MASTERARBEIT / MASTER'S THESIS

Titel der Masterarbeit / Title of the Master's Thesis

„The Influence of Sexual Objectification on Empathy and the Impact of Socially Aversive Personality Traits: an fMRI Study"

verfasst von / submitted by

Christian Marx BSc

angestrebter akademischer Grad / in partial fulfilment of the requirements for the degree of

Master of Science (MSc)

Wien, 2023 / Vienna 2023

Studienkennzahl lt. Studienblatt / degree programme code as it appears on the student record sheet:	UA 066 840
Studienrichtung lt. Studienblatt / degree programme as it appears on the student record sheet:	Masterstudium Psychologie UG2002
Betreut von / Supervisor:	Univ.-Prof. Dr. Claus Lamm

Contents

Introduction and Theoretical Background

Recent research on the background of sexually violent behavior emphasizes the connection between sexual objectification and empathy. Studies have shown that sexual objectification of targets leads to reduced empathic responses at the behavioral and neural levels. At the same time, the influence of other variables on sexual objectification and empathy is also highlighted. Research on the impact of personality suggests that socially aversive personality traits have relevant effects on empathy as well as sexual objectification. Recent findings highlight personality traits as being related to empathy and objectification behavior, but the nature of this relation has not been directly addressed yet. This thesis aims to gain more insight to the role of socially aversive personality traits in sexually violent attitudes and behaviors by examining the impact of such personality traits on the relation between sexual objectification and empathic responses. For this, the theoretical background of sexual objectification, empathy and the dark triad traits will be discussed in detail to demonstrate how these constructs might be related. Afterwards the hypothesis and study design will be presented. Subsequently the analysis and results will be presented and explained. Finally, findings will be discussed considering the current state of research and limitations and strengths of this thesis will be addressed. Study results are summarized in the conclusion.

Sexual Objectification

Sexual objectification, which can be defined as seeing or treating another person as a sexualized object (Loughnan & Pacilli, 2014) or reducing people to their sexual body parts (Gervais et al., 2012) is a phenomenon that can have extensive consequences for the target of objectification. Objectification affects the way people are seen. Two cognitions seem particularly likely to be associated with behavior change: perceived lack of competence and lack of morality (Loughnan & Pacilli, 2014). Also, it has been shown that not only men, but also women tend to dehumanize sexualized women (Vaes et al., 2011). A predictor of objectification behavior in women is the tendency to self-objectification (Loughnan & Pacilli, 2014). Women who have concerns with their own sexualized appearance are more likely to be worried with how others see them. Also in interpersonal interactions, objectification of others occurs before self-objectification as self-objectification is thought to result from adopting an external vision of oneself.

A Study conducted by Graff et al. (2012) investigated the effect of sexualized appearance and the level of accomplishment on the evaluation of certain traits in women. It was found that women who were portrayed sexualized and as having a lower level of accomplishment were significantly rated as least intelligent, competent, determined and capable. Furthermore, those women were rated lower in self-respect and morality (Graff et al., 2012). Loughnan et al. (2010) studied how sexualized men and women were rated in terms of intelligence. The study also found that sexualized people were considered to be significantly less intelligent. Another study by Loughnan et al. (2013) highlights the effects of this denial of morality of sexualized targets. The authors argue that this denial of moral concern is one key mechanism of the objectifying behavior towards sexualized targets, which leads to a perception of being less human and more object-like. Also, they found that in cases of sexual assault, objectified women are seen to suffer less and being more blamed. They assume that this relation is mediated by the attribution of moral concern (Loughnan et al., 2013). Furthermore, sexual objectification influences the way victims of sexual assault are perceived. In rape cases, sexual objectification of the victims leads to being perceived as more responsible for being raped (Loughnan et al., 2013) and to less blame being attributed to the rapists (Bernard et al., 2015).

Taken together, sexual objectification involves perceiving individuals as sexual objects, impacting their perception on traits like competence and morality. Both men and women tend to dehumanize sexualized women. Research consistently shows that sexualized individuals are perceived as less intelligent and experience moral denial. This denial drives objectifying behavior, viewing them as less human. Sexual objectification also distorts perceptions of sexual assault victims, increasing victim blame and reducing rapist blame. It is important to note how and through what mechanisms the effects of objectification on attitudes and behavior come about. Recent research is examining the relationship between sexual objectification and empathy (Beck & Rose, 2021; Galdi & Guizzo, 2020; Pond et al., 2022; Sáez et al., 2022). The following sections discuss this in more detail.

