, 1997). Investigating attentional processes in BDD, we found that individuals with BDD, in contrast to healthy controls, selectively attended especially to appearance-related information, and also to emotional appearance-unrelated information (Buhlmann,

McNally, Wilhelm, & Florin, 2002). Selective attention to appearance-related information, for example, might partly explain why individuals with BDD have to think about their imagined defect over and over again.

Another cognitive bias refers to the manner individuals interpret ambiguous information. Previous research has shown that anxious individuals tend to impose threatening interpretations on ambiguous stimuli (e.g., Amir, Foa, & Coles, 1998; McNally & Foa, 1987). Research on social phobia, for example, has shown that socially anxious individuals tend to draw negative conclusions about ambiguous social events, which might lead to increased anxiety and consequently to avoidance of those anxiety-provoking events (Amir et al., 1998). Specifically, Amir and colleagues showed that social phobic patients, compared to OCD patients and healthy controls, interpreted ambiguous social situations as threatening, even when the participants could choose between a threatening, neutral, and positive interpretation (Amir et al., 1998). Moreover, this interpretive bias was specific to self-relevant situations (i.e., imagining oneself being in that situation), and did not occur in non-self-relevant situations (i.e., imagining a good friend being in that situation). Furthermore, McNally and Foa tested whether agoraphobic patients, compared to recovered agoraphobics and healthy controls, are characterized by a negative interpretive bias when presented with ambiguous information that was related to their specific concerns (McNally & Foa, 1987). The results revealed that agoraphobic patients tended to interpret ambiguous scenarios that were related to their agoraphobic concerns in a more threatening way than did recovered agoraphobic patients and controls. Taken together, given the ambiguity in many situations, interpretation seems to be an important factor of whether a situation is perceived as

threatening. Consequently, negative interpretive biases may be a high risk factor for the development or maintenance of emotional disorders.

The purpose of the current study was to test whether BDD patients, like anxious patients, are characterized by a tendency to interpret ambiguous information as threatening. Specifically, given the close relation to social phobia, we explored whether BDD patients are not only characterized by a negative BDD-related interpretive bias, but also by a negative bias for social information. We also investigated whether these phenomena are specific to BDD or characterize a broader spectrum of psychiatric disorders such as OCD.

3.3. Method

3.3.1. Participants

The BDD group comprised 19 outpatients (14 women) who met DSM-IV (APA, 1994) criteria for BDD. The following comorbid diagnoses were present in the BDD group: major depression ($n = 7$), agoraphobia without panic disorder ($n = 1$), specific phobia ($n = 1$), trichotillomania ($n = 1$), and kleptomania ($n = 1$). Six BDD participants were unmedicated at the time of testing. The remaining 13 participants were currently on the following psychotropic medications: fluoxetine ($n = 7$), paroxetine ($n = 2$), fluvoxamine ($n = 3$), and clomipramine ($n = 1$). Fourteen BDD participants were unmarried (73.7%), 2 BDD participants were married (10.5%), and 3 BDD participants were divorced at the time of testing (15.8%).

The OCD group comprised 20 outpatients (9 women) who met DSM-IV (APA, 1994) criteria for OCD. The following comorbid diagnoses were present in the OCD group: alcohol abuse ($n = 1$), panic disorder without agoraphobia ($n = 1$), and chronic

motor tic ($\underline{n}$ = 1). Eight OCD participants were unmedicated at the time of testing. The remaining 12 participants were currently on the following psychotropic medications: fluoxetine ($\underline{n}$ = 4), paroxetine ($\underline{n}$ = 3), sertraline ($\underline{n}$ = 3), clonazepam ($\underline{n}$ = 1), and fluvoxamine ($\underline{n}$ = 1). Fourteen OCD participants were unmarried (70%), 5 OCD participants were married (25%), and 1 OCD participant was separated (5%).

Diagnoses in the patients' groups were determined by structured clinical interviews (Structured Clinical Interview for DSM-IV – Outpatient Version [SCID]; First, Spitzer, Gibbon, & Williams, 1995).

The healthy control group consisted of 22 participants (15 women). SCID interviews confirmed the absence of current or past psychiatric disorders. Fifteen control participants were unmarried (68.2%), and 7 control participants were married (31.8%).

As evident from Table 1, the healthy control group was matched with the BDD group and OCD group with respect to age, $\underline{F}$ (2, 57) = 0.09, $\underline{p}$ = .92, education, $\underline{F}$(2, 57) = 0.05, $\underline{p}$ = .95, verbal IQ, $\underline{F}$(2, 57) = 1.45, $\underline{p}$ = .24, and gender, χ^2 (2, 0.95) = 3.92, $\underline{p}$ = .14. All participants were native English speakers.

3.3.2. Material

Interpretation Questionnaire. To investigate interpretive biases, we designed an Interpretation Questionnaire modeled on the one developed by Butler and Mathews (1983). It consisted of 33 ambiguous scenarios (11 BDD-related, 11 social, and 11 general scenarios; see Figure 1). Each scenario consisted of a short description of the scenario and was followed by the question *What thoughts occur to you?*. Moreover, participants were provided with three possible thoughts and were asked to rate each thought on a scale from 0 (very unlikely) to 4 (very likely) in terms of their likelihood of

coming to mind. The following scenario is an example of an ambiguous BDD-related situation: *Your blind date says, "You're certainly not what I expected". What thoughts occur to you?* a) *I get nervous about having made such a bad impression*, b) *I feel confident that I impressed him/her*, c) *Whatever it meant, I don't take this comment serious*. The following scenario is an example of an ambiguous social situation: *You are having a conversation with some friends. You say something and the conversation stops. What thoughts occur to you?* a) *They are thinking about what I just said*, b) *There was nothing more to say on this topic*, c) *I must have said something foolish or insulting*. The following scenario is an example of a general ambiguous situation: *You turn on the key but your car doesn't start. What thoughts occur to you?* a) *The engine is still cold*, b) *I have to give it more gas*, c) *The starter is broken*. Experienced clinicians rated the scenarios in terms of the appropriateness for each category, and we included only scenarios that were rated as highly appropriate to represent the particular concerns.

Furthermore, Cronbach's coefficient alpha values were calculated for each of the categories. Reliability analyses yielded alpha values ranging from 0.74 to 0.93, with only two values falling below 0.80 (see Table 2).

Psychometrics. Participants completed a form that asked about demographic information such as age, gender, education, and marital status. Furthermore, they completed the following questionnaires: the Beck Depression Inventory (BDI; Beck & Steer, 1987), the Body Dysmorphic Disorder Modification of the YBOCS (BDD-YBOCS; Phillips et al., 1997), the Fear of Negative Evaluation Scale (FNE; Watson & Friend, 1969), and the Shipley Institute of Living Scale (Zachary, 1991).

The Beck Depression Inventory (BDI) is a 21-item inventory that examines the severity of depression. Each item describes a manifestation of depression. Specifically,

each item has a series of four self-evaluative statements that indicate the severity of a particular symptom. Statements are rated from 0 (no symptom) to 3 (most severe symptom). The total score can range from 0 to 63. It has a good test-retest reliability for one to three month (.74; Rehm, 1988). Tests of internal consistency produce alpha coefficients of .76 to .95 (Rehm, 1988). Moreover, the BDI has a high correlation with the Hamilton Rating Scale (r = .82; Hamilton, 1960).

The Body Dysmorphic Disorder Modification of the YBOCS (BDD-YBOCS; Phillips et al., 1997; see General Appendix A) is a modified version of the Yale-Brown Obsessive-Compulsive Scale (Goodman et al., 1989). It consists of 12 items that measure the severity of BDD symptoms during the past week. Each item assesses a particular symptom of BDD and is rated from 0 (no symptom) to 4 (extreme symptom). The total score varies from 0 to 48. Intraclass correlation coefficients reveal that the interrater reliabilities both for the total score and for the individual item score are very high (rr = .79 - 1.00; Phillips et al., 1997).

The Fear of Negative Evaluation Scale (FNE) examines the expectation and fear of negative evaluation. The original version consists of 30 items which are rated by the participants as true or false. The short version (Leary, 1983) consists of 12 items. Each item assesses a particular symptom of social phobia and is rated on a Likert-type scale from 1 ("Not at all characteristic of me") to 5 ("Extremely characteristic of me"). We used the short version because the correlation between the original and the short version is very high (r = .96). Both the original and the short version have also very high interitem reliabilities (alpha = .92 and .94). The test-retest reliability for one month is satisfactory (r = .78; Leary, 1983).

The Shipley Institute of Living Scale examines general intelligence. It consists of a vocabulary test and an abstract thinking test. The vocabulary test consists of 40 items. For each item, participants are instructed to choose which of four words describes the target word best. The abstract thinking test consists of 20 items. Participants are given a logical sequence and are required to complete the numbers or letters that best complete it. The Shipley Institute of Living Scale yields a measure of general intellectual functioning that correlates .74 with the Full Scale IQ as measured by the Wechsler Adult Intelligence Scale - Revised (Wechsler, 1981). We only used the vocabulary test. Mean scores and standard deviations are presented in Table 1.

3.3.3. Design

A 3 (Group: BDD, OCD, Healthy Control) X 6 (Category: BDD-related threatening, BDD-related nonthreatening, Social anxiety-related threatening, Social anxiety-related nonthreatening, general threatening, general nonthreatening) factorial design was used. The first variable was measured between-subjects, whereas the last variable was measured within subjects.

3.3.4. Procedure

Participants first completed the Interpretation questionnaire in which they were presented with the following instructions:

This questionnaire describes a variety of every day situations. These situations might mean different things to different people. Please try to imagine yourself in each situation and think about the thoughts the

specific situation would evoke in **you**. After this, please indicate EACH

of the three thoughts connected to the situation how **likely** it is that it

would come to your mind under similar circumstances. Rank each

thought from 0 to 4 where 0 means "very unlikely" and 4 means "very

likely".

Some situations might not be very typical for you. Please try to picture

yourself in them anyway and indicate the probability that each of the

three thoughts would come to your mind. There are no right or wrong

answers. Please do not think too long about the rating before you decide

on it. **Your first impression is important to us**.

After that, they completed the BDI, BDD-YBOCS, FNE, and Shipley Institute of

Living Scale. They were then paid and debriefed about the purpose of the study.

3.4. Results

3.4.1. Psychometric data

The mean scores for the questionnaires at the time of experimental testing are

presented in Table 1. Analyses of variance (ANOVAs) confirmed differences among

groups on the BDD-YBOCS, $F(2, 56) = 80.80$, $p < .001$, the BDI, $F(2, 56) = 28.45$, $p <$

.001, and the FNE, $F(2, 56) = 27.64$, $p < .001$. However, data of one participant were

missing. Post hoc Bonferroni-corrected t-tests indicated the following differences

between the groups (see Table 1).

3.4.2. Interpretation Questionnaire

We predicted that BDD participants, compared to OCD participants and healthy controls, are characterized by a BDD-related and social anxiety-related negative interpretive biases. Furthermore, we hypothesized that both patient groups show a general negative interpretive bias, whereas control participants ought not show this bias. We first submitted the data to a 3 (Group: BDD, OCD, Healthy Control) X 6 (Category: BDD-related threatening, BDD-related nonthreatening, social anxiety-related threatening, social anxiety-related nonthreatening, general threatening, general nonthreatening) ANOVA with repeated measurements on the second variable. This analysis yielded a significant main effects for Group, $\underline{F}(2, 58) = 3.61$, $\underline{p} = .03$, and Category, $\underline{F}(5, 290) = 46.81$, $\underline{p} < .001$. Moreover, it yielded a significant Category X Group interaction, $\underline{F}(10, 290) = 16.63$, $\underline{p} < .001$. As evident from Figures 2 and 3, post hoc Tukey multiple comparisons and paired $\underline{t}$-tests revealed the following effects:

BDD-related Scenarios. When presented with BDD-related scenarios, BDD participants rated the likelihood of threatening thoughts as significantly higher, compared to control participants, $\underline{p} < .001$, effect size $\underline{r} = .71$, and to OCD participants, $\underline{p} < .001$, effect size $\underline{r} = .72$. Moreover, they rated the likelihood of nonthreatening thoughts as significantly lower, compared to control participants, $\underline{p} < .001$, effect size $\underline{r} = .56$, and to OCD participants, $\underline{p} = .002$, effect size $\underline{r} = .48$. However, paired $\underline{t}$-tests within the BDD group indicated that BDD participants did not rate the likelihood of threatening thoughts as higher than that of nonthreatening thoughts, $\underline{t}(18) = .65$, $\underline{p} = .53$, effect size $\underline{r} = .13$. OCD participants and controls did not differ with respect to the ratings for threatening thoughts, $\underline{p} = .54$, effect size $\underline{r} = .17$, and nonthreatening thoughts, $\underline{p} = 84$, effect size $\underline{r} = .10$. Moreover, significant differences were obtained for the ratings of the likelihood of

threatening and nonthreatening thoughts in the OCD group, $\underline{t}(19) = 10.89$, $\underline{p} < .001$, effect size $\underline{r} = .87$, and in the control group, $\underline{t}(21) = 8.92$, $\underline{p} < .001$, effect size $\underline{r} = .85$. That is, both OCD participants and controls rated the likelihood of nonthreatening thoughts as significantly higher than the likelihood of threatening thoughts.

Social Scenarios. In the social anxiety category, a similar pattern occurred. BDD participants rated the likelihood of threatening thoughts as significantly higher, compared to control participants, $\underline{p} < .001$, effect size $\underline{r} = .53$, and to OCD participants, $\underline{p} = .002$, effect size $\underline{r} = .46$. BDD participants also rated the likelihood for nonthreatening thoughts as significantly lower, compared to controls, $\underline{p} = .002$, effect size $\underline{r} = .50$, and to the OCD group, $\underline{p} = .009$, effect size $\underline{r} = .38$. Paired $\underline{t}$-tests within the BDD group, however, indicated that BDD participants did not rate the likelihood of threatening thoughts as higher, compared to the likelihood of nonthreatening thoughts, $\underline{t}(18) = .88$, $\underline{p} = .39$, effect size $\underline{r} = .18$. Again, no significant differences occurred between the OCD participants and the controls with respect to the ratings for threatening thoughts, $\underline{p} = .50$, effect size $\underline{r} = .17$, and for nonthreatening thoughts, $\underline{p} = .67$, effect size $\underline{r} = .13$. Moreover, paired $\underline{t}$-tests obtained significant differences for the ratings of the likelihood of threatening and nonthreatening thoughts in the OCD group, $\underline{t}(19) = 5.34$, $\underline{p} < .001$, effect size $\underline{r} = .64$, and in the control group, $\underline{t}(21) = 5.93$ $\underline{p} < .001$, effect size $\underline{r} = .71$. That is, both OCD participants and controls rated the likelihood of nonthreatening thoughts as significantly higher than the likelihood of threatening thoughts.

General Scenarios. In the general category, BDD participants rated the likelihood for threatening thoughts as significantly higher, compared to controls, $\underline{p} = .04$, effect size $\underline{r} = .37$. As we predicted, there was no difference between the BDD group and OCD group in their rating of the likelihood for threatening thoughts in general scenarios, $\underline{p} =$

.88, effect size r = .09. Furthermore, OCD participants rated the likelihood for threatening thoughts significantly higher than did controls, p = .01, effect size r = .41. With respect to nonthreatening thoughts, BDD participants rated them as less likely than did controls. However, this difference was only marginally significant, p = .06, effect size r = .37. However, paired t-tests within the BDD group indicated that BDD participants did not rate the likelihood of threatening thoughts as higher than that of nonthreatening thoughts, $t(18)$ = 1.39, p = .18, effect size r = .26. As we predicted, no difference was obtained between the BDD group and OCD group, p = .39, effect size r = .19. The difference between the OCD group and the controls was also nonsignificant, p = .61, effect size r = .15. Moreover, paired t-tests indicated that OCD participants rated the likelihood of threatening thoughts higher than the likelihood of nonthreatening thoughts. However, this difference fell short of significance, $t(19)$ = 2.04, p = .06, effect size r = .31. Controls, in contrast to the other groups, rated the likelihood of nonthreatening thoughts as significantly higher than they rated the likelihood of threatening thoughts, $t(21)$ = 6.19, p < .001, effect size r = .72.