Empathy

Empathy can be defined as the ability to understand a person from his or her perspective rather than one’s own, or vicariously experiencing that person’s feelings, perceptions, and thoughts (“Empathy”, 2023). Still, Empathy is a broad concept that can be viewed in multifaceted ways from a scientific perspective. Shamay-Tsoory et al. (2009) found two possible neuronal systems for empathy processing in their research. The first is based on cognitive perspective-taking, also called *cognitive empathy*. The second system is an emotional system which relates on being affected by the emotional state of another person, also called *emotional empathy*. Cognitive empathy, which is often referred to as mentalizing

(Shamay-Tsoory et al., 2009), means the ability of drawing cognitive insights about a person's state. It involves comprehending intentions, desires, and adopting their viewpoint (Hein & Singer, 2008). In contrast to cognitive empathy, emotional empathy is an affective state, also called emotional contagion (De Waal, 2008). This indicates that the emotional arousal of one person is transferred to the person empathizing. For example, by using self-reports of emotional reactions, Batson et al. (1997) showed that empathizing with others increases emotional arousal.

When it comes to research in the field of empathy, conceptualization and operationalization are two important things to consider (Surma-aho & Hölttä-Otto, 2022). Since this thesis will focus on neural correlates of empathy, the neural basis of empathy will be explained in more detail to provide an understanding of the essential brain areas related to empathy processing. This will be addressed in the methods of this study. Furthermore, the empathy for pain paradigm will be highlighted, since it plays a crucial role in this study.

Neural Basis of Empathy

Regarding the neuroscience of empathy, it is assumed that mirror neurons are part of a larger brain network responsible for perceiving the intentions and behaviors of others (Bear, 2015). The mirrored activation of these neurons in the observer's brain promotes the neurological replication of observed events. The differentiation between cognitive and affective empathy can also be found on the neurological level. In their study, Shamay-Tsoory et al. (2009) showed that emotional empathetic abilities are distinct from those related to cognitive empathy and that they also depend on separated anatomical structures. While investigating patients with specific lesions, they found that damages in the ventromedial prefrontal cortices were associated to deficits in cognitive empathy and theory of mind while emotional empathy abilities were unaffected. Because of this, they concluded that the ventromedial prefrontal cortices are key structures of cognitive empathy. On the other hand, patients who had impairments in the inferior frontal gyrus, showed impaired emotional empathy and emotion recognition. They claimed that there is a *simulation system* as a subsystem of emotional empathy which regulates empathetic behaviors such as emotional contagion, personal pain, sympathetic care, and emotional recognition. The core structure of this subsystem is the inferior frontal gyrus (Shamay-Tsoory et al., 2009).

More recent insights come from a review by Walter (2012). He also focused on the neuroscience of cognitive and affective empathy and came up with similar findings. Regarding cognitive empathy, Walter highlights that, since cognitive empathy does not focus on actual affective sharing but more on understanding the affective state of a person, the brain activity of interest lies in the structures of cognitive theory of mind (Walter, 2012). It has been found that especially the dorsomedial prefrontal cortex (Amodio & Frith, 2006) and the temporoparietal junction (Saxe & Wexler, 2005) seem to play a crucial role in this mentalizing network. While the dorsomedial prefrontal cortex is thought to be involved in controlling and enforcing one's own motor intentions over externally triggered response tendencies, the temporoparietal junction is believed to play a crucial role in *agency attribution*. Agency attribution refers to the ability to attribute or assign the cause of an observed action to either oneself or someone else (Walter, 2012). Also, mentalizing about the emotional state in comparison to mentalizing about the cognitions of a person elicits higher activation in different regions. Mentalizing about cognitions evokes higher activation in the anterior part of the mentalizing network. But at the same time there are also connections between the paths. Research emphasizes the role of the ventromedial prefrontal cortex in the context of cognitive empathy and there is evidence for it to be an important relay station between cognitive and affective processing (Walter, 2012).