3.4.3. Comorbidity of Depression

To estimate whether depression had a significant effect on the likelihood ratings, we conducted Mann Whitney U tests between the BDD participants who met criteria for comorbid depression and those who were not depressed. As evident from Table 3, no differences between the groups were obtained (ps > .05). Furthermore, we calculated effect size correlation r between those groups. As evident from Table 3, effect sizes between the groups were low indicating that it is unlikely that depression had an significant influence on the results. Furthermore, we conducted Wilcoxon Signed Ranks

Tests within each group (depressed versus nondepressed BDD participants). Within the depressed BDD group, we found no significant differences between the ratings of threatening and nonthreatening thoughts in the BDD-related scenarios, $Z = 1.18$, $p = .24$, in the social anxiety-related scenarios, $Z = 1.27$, $p = .20$, and in the general scenarios, $Z = .14$, $p = .89$. Within the nondepressed BDD group, we also found no significant differences between the ratings of threatening and nonthreatening thoughts in the BDD-related scenarios, $Z = .314$, $p = .75$, in the social anxiety-related scenarios, $Z = .94$, $p = .35$, and in the general scenarios, $Z = 1.58$, $p = .11$.

In summary, both BDD participants and OCD participants rated threatening thoughts in general scenarios as significantly more likely and nonthreatening thoughts as significantly less likely, compared to control participants. Furthermore, BDD participants rated threatening thoughts in BDD-related scenarios as significantly more likely and nonthreatening thoughts as significantly less likely than OCD participants and controls. The same effect was found in social anxiety-related scenarios indicating that BDD participants show a negative interpretive bias for BDD-related and social anxiety-related information, whereas this effect was not found in the OCD group and the control group. Paired t-tests within each group, however, indicated that BDD participants did not rate nonthreatening thoughts as less likely than threatening thoughts in all scenario types, whereas the opposite patterns occured in the OCD and control groups. That is, both OCD participants and controls rated nonthreatening thoughts as more likely than threatening thoughts in all scenario types. However, in the OCD group, the difference in the general scenarios fell short of significance. Moreover, further analyses suggest that comorbid depression had no significant influence on the likelihood ratings of the thoughts.

3.5. Discussion

Both BDD participants and OCD participants exhibited a negative interpretive bias in general situations which may indicate a general not disorder-specific vulnerability. In other words, patients might be characterized by a general tendency to interpret ambiguous situations in a negative way, no matter what kind of psychiatric diagnosis they have. One explanation might be that those individuals who exhibit a negative interpretive bias for general ambiguous situations are more prone to develop a psychiatric disorder when confronted with life stressors than other individuals are. On the other hand, it might be that patients with psychological disorders, once they developed their negative interpretive biases, overgeneralize these information-processing errors to ambiguous general situations.

Consistent with previous research in anxiety-disordered and depressive patients, BDD participants revealed a disorder-specific negative interpretive bias. In other words, they rated the likelihood that they would experience negative body-related interpretations as significantly higher than did participants without BDD. For example, an individual with BDD is more likely to interpret somebody laughing behind him as a negative response to his or her appearance than people who do not have BDD.

Furthermore, just like the social phobic participants in the study by Amir et al. (1998), our BDD participants were characterized by a negative interpretive bias for social information. This effect was also specific for the BDD group and could not be found in the OCD group and control group. This result is very interesting especially because none of the BDD participants met criteria for comorbid social phobia. Thus, BDD patients do not only seem to have similar clinical features with social phobic patients such as a strong

fear of negative evaluation, but also seem to have similar information-processing biases, supporting the hypothesis that BDD might indeed be related to social phobia.

What are the clinical implications of this study? BDD patients tend to interpret ambiguous everyday events as threatening, which might, in turn, confirm distorted beliefs about themselves and their body image. As a result, this might lead to even more emotional vulnerability for ambiguous situations. Given that the meaning of a situation is not always obvious, the way individuals interpret it is an important factor of whether a situation is anxiety-provoking or not. For example, an individual with BDD might interpret somebody looking at him or her in a threatening way (e.g., "that person was staring at me because I look so hideous"), whereas that person might simply have looked at the BDD sufferer for entirely unrelated reasons.

However, although BDD patients interpret ambiguous scenarios as threatening, compared to the other groups, they do not differ in their likelihood ratings of threatening and nonthreatening thoughts. In other words, although BDD patients interpret ambiguous scenarios as more threatening as OCD patients and controls, they might, nevertheless, be more open for all different kinds of threatening and nonthreatening interpretations. For example, even if BDD patients rate the likelihood of a threatening thought (e.g., *That person is staring at me because of my horrible nose*) higher than the other groups, they do not rate the likelihood of a nonthreatening thought (e.g., *The person might know me from seeing*) lower than the likelihood of the threatening thought.

OCD patients and controls, however, may be characterized by a "nonthreatening interpretive bias". That is, they rate – unlike BDD patients - the likelihood of a nonthreatening thought higher than the likelihood of a threatening thought.

This study has a number of limitations. Unsurprisingly, seven participants in the BDD group met criteria for comorbid depression. Separate analyses between depressed and nondepressed BDD participants indicated that there were no differences between the two groups with respect to their likelihood ratings. Moreover, analyses of effect sizes of depressed and nondepressed BDD participants indicated that it is unlikely that depression had a significant influence on the results. However, given the small sample size, this finding needs to be replicated with a bigger sample size. Furthermore, 13 BDD participants and 12 OCD participants were medicated at the time of testing which might have influenced their test performance. However, comparing neuropsychological performance in medicated and unmedicated OCD patients treated with serotonin reuptake inhibitors (SRIs), Mataix-Cols and colleagues recently found that SRI-medicated and unmedicated OCD patients performed equally on cognitive domains such as attention, visuo-spatial skills, verbal and non-verbal memory, and executive functioning (Mataix-Cols, Alonso, Pifarre, Menchon, & Vallejo, 2002). These findings are consistent with previous findings comparing neuropsychological performance in medicated versus unmedicated OCD patients (Purcell, Maruff, Kyrios, & Pantelis, 1998; Savage et al., 2000). Therefore, it seems unlikely that the results of the current study would have been different if we had only tested unmedicated patients. It might even be that we had found stronger effects if we had tested only unmedicated patients. Another limitation is that we did not include an OCD-related scenario type to directly compare possible negative interpretive biases between BDD and OCD patients. Furthermore, it is possible that BDD patients exhibited a negative interpretive bias for both BDD-related and social scenarios because of an overlap of the stimulusmaterial. That is, the stimuli used BDD-related scenarios and in the social scenarios were too similar. However, all scenarios were rated

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by experienced clinicians in terms of their appropriateness to represent the social phobic patients' concerns and to represent the specific BDD patients' concerns.

Our findings support one of the basic concepts underlying cognitive therapy, namely that individuals with emotional disorders have interpretive biases that cause or maintain anxiety. Indeed, cognitive models that guide BDD treatments have just been developed in recent years (e.g., Wilhelm & Neziroglu, 2002) and propose that individuals interpret normal visual input (such as minor flaws) and normal situations in a distorted way which leads to further cognitive, emotional and behavioral consequences.

If negative interpretive biases might contribute to anxiety, the crucial question is whether they can be modified or changed. Evidence for this has been found by McNally and Foa (1987) who found that these biases are absent in those patients who have responded well to cognitive behavioral therapy. Future research in BDD is needed to examine these biases before and after cognitive behavioral therapy. This investigation of the role and nature of interpretive biases in BDD will be beneficial for diagnostic assessments and the development of cognitive-behavioral treatments which focus directly on the modification of maladaptive interpretations. For example, the findings of this study might help to develop specific inventories for BDD which directly assess dysfunctional thoughts such as the patients' interpretations during the course of treatment.

3.6. Appendix

Table 1

Psychometric Data

Variable	BDD Group		OCD Group		Control Group	
	$\underline{M}$	$\underline{SD}$	$\underline{M}$	$\underline{SD}$	$\underline{M}$	$\underline{SD}$
BDD-YBOCS	25.42_a	6.26	5.83_b	7.24	4.14_b	3.75
BDI	17.00_a	8.39	8.22_b	6.62	2.55_c	2.30
FNE	49.84_a	7.59	41.67_b	9.84	29.45_c	9.02
Age	30.68_a	10.18	31.37_a	10.37	32.09_a	11.66
Education	16.58_a	2.55	16.68_a	2.06	16.45_a	2.15
Verbal IQ	60.53_a	4.83	60.37_a	3.44	62.32_a	3.96

Notes. BDD-YBOCS = Body Dysmorphic Disorder Modification of the YBOCS; BDI =

Beck Depression Inventory; FNE = Fear of Negative Evaluation Scale; Age in years;

Education = Years of Education; Verbal IQ = Shipley Institute of Living Scale t-scores;

Means sharing subscripts do not differ ($\underline{p}$ > .05, Bonferroni-corrected).

Table 2

Cronbach's Coefficient Alpha for the Interpretation Questionnaire

Category/Subscale	Cronbach's Coefficient Alpha
BDD- threatening	0.93
BDD- nonthreatening	0.89
Social anxiety- threatening	0.89
Social anxiety- nonthreatening	0.87
General threatening	0.79
General nonthreatening	0.74

Table 3

Effects of Depression on Interpretation in the BDD Group

	Depressed Group		Nondepressed Group			
Category	M	SD	M	SD	p	r
BDD-threatening	2.48	0.78	2.20	0.73	.38	.18
BDD-nonthreatening	2.03	0.39	2.20	0.58	.48	.17
Social anxiety-threatening	2.51	0.81	2.09	0.65	.14	.27
Social anxiety-nonthreatening	1.88	0.40	2.11	0.56	.23	.23
General-threatening	2.01	0.59	1.90	0.39	.90	.11
General-nonthreatening	2.14	0.33	2.22	0.52	.97	.09

Notes. BDD-threatening= likelihood of threatening thoughts in BDD-related scenarios; BDD-nonthreatening = likelihood of nonthreatening thoughts in BDD-related scenarios; Social anxiety-threatening = likelihood of threatening thoughts in social anxiety-related scenarios; Social anxiety-nonthreatening = likelihood of nonthreatening thoughts in social anxiety-related scenarios; General-threatening = likelihood of threatening thoughts in general scenarios; General-nonthreatening = likelihood of nonthreatening thoughts in general scenarios; r = effect size correlation; p = statistical significances were computed using Mann Whitney U tests

Figure 1

Examples of BDD-related, Social anxiety-related, and General Scenarios

BDD-related scenario

While talking to some colleagues, you notice that some people take special notice of you.

What thoughts occur to you?

a) I am sure they are judging the way I look.

b) They probably agree with my opinion.

c) They are interested in our conversation.

Social anxiety-related scenario

You are having a conversation with some friends. You say something and the conversation stops.

What thoughts occur to you?

a) They are thinking about what I just said.

b) There was nothing more to say about this topic.

c) I must have said something foolish or insulting.

General scenario

A letter marked "URGENT" arrives.

What thoughts occur to you?

a) It is probably an ad designed to attract my attention.

b) Maybe I forgot to pay a bill.

c) Somebody must have died or is seriously ill.

Figure 2

Likelihood of Threatening Interpretation of Ambiguous BDD-related, Social anxiety-related, and General Scenarios
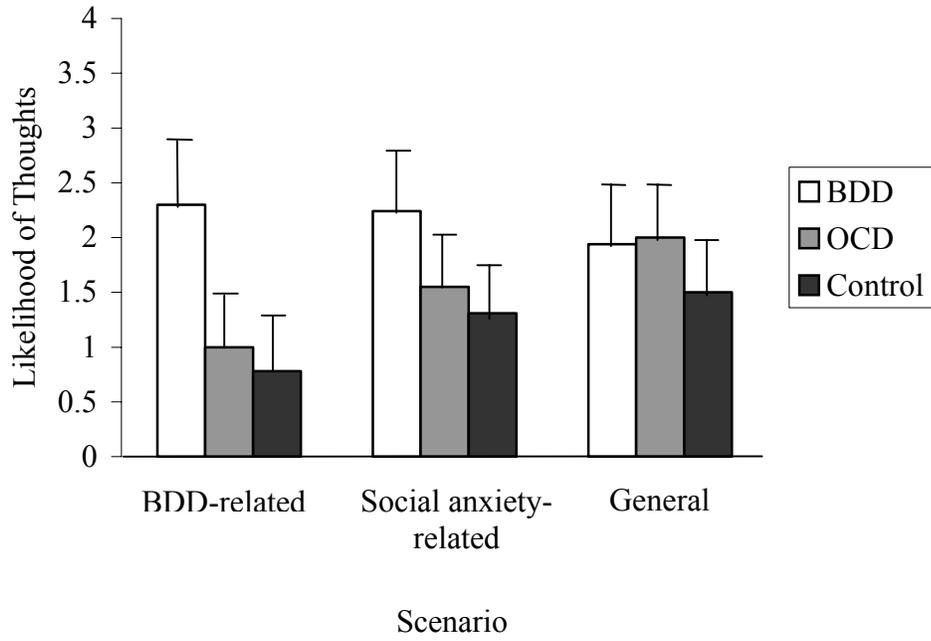
Figure 3

Likelihood of Nonthreatening Interpretation of Ambiguous BDD-related, Social anxiety-related, and General Scenarios
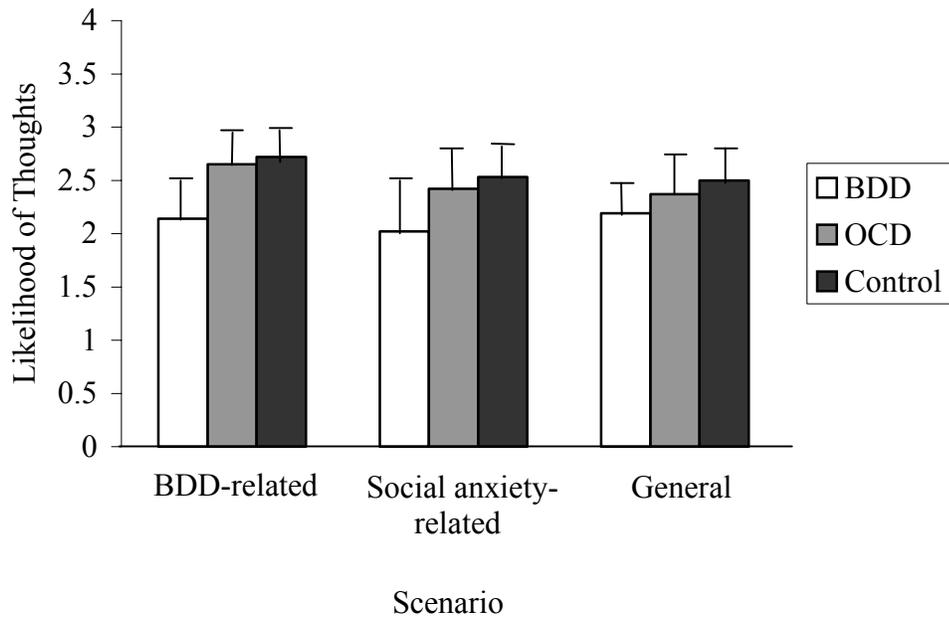
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4. Interpretive Biases for Ambiguous Information in Body Dysmorphic Disorder:

A Text Comprehension Study

(Study 2)

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4.1. Abstract

Anxiety patients and high trait anxious individuals interpret ambiguous stimuli as threatening. In the current study, we investigated interpretive biases in body dysmorphic disorder (BDD) whose hallmark is a preoccupation with imagined defects in one's appearance. Specifically, we used a text comprehension paradigm that controls for response bias. We tested whether BDD participants, compared to OCD participants and healthy controls, interpret ambiguous social and ambiguous body-related information as threatening. As we hypothesized, BDD participants exhibited a negative interpretive bias for body-related information. However, they did not exhibit an interpretive bias for social and general information. As predicted, OCD participants exhibited a bias for general information, whereas controls, in contrast to the other groups, exhibited a bias for social information.

4.2. Introduction

Body dysmorphic disorder (BDD) is a chronic, debilitating syndrome characterized by distress about imagined defects in one's appearance (American Psychiatric Association [APA], 1994). Individuals with BDD are preoccupied about defects in their skin, hair, nose, ears, and so forth that are either completely imaginary or, if there is a slight physical defect, their concern is very excessive. Furthermore, BDD is characterized by repetitive behaviors (e.g., excessive grooming, mirror checking, skin picking) and avoidance behaviors (e.g., avoidance of social situations, mirrors; Phillips, McElroy, Keck, Pope, & Hudson, 1993). Instead of seeking psychiatric help, many BDD patients repeatedly undergo plastic surgeries which produce only temporary relief (e.g., Phillips et al., 1993; Hollander, Cohen, & Simeon, 1993). Although classified among the somatoform disorders, BDD shares many features with anxiety disorders such as social phobia and obsessive-compulsive disorder (OCD). Like social phobia patients, BDD patients exhibit fear and avoidance of situations in which they may be exposed to scrutiny and negative evaluation (about their appearance). Like OCD, BDD is characterized by recurrent, intrusive thoughts about one's "ugliness" that are difficult to resist and that prompt checking (e.g., glancing in mirrors) and excessive grooming.