Research on the neuroscience of affective empathy is often based on the investigation of common activation patterns, or shared networks (Walter, 2012). A study by Cox et al. (2012) showed that affective empathy was associated with functional connectivity between ventral anterior insula, orbitofrontal cortex, amygdala, and the anterior cingulate cortex (Cox et al., 2012). These findings were reviewed and confirmed by Leigh et al. (2013). In their study, they tested affective empathy abilities of participants with acute lesions in the right hemisphere and found the prefrontal cortex, anterior cingulate cortex, anterior Insula, orbitofrontal cortex, amygdala, and the temporal pole to be significantly associated with affective empathy (Leigh et al., 2013).

In summary, the neuroscience of empathy reveals a complex network of brain regions that is involved in perceiving and understanding the intentions and feelings of others. Studies that distinguish between cognitive and affective empathy point to different anatomical structures. The dorsomedial prefrontal cortex and the temporoparietal junction are important regions for the mentalizing aspect of cognitive empathy while for affective empathy, several brain regions are interconnected, including the anterior insula and anterior cingulate cortex. In this study, empathy is examined in the context of pain perception. The underlying neurological mechanisms are explained below.

Empathy for Pain

Pain is by far the most frequently studied affective state in the context of empathy research (Walter, 2012). A meta-analysis by Lamm et al. (2011) focused on the issue whether empathy for pain is based on brain regions that are also engaged in direct experience of pain. Relying on neuroimaging studies, their analyses suggest that empathy for pain is linked to a network comprising both the bilateral anterior insular cortex and the medial/anterior cingulate cortex. The activation within these regions is also associated with the activation observed during firsthand experiences of pain. They concluded that the bilateral anterior Insula and a region at the border of anterior medial cingulate cortex and posterior anterior cingulate cortex constitute a core network for pain empathy (Lamm et al., 2011). Areas of the cingulate cortex are known to be related to general pain processing (Morrison at al., 2004). The anterior insula is also directly and indirectly involved in the processing of pain, but also in other processes such as interoception and salience processing and emotional experience (Craig, 2009; Ferraro et al., 2022). Other studies addressing the relationship between firsthand pain and empathy for pain examined the effects of placebo analgesia on empathy for pain. Findings emphasize that placebo analgesia also decreased empathy for pain (Rütgen et al., 2021; Rütgen, Seidel, Riečanský, et al., 2015; Rütgen, Seidel, Silani, et al., 2015), which strengthens the assumption that empathy for pain is based on the same neural circuits as first hand experienced pain.

The neural background of empathy and the existing extensive research on empathy for pain are essential to the methods of this study. After this has been discussed in depth, the relationship between empathy and sexual objectification will be examined in more detail in order to provide a theoretical understanding of the subject matter of this research.

Empathy and Sexual Objectification

The link between empathy and sexual objectification has already been addressed extensively in research. A recent review by Galdi & Guizzo (2020) highlights how sexually objectifying media is related to sexual harassment. They also focused on the influence of empathy on sexual violent behavior, and they provided evidence that deficits in empathy are associated with or facilitate increased sexually violent behavior. They emphasized that a lack of empathy is generally important when it comes to sexual harassment and sexual assault behaviors. Besides, higher levels of empathy are associated with helping behavior like defending victims of bullying and sexual violence (Galdi & Guizzo, 2020).

Another study by Sáez et al. (2022) found that besides an increased tendency to violence, the dehumanization of targets is closely associated with a decreased empathy for them. This decrease in empathy is seen as the basis for objectifying targets, which can lead to violence in partnership. A mediation pathway analysis revealed that for men in particular, perceiving their partner as less human is associated with a lower ability to empathize with their feelings and perspective. This relationship between empathy and intermediate partner violence was consistent with previous research findings (Sáez et al., 2022). This is also confirmed by findings showing that masculine norms may lead to reduced empathy towards victims of sexual violence (Galdi & Guizzo, 2020).

The effects of sexual objectification on empathy are also being studied at the neural level. An fMRI study conducted by Cikara et al. (2011) investigated the mentalizing network of subjects while viewing sexualized and non-sexualized female targets. They found that men with higher sexist attitudes showed less activation of brain regions associated with the mentalizing network while viewing sexualized targets. Those effects did not occur while viewing non-sexualized targets. Lower activation of brain regions associated with the mentalizing network due to sexualization is also related to less empathic behaviors towards sexualized women (Bernard et al., 2020). Another study by Cogoni et al. (2018) focused on the link between sexual objectification and empathic reactions on a behavioral and neural level. By using a social exclusion task, less empathic reactions were observed towards objectified women. At the same time, a reduction of empathic responses at the neural level was reported in the sexualized condition (Cogoni et al., 2018).