There has been increased interest in information-processing biases in emotional disorders. This research has shown that emotionally disturbed patients preferentially process information having personal emotional significance. Among the biases most frequently studied are those of attention and memory (for a review, see Williams, Watts, MacLeod, & Mathews, 1997), but also interpretation of ambiguous information (e.g., Butler & Mathews, 1983; McNally & Foa, 1987; Amir, Foa, & Coles, 1998). Selective processing of emotional information may contribute to emotional disturbance. For

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example, selective attention to threatening information and negative interpretive biases should increase anxiety. Specifically, investigating selective attention, MacLeod and colleagues experimentally induced attentional biases either towards negative information or away from negative information and subsequently had participants complete a standardized stress task (MacLeod, Rutherford, Campbell, Ebsworthy, & Holker, 2002). They found that those participants who were trained to attend toward negative information were those most emotional vulnerable to a subsequent stressor. Furthermore, research on social phobia, for example, has shown that socially anxious individuals tend to draw negative conclusions about ambiguous social events, which might lead to increased anxiety and to avoidance of those anxiety-provoking events (Amir et al., 1998). Specifically, Amir and colleagues have shown that social phobia patients, compared to OCD patients and controls, interpreted ambiguous social situations as threatening, even when the participants could choose between a threatening, neutral, and positive interpretation. Moreover, this interpretive bias was specific to self-relevant situations (i.e., imagining oneself being in that situation), and did not occur in non-self-relevant situations (i.e., imagining a good friend being in that situation).

To the extent that BDD shares core phenomenological features with social phobia and OCD, it may also resemble these anxiety disorders in terms of information-processing biases. However, there is not much research on BDD, and only two studies on cognitive biases in BDD. Examining selective attention in BDD, we recently found that BDD patients, unlike most anxiety patients, exhibit attentional biases especially for concern-related positive information (e.g., *beautiful*, *attractive*) and not, like most anxiety patients, for concern-related negative information (e.g., *disfigured*, *ugly*; Buhlmann, McNally, Wilhelm, & Florin, 2002). In the other study, we asked BDD patients, OCD

patients, and healthy controls to rate ambiguous body-related, ambiguous social, and general scenarios (Buhlmann, Wilhelm et al., 2002). As we hypothesized, BDD patients, compared to the other groups, exhibited a negative interpretive bias for body-related scenarios and for social scenarios, whereas the other groups did not. Moreover, both clinical groups exhibited a negative interpretive bias for general scenarios.

But as MacLeod and Cohen (1993) observed, most studies on interpretive biases have methodological limitations. Specifically, it was unclear whether our results reflected an interpretive bias or an anxiety-linked response-selection bias. It is certainly possible that patients immediately disambiguated these scenarios as threatening, thereby exhibiting an interpretive bias. On the other hand, they may have initially entertained diverse interpretations, not necessarily threatening ones, but then settled on a threatening interpretation as their final answer. Hence, what might appear to be a bias at the early interpretive stage of processing might actually reflect a late-stage response-selection bias. In other words, it is unclear whether in our first interpretation study (Buhlmann, Wilhelm, et al., 2002) the results were caused by a response bias.

MacLeod and Cohen (1993) used the Rapid Serial Visual Presentation (RSVP; Williams & Tarr, 1998) paradigm to distinguish interpretive from response biases in high- and low-trait anxious individuals. The advantage of this paradigm is that it enables researchers to determine the participants' initial interpretive response to ambiguous lexical input. On each trial, the participant views and reads two successive sentences. The first sentence of each pair is ambiguous (*They completed the service by filling in the hole*), and the second sentence is either a plausible continuation for a threatening meaning (threat continuation condition, e.g., *The funeral finished much sooner than had been expected*) or a nonthreatening meaning (nonthreat continuation condition, e.g., *The*

repairs finished much sooner than had been expected) of the initial ambiguous sentence.

Participants begin a trial by pressing the space bar which presents the first (ambiguous) sentence. After reading it, they press the space bar again to view the second (continuation) sentence which is either a nonthreatening or threatening continuation of the first sentence. When the participants press the space bar for the third time, they see a single question (*Did the service take less time than anticipated?*) which they answer with either *Yes* or *No* by pressing one of two other keys. The dependent measure is the time between the second pressing of the space bar (which presents the continuation sentence) and the following key press that ends the display of the continuation sentence and replaces it with the question. Accordingly, on each trial the software provides an index of the comprehension latency for each continuation sentence. However, participants believe that the answer of the subsequent question is the variable of interest.

Using this procedure, MacLeod and Cohen (1993) compared the relative comprehension latencies for the two types of continuation sentences across three experimental conditions, in which (1) the initial sentence was ambiguous, (2) the initial sentence was unambiguously threatening, or (3) the initial sentence was unambiguously nonthreatening. That is, they subtracted, for each experimental condition, the comprehension latencies for the threat continuation sentences from the nonthreat continuation sentences. If the participants consistently interpret the initial sentence as threatening when it is ambiguous, they ought to exhibit the same relative comprehension latencies for the two types of continuation sentences: when the initial sentence is ambiguous and when the initial sentence is unambiguously threatening. But they ought to have disproportionately long comprehension latencies for threat continuations in the third condition (in which the initial sentence is unambiguously nonthreatening). In other

words, they should respond to ambiguous input as if it were threatening. In contrast, if the participants impose the less threatening meaning on the initial sentence when it is ambiguous, they ought to show the same relative comprehension latencies for the two types of continuation sentence in the first condition (in which the initial sentence is ambiguous) and in the third condition (in which the initial sentence is unambiguously nonthreatening), but should exhibit disproportionately long comprehension latencies for nonthreat continuations under the second condition (in which the initial sentence is unambiguously threatening). Therefore, the initial sentence was presented under three "cue" conditions. That is, each sentence pair was proceeded by a single word (cue), which was used to either orient the participant to the meaning of the sentence (*Burial*: threat cue; *Renovate*: nonthreat cue) or to leave it completely ambiguous (*?????*). Participants were told that this cue would provide a hint about the topic of the following passage, and they were instructed to use this hint to develop an anticipation of the sentence's theme.

Testing these hypotheses with high-and low-trait anxious individuals, MacLeod and Cohen (1993) found that the high-trait anxious individuals selectively imposed the threatening interpretations on unconstrained ambiguous sentences. In contrast, the low-trait anxious individuals selectively imposed the nonthreatening interpretations on the ambiguous sentences.

The purpose of the present study was to test whether BDD patients, like other depressed and anxious patients, are characterized by a tendency to interpret ambiguous information as threatening. By using the RSVP paradigm, we investigated whether these phenomena are specific to BDD or characterize OCD as well. Based on previous findings (Buhlmann, Wilhelm et al., 2002), we hypothesized that BDD patients are not

only characterized by a negative interpretive bias for ambiguous BDD-related scenarios, but also for ambiguous social scenarios and for general ambiguous scenarios. Moreover, based on these findings, we expected that OCD patients would exhibit a negative interpretive bias only for general ambiguous scenarios, whereas no biases for threat were exprected in the control group.

4.3. Method

4.3.1. Participants

The BDD group comprised 18 outpatients (5 men) who met DSM-IV (APA, 1994) criteria for BDD as determined by structured clinical interviews (SCID; First, Spitzer, Gibbon, & Williams, 1995). BDD patients had the following comorbid diagnoses: major depression ($\underline{n}$ = 7), agoraphobia without panic disorder ($\underline{n}$ = 1), and social phobia ($\underline{n}$ = 1). Five BDD participants were unmedicated at the time of testing. The remaining 13 participants were currently on the following psychotropic medications: fluoxetine ($\underline{n}$ = 7), fluvoxamine ($\underline{n}$ = 3), paroxetine ($\underline{n}$ = 2), and clomipramine ($\underline{n}$ = 1). Furthermore, fifteen BDD participants were single at the time of testing (83.3%), 1 BDD participant was married (5.6%), and 2 BDD participants were divorced at the time of testing (11.1%).

The OCD group comprised 18 outpatients (5 men) who met DSM-IV (APA, 1994) criteria for OCD as determined by the SCID (First et al., 1995). Only one OCD patient had a comorbid diagnosis (major depression). Five OCD participants were unmedicated at the time of testing. The remaining 13 participants were currently on the following psychotropic medications: fluoxetine ($\underline{n}$ = 4), fluvoxamine ($\underline{n}$ = 1), paroxetine ($\underline{n}$ = 3), sertraline ($\underline{n}$ = 3), clomipramine ($\underline{n}$ = 1), and clonazepam ($\underline{n}$ = 1). Eleven OCD

participants were single at the time of testing (61%), 5 OCD participants were married (27.8%), 1 OCD participant was separated (5.6%), and 1 OCD participant was divorced at the time of testing (5.6%).

The control group consisted of 18 participants (5 men). SCID interviews confirmed the absence of any psychiatric history. Fourteen control participants were single at the time of testing (77.8%), and 4 of the control participants were married at the time of testing (22.2%).

As evident from Table 1, the control group did not differ from the BDD group and OCD group with respect to age, $\underline{F}$(2, 53) = .32, $\underline{p}$ = .73, education, $\underline{F}$(2, 53) = .14, $\underline{p}$ = .87, verbal IQ, $\underline{F}$(2, 53) = 1.67, $\underline{p}$ = .20, and gender, χ^2 (2, 0.95) = 1.14, $\underline{p}$ = .57. All participants were native English speakers.

4.3.2. Material

Stimulus sentence set. The experimental material comprised 54 sentence sets (18 BDD-related, 18 social phobia-related, and 18 general sentence sets; see General Appendix B). The general sentence sets were adapted from MacLeod and Cohen (1993). The social sentence sets were adapted from A. Hähnel who had already used these sentences in a previous study (personal communication, January 20, 2000). BDD-related sentence sets were created by experienced clinicians. All sentence sets were again rated by experienced clinicians, and we included only those sentences that represented the patients' specific concerns. Each set consisted of an ambiguous first sentence (e.g., *Bob was watching Susan from a distance.*) that had one threatening meaning and one nonthreatening meaning. Moreover, each sentence set contained two versions of a second sentence, each representing a plausible continuation of the first sentence (e.g., *He*

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had never liked the way she looked [threatening continuation]; *He had always liked the way she looked* [nonthreatening continuation]). Three different cue words were also included in each sentence set: one threat cue word (e.g., *repulsion*), one nonthreat cue word (e.g., *attraction*), and no cue (*?????*). Finally, each sentence set contained a single question for which the answer was either yes or no. Furthermore, each question was composed in a way that it could be answered regardless of the previous continuation sentence (threatening vs. nonthreatening continuation). For example, *Was Bob indifferent towards Susan*?

Experimental hardware. A Macintosh Powercomputing Powerbase 180 computer presented the stimuli. In addition, the computer measured the participants' reading times -- that is, comprehension latencies -- (in milliseconds). Three buttons were used. Participants pushed the space bar to advance to the next sentence and to the next trial. Two other buttons (on the left and right side of the space bar), labeled with Y for 'Yes' and N for 'No', were used by the participants to register their response to the questions.

Experimental software. We used the RSVP software (Williams & Tarr, 1998) which presented the participants with 54 experimental trials. Each trial consisted of one stimulus sentence set, presented with black letters on a white background. Participants read the following instructions:

During this part of the study we will present 57 short scenarios to you.

Each scenario consists of a headline followed by two sentences. Based on

the headline, we want you to form a clear anticipation of the passage topic.

In some of the scenarios there won't be a headline. Instead, you will see a

string of question marks. In this case, we don't expect you to form any

anticipations. After reading the headline and anticipating the upcoming scene, please press the long space bar on the computer keyboard. After you press the space bar, you will see the first sentence of the scenario. Read this sentence carefully until you understand the meaning. After you understand the meaning, press the space bar again. Then the second sentence will appear on the computer screen in front of you.

Again, read the sentence until you fully understand the meaning and press the space bar. Read carefully but at normal speed. We don't want you to try to memorize each sentence. After each pair of sentences there will be a simple question regarding the information you just read. To answer the question, simply press one of the keys marked with either a 'Y' or an 'N'. 'Y' stands for 'Yes, this is correct' and 'N' stands for 'No, this is not correct'. The computer will indicate a wrong answer with a warning tone. In addition, the computer will count your mistakes. Please answer the questions as quickly and as accurately as possible. We are interested in how the headline might affect your ability to answer these questions.

We will practice this procedure now with two exercise scenarios. Please report any difficulties or questions you have during the practice task to the experimenter. Do you have any remaining questions? If not, press the space bar of the keyboard and read the first practice scenario.

Before the actual experiment, participants completed three practice trials. Although they were told that the first two trials were for practice, the first three trials were not scored as experimental data. To start a trial, the participants pressed the space bar for the first time. Each trial began with the presentation of the cue (no cue, threat cue, or nonthreat cue) in the upper left corner of the computer screen. The participants were then presented with the first (ambiguous) sentence. After having read this sentence, they pressed the space bar again to see the second (continuation) sentence which was either a nonthreatening or a threatening continuation of the first sentence. When the participants pressed the space bar for the third time, they were presented with a single question which they answered with either Yes or No.

The dependent measure was the time between the second pressing of the space bar (which presented the continuation sentence) and the following button press that ended the display of the continuation sentence and replaced it with the question. That is, the dependent measure was the comprehension latency for each continuation sentence.

For each participant, one-third of the trials were presented in the no cue condition, one-third of the trials were presented in the threat cue and nonthreat cue condition, respectively. In any of the cue conditions, half of the trials were presented in the threat continuation condition and half in the nonthreat continuation condition. Each experimental condition was assigned to the 54 sentence sets in a fully balanced way. Consequently, across each group of participants, each sentence set was assigned an equal number of times to each experimental condition at the completion of testing.

Psychometrics. Participants completed the Beck Depression Inventory (BDI; Beck & Steer, 1987), the Body Dysmorphic Disorder Modification of the Yale-Brown Obsessive-Compulsive Scale (BDD-YBOCS; Phillips et al., 1997; see General Appendix

A), the Fear of Negative Evaluation Scale (FNE; Watson & Friend, 1969), and the verbal part of the Shipley Institute of Living Scale (Zachary, 1991). Mean scores and standard deviations are presented in Table 1.

4.3.3. Design

A 3 (Group: BDD, OCD, Healthy Control) X 3 (Scenario Type: BDD-related, Social anxiety-related, General) X 3 (Cue: Threat, Nonthreat, No Cue) X 2 (Continuation: Threat, Nonthreat) factorial design was used. The first variable was measured between-subjects, whereas the last variables were measured within-subjects.

4.3.4. Procedure

All participants were tested individually. Upon arrival, participants read and signed a consent form prior to receiving a SCID interview. Before the actual experiment, participants were told that the purpose of the study was to increase knowledge about cognitive processes, such as reading comprehension, in BDD. Before the experimental trials, a short practice session was given. Each trial consisted of a cue that was followed by an ambiguous sentence, followed by the continuation sentence and a single question. The participants were told to complete each trial at their individual pace. Moreover, they were told that we were interested in how a cue word might affect their ability to answer the subsequent question. However, we were mainly interested in the participants' comprehension latencies rather in their ability to answer the questions. After the completion of the experiment, the participants filled out the remaining questionnaires assessing BDD-symptoms, social anxiety, and depression. Finally, participants were paid and debriefed about the purpose of the research.

4.4. Results

4.4.1. Psychometric Data

Mean scores for the questionnaires at the time of experimental testing are presented in Table 1. It also indicates significant differences, as calculated by analyses of variance (ANOVAs) and follow-up Bonferroni-corrected t-tests.

4.4.2. Comprehension Latencies

The computer measured the comprehension latency, for each trial, by recording the time between the key press, which showed the second sentence, and the subsequent key press. Therefore, this dependent variable measured how long it took for the participant to read and understand the disambiguating sentence. The mean comprehension latencies are presented in Tables 2 and 3.

We first examined the sensitivity of the paradigm by submitting the data to an analysis of variance (ANOVA) with one between-subjects variable (BDD vs. OCD vs. Control) and three repeated measures variables. The repeated measures variables were scenario type (BDD-related, Social anxiety-related, General), cue condition (Threat vs. Nonthreat vs. No cue) and continuation condition (Threat vs. Nonthreat Continuation). We found, as expected, a significant Cue X Continuation interaction, $F(2, 51) = 11.30$, $p < .001$. Therefore, this manipulation check confirmed that the relative comprehension latencies across the two continuation conditions were influenced by the participants' interpretations of the initial sentence. For example, when participants saw the cue "ugly" followed by the sentence "When Nicole walked down the street, everybody was staring at her", they were faster in pushing the button

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when the continuation sentence was "She felt upset since she was disfigured",
compared to when the initial cue was nonthreatening such as "model".

Moreover, as expected, the analysis yielded main effects for Scenario type, $F(2, 51) = 20.60$, $p < .001$, and for Continuation, $F(1, 51) = 19.37$, $p < .001$, and a significant Scenario type by Continuation interaction, $F(2, 51) = 7.60$, $p < .002$. However, the main effect for Group was nonsignificant, $F(2, 51) = 0.6$, $p = .55$. Furthermore, the analysis yielded, as expected, neither a main effect for Cue, $F(2, 51) = 0.97$, $p = .38$, nor a Cue by Group interaction, $F(4, 51) = 0.33$, $p = .86$, but a significant Cue by Scenario type interaction, $F(4, 51) = 3.47$, $p < .01$. However, our predicted four-way interaction, namely that the three groups would differ in their preferred interpretations of ambiguity depending on the scenario types, fell short of significance, $F(8, 51) = 1.69$, $p = .10$. All other effects were nonsignificant, $ps > .05$.

Furthermore, we calculated, separately for each cue type, difference scores between the comprehension latencies for the threat continuation sentences and for the nonthreat continuation sentences by subtracting the threat continuations from the nonthreat ones (see Figures 1, 2, and 3). For example, we subtracted the comprehension latencies for the threat continuation "She felt upset since she was disfigured" from the comprehension latencies for the nonthreat continuation "She was confident of her perfect body." Because we had specific hypotheses to test, we calculated one-tailed contrasts corresponding to each prediction[1]. Focused contrasts are more powerful in testing specific predictions than unfocused ANOVAs (Rosenthal & Rosnow, 1991). Specifically, in those cases in which we expected to find a negative interpretive bias, we used contrast weights of +1 in the threat cue and no cue conditions, respectively,

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[1] Results of the contrasts analyses were also confirmed by two-tailed paired t tests.

and a contrast weight of –2 in the nonthreat cue condition. In those cases in which we did not expect to find a negative interpretive bias, we used contrast weights of -1 in the nonthreat cue and no cue conditions, respectively, and a contrast weight of +2 in the threat cue condition.

Based on the findings of the first interpretation study, we expected that BDD participants ought to impose a threatening interpretation on ambiguous stimuli, irrespective of scenario types (BDD-related, social, and general), whereas OCD participants should impose a threatening interpretation only on ambiguous stimuli for general scenarios. That is, their comprehension latencies should be just as fast in the no cue condition (*?????*) as in the threat cue condition, and both should be faster than in the nonthreat cue condition[2]. That is, BDD participants should exhibit faster comprehension latencies in the threat cue condition (e.g., *ugly*) than in the nonthreat cue condition (e.g., *model*), regardless of scenario type. However, OCD participants should exhibit faster comprehension latencies in the threat cue condition than in the nonthreat cue condition, but only for general scenarios. No biases for threat, of course, were expected in the control group.

BDD scenarios. As evident from Figure 1, and consistent with our hypothesis, the BDD group did not differ in their comprehension latencies for the threat cue and no cue conditions, $t(17) = 1.27$, $p = .22$, two-tailed, effect size $r = .30$, whereas their comprehension latencies for threat cue and no cue conditions combined were faster than for the nonthreat cue condition, $t(17) = 2.19$, $p < .025$, one-tailed, effect size $r = .46$. In other words, consistent with our hypothesis, BDD participants imposed a threatening

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[2] The term "Comprehension latencies" used in this context refers to relative comprehension latencies (difference scores between comprehension latencies shown on threat continuations and on nonthreat continuations).

interpretation on the ambiguous sentence when its meaning was unconstrained (i.e., in the no cue condition). OCD participants did not differ in their comprehension latencies for the nonthreat and no cue conditions, $t(17) = .92$, $p = .37$, two-tailed, effect size $r = .21$, whereas their comprehension latencies for nonthreat cue and no cue conditions combined were slower than for the threat cue condition, $t(17) = 1.83$, $p < .05$, one-tailed, effect size $r = .73$. That is, OCD participants imposed a nonthreatening interpretation on the ambiguous sentence when its meaning was unconstrained. Inconsistent with our hypothesis, the control group showed significantly faster comprehension latencies for the nonthreat than for the no cue conditions, $t(17) = 2.43$, $p = .03$, two-tailed, effect size $r = .51$. However, most importantly, their comprehension latencies for nonthreat cue and no cue conditions combined were slower than for the threat cue condition, $t(17) = 4.03$, $p < .0005$, one-tailed, effect size $r = .70$, suggesting that they selectively imposed the nonthreatening interpretations on the ambiguous sentences.

Social scenarios. As evident from Figure 2, the BDD group did not differ in their comprehension latencies for the threat cue and no cue conditions, $t(17) = .96$, two-tailed, $p = .35$, effect size $r = .05$. Inconsistent with our hypothesis, their comprehension latencies for threat cue and no cue conditions combined were not slower than for the nonthreat cue condition, $t(17) = 1.26$, one-tailed, $p > .10$, effect size $r = .37$. OCD participants, as expected, did not differ in their comprehension latencies for nonthreat and no cue conditions, $t(17) = .42$, two-tailed, $p = .68$, effect size $r = .04$, whereas their comprehension latencies for the nonthreat cue and no cue conditions combined, inconsistent with our hypothesis, were not slower than for the threat cue condition, $t(17) = 1.33$, $p = .10$, one-tailed, effect size $r = .41$. However, the effect size suggests that this comparison fell short of significance due to a lack of power. The control group showed,

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inconsistent with our hypothesis, significant differences between the nonthreat cue and no cue condition $t(17) = 2.27$, $p = .04$, one-tailed, effect size $r = .23$. However, their comprehension latencies for nonthreat cue and no cue conditions combined were slower than for the threat cue condition, $t(17) = 1.76$, one-tailed, $p < .05$, effect size $r = .69$, suggesting that controls selectively imposed the threatening interpretation on the ambiguous sentence, when its meaning was unconstrained (i.e., in the no cue condition).

General scenarios. As evident from Figure 3, the BDD group did not differ in their comprehension latencies for threat cue and no cue conditions, $t(17) = .42$, $p = .68$, two-tailed, effect size $r = .04$, whereas their comprehension latencies for threat cue and no cue conditions combined were not faster than for the nonthreat cue condition, $t(17) = 1.21$, one-tailed, $p > .10$, effect size $r = .34$. Therefore, inconsistent with our hypothesis, the BDD participants did not selectively impose the threatening interpretation on the ambiguous sentence, when its meaning was unconstrained. The OCD participants, as we expected, did not differ in their comprehension latencies for threat cue and no cue conditions, $t(17) = .03$, $p = .98$, two-tailed, effect size $r = .23$, whereas their comprehension latencies for threat cue and no cue conditions combined were faster than for the nonthreat cue condition, $t(17) = 2.20$, $p < .025$, one-tailed, effect size $r = .47$. Therefore, as we expected, OCD participants imposed a threatening interpretation on the ambiguous sentence when its meaning was unconstrained. The control participants, as we expected, did not differ in their comprehension latencies for the nonthreat cue and no cue conditions, $t(17) = .24$, $p = .82$, two-tailed, effect size $r = .01$, whereas their comprehension latencies for nonthreat cue and no cue conditions combined were slower than for the threat cue condition, $t(17) = 1.94$, one-tailed, $p < .05$, effect size $r = .82$,

suggesting that controls selectively imposed the nonthreatening interpretations on the ambiguous sentences.

4.4.3. Comorbidity of Depression

To estimate the effects of depression on interpretation in the BDD group, we conducted Mann Whitney U tests between the means of the comprehension latencies for BDD participants who met criteria for comorbid depression and those who were not depressed. Moreover, to examine the magnitude of these effects, we computed effect sizes r. As evident from Tables 4 and 5, no significant differences were obtained between the groups. Effect sizes r also indicated that there are no differences between the groups.

4.5. Discussion

The aim of this study was to investigate interpretive biases for ambiguous information in BDD using a paradigm that controls for response biases. Furthermore, we examined whether these biases are typical for BDD or whether they occur in OCD as well.

In contrast to previous findings (Buhlmann, Wilhelm et al., 2002), the results of the current study suggest that BDD patients exhibit a negative interpretive bias only for BDD-related, but not for social and general scenarios. Moreover, we found a different pattern in the control group, suggesting that the controls did not exhibit these biases for BDD-related and general scenarios. Consistent with previous findings (Buhlmann, Wilhelm et al., 2002), OCD patients, unlike BDD patients and controls, tended to

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interpret general ambiguous scenarios as threatening, whereas they did not exhibit a negative interpretive bias for BDD-related and social information.

Moreover, in contrast to previous findings (Buhlmann, Wilhelm et al., 2002), controls exhibited a negative interpretive bias in ambiguous social situations. This finding is inconsistent with previous findings showing that nonanxious individuals, in contrast to anxiety patients, tend to draw positive inferences when presented with an ambiguous situation (e.g., Constans, Penn, Ihen, & Hope, 1999). It seems unclear whether positive interpretive biases in nonanxious individuals occur because of response biases, and to our knowledge the current study is the first study using a paradigm that controls for these biases. What are possible explanations for this negative interpretive bias for ambiguous social situations in the control group? A possible explanation might be that the control group of this study was unrepresentative of most healthy participants. However, this seems unlikely because the results of the questionnaires indicate that controls were significantly less socially anxious than were the clinical groups. Another possible explanation might be that a nonanxious individual, although initially imposing the more threatening meaning on an ambiguous social situation (e.g., *The teacher is looking at me because I said something insufficient*), might nevertheless not give so much importance to his or her interpretation, compared to clinical groups (e.g., *She might have a bad day*).

The current study has several limitations. First, due to problems with recruitment, we failed to include a social phobia control group to test for information-processing similarities among BDD, OCD and social phobia patients. Second, unsurprisingly, seven out of 18 BDD patients had comorbid depression. Therefore, results in the BDD group might be partly due to comorbid depression. However, since the BDD group only

revealed a negative interpretive bias for BDD-related scenarios and not for general

scenarios - as one would expect in depressed patients - , it seems unlikely that the results

would have been different if there had been no comorbidity with depression in the BDD

group. Additional analyses comparing the comprehension latency means for depressed

and nondepressed BDD patients obtained no significant differences. Moreover, low

effect sizes further suggest no significant differences between the depressed and

nondepressed BDD patients. Third, 13 BDD participants and 13 OCD participants were

currently receiving psychotropic medications. However, recent findings investigating the

impact of psychotropic medication on neuropsychological performance in OCD suggest

that medicated and unmedicated OCD patients performed equally on various cognitive

domains such as attention, visuo-spatial skills, verbal and non-verbal memory, and

executive functioning (Mataix-Cols, Alonso, Pifarre, Menchon, & Vallejo, 2002; Purcell,

Maruff, Kyrios, & Pantelis, 1998; Savage et al., 2000). Thus, it seems unlikely that the

results of the current study would have been different if we had only tested unmedicated

patients. It might even be that we had got even stronger results if we had tested an

unmedicated clinical sample. Fourth, it is possible that the sentences used in this study

did not appropriately reflect the patients' concerns and that this might have biased the

results, especially because the results of this study are partly inconsistent with the results

of our previous study (Buhlmann, Wilhelm, et al., 2002). However, the sentences used in

the current study had either been used in earlier studies (MacLeod & Cohen, 1993) or had

been rated by experienced clinicians in terms of their appropriateness to reflect the

patients' concerns. Fifth, unfortunately, we had a small sample size. Hence, the results

of this study are preliminary and must be interpreted with some caution. Consequently,

future research is needed to replicate our findings with larger sample sizes and to further

investigate why our control group in this study exhibited a negative interpretive bias for social situations.

What are the clinical implications of this study? BDD patients tend to interpret body-related ambiguous scenarios in a negative way, which might, in turn, confirm distorted beliefs about themselves and their body image. The interpretation of a situation is directly related to the way a person feels about himself or herself. For example, a BDD patient might interpret somebody looking in his or her direction in a negative way (e.g., "that person is staring at me because of my horrible nose"), whereas that person might have looked at the BDD sufferer for diverse reasons. This negative interpretation would cause anxiety and shame. However, the interpretation "that person is looking at me because she is interested in what I have to say" would cause neutral or positive emotions. That is, it is not the situation itself but a person's interpretation of it that causes emotions such as anxiety and shame so often found in BDD. Consequently, interpretive biases should be addressed in clinical settings.

4.6. Appendix

Table 1

Psychometric Data

Variable	BDD Group		OCD Group		Control Group	
	M	SD	M	SD	M	SD
BDD-YBOCS	26.4$_a$	7.2	6.2$_b$	7.7	3.8 [b]	3.6
BDI	17.2$_a$	8.7	9.6$_b$	8.5	3.0$_c$	3.6
FNE	49.5$_a$	7.8	43.3$_a$	10.5	28.5$_b$	8.0
Age	30.5$_a$	10.1	32.8$_a$	12.1	33.2$_a$	11.1
Education	16.4$_a$	2.8	16.7$_a$	2.1	17.1$_a$	2.0
Verbal IQ	60.1$_a$	6.2	60.1$_a$	3.4	62.5$_a$	4.2

Notes. BDD-YBOCS = Body Dysmorphic Disorder Modification of the YBOCS;

BDI = Beck Depression Inventory; FNE = Fear of Negative Evaluation Scale; Age in

years; Education = years of education; Verbal IQ = Shipley Institute of Living Scale t-

scores. Means sharing subscripts do not differ (p > .05, Bonferroni-corrected).

Table 2

Mean Comprehension Latency: Threat Consistent Continuation

Condition	BDD Group		OCD Group		Control Group	
	M	SD	M	SD	M	SD
BDD scenarios						
Threat cue	2335	718	2480	964	2452	1239
Nonthreat cue	2487	928	2747	932	2269	918
No cue	2212	661	2721	1071	2629	788
Social scenarios						
Threat cue	2357	637	3075	1132	2334	835
Nonthreat cue	2479	761	2750	839	2684	854
No cue	2456	979	2705	920	2290	742
General scenarios						
Threat cue	2621	732	2814	984	2568	1209
Nonthreat cue	3056	876	3277	1032	3038	1072
No cue	2851	996	2761	1105	2810	837

Notes. Data are in milliseconds.

Table 3

Mean Comprehension Latency: Nonthreat Consistent Continuation

	BDD Group		OCD Group		Control Group	
Condition	M	SD	M	SD	M	SD
BDD scenarios						
Threat cue	2884	1089	3031	1502	3262	1361
Nonthreat cue	2515	640	2636	899	2558	973
No cue	2845	1056	2929	1117	2474	980
Social scenarios						
Threat cue	2706	878	2864	1036	2808	807
Nonthreat cue	2467	850	2811	976	2518	1041
No cue	2559	908	2897	928	2664	921
General scenarios						
Threat cue	2609	967	3134	1254	3035	809
Nonthreat cue	2651	1133	2977	1287	3010	1249
No cue	2567	808	3074	1088	2733	692

Notes. Data are in milliseconds.