A very recent study on this subject comes from Cogoni and colleagues (2023). Using an empathy for pain paradigm, they measured electrophysical responses to sexualized versus non-sexualized targets. It was assumed that sexually objectified women are perceived as dehumanized and that this affects both the neural and behavioral responses that underlie empathic responses to their physical pain. This study demonstrated that the neuropsychological responses associated with vicarious experience of physical pain are suppressed or potentially absent in the context of sexualized women. Given that empathy plays a critical role in mitigating aggressive behaviors and sexual violence, this provides a plausible explanation for abusive behavior against sexually objectified targets (Cogoni et al., 2023). This research demonstrates the relevance of sexual objectification to empathic processes. Sexual objectification has been shown to influence people's empathic experience at both behavioral and neural levels.

Cogoni, Cargnaghi and Silani (2021) conducted a study using the Empathy for Affective Touch paradigm. In their study design, a participant and a confederate who played the role of a second participant experienced visually and tactually stimulation. In different experimental conditions, the confederate could be represented as a mannequin (a human-like object), a sexually objectified woman (dressed in a sexually objectifying manner), or a non-sexually objectified woman. Tactile stimulation involved touching the palm of either the participant or the confederate with materials that, when combined with corresponding images, could evoke pleasant, unpleasant, or neutral sensations. Participants were asked to evaluate their own emotional experiences and to rate the confederate's feelings during the stimulation. Notably, participants exhibited higher levels of empathy when interacting with non-sexually objectified women compared to interactions involving sexually objectified women. Also, the findings demonstrated that both male and female participants were more likely to administer pain to sexually objectified targets than non-sexually objectified targets. This implies that reduced empathy towards sexually objectified women can increase the tendency to harm them (Cogoni et al., 2021).

In addition to the existing correlation between sexual objectification and empathy, research is also paying attention to other influential factors and their impact on this relation. In this master's thesis, the influence of socially aversive personality traits, measured with the validated version of the German Short Dark Triad (Wehner et al., 2021), on the effect of sexual objectification on empathy will be examined in more detail. In order to support the assumption of an existing influence, the following part of this paper presents existing literature on the dark triad traits and previous research on their relationship with empathy and sexual objectification.

The Dark Triad

The Dark Triad of personality describes the three socially aversive, non-pathological personality traits psychopathy, narcissism and Machiavellianism (Paulhus & Williams, 2002). It is considered that all three traits are accompanied by various emotional deficits (Szabó & Bereczkei, 2017) and Dark Triad traits have been proven to be a strong predictor of aggressive and norm-violating behavior (Nagler et al., 2014; O'Boyle et al., 2012). Furthermore, the relationship between empathy and the Dark Triad has gained interest in research. Studies on this field highlight that there is a negative correlation between all Dark Triad personality traits and affective empathy, which refers to a consistent emotional response of the observer with the affective state of another (Jonason et al., 2013; Pajevic et al., 2018; Palmer & Tackett, 2018; Wai & Tiliopoulos, 2012). In addition to the association with empathy, recent research also shows a direct link between dark triad personality traits and cognitions and attitudes related to the perpetration of sexual violence (Lyons et al., 2022). Moreover, the personality traits of the dark triad, especially psychopathy and Machiavellianism, share many key conceptual features with objectification like, for example, not respecting interpersonal boundaries, body gazes and body comments (Bernard et al., 2021;

Costello et al., 2020). Research on the link between sexual objectification and Dark Triad traits also show a strong correlation between the traits and measures of sexual objectification (Bernard et al., 2021; Costello et al., 2020; Jonason et al., 2013). In the following, all three personality traits of the Dark Triad will be explained in more detail and relevant research on their connection to empathy and sexual objectification will be presented.

Narcissism

Narcissists are characterized by having exaggerated self-worth and grandiosity; they are self-centered, arrogant, and exploitative in interpersonal relationships, perceiving others as an instrument for satisfying their needs for adulation and confirmation of self-views (Wai & Tiliopoulos, 2012). Other definitions follow a hierarchical approach and differentiate between different kinds of narcissism. A common division is into grandiose and vulnerable narcissism. Grandiose narcissism is defined by traits such as arrogance, entitlement, high self-esteem, sociability, aggression, initial likability, a proclivity for risk-taking, and a competitive interpersonal style that views relationships as zero-sum games in which only one person can win. Vulnerable narcissism, on the other hand, is linked to egocentrism, poor and variable (contingent) self-esteem, a lack of trust in others, persistent negative emotions, and social isolation (Miller et al., 2022). To summarize, a narcissistic person typically behaves in a self-centered and grandiose manner, seeking constant admiration and validation, which may lead to exploiting behaviors for their own gain. Associated effects in connection with empathy and sexual objectification will be explained in more detail below.

Narcissism and Empathy. On a clinical level, low empathy is one of the diagnosis criteria for narcissistic personality disorder. On the non-clinical level, research shows mixed findings depending on factors like the conceptualization of empathy, the diversity of narcissism or the methods used (Urbonaviciute & Hepper, 2020). A study conducted by Wai and Tiliopoulos (2012) focused on Dark Triad personality traits and their relation to empathy. They found narcissism to be negatively correlated with affective empathy. Regarding cognitive empathy, the found effect was inverted. Higher scores in narcissism were associated with higher self-reports of cognitive empathy. The authors explain these findings with the tendency to overestimate themselves on the one hand. On the other, it might be that higher skills in cognitive empathy are important to gain an understanding of how others view them in order to fulfill their need for admiration and reinforcement of self-views (Wai & Tiliopoulos, 2012). These findings were confirmed by another study by Pajevic et al. (2018) who found very similar results. A further experiment also highlighted a more adaptive nature of empathy, with increased empathic capacities regarding perspective taking in individuals scoring higher in narcissism (Heym et al., 2019). A meta-analysis by Urbonaviciute and Hepper (2020) found that grandiose narcissism was associated with lower affective empathy, both in self-report and behavioral measures, suggesting a lack of motivation and capacity for emotional empathy. Additionally, similar to the previously mentioned findings, grandiose narcissism was only linked to lower cognitive empathy in self-report measures, but not in behavioral measures, indicating reduced motivation but intact cognitive empathy capacity. In a review by Jankowiak-Siuda & Zajkowski (2013) this relationship was studied at the neurological level and found neurological deficits of empathy in narcissistic persons. They assume a dysfunction in the *salience network* of affected people, which impairs the activation of the anterior cingulate cortex and the anterior insula. A dysfunction of the anterior Insula might lead to an abnormal perception of emotional stimuli as threats. This can result in heightened sensitivity, difficulty suppressing the threat response, and hindered helping behavior, particularly towards perceived threats and it can hinder their ability to understand others' perspectives (Jankowiak-Siuda & Zajkowski, 2013). In summary, research indicates that individuals with narcissistic personality traits tend to exhibit lower affective empathy, mixed findings on cognitive empathy, and potential neurological deficits in empathy-related brain regions, highlighting their challenges in understanding and relating to others' emotions and perspectives.

Narcissism and Sexual Objectification. Research directly addressing the link between Narcissism and sexually objectifying behavior is limited. Still, there are some findings implementing a positive relationship. In general people scoring high on narcissism show the tendency to objectify other people by using them to gain personal advantage or achieve goals (Lachowicz-Tabaczek et al., 2021). When it comes to sexual objectification, it has been shown that narcissism is related to sexist attitudes and males with higher narcissism ratings show more acceptance of rape myth (de Zavala & Bierwiaczonek, 2021; Navas et al., 2020). A study conducted by Bernard et al., (2021) found, that seeing women as objects was associated with all dark triad traits, however, the correlation with narcissism was the lowest.