Table 4

Mean Comprehension Latency: Threat Consistent Continuation for Depressed versus

Nondepressed BDD Participants

	Depressed Group		Nondepressed Group			
Condition	M	SD	M	SD	p	r
BDD scenarios						
Threat cue	2407	849	2290	661	.86	.08
Nonthreat cue	2416	698	2532	1079	.72	.06
No cue	2187	650	2227	699	.99	.03
Social scenarios						
Threat cue	2419	821	2317	531	.86	.07
Nonthreat cue	2389	998	2537	614	.33	.09
No cue	2411	1246	2484	833	.48	.03
General scenarios						
Threat cue	2714	916	2562	630	.93	.10
Nonthreat cue	2915	948	3147	862	.66	.13
No cue	2741	912	2921	1083	.86	.09

Notes. Data are in milliseconds; p = statistical significances were computed using Mann

Whitney U tests; r = effect size correlation

Table 5

Mean Comprehension Latency: Nonthreat Consistent Continuation for Depressed versus

Nondepressed BDD Participants

Condition	Depressed Group		Nondepressed Group			
	M	SD	M	SD	p	r
BDD scenarios						
Threat cue	2557	854	3093	1206	.38	.25
Nonthreat cue	2436	696	2565	631	.66	.10
No cue	2716	1131	2927	1053	.60	.10
Social scenarios						
Threat cue	2676	1014	2726	831	.54	.03
Nonthreat cue	2458	927	2472	845	.79	.01
No cue	2499	951	2597	925	.79	.05
General scenarios						
Threat cue	2692	1116	2557	913	.79	.07
Nonthreat cue	2546	925	2718	1287	.93	.08
No cue	2222	595	2786	872	.18	.35

Notes. Data are in milliseconds; p = statistical significances were computed using Mann
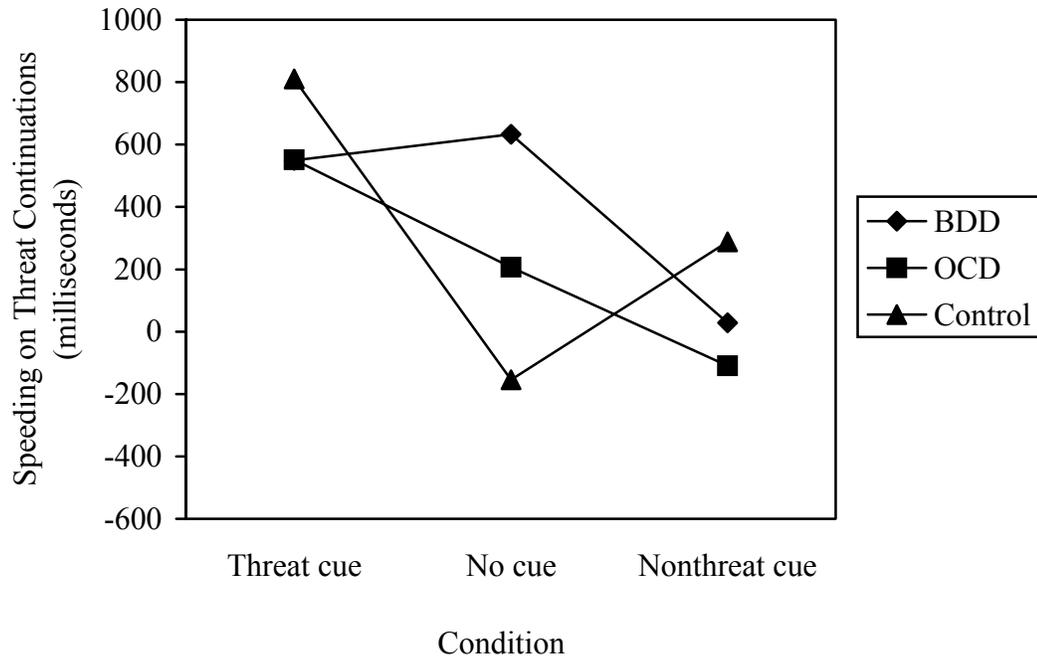
Whitney U tests; r = effect size correlation

Figure 1

Relative Speeding on Threat Continuations across Cue Conditions for BDD Scenarios

Notes. Relative speeding on threat continuations across cue conditions. Higher values indicate a shorter latency for threat continuation sentences compared to nonthreat continuation sentences.

Figure 2

Relative Speeding on Threat Continuations across Cue Conditions for Social Scenarios

Notes. Relative speeding on threat continuations across cue conditions. Higher values indicate a shorter latency for threat continuation sentences compared to nonthreat continuation sentences.
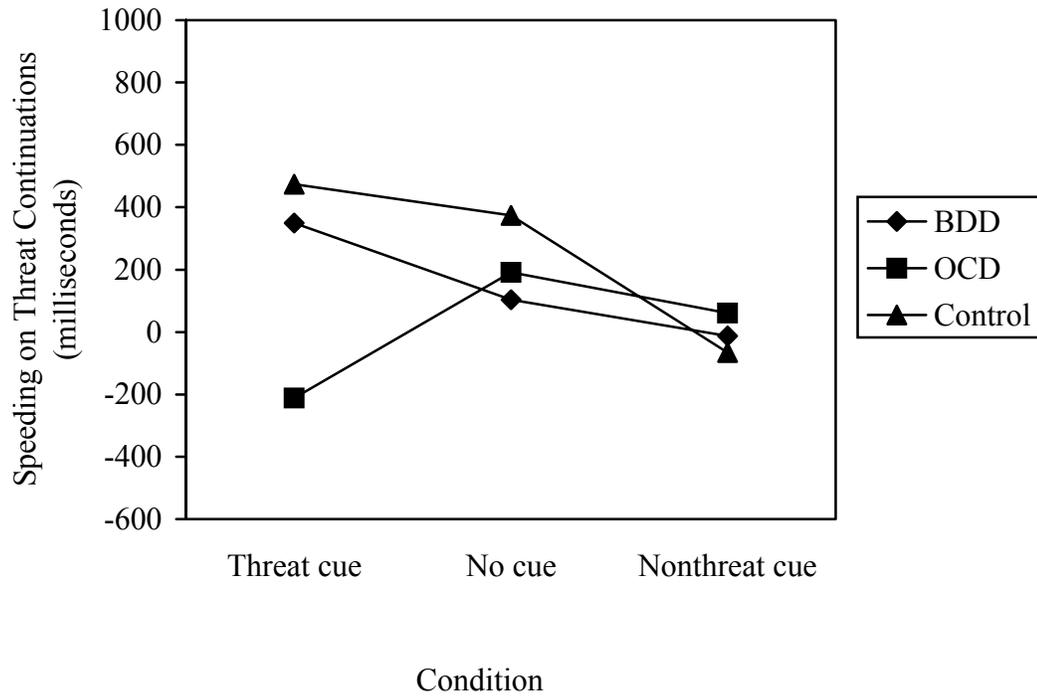
Figure 3

Relative Speeding on Threat Continuations across Cue Conditions for General Scenarios

Notes. Relative speeding on threat continuations across cue conditions. Higher values indicate a shorter latency for threat continuation sentences compared to nonthreat continuation sentences.

Author Note

5. Interpretive Biases for Facial Expressions in Body Dysmorphic Disorder

(Study 3)

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5.1. Abstract

Body dysmorphic disorder (BDD) is a syndrome characterized by distress about imagined defects in one's appearance and by a strong fear of negative evaluation (about one's appearance). Moreover, many BDD sufferers are convinced that other people make fun of their imagined defect. Given this fear of negative evaluation and the frequent presence of ideas of reference, BDD patients might be particularly sensitive to facial emotional expressions. Therefore, the ability to recognize these facial expressions may play a role in the maintenance or etiology of BDD. The purpose of the current study was to examine whether BDD patients, compared to OCD patients and healthy controls, tend to misinterpret neutral and other emotional expressions as angry. Participants were presented with facial photographs, one at a time, and were asked to identify the corresponding emotion. Findings suggest that BDD patients, in contrast to the other groups, indeed misclassify other emotional expressions as angry. This might partly explain the poor insight and ideas of reference often found in BDD patients. Furthermore, this might confirm distorted beliefs about themselves and their body image.

5.2. Introduction

Body Dysmorphic Disorder (BDD) is marked by debilitating distress about imagined defects in one's appearance (American Psychiatric Association [APA], 1994). Most individuals with BDD are preoccupied about imagined flaws in their skin, hair, nose, ears, etc. Moreover, BDD is characterized by self-criticism, low self-esteem and depression, repetitive behaviors (e.g., mirror checking, excessive grooming or reassurance seeking), and avoidance of social situation (Hollander, Cohen, & Simeon, 1993; Phillips, McElroy, Keck, Pope, & Hudson, 1993). It causes significant distress and impairment in functioning including hospitalization and being housebound for years (e.g., Phillips et al., 1993).

Previous research has shown that selective processing of threat might play an important role in the etiology or maintenance of emotional disorders (for a review, see Williams, Watts, MacLeod, & Mathews, 1997). One cognitive bias is that anxious individuals tend to interpret ambiguous situations as threatening (e.g., Butler & Mathews, 1983). For example, previous research has shown that BDD patients, compared to OCD patients and healthy controls, interpret ambiguous BDD-related situations as threatening (e.g., Buhlmann, Wilhelm, et al., 2002) which might lead to increased anxiety in ambiguous situations, and BDD patients might, as a result, avoid these situations.

However, most researchers investigating information-processing biases for negative information used words as stimuli, and there is scant research investigating "real life" stimuli such as faces. However, the advantage of using more ecologically valid stimuli to investigate information-processing abnormalities has been discussed (e.g., Lundh & Öst, 1996).

Studying recognition memory for faces in social phobia, Lundh and Öst (1996), for example, argued that facial stimuli may be very relevant for social phobic patients because the patients are especially afraid of negative evaluations by others. That is, facial expressions are an important means to express negative or positive evaluations, and information-processing biases for these expressions may be a key factor in the maintenance or even etiology of psychological disorders that are characterized by a strong fear of negative evaluations. In their experiment, Lundh and Öst (1996) presented social phobic patients and controls with faces varying in their emotional valence (positive or negative). They found that social phobics, when presented with critical and accepting faces, recognized significantly more of the former than of the latter in a subsequent memory task for these faces. Consequently, enhanced recognition memory for critical faces may contribute to anxiety, especially to fear of negative evaluation. However, it is unclear whether the results of Lundh and Öst's study were caused by a response bias or by a memory bias for critical faces.

To further address this issue, Foa and colleagues also studied the ability to recognize facial expressions in social phobia (Foa, Gilboa-Schechtman, Amir, & Freshman, 2000). They found that social phobics are better at recognizing negative emotions (e.g., anger, disgust), compared to non-negative emotions (e.g., neutral, happy) and compared to nonanxious controls. To examine whether the enhanced memory of social phobics for negative expressions was a result of a response bias, Foa et al. (2000) submitted the data to a signal detection analysis and found that the enhanced recognition of negative expressions was caused by a memory bias rather than by a response bias.

Researchers also started to investigate the ability to recognize facial expressions in individuals with psychological disorders. So far, these phenomena have been mostly

studied in schizophrenia (e.g., Addington & Addington, 1998; Mueser et al., 1996; Kerr & Neale, 1993). Kerr and Neale (1993), for example, presented schizophrenic patients and healthy controls with faces varying in emotional expressions and found that schizophrenics, in contrast to controls, exhibited a generalized performance deficit to recognize emotions.

Studying the relation between emotion recognition and social competence in schizophrenia, Mueser and colleagues also found that schizophrenic patients, unlike controls, exhibited a generalized deficit to recognize emotional expressions (Mueser et al., 1996). Moreover, they found that the ability to recognize emotions was related to social competence and concluded that deficits in emotion recognition might affect the ability to behave in social situations in an appropriate way. Further support for the hypothesis that schizophrenic patients exhibit a generalized emotion recognition deficit was found by Addington and Addington (1998) and Salem, Kring, and Kerr (1996).

Investigating recognition of facial expressions in mania, Lembke and Ketter (2002) found that manic patients, in contrast to euthymic patients with bipolar I or bipolar II and to controls, showed worse overall recognition of facial expressions, especially of fear and disgust. The authors concluded that impaired perception of facial expressions may contribute to behaviors associated with mania such as inappropriate approach when withdrawal would be more adaptive.

Given the strong fear of negative evaluation and the frequent presence of ideas of reference, individuals with BDD, like social phobics and delusional patients, might be particularly sensitive to facial expressions. For example, they might interpret a person's facial expression as negative although that person might have a neutral facial expression instead. Therefore, the ability to recognize facial expressions may play a role in the

maintenance or even etiology of disorders that are characterized by a strong fear of negative evaluations such as social phobia and BDD. For example, studying recognition of facial expressions in children with social phobia, Simonian and colleagues found that clinically socially anxious children had significantly poorer facial expression recognition skills than had children with no psychiatric disorder (Simonian, Beidel, Turner, Berkes, & Long, 2001). Especially, socially anxious children performed poorer when presented with happy, sad, and disgusted facial expressions. However, Simonian et al. (2001) failed to report the emotions to which the socially anxious children incorrectly misclassified the happy, sad, and disgusted facial expressions.

Taken together, information-processing biases for threatening facial expressions might play an important role why clinically anxious patients, especially those with an excessive fear of negative evaluation such as social phobics and BDD patients, develop or maintain these fears and consequently tend to avoid social situations.

5.3. Method

5.3.1. Participants

The BDD group comprised 20 outpatients (7 men) who met DSM-IV (APA, 1994) criteria for BDD, as determined by structured clinical interviews (SCID; First, Spitzer, Gibbon, & Williams, 1995). BDD patients had the following comorbid diagnoses: major depression (n = 9), agoraphobia without panic disorder (n = 1), specific phobia (n = 1), trichotillomania (n = 1), kleptomania (n = 1), and social phobia (n = 3). Seven BDD participants were unmedicated at the time of testing. The remaining 13 participants were currently on the following psychotropic medications: fluoxetine (n = 7), fluvoxamine (n = 2), paroxetine (n = 2), clomipramine (n = 1), and sertraline (n = 1).

Fourteen BDD participants were unmarried (70%), 1 BDD participant was married (5%), 1 BDD participant was separated (5%), and 4 BDD participants were divorced at the time of testing (20%).

The OCD group comprised 20 outpatients (8 men) who met DSM-IV (APA, 1994) criteria for OCD as determined by the SCID (First et al., 1995). OCD patients had the following comorbid diagnoses: major depression ($n = 2$), alcohol abuse ($n = 1$), panic disorder without agoraphobia ($n = 1$), and chronic motor tic ($n = 1$). Nine OCD participants were unmedicated at the time of testing. The remaining 11 participants were currently on the following psychotropic medications: fluoxetine ($n = 4$), paroxetine ($n = 3$), sertraline ($n = 3$), and fluvoxamine ($n = 1$). Fourteen OCD participants were unmarried (70%), 4 OCD participants were married (20%), 1 OCD participant was separated (5%), and 1 OCD participant was divorced at the time of testing (5%).

The control group consisted of 20 participants (7 men). SCID interviews confirmed the absence of any psychiatric history. Fourteen control participants were unmarried (70%), and 6 control participants were married at the time of testing (30%).

As evident from Table 1, the control group did not differ from the BDD group and OCD group with respect to age, $F(2, 59) = .17$, $p = .85$, education, $F(2, 59) = .08$, $p = .92$, verbal IQ, $F(2, 59) = 1.96$, $p = .15$, and gender, $\chi^2 (2, 0.95) = .14$, $p = .93$. All participants were native English speakers.

5.3.2. Material

General Facial Recognition Stimuli. To determine whether impairments in recognition of facial emotions were caused by emotion recognition impairment rather than general deficits in facial feature processing, we included the Benton Facial

Recognition Test (BFRT; Benton, Hamsher, Varney, & Spreen, 1983). It is a neuropsychological test that measures visualspatial processes. Specifically, the test required matching a target face with up to three pictures of the same person in a six-stimuli array of faces. Thirteen faces were presented in black and white; none was expressing emotion. For the first six items, only one face matched the target face. For the last seven items, three faces matched the target face. Scores could range from 0 to 27 correct responses.

Emotional Expression Stimuli. The experimental material comprised 42 photographs showing facial expressions. Each photograph showed one of the six basic emotions or no emotion (neutral condition). The photographs were drawn from the Ekman and Friesen (1975, 1976) series. Each emotion was presented by 6 different models (3 females and 3 males), and each condition (angry, disgusted, happy, neutral, sad, scared, surprised) was presented 6 times. For each photograph, participants circled on an answer sheet the corresponding expression (angry, disgusted, happy, neutral, sad, scared, surprised). The total score could range from 0 to 42, whereas for each emotion subcategory, the score could range from 0 to 6. One set of photographs including each emotional expression and the neutral expression was used as a practice trial.

Psychometrics. Participants completed the Beck Depression Inventory (BDI; Beck & Steer, 1987), the Body Dysmorphic Disorder Modification of the Yale-Brown Obsessive-Compulsive Scale (BDD-YBOCS; Phillips et al., 1997; see General Appendix A), the Fear of Negative Evaluation Scale (FNE; Watson & Friend, 1969), and the verbal part of the Shipley Institute of Living Scale (Zachary, 1991). Mean scores and standard deviations are presented in Table 1.

5.3.3. Design

A 3 (Group: BDD, OCD, Healthy Control) X 7 (Emotion: angry, disgusted, happy, neutral, sad, scared, surprised) factorial design was used. The first variable was measured between-subjects, whereas the second variable was measured within subjects.