Machiavellianism

Machiavellianism is a personality trait characterized by strategic social manipulation. Individuals with this feature are skilled in detecting deception cues, adapting behavior to context, manipulating others, and forming self-serving alliances. They are capable social strategists that are interested in personal advantage (Hart et al., 2021). Furthermore, research focusing on behavior in working environments has demonstrated that Machiavellianism predicts a host of counterproductive, deviant, and unethical behaviors (Jones & Mueller, 2022; Loftus & Glenwick, 2001). Furthermore Machiavellianism, besides Psychopathy, is highlighted to be on the darker side of the dark triad traits and correlated to psychopathy (Wai & Tiliopoulos, 2012). In summary, Machiavellians can be described as persons who show cold, cynical, pragmatic, and immoral thinking; strategic long-term planning; agentic motivation as well as deceit and exploitation (Rauthmann & Kolar, 2012). The following sections focus on the associations between Machiavellianism and Empathy and how it affects objectifying behavior.

Machiavellianism and Empathy. When it comes to empathizing with others, Machiavellians tend to under-perform on various social-cognitive tasks that entail intuiting other's internal states such as a person's intentions or emotions (Hart et al., 2021). A study conducted by Wai and Tiliopoulos (2012) found that higher scores in Machiavellianism was associated with deficits in identifying emotions. They conclude that Machiavellians show lower affective empathy. Other studies generally highlight the negative association between Machiavellianism and empathy (Heym et al., 2019; Jonason & Krause, 2013; Pajevic et al., 2018). It is assumed that high empathy would inhibit the successful exploitation of people (Jonason et al., 2013). Besides this, Machiavellianism has been shown to be negatively correlated with emotional intelligence (Szabó & Bereczkei, 2017) which is the ability of an individual to identify their own emotions as well as the emotions of others, allowing them to build meaningful relationships (Mayer et al., 2004). These findings indicate that Machiavellian tendencies are related to lower empathy. Nevertheless, it is important to mention that most of the presented findings used self-report measurements of empathy. There are also other studies using different methods which challenge these assumptions of generally impaired empathy. Bagozzi et al. (2013) used a neuroscientific approach to investigate empathic underpinnings of Machiavellianism by use of functional magnetic resonance imaging. They found that individuals with Machiavellian traits are more skilled at understanding and resonating with the emotions of others when compared to individuals without these traits. The study found a unique connection between two aspects of empathy: perspective-taking and emotional sharing. In the case of Machiavellianism, higher perspective-taking ability was linked to lower emotional sharing, indicating a distinct pattern of empathic processing (Bagozzi et al., 2013). The perspective-taking might be helpful in terms of socially manipulative behavior, while the low emotional affectivity promotes the distant and exploitative nature. Nevertheless, it is often emphasized that socially aversive behavioral tendencies in Machiavellians are context dependent. Individuals high in Machiavellianism constrain their antisocial behavior to environments when the benefits outweigh the costs (Jones & Mueller, 2022). This may also be one reason why the research findings on empathy are inconclusive.

Machiavellianism and Sexual Objectification. As with narcissism, existing research on this issue is limited. A study by Bernard et al. (2021) explored the association of the Dark Triad traits with objectification behavior and sexism and found the dark triad traits being associated with cognitive objectification and self-reported objectifying behaviors. They concluded that the Dark Triad traits might be a better predictor for objectifying tendencies then sexist attitudes. Also, they found a high correlation of the Dark Triad traits and hostile sexism (Bernard et al., 2020). Focusing directly on Machiavellianism, a moderate correlation with body gazes and body comments was found. Also, it has been found that in males higher scores on Machiavellianism are associated with higher self-objectifying behavior, which is related, among other things, to poor cognitive performance, negative affect and decreased sexual self-esteem (Carrotte & Anderson, 2018; Fox & Rooney, 2015).

Psychopathy

People with psychopathic tendencies engage in damaging interpersonal activities that are driven by distorted thinking, and they utilize deceptive strategies to enrich themselves while disregarding the harm they cause others. Unlike the other Dark Triad traits, psychopathy is distinguished by its increased impulsiveness and tendency for inappropriate, unethical, or even aggressive behavior (Hare, 1999). According to Del Gaizo & Falkenbach (2008) psychopathy can be distinguished between primary and secondary psychopathy. Primary psychopaths maintain emotional control while carrying out planned activities motivated by a lack of moral considerations. Secondary psychopathy, on the other hand, is a reaction to external events that results in impulsive and emotionally unstable behaviors that may cause harm to others as a reaction to negative feelings. Research on psychopathy has also shown significant correlations to several types of socially undesirable outcomes like aggression, self-control, and an exploitive interpersonal/sexual style with aggressive attitudes and behaviors (Jonason & Kroll, 2015). Its relation to empathy and objectification will be discussed below.

Psychopathy and Empathy. Despite the general correlation between the Dark Triad traits and different aspects of empathy, numerous studies highlight psychopathy as the strongest predictor when it comes to empathic deficits (Heym et al., 2019; Jonason & Krause, 2013; Szabó & Bereczkei, 2017). It has been shown that people with high psychopathy ratings show a significant desensitization to the emotions of others and an overall association to lower global empathy (Wai & Tiliopoulos, 2012). A study conducted by Jonason and Kroll (2015) mainly found a negative correlation of higher psychopathy scores with perspective taking. Furthermore, especially secondary psychopathy was found to be associated with lower emotional intelligence which predicts antisocial behavior (Szabó & Bereczkei, 2017). Regarding antisocial behavior, people scoring higher on psychopathy are more likely to bully (Heym et al., 2019). In addition, Heym and colleagues (2019) investigated the relation between Dark Triad traits and aggression and found psychopathy to be the strongest predictor of physical and premeditated aggression (Heym et al., 2019). On a neurological level it has been found that psychopathy correlates with impairments in the amygdala and the ventromedial prefrontal cortex. This might affect cognitions of decision making and thus lead to antisocial behavior (Blair, 2008). In general, research shows that those effects of psychopathy on empathy are stronger in men than women (Jonason et al., 2013).

Psychopathy and Sexual Objectification. Among the dark triad traits, psychopathy is the one most researched for its association with sexual behavior and sexual objectification. Findings indicate that psychopathic tendencies promote objectification behavior and diverse sexist attitudes. Previous research underlines that psychopathic individuals are more likely to engage in sexual objectification (Costello et al., 2020). A study conducted by Williams et al. (2005) focused on the influence of subclinical psychopathy on intimate Relationships. They found subclinical psychopathy to be associated with a wide range of risky and violent sexual behaviors, various negative attitudes and cognitions towards their partners and towards relationships in general, and several indicators of infidelity. Also, their findings indicate that people with psychopathic tendencies show more accepting of rape myths and hold more pro-rape attitude. They conclude that the intimate relationships of subclinical psychopaths are extremely abusive and volatile, with respect to both attitudes and behaviors. Methot-Jones and colleagues (2019) explored the relationship between subclinical psychopathy and negative attitudes toward women, focusing on the underlying mechanisms of these correlations. They also discovered a link between psychopathy and sexist and aggressive attitudes against women, as well as hostile sexism. They also discovered a link between psychopathy and multiple measures of dehumanization. Their findings suggest that dehumanization may have an indirect or direct influence on these relationships (Methot-Jones et al., 2019). In summary, previous research has extensively linked subclinical psychopathy to harmful attitudes and behaviors in intimate relationships. These traits are associated with sexual objectification, negative views of partners and relationships, as well as acceptance of rape myths and aggressive attitudes towards women.

The extensively studied relation between the Dark Triad traits and empathy behaviors and responses and the current findings regarding the effects of those traits on sexual objectification and objectification behaviors suggest that there may be a link between the effects of sexual objectification and socially aversive traits on empathy. While socially aversive personality traits have been discussed as being one of several influences on the correlates of sexual objectification and empathy, the specific impact of those personality traits has yet not been studied in more detail. Based on the research findings showing that dark triad personality traits are associated with both sexual objectification and empathy, and the awareness that sexually objectifying people leads to lower empathic responses, it is assumed in this thesis that the Dark Triad traits may function as a moderating (amplifying) variable on the negative effect of sexual objectification on empathy.

Hypothesis

A basic requirement for investigating the expected effect is to demonstrate the negative influence of sexual objectification on empathy. Therefore, it will be hypothesized that a) empathy responses towards targets will be decreased in the sexual objectification condition in comparison to the personalization condition. The main research question addresses the nature of the impact of socially aversive personality traits on the relationship between sexual objectification and empathy. Based on the correlations found by previous research, it is thus hypothesized that b) the influence of sexual objectification on empathy is moderated by the dark triad personality traits in an amplifying way. Also, since psychopathy has been shown to be the strongest predictor of empathy deficits and sexually objectifying attitudes and behaviors, it will be hypothesized that c) psychopathy, as measured in the Dark Triad Personality Inventory, will be having the strongest moderating effect of the influence of sexual objectification on empathy.