5.3.4. Procedure

All participants were tested individually. Upon arrival, participants read and signed a consent form prior to receiving a SCID interview. Before the experimental trials, a short practice session was given. During the practice trial, participants were presented with seven photographs varying in the emotional expression, one at a time. During the experimental phase, participants were presented with 42 photographs, one at a time. Each photograph was presented for 15 seconds. Participants were asked to circle on an answer sheet for each photograph the corresponding expression (angry, disgusted, happy, neutral, sad, scared, surprised). The experimenter presented the photographs in random order to the participant. Participants in the BDD group received the photographs in different random orders, and participants in the OCD and control group were yoked to the BDD participants. Prior to the practice trial, participants received the following instructions:

This experiment requires the rating of facial expressions. You will be presented with different faces, one at a time. Each face will be presented for 15 seconds. Your task is to rate each face in terms of its emotional expression. Before the actual experiment, there will be a practice trial. If you have any questions, please ask the experimenter.

After the emotional recognition task was finished, participants completed the BFRT. Afterwards, the participants filled out the remaining inventories assessing BDD-symptoms, social anxiety, depression, and verbal IQ. Finally, participants were paid and debriefed about the purpose of the research.

5.4. Results

5.4.1. Psychometric data

Mean scores for the questionnaires at the time of experimental testing are presented in Table 1. It also indicates significant differences, as calculated by analyses of variance (ANOVAs) and follow-up Bonferroni-corrected $\underline{t}$-tests.

5.4.2. Benton Facial Recognition Test

To exclude the possibility that neuropsychological deficits in facial feature processing caused impairment in facial expression recognition, we analyzed whether the groups differed in their overall test performance of the Benton Facial Recognition Test. As evident from Table 2, there was no difference among the groups, $\underline{F}$ (2, 59) = .14, $\underline{p}$ = .87.

5.4.3. Facial Expression Ratings

To investigate group differences in the ability of identifying emotional expressions correctly, we submitted the data to oneway ANOVAs and follow-up Bonferroni-corrected $\underline{t}$-tests. First, we analyzed whether the groups differed in their overall test performance across all facial expression categories; that is, how well they did

in identifying facial expressions in general. As evident from Table 3, we found a significant group difference, $\underline{F}$ (2, 59) = 4.70, $\underline{p}$ = .01. Follow-up comparisons indicated that BDD participants, compared to controls, performed significantly worse in identifying facial expressions correctly, $\underline{p}$ = .01, effect size $\underline{r}$ = .43. There were no significant differences between OCD participants and controls, $\underline{p}$ = .31, effect size $\underline{r}$ = .20, and between BDD participants and OCD participants, $\underline{p}$ = .49, effect size $\underline{r}$ = .20.

Neutral facial expressions. As evident from Table 3, there was a significant difference in correctly identifying neutral emotional expressions, $\underline{F}$(2, 59) = 5.29, $\underline{p}$ = .008. Follow-up comparisons indicated that BDD participants correctly identified significantly fewer neutral expressions than did controls, $\underline{p}$ = .006, effect size $\underline{r}$ = .47. However, there was no difference between BDD and OCD participants, $\underline{p}$ = .40, effect size $\underline{r}$ = .21, and between OCD participants and controls, $\underline{p}$ = .27, effect size $\underline{r}$ = .29. To further investigate these errors, we analyzed separately how many neutral expressions were misinterpreted as angry, disgusted, happy, sad, surprised, or scared. Oneway ANOVAs indicated the following differences: The groups differed significantly in misinterpreting neutral expressions as surprised ones, $\underline{F}$(2, 60) = 3.35, $\underline{p}$ = .04. Specifically, we found a trend that BDD participants, compared to controls, misinterpreted more neutral expressions as surprised ones, $\underline{p}$ = .09, effect size $\underline{r}$ = .28. Moreover, we found a trend that BDD participants, compared to OCD participants, misinterpreted more expressions as surprised, $\underline{p}$ = .09, effect size $\underline{r}$ = .28. We did not find a difference between OCD patients and controls, $\underline{p}$ > .99. The groups marginally differed in misinterpreting neutral expressions as sad ones, $\underline{F}$(2, 60) = 3.18, $\underline{p}$ = .05. We found a trend that BDD participants, compared to controls, misinterpreted more neutral expressions as sad ones, $\underline{p}$ = .07, effect size $\underline{r}$ = .37. There was no difference between

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BDD and OCD participants, p = .17, effect size r = .35, and between OCD participants

and controls, p > .99. Oneway ANOVAs revealed no overall differences between the

groups for neutral expressions that were misinterpreted as angry, disgusted, happy, and

scared expressions, ps > .05.

Disgusted facial expressions. As evident from Table 3, a significant group

difference was obtained for disgusted expressions, $F(2, 59)$ = 4.46, p = .02. Follow-up

comparisons indicated that BDD participants correctly classified significantly fewer

disgusted expressions than did controls, p = .01, effect size r = .41. However, there was

no significant difference between BDD and OCD participants, p = .27, effect size r = .23.

Furthermore, no difference was found between OCD participants and controls, p = .65,

effect size r = .25. To further analyze to which emotional expressions the disgusted

expression was incorrectly categorized, we analyzed the incorrect answers separately for

each category. That is, we analyzed separately how many disgusted expressions were

misinterpreted as angry, happy, neutral, sad, surprised, or scared expressions. Oneway

ANOVAs indicated the following differences: The groups only differed significantly in

misinterpreting disgusted expressions as angry ones, $F(2, 60)$ = 4.67, p = .013. Follow-up

comparisons indicated that BDD participants misinterpreted significantly more disgusted

expressions as angry as did controls, p = .01, effect size r = .43. No differences were

found between BDD and OCD participants, p = .29, effect size r = .23, and between OCD

participants and controls, p = .54, effect size r = .25. No differences were found between

the groups in classifying disgusted expressions as happy, neutral, sad, scared, and

surprised expressions, ps > .05.

Angry, happy, sad, scared, and surprised facial expressions. Oneway ANOVAs

indicated no overall differences between the groups, ps > .05.

5.4.4. Overall Facial Recognition Biases

To further investigate overall recognition biases, we calculated the number of mistakes across the categories separately for each facial expression. For example, we calculated how many photographs the participants incorrectly classified as angry. We found a significant group difference with respect to misinterpreting facial expressions as angry, $\underline{F}(2, 58) = 6.4$, $\underline{p} = .003$. Follow-up comparisons indicated that BDD participants misinterpreted significantly more faces as angry as did controls, $\underline{p} = .002$, effect size $\underline{r} = .49$ (see Table 3). Neither the difference between BDD and OCD participants reached statistical significance, $\underline{p} = .10$, effect size $\underline{r} = .30$, nor did the difference between OCD participants and controls, $\underline{p} = .52$, effect size $\underline{r} = .24$. No further group differences in a general tendency to misinterpret facial expressions as disgusted, happy, neutral, sad, scared, and surprised were found, $\underline{ps} > .05$.

5.4.5. Comorbidity of Depression

To estimate the effects of depression on facial recognition, we conducted Mann Whitney U Tests between the BDD participants who met criteria for comorbid depression and those who were not depressed (see Table 4). Moreover, we computed effect sizes $\underline{r}$. There was a significant difference between the groups with respect to surprised faces, $p = .001$, showing that nondepressed BDD participants were better in identifying surprised expressions than were depressed BDD participants. However, no further differences between the groups with respect to the other face categories were obtained. As evident from Table 4, the low effect sizes further indicate that there are no differences between depressed and nondepressed BDD participants. In sum, it seems unlikely that depression had an significant influence on the data, with the exception of surprised faces.

5.5. Discussion

Information-processing biases for threatening facial expressions might play an important role why clinically anxious patients, especially those with an excessive fear of negative evaluation such as BDD patients, develop or maintain these fears and consequently tend to avoid social situations. That is, given the strong fear of negative evaluation and the frequent presence of ideas of reference, individuals with BDD might be particularly sensitive to facial expressions. The purpose of this study was to investigate facial recognition ability in BDD patients. We further intended to explore whether these facial recognition characteristics were typical for BDD or could also be found in other psychiatric disorders such as OCD. Based on clinical observations, we hypothesized that BDD patients exhibit an interpretive bias for angry facial expressions.

First, to determine whether difficulties in identifying emotional expressions were not caused by neuropsychological deficits rather than interpretive biases, we applied the BFRT (Benton et al., 1983) in which participants were presented with general faces not displaying an emotion. We found no difference among the groups indicating that differences in identifying emotional expressions are caused by interpretive biases rather than general neuropsychological deficits.

Moreover, we found that, overall, BDD participants performed worst in identifying emotional expressions, compared to the other groups. Specifically, the analyses revealed that they correctly identified significantly fewer facial expressions than did controls. However, there was no significant difference between BDD and OCD patients and between OCD patients and controls, suggesting that BDD patients had the most difficulties decoding emotional expressions, followed by OCD patients who did not differ in their decoding abilities from controls.

Moreover, BDD patients exhibit an interpretive bias for angry expressions, whereas we did not find this bias in the OCD patients and controls. Although BDD patients were as accurate as the other groups in correctly identifying angry facial expressions, they misinterpreted, overall, significantly more other facial expressions as angry than did OCD patients and controls, whereas there was no difference between OCD patients and controls. Although the difference between BDD patients and OCD patients fell short of significance, effect size r indicated that this difference might have become significant if we had tested more participants.

Furthermore, BDD patients were worse in identifying disgusted expressions, compared to controls. OCD patients did not differ from controls in their ability to identify disgusted expressions, nor did they differ from BDD patients. This finding is inconsistent with previous findings (Sprengelmeyer et al., 1997) that found an impaired ability in decoding disgusted expressions in OCD patients.

Our BDD patients were not better in identifying angry expressions, compared to the other groups. Specifically, when presented with disgusted expressions, BDD patients misinterpreted significantly more disgusted expressions as angry, whereas there was no difference between OCD patients and controls. However, the difference between BDD patients and OCD patients was also nonsignificant. Moreover, when presented with neutral expressions, BDD patients misinterpreted more facial expressions than did controls, whereas there was no difference between BDD patients and OCD patients, and between OCD patients and controls. Follow-up comparisons revealed that there was a trend that BDD patients misinterpreted more neutral expressions as surprised than did OCD patients and controls. Again, there was no difference between OCD patients and controls. When presented with sad expressions, we found a trend that BDD patients

misinterpreted more neutral expressions as sad than did controls. Effect size r further indicated that this difference might have become significant if we had tested more BDD participants. Moreover, we did not find such a difference between OCD patients and controls, and between BDD patients and OCD patients.

The present study has several limitations. We failed to include a social phobia control group to test for facial recognition impairments among BDD, OCD and social phobia patients. Moreover, as in most studies (e.g., Phillips, McElroy, Hudson, & Pope, 1995), depression was a common comorbid diagnosis in our BDD patients, and thus might have affected the results. However, follow up analyses including effect sizes indicated that it seems unlikely that comorbid depression had an significant influence on the overall results, except for surprised emotional expressions in which depressed BDD patients performed significantly worse than nondepressed BDD patients. Specifically, depressed BDD patients misinterpreted neutral expressions more often as surprised than did nondepressed BDD patients. However, future research is needed to address the influence of depression on facial recognition. Furthermore, 13 BDD participants and 11 OCD participants were medicated at the time of testing which might have influenced their test performance on general facial recognition and recognition of emotional expression. However, recent studies found no difference in neuropsychological performance in medicated and unmedicated OCD patients (Mataix-Cols, Alonso, Pifarre, Menchon, & Vallejo, 2002; Purcell, Maruff, Kyrios, & Pantelis, 1998; Savage et al., 2000). Therefore, it seems unlikely that the results of the current study would have been different if we had only tested unmedicated patients.

Overall, BDD patients have more difficulties interpreting facial expressions than OCD patients and controls. Although BDD patients are as good as OCD patients

and controls in identifying angry expressions, they misinterpret, in contrast to these groups, other facial expressions as angry. Therefore, poor insight and ideas of reference that are common found in BDD might be partly explained by this interpretive bias for angry facial expressions. That is, even if other people such as friends reassure them of the nonexistence of their imagined flaw, they might still be convinced of it because of their misinterpretation of other people's facial expressions, which the BDD sufferer might interpret as a negative reaction to their unattractive appearance. As a result, this might confirm distorted beliefs about themselves and their body image.

Social situations are usually somewhat ambiguous. One can never be certain what the other person thinks. Consequently, the way an individual interprets a situation is very important and is directly linked to the individual's feelings. For example, a BDD patient who misinterprets a neutral emotional expression of somebody in a negative way (e.g., "that person is angry with me" or "that person must have seen my flaw because he looks so surprised") might consequently feel emotionally vulnerable, anxious or negatively evaluated. However, an individual who does not misinterpret a neutral expression in a negative way would not have these negative emotions. Furthermore, these findings are consistent with the findings of previous findings (e.g., Buhlmann, Wilhelm et al., 2002) that BDD patients interpret ambiguous situations in a negative way. Therefore, negative interpretive biases and misinterpretations of facial expressions might be key factors in the maintenance or even etiology of BDD because they might contribute to the development of associated features in BDD such as a strong fear of negative evaluation, emotional vulnerability, or ideas of reference.

5.6. Appendix

Table 1

<u>Psychometric Data</u>

Variable	BDD Group		OCD Group		Control Group	
	<u>M</u>	<u>SD</u>	<u>M</u>	<u>SD</u>	<u>M</u>	<u>SD</u>
BDD-YBOCS	25.8_a	7.5	5.5_b	7.1	3.3_b	2.7
BDI	17.1_a	8.5	9.5_b	7.8	2.0_c	1.9
FNE	49.4_a	7.7	43.4_a	9.4	28.3_b	6.8
Age	32.7_a	11.3	31.0_a	10.5	32.9_a	11.7
Education	16.4_a	2.7	16.6_a	2.0	16.6_a	2.1
Verbal IQ	59.3_a	6.3	60.2_a	3.0	62.1_a	4.1

<u>Notes</u>. BDD-YBOCS = Body Dysmorphic Disorder Modification of the YBOCS; BDI =

Beck Depression Inventory; FNE = Fear of Negative Evaluation Scale; Age in years;

Education = years of education; Verbal IQ = Shipley Institute of Living Scale t-scores.

Means sharing subscripts do not differ ($\underline{p} > .05$, Bonferroni-corrected).

Table 2

General Facial Recognition

Variable	BDD Group		OCD Group		Control Group	
	M	SD	M	SD	M	SD
BFRT	23.7_a	2.5	23.5_a	2.2	23.3_a	2.7

Notes. BRFT = Benton Facial Recognition Test. Means sharing subscripts do not differ (p > .05, Bonferroni-corrected).

Table 3

Mean Performance of Facial Expression Recognition

Category	BDD Group		OCD Group		Control Group	
	$\underline{M}$	$\underline{SD}$	$\underline{M}$	$\underline{SD}$	$\underline{M}$	$\underline{SD}$
total score	35.4_a	3.2	36.6_{ab}	2.6	38.0_b	2.2
angry	5.6_a	.6	5.4_a	.6	5.5_a	.7
disgusted	4.8_a	1.4	5.3_{ab}	.9	5.7_b	.6
happy	6.0_a	.2	6.0_a	.22	6.0_a	.0
neutral	4.8_a	1.0	5.2_{ab}	.7	5.7_b	.5
sad	4.5_a	1.2	4.2_a	1.1	4.4_a	1.4
scared	4.6_a	1.5	5.1_a	1.0	5.2_a	.9
surprised	5.2_a	1.1	5.5_a	.9	5.6_a	.7
bias for angry faces	2.7_{a*}	1.7	1.7_{ab*}	1.3	1.1_b	1.1

Notes. Means sharing subscripts do not differ ($p > .05$, Bonferroni-corrected); angry = angry facial expressions; disgusted = disgusted facial expressions; happy = happy facial expressions; neutral = neutral facial expressions; sad = sad facial expressions; scared = scared facial expressions; surprised = surprised facial expressions; bias for angry faces = facial expressions misinterpreted as angry across all emotion categories; * = difference between the two groups fell short of statistical significance

Table 4

Effects of Depression on Facial Recognition in the BDD Group

Category	Depressed Group		Nondepressed Group			
	M	SD	M	SD	p	r
total score	34.9	2.3	35.7	3.8	.33	.13
angry	5.6	0.7	5.6	0.5	.99	.00
disgusted	5.3	0.5	4.3	1.7	.10	.37
happy	6.0	0.0	5.9	0.3	.77	.23
neutral	4.9	1.1	4.7	1.0	.71	.09
sad	4.1	1.3	4.8	1.2	.23	.22
scared	4.6	1.8	4.6	1.4	.88	.00
surprised	4.4	1.1	5.7	0.7	.01	.58
bias for angry faces	2.2	0.7	3.0	2.1	.66	.25

Notes. r = effect size correlation; angry = angry facial expressions; disgusted = disgusted facial expressions; happy = happy facial expressions; neutral = neutral facial expressions; sad = sad facial expressions; scared = scared facial expressions; surprised = surprised facial expressions; bias for angry faces = facial expressions misinterpreted as angry across all emotion categories.

Author Notes

6. General Discussion

In the current studies, I investigated BDD from a cognitive perspective. Specifically, I examined interpretation of verbal stimuli and real-life stimuli such as facial expressions. In the first study, using an Interpretation Questionnaire, I found that BDD patients, compared to OCD patients and controls, exhibit a negative interpretive bias not only for BDD-related information, but also for social anxiety-related and for general information. OCD patients, however, only revealed a negative interpretive bias for general information, whereas controls, as expected, did not exhibit any negative interpretive bias at all. Interestingly, further analyses indicated that BDD patients rated the likelihood of nonthreatening interpretations as high as they rated the likelihood of threatening interpretations. In other words, it might be that BDD patients, although rating the likelihood of a threatening interpretation significantly higher than OCD patients and controls, are nevertheless more open for diverse kind of interpretations (e.g., *I think she is judging the way I look, but maybe she just happens to look in my direction? But isn't she judging the way I look?*), whereas healthy individuals might be characterized by an interpretive bias for nonthreatening information (e.g., *That person definitely just happens to look in my direction*).

However, it remains unclear whether the results of the first study were influenced by response biases (e.g., experimenter demand effect). Therefore, in the second study, I used a paradigm which controls for these response biases. I found that, inconsistent with the findings of the first study, BDD patients, compared to OCD patients and controls, only revealed a negative bias for BDD-related information, whereas OCD patients, consistent with the findings of the first study, exhibited a negative bias for general information. However, inconsistent with previous findings, controls revealed a negative

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bias for social information. Thus, it might be that healthy individuals, although imposing the more threatening meaning on an ambiguous social situation, might nevertheless not give so much importance to his or her interpretation, compared to clinical groups. Because the results of the first two interpretation studies are only partly consistent, it seems reasonable that studies on interpretation using self-report measures might indeed be influenced by response biases. However, the results of these studies must be interpreted cautiously because of small sample sizes. Thus, future research is needed to replicate these findings with bigger sample sizes. Moreover, future studies are needed to investigate interpretive biases in BDD, OCD, and social phobia.

In the third study, I used real-life stimuli such as facial expressions to test for interpretive biases. Specifically, I investigated facial recognition and interpretive biases for emotional facial expressions in BDD and OCD. As expected, I found that BDD patients, unlike the other groups, misinterpreted facial expressions as angry.

Furthermore, BDD patients performed significantly worse in decoding disgusted and neutral expressions, whereas OCD patients and controls did not exhibit these deficits. Consequently, BDD patients might have difficulties interpreting the intentions or feelings of other people in a social situation, which, in turn, might lead to increased social anxiety.

Although research has shown that individuals with psychological disorders are characterized by selective processing of threat, the crucial question remains whether there is a causal relation between these cognitive biases and the development of psychological disorders. If the answer is ‚yes', it would be essential that clinical psychologists and psychiatrists focus more on selective processing of threat shown by their patients. This might include the development of more objective assessment procedures such as information-processing paradigms instead of self-report measures. For example,

researchers could use information-processing paradigms in addition to self-report measures prior to a treatment trial and after the completion of the treatment.

Several studies on selective attention have already shown that selective processing indices represent a sensitive measure of clinical change in therapeutic interventions. Mogg and colleagues, for example, found that recovered GAD patients did not show selective attention to threat, compared to patients currently diagnosed with GAD (Mogg, Mathews, & Eysenck, 1992). Many other studies also found that selective attention to threat declines with treatment (e.g., Foa & McNally, 1986). However, the strongest evidence was provided by Mattia et al. (1993) who did not only demonstrate reduced threat interference with treatment but also showed that the magnitude of this reduction was related to the efficacy of the treatment. In other words, only those social phobics who had responded well to treatment showed reduced threat interference effects.

So far, less research has examined whether negative interpretation indices might be a sensitive measure of clinical change. However, interpretive biases might be especially important in understanding the maintenance or maybe even etiology of psychological disorders because they might be a contributing cause of anxiety. For example, ambiguous events or social situations that could be perceived as threatening are quite common in everyday life. However, if a situation's interpretation is stored in memory as if it was a real event, then a negative interpretive bias could have the same consequence as frequent encounters with real threats, which could, in turn, lead to increased anxiety (Mathews, 1990). A BDD patient, for example, might interpret somebody whispering or laughing behind him in a threatening way („That person is making fun of my ugly nose") and consequently store this event in memory as if one

could be certain that the person spoke about the BDD sufferer's nose in a negative way. However, that person might have whispered or laughed for other reasons.

Thus, negative interpretive biases may be a high risk factor for the development or maintenance of psychological disorders. Consequently, if negative interpretive biases might contribute to anxiety, the crucial question is whether they can be modified or changed. Clinical observations with anxious or depressed patients already suggest that modifications of these biases are possible. For example, automatic thoughts and beliefs that are directly addressed in cognitive-behavioral therapy often resemble the products of negative interpretive biases. In other words, to the extent that automatic thoughts and beliefs can be modified in therapeutic settings, one should be able to modify the corresponding interpretive biases as well.

Mathews et al. (1989), for example, found that recovered GAD patients, compared to GAD patients, spelled less ambiguous homophones in their threatening form, but did, nevertheless, spell more homophones in their threatening form than did controls. Furthermore, McNally and Foa (1987) tested whether agoraphobic patients, compared to recovered agoraphobics and controls, are characterized by a negative interpretive bias when presented with ambiguous information that was related to their specific concerns. The results revealed that agoraphobic patients tended to interpret ambiguous scenarios that were related to their agoraphobic concerns in a more threatening way than did recovered agoraphobic patients and controls. Moreover, studying interpretive biases in panic disorder, Westing and Öst (1995) found that the reduction of negative interpretive biases were greatest for those patients who had the best treatment outcomes. Taken together, measures of information-processing biases such as interpretive biases may serve as an indicator of treatment efficacy. Thus, studying the

underlying mechanisms of these biases is very important to develop cognitive-behavioral treatment concepts which directly focus on these mechanisms.

These findings support one of the basic concepts underlying cognitive therapy, namely that individuals with psychological disorders have interpretive biases that cause or maintain anxiety. Furthermore, recent studies on inducing information-processing biases in nonclinical populations suggest that these biases are anything but fixed. In other words, they can be learned and be unlearned which, in turn, may have important implications for treatment and prevention.

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8. General Appendix

8.1. Appendix A: **Body Dysmorphic Disorder Modification of the YBOCS**
(cited with permission of authors)

Name: _____ Date: _____ Subject: _____

For each item circle the number identifying the response which best characterizes the patient during the **past week**.

---

1. <u>TIME OCCUPIED</u> BY THOUGHTS
   ABOUT THE BODY DEFECT

   How much of your time is occupied by
   THOUGHTS about a defect or flaw in
   your appearance (such as your face,
   nose, hair, skin, breasts, genitals, hands?)

   0 = None
   1 = Mild (less than 1 hr/day)
   2 = Moderate (1-3 hrs/day)
   3 = Severe (greater than 3 and up to
       8 hrs/day)
   4 = Extreme (greater than 8 hrs/day)

---

2. <u>INTERFERENCE</u> DUE TO THOUGHTS
   ABOUT THE BODY DEFECT

   How much do your THOUGHTS about your
   body defect(s) interfere with your social or
   work (role) functioning?

   Is there anything you aren't doing or can't
   do because of them?

   0 = None
   1 = Mild, slight interference with
       social or occupational activities,
       but overall performance not
       impaired
   2 = Moderate, definite interference
       with social or occupational
       performance,
   3 = Severe, causes substantial
       but still manageable impairment
       in social or occupational
       performance
   4 = Extreme, incapacitating

---

3. <u>DISTRESS</u> ASSOCIATED WITH
   THOUGHTS ABOUT THE BODY
   DEFECT

   How much distress do your THOUGHTS
   about your body defect(s) cause you?
   (Rate „disturbing" feelings or anxiety that
   seem to be triggered by these thoughts, *not*
   general anxiety or anxiety associated with
   other symptoms)

   0 = None
   1 = Mild, and not too disturbing
   2 = Moderate, and disturbing
       but still manageable
   3 = Severe, and very disturbing
   4 = Extreme, and disabling distress

For each item circle the number identifying the response which best characterizes the patient during the **past week**.

---

4. <u>RESISTANCE</u> AGAINST THOUGHTS
   OF BODY DEFECT

How much of an effort do you make to resist these THOUGHTS? How often do you try to disregard them or turn your attention away from these thoughts as they enter your mind?

(Only rate effort made to resist, NOT success or failure in actually controlling your thoughts. How much patient resist may or may not correlate with ability to control them)

0 = Makes an effort to always resist, or symptoms so minimal doesn't need to actively resist
1 = Tries to resist most of time
2 = Makes some effort to resist
3 = Yields to all such thoughts without attempting to control them but yields with some reluctance
4 = Completely and willingly yields to all such thoughts

---

5. <u>DEGREE OF CONTROL</u> OVER
   THOUGHTS ABOUT BODY DEFECT

How much control do you have over your THOUGHTS about your body defect(s)? How successful are you in stopping or diverting these thoughts?

0 = Complete control, or no need for control because these thoughts are so minimal
1 = Much control, usually able to stop or divert these thoughts with some effort and concentration
2 = Moderate control, sometimes able to stop or divert these thoughts
3 = Little control, rarely successful in stopping thoughts, can only divert attention with difficulty
4 = No control, rarely able to even momentarily divert attention

---

For each item circle the number identifying the response which best characterizes the patient during the **past week**.

---

6. <u>TIME SPENT</u> IN ACTIVITIES
    RELATED TO BODY DEFECT

How much time do you spend in ACTIVITIES related to your concern over your appearance (such as, but not limited to, checking mirrors, seeking reassurance, grooming, comparing with others)?

READ LIST OF ACTIVITIES
(check all that apply)
___   Checking mirrors/other surfaces
___   Grooming activities
___   Applying makeup
___   Camouflaging with clothing/other cover
        (rate time spent selecting/changing clothes, not time wearing them)
___   Scrutinizing others' appearance (comparing)
___   Questioning others about/discussing your appearance
___   Picking at your skin
___   Other   _____

0 = None
1 = Mild (spends less than 1 hr/day)
2 = Moderate (1-3 hrs/day)
3 = Severe (spends more than 3 and up to 8 hrs/day)
4 = Extreme (spends more than 8 hrs/day in these activities)

---

7. <u>INTERFERENCE</u> DUE TO ACTIVITIES
    RELATED TO BODY DEFECT

How much do the above ACTIVITIES interfere with your social or work (role) functioning? Is there anything you don't do because of them?

0 = None
1 = Mild, slight interference with social or occupational activities, but overall performance not impaired
2 = Moderate, definite interference with social or occupational performance, but still manageable
3 = Severe, causes substantial impairment in social or occupational performance
4 = Extreme, incapacitating

For each item circle the number identifying the response which best characterizes the patient during the **past week**.

---

8. <u>DISTRESS</u> ASSOCIATED WITH ACTIVITIES RELATED TO BODY DEFECT

How would you feel if you were prevented from performing these ACTIVITIES? How anxious would you become?

0 = None
1 = Mild, only slightly anxious if behavior prevented, or only slight anxiety during the behavior
2 = Moderate, reports that anxiety would mount but remain manageable if behavior is prevented, or that anxiety increases that anxiety increases but remains manageable during such behaviors
3 = Severe, prominent and very disturbing increase in anxiety during behavior
4 = Extreme, incapacitating anxiety from any intervention aimed at modifying activity, or incapacitating anxiety develops during behavior related to body defect

---

9. <u>RESISTANCE</u> AGAINST COMPULSIONS

How much of an effort do you make to resist these ACTIVITIES? (How much the patient resists these behaviors may or may not correlate with his/her ability to control them)

0 = Makes an effort to always resist, or symptom is so minimal, doesn't need to actively resist
1 = Tries to resist most of the time
2 = Makes some effort to resist
3 = Yields to almost all of these behaviors without attempting to control them, but does so with some reluctance
4 = Completely and willingly yields to all behaviors related to body defect

---

For each item circle the number identifying the response which best characterizes the patient during the **past week**.

---

10. <u>DEGREE OF CONTROL</u> OVER COMPULSIVE BEHAVIOR?

How strong is the drive to perform these behaviors? How much control do you have over them?

0 = Complete control, or control is unnecessary because symptoms are mild
1 = Much control, experiences pressure to perform the behavior, but usually able to exercise voluntary control over them
2 = Moderate control, strong pressure to perform behavior, can control it only with difficulty
3 = Little control, very strong drive to perform behavior, must be carried to completion, can delay only with difficulty
4 = No control, drive to perform behavior experienced as completely involuntary and overpowering, rarely able to even momentarily delay activity

---

11. <u>INSIGHT</u>
Is it possible that your defect might be less noticeable or less unattractive than you think it is? How convinced are you that (body part) is as unattractive as you think it is? Can anyone convince you that it doesn't look so bad?

0 = Excellent insight, fully rational
1 = Good insight, readily acknowledges absurdity of thoughts (but doesn't seem completely convinced that there isn't something besides anxiety to be concerned about
2 = Fair insight, reluctantly admits that thoughts seem unreasonable but wavers
3 = Poor insight, maintains that thoughts are not unreasonable
4 = Lacks insight, delusional, definitely convinced that concerns are reasonable, unresponsive to contrary evidence

For each item circle the number identifying the response which best characterizes the patient during the **past week**.

---

12. AVOIDANCE

How you have been avoiding doing anything, going any place, or being with anyone because of your thoughts or behaviors related to your body defects?

(If YES, then ask: How much do you avoid? Rate degree to which patient deliberately tries to avoid things?)

0 = No deliberate avoidance
1 = Mild, minimal avoidance
2 = Moderate, some avoidance
   clearly present
3 = Severe, much avoidance,
   avoidance prominent
4 = Extreme, very extensive
   avoidance, patient avoids
   almost all activities

8.2. Appendix B: **Stimulus Material used in Study 2**

Key:
0xxx   practise scenarios
1xxx   nonspecific general scenario
2xxx   social phobic scenario
3xxx   BDD scenario
x01x...x18x   running scenario number
xxx0   no cue
xxx1   threatening/disorder-relevant cue
xxx2   nonthreatening/disorder-irrelevant cue
xxx3   ambiguous sentence
xxx4   threatening/disorder-relevant continuation
xxx5   nonthreatening/disorder-irrelevant continuation
xxx6   question
xxx7   correct answer
(xx)   syllable number

0012   invitation (4)
0013   Lily came home from school with a note for her parents. (13)
0015   She hung around eager to see how they would react. (13)
0016   Did Lily wait for her parent's response to the letter?
0017   Yes.

0020   ?????
0023   Gail's exhibition attracted a lot of attention. (14)
0025   Nobody had anticipated that she could create such great art. (17)
0026   Did everyone anticipate such a great exhibition from Gail?
0027   No.

0032   height (1)
0033   The doctor examined little Theresa's growth. (12)
0034   Her tumor had changed very little since the last visit. (14)
0036   Did the doctor find any change since the last visit?
0037   Yes.

1010   ?????
1011   suture (2)
1012   fabric (2)
1013   Ann changed her nightgown after the operation and tore the stitches. (17)
1014   She bent down to examine the damage to the wound. (13)
1015   She bent down to examine the damage to the seam. (13) n
1016   Did Ann ignore the torn stitches?
1017   No.

1020 ?????
1021 terrorist (3)
1022 birthday (2)
1023 The man put the box outside the door and quickly left. (13)
1024 The bomb went unnoticed for several hours before being found. (17)
1025 The gift went unnoticed for several hours before being found. (17) p
1026 Was the box discovered right away?
1027 No.

1030 ?????
1031 cavities (3)
1032 laborer (3)
1033 The sound of the drill droned on and on. (9)
1034 The dentist finally stopped working on the hole in the tooth. (15)
1035 The construction-worker finally stopped making so much noise. (15)
1036 Did the drilling eventually stop?
1037 Yes.

1040 ?????
1041 rotten (2)
1042 exotic (3)
1043 The meat Mary ate had an unusual flavor. (12)
1044 The rancid taste lasted long after the meal had ended. (14)
1045 The spicy taste lasted long after the meal had ended. (14) n
1046 Did Mary eat meat?
1047 Yes.

1050 ?????
1051 riot (2)
1052 argue (2)
1053 The organization/event was attacked by political opponents. (17/14)
1054 The violence intensified as the day went on. (13)
1055 The debate intensified as the day went on. (12) n
1056 Was the event met with opposition?
1057 Yes.

1060 ?????
1061 complaint (2)
1062 compliment (3)
1063 After dinner at the restaurant, the couple called the chef to the table. (19)
1064 They wanted to blame him for the terrible meal. (12)
1065 They wanted to thank him for the delicious meal. (12) p
1066 Did the couple call the chef over to discuss the meal?
1067 Yes.

1070   ?????
1071   minus (2)
1072   plus (1)
1073   Barbara was surprised by the amount in her bank account. (15)
1074   She had not expected to be so much in debt. (12)
1075   She had not expected to have so much money. (12) p
1076   Did Barbara expect the amount stated in her bank account?
1077   No.

1080   ?????
1081   drowning (2)
1082   playing (2)
1083   Oksana did not hear her little son calling for her from the lake. (17)
1084   Otherwise she would have swum out to rescue him. (17)
1085   Otherwise she would have swum out to splash with him. (17) n
1086   Was Oksana called by her little son?
1087   Yes.

1090   ?????
1091   burning (2)
1092   tobacco (3)
1093   The children were removed from the smoky room. (11)
1094   They returned when the blaze had been extinguished and the room aired out. (16)
1095   They returned when the cigar had been extinguished and the room aired out. (17) n
1096   Did the children return to the room immediately?
1097   No.

1100   ?????
1101   ignite (2)
1102   brighten (2)
1103   It was late night when the building was lit. (10)
1104   It was not possible to see the fire from a far distance. (16)
1105   It was not possible to see the lights from a far distance. (15) n
1106   Was it possible to see that the building was lit from afar?
1107   No.

1110   ?????
1111   crash (1)
1112   skate (1)
1113   Pat slid fast along the icy pond. (9)
1114   She fell pretty hard beside her best friend Diane. (11)
1115   She skated well beside her best friend Diane. (11) p
1116   Was Pat's friend with her on the pond?
1117   Yes.

1120   ?????
1121   clash (1)
1122   detour (2)
1123   Beth made a wrong turn with her Pontiac. (10)
1124   The inevitable accident resulted in her the seminar. (20)
1125   The inevitable delay resulted in her the seminar. (19) n
1126   Did Beth drive a BMW?
1127   No.

1130   ?????
1131   stealing (2)
1132   withdrawal (3)
1133   The bank clerk handed the money over to the man. (13)
1134   The robber put the money in his plastic bag. (12)
1135   The costumer put the money in his wallet. (12) n
1136   Did the man put the money in a suitcase?
1137   No.

1140   ?????
1141   malignant (3)
1142   baby (2)
1143   Carmen was surprised when the doctor informed her about the results. (17)
1144   She did not expect to have cancer. (9)
1145   She did not expect to be pregnant. (9) n
1146   Did Carmen expect the results?
1147   No.

1150   ?????
1151   mourning (2)
1152   Christmas (2)
1153   It was snowing heavily when the wreath was brought. (12)
1154   The family watched as it was put on the coffin. (13)
1155   The family watched as it was attached to the door (13) n
1156   Did somebody observe how the wreath was placed?
1157   Yes.

1160   ?????
1161   repulsion (3)
1162   attraction (3)
1163   Brenda found it hard to hide her feelings for Peter. (12)
1164   She had always hated the way he treated people. (13)
1165   She had always loved the way he treated people. (12) p
1166   Did Brenda have difficulties hiding her emotions from Rob?
1167   Yes.

1170 ?????
1171 surgery (3)
1172 carpentry (3)
1173 He decided that the leg was beyond repair. (12)
1174 After several hours the doctor had to admit defeat. (16)
1175 After several hours the craftsman had to admit defeat. (16) n
1176 Was a great effort made to repair the leg?
1177 Yes.

1180 ?????
1181 refused (2)
1182 accepted (3)
1183 Joan received a call from her bank regarding her credit application. (18)
1184 The bank denied her application. (9)
1185 The bank approved her application. (9) p
1186 Did the bank want further information from Joan?
1187 No.

2010 ?????
2011 shame (1)
2012 rage (1)
2013 Kristin felt herself flush when her male colleague spoke to her. (14)
2014 Her reaction embarrassed her. (8)
2015 His words infuriated her. (8) n
2016 Did Kristin have a strong emotional reaction to her male colleague?
2017 Yes.

2020 ?????
2021 embarrassment (4)
2022 enthusiasm (4)
2023 Sandra felt her heart beat rapidly when her attractive neighbor invited her for dinner. (23)
2024 She was afraid she would make a big fool of herself. (13)
2025 She was very happy about the invitation. (13) p
2026 Was Sandra indifferent about the invitation of her neighbor?
2027 No.

2030 ?????
2031 frightened (2)
2032 admired (3)
2033 When Vera stood up to deliver the poem all her classmates looked at her. (19)
2034 Their reaction made her so nervous that she stuttered. (13)
2035 Their reaction made her so proud that she was inspired. (14)
2036 Was Vera influenced by the attention of her classmates?
2037 Yes.

2040   ?????
2041   fear (1)
2042   cold (1)
2043   At the barbecue Amy's hands trembled so much she almost spilled her drink. (18)
2044   She was afraid of the unfamiliar people at the party. (16)
2045   She had forgotten her jacket back home and was freezing now. (15) n
2046   Did Amy spoil her dress with a stain?
2047   No.

2050   ?????
2051   stare (1)
2052   flirt (1)
2053   In the elevator Dorothy was alone with an attractive young man. (20)
2054   He observed her and saw how nervous she was. (11)
2055   He smiled approvingly and winked at her. (10) p
2056   Did the young man pay any attention to Dorothy?
2057   Yes.

2060   ?????
2061   lecture (2)
2062   virus (2)
2063   Facing the audience, Sabrina's legs were so shaky she had to sit down. (19)
2064   She was sure to screw up her presentation. (11)
2065   She was certain she had fallen ill. (10) n
2066   Was Sabrina too weak to stand up because she had not eaten all day?
2067   No.

2070   ?????
2071   unwelcome (3)
2072   outfit (2)
2073   When Miriam appeared at the party the guests fell silent. (15)
2074   Miriam feared they were not happy to see her. (12)
2075   Miriam enjoyed the awe her dress inspired. (12)
2076   Did Miriam's appearance at the party stay unnoticed?
2077   No.

2080   ?????
2081   stammer (2)
2082   err (1)
2083   A stranger addressed Alexandra on the street. (12)
2084   She was ashamed she stuttered when replying. (11)
2085   She really wondered who he mistook her for. (11)
2086   Did Alexandra meet an old friend on the street?
2087   No.

2090 ?????
2091 stupid (2)
2092 funny (2)
2093 Rebecca's speech made everyone in class giggle. (12)
2094 Her choice of words reflected her dullness. (10)
2095 Her choice of words reflected her great wit. (10) p
2096 Were Rebecca's classmates amused by her speech?
2097 Yes.

2100 ?????
2101 incompetent (4)
2102 exceptional (4)
2103 Susan only guessed what her colleagues thought of her work. (13)
2104 Their criticisms were never made within her earshot. (14)
2105 Their honest praises were never made within her earshot. (14) p
2106 Did Susan have to guess the opinion of her colleagues?
2107 Yes.

2110 ?????
2111 ridicule (3)
2112 entertain (3)
2113 Holly's travel stories made the class laugh. (10)
2114 She made a lot of silly mistakes in her discription of Italy. (18)
2115 She made a lot of silly jokes in her discription of Italy. (17) p
2116 Did Holly's travel stories cause great amuesement?
2117 Yes.

2120 ?????
2121 shy (1)
2122 fun (1)
2123 Linda's expectations of the party were correct. (13)
2124 She was too nervous to start a conversation. (12)
2125 She was happy to start a conversation. (11) p
2126 Did Linda find her expectations confirmed?
3127 Yes.

2130 ?????
2131 upset (2)
2132 glad (1)
2133 When Debbie entered the classroom late, everyone looked at her. (15)
2134 The class was reproachful at her tardiness. (11)
2135 The class was relieved at her arrival. (10)
2136 Did the class respond to Debbie's late entrance?
2137 Yes.

2140 ?????
2141 dull (1)
2142 busy (2)
2143 Eric called Lucia to cancel the date they had for the evening. (17)
2144 He did not want to go out with her because she was so boring. (16)
2145 He really wanted to go out with her but his boss needed him. (16)
2146 Did Eric call Lucia to confirm their date?
2147 Yes.

2150 ?????
2151 failure (2)
2152 success (2)
2153 Tonya was awaiting the results of her finals. (13)
2154 She feared that she had flanked her exams. (9)
2155 She knew that she had passed her exams. (9) p
2156 Had Tonya been told her examination results?
2157 No.

2160 ?????
2161 blamed (1)
2162 praised (1)
2163 Her boss called Frances into his office. (10)
2164 He wanted to criticize her for a job she had done yesterday. (17)
2165 He wanted to congratulate her for a job she had done yesterday. (18) p
2166 Did Frances receive a raise from her boss?
2167 No.

2170 ?????
2171 afraid (3)
2172 dishes (2)
2173 Bobbie had wet hands when her guests arrived. (10)
2174 She was sweating anxiously about their arrival. (13)
2175 She had just rinsed some plates before their arrival. (12) n
2176 Did Bobbie launder her clothes before the guests appeared?
2177 No.

2180 ?????
2181 belittled (3)
2182 interested (4)
2183 When Rachel entered the restaurant a guest looked at her intensely. (17)
2184 His gaze revealed how uninteresting he found her. (12)
2185 His gaze revealed how interesting he found her. (11) p
2186 Was Rachel stared at when she entered the restaurant?
2187 Yes.

3010   ?????
3011   disgust (2)
3012   affection (3)
3013   Bob was watching Susan from a distance. (10)
3014   He had never liked the way she looked. (9)
3015   He had always liked the way she looked. (10)
3016   Was Bob indifferent towards Susan?
3017   No.

3020   ?????
3021   defect (2)
3022   joke (1)
3023   Some people behind Jane were laughing. (9)
3024   They had noticed how awful she looked. (9)
3025   One of them had mad a funny remark. (10)
3026   Did anybody laugh?
3027   Yes.

3030   ?????
3031   hideous (3)
3032   pretty (2)
3033   Mary realized that others took special notice of her. (14)
3034   She felt very uncomfortable because of her appearance. (16)
3035   She felt very self-confident because of her appearance. (16)
3036   Did Mary get special attention?
3037   Yes.

3040   ?????
3041   sad (1)
3042   proud (1)
3043   Standing in front of the mirror, Nancy examined her appearance. (18)
3044   She felt despairing about her new hair style. (11)
3045   She felt very good about her new hair style. (11)
3046   Did Nancy stand in front of a reflecting window?
3047   No.

3050   ?????
3051   misshapen (3)
3052   theater (3)
3053   Watched by the crowd, Andrea covered her face with her hands. (14)
3054   She was afraid that other people saw her flaw. (12)
3055   She was an excellent actress who knew her business. (13)
3056   Did anyone talk to Andrea?
3057   No.

3060 ?????
3061 acne (2)
3062 invitation (4)
3063 Before leaving the house, Lisa checked her makeup again. (14)
3064 She was sure that everybody would stare at her skin. (13)
3065 She wanted to make a good impression on her date. (13)
3066 Did Lisa leave the house?
3067 Yes.

3070 ?????
3071 asymmetry (4)
3072 competition (4)
3073 Mike used to compare himself with others. (10)
3074 He thought other men looked much better in short pants. (12)
3075 He was pretty sure he had a good chance to get this job. (12)
3076 Did Mike compare himself with other people?
3077 Yes.

3080 ?????
3081 homely (2)
3082 heat (1)
3083 Betty felt really uncomfortable lying on the beach. (14)
3084 She worried others would take special notice of her. (13)
3085 There was no shade and the sun was burning her. (11)
3086 Did Betty feel really good at the beach?
3087   No.

3090 ?????
3091 deformed (2)
3092 taste (1)
3093 Sitting together at dinner, Linda asked for reassurance. (16)
3094 She was afraid what she looked like tonight. (10)
3095 She was afraid her meal might be too salty. (11)
3096 Did Linda feel good in this situation?
3097 No.

3100 ?????
3101 disfigured (3)
3102 chlorine (2)
3103 Jennifer avoided swimming in public pools. (12)
3104 Being in such a bad shape, she did not dare to expose herself in public. (19)
3105 Coming into contact with these chemicals, her eyes used to get irritated. (20)
3106 Did Jennifer go swimming?
3107 No.

3110   ?????
3111   misshapen (2)
3112   studying (3)
3113   Kristin had not dated anybody for 6 months. (13)
3114   Preparing for her final exams, she did not have any time to go out. (19)
3115   Comparing herself to other women, she found herself really ugly. (18)
3116   Had Kristin dated anybody?
3117   No.

3120   ?????
3121   wrinkle (2)
3122   stewardess (3)
3123   Cheryl spent a lot of money for cosmetics. (12)
3124   She was afraid that she could look hideous. (11)
3125   It was very important in her job to look good. (11)
3126   Did Cheryl spend less money for cosmetics?
3127   No.

3130   ?????
3131   repulsion (3)
3132   dating (2)
3133   Paula spent a lot of time grooming. (9)
3134   She was really unhappy with her appearance. (13)
3135   She wanted to look beautiful for her boyfriend. (12)
3136   Did Paula spend a lot of time grooming?
3137   Yes.

3140   ?????
3141   blemish (2)
3142   dermatosis (4)
3143   Mary had consulted a dermatologist several times. (16)
3144   She felt very upset about her appearance. (13)
3145   It was really hard to get rid of the measles. (12)
3146   Had Mary seen the doctor more than once?
3147   Yes.

3150   ?????
3151   flaw (1)
3152   bright (1)
3153   Rosemary felt more comfortable sitting in the dark part of the room. (18)
3154   She thought her defect would be less visible there. (12)
3155   The sun light falling through the window had dazzled her. (13)
3156   Did Rosemary feel less comfortable sitting there?
3157   No.

3160 ?????
3161 scar (1)
3162 job (1)
3163 Marianne applied makeup many times a day. (12)
3164 She spent lots of time using makeup to cover her red scar. (15)
3165 She was really happy that she found work as a beautician. (15)
3166 Did Marianne apply makeup a lot?
3167 Yes.

3170 ?????
3171 ugly (2)
3172 model (2)
3173 When Linda walked down the street, everybody was staring at her. (16)
3174 She felt upset since she was disfigured. (10)
3175 She was confident of her perfect body. (11)
3176 Was everybody staring at her?
3177 Yes.

3180 ?????
3181 disease (2)
3182 appearance (4)
3183 Jeremy had undergone several surgeries. (13)
3184 After this refractory illness, it took him a long time to feel better. (19)
3185 He was more satisfied with the shape of his nose than he was before. (17)
3186 Had Jeremy undergone more than one surgery?
3187 Yes.

9. Curriculum Vitae

31.03.1972	Geboren in Bad Hersfeld
1978-1982	Grundschule in Bad Hersfeld
1982-1988	Gesamtschule Obersberg, gymnasialer Zweig, in Bad Hersfeld
1988-1991	Modelschule Obersberg in Bad Hersfeld – Abitur
1991-1992	Freiwilliges Soziales Jahr der Evangelischen Kirche von Kurhessen-Waldeck
1992-1993	Studium Biologie/Chemie auf Lehramt Technische Hochschule Darmstadt
1993-1999	Immatrikulation für das Studium Psychologie Philipps-Universität Marburg
1996	Vordiplom in Psychologie
1997	Research Fellow Obsessive-Compulsive Disorder Clinic, Massachusetts General Hospital, Harvard Medical School, Boston, U.S.A.
1998	Studentische Hilfskraft für Prof. Dr. Irmela Florin Philipps-Universität Marburg
1999	Diplom in Psychologie
1999-	Research Fellow Obsessive-Compulsive Disorder Clinic, Massachusetts General Hospital, Harvard Medical School, Boston, U.S.A.
2001	Teaching Fellow für Prof. Dr. Patrick Cavanagh

	Harvard University, Department of Psychology, Cambridge, U.S.A.
2002	Teaching Fellow für Prof. Dr. Daniel Gilbert
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2002	Clinical Fellow
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