Methods

Participants

This thesis is part of a bigger study which is still ongoing at the timepoint of the finalization of this thesis. At the time of this analysis, the number of participants was 31. The participants were 13 male and 18 females. Recruitment was carried out via an online recruitment platform and through postings in social media groups in which younger persons were expected to be part of. During recruitment, care was taken to have a balanced ratio of male and female participants. Participants received a monetary reward of 30€. People interested in participating were sent a questionnaire to fill out in advance. This was used to check for exclusion criteria and to select eligible participants. Qualified participants were between 18 and 35 years old. With the purpose of reducing variability only participants were included which sexual orientation was heterosexual and that their gender was male or female. Exclusion criteria included factors that would prevent performing an MRT scan, such as surgical implants or non-removable piercings. In addition, people with mental illnesses or those taking specific medications, such as painkillers, were excluded. Furthermore, psychology students were excluded because the experimental design was based on deception and no risk was to be taken regarding the detection of the experiment. In addition, it was necessary for the participants to be able to understand German fluently, as the entire instruction and execution of the study was carried out in German.

Experimental Procedure

After participants were considered suitable following the evaluation of the questionnaire, they were sent a link to the validated version of the German Short Dark Triad (Wehner et al., 2021), which they were asked to complete online prior to the actual date of the experiment. One day before the actual scanning, the subjects received a reminder with precise details of the place and time of the testing, as well as the participant information and consent form. The test took place at the Dental Clinic of the Medical University of Vienna. One participant and two female confederates appeared at each session. The confederates were models who were part of the experiment and were supposed to give the impression of being actual participants. They served the purpose of operationalizing the two experimental conditions (independent variable of appearance: sexualized versus personalized) and did not actually participate in the experiment. The models arrived thirty minutes before the participant at each scanning slot to prepare. For each experimental session one model represented the sexualized and the other the personalized condition. In the sexualized condition, the model wore a short and tight black dress, heeled shoes and light make-up. The chest area and the shoulders were visible. In the personalized condition, on the other hand, the models wore modest clothes in muted colors that covered most of their skin and flat shoes (Figure 1). In addition, care was taken to ensure that the models did not show any differences apart from this. For example, they wore no jewelry and had no visible tattoos. Appearance for both conditions was piloted prior to this study by evaluation of sexiness, attractiveness and with the mental attribution scale in order to assess the efficacy of the experimental manipulation. To guarantee a standardized procedure, an experimental supervisor did a last check of the appearance of the models to make sure that everything looks the same for each run. In order to be able to assign dates for the study as flexibly as possible, several models were recruited. They evenly varied in whether they represented the personalized or the sexualized condition.

Figure 1.

Example for the Manipulation of Appearance

Note. A shows an example for the personalized condition. B shows the sexualized condition.

The models did then leave the preparation room about 15 minutes prior to the start of the experimental session to give the actual participant the impression that they also arrive for the testing at the appropriate time. To make this seem more natural, one model went to the entrance area of the clinic, the other model left the building via backdoor and went around the building to arrive at the front door from the outside. The models were instructed beforehand to not interact and behave in a way they do not know each other once they both got to their position at the front entrance of the building. The study supervisor then went to the entrance at the time of the start of the study to pick up the participant and the confederates and take them to the preparation room. As before, caution was taken to ensure that the supervisor did not interact unnecessarily with the models. It was critical that there was no doubt that the models were always regular participants in the experiment. If the participant was late, the supervisor waited with the models without talking in an obvious manner.

Once the participant arrived, the supervisor guided them and the confederates to the preparation room. The preparation room was cleaned up and arranged for the experiment after the models got ready. Since part of the study took place in this room, the objects that were used by the models to prepare had to be removed, like the mirror and their personal belongings. Also, two computers and a pain stimulator were arranged to create the illusion that the experiment will take place in this room. In the preparation room the participant and the confederates were instructed to the procedure of the study. They were told that three participants were recruited since the study was about researching pain perception in oneself and others and for this purpose they participate in a joint task. Further, it was told that the actual participant will perform the experimental tasks inside the MRI scanner (because they got specifically recruited as a participant who will be scanned) and the confederates will stay in the preparation room and perform the tasks at the computers. After explaining the procedure and answering open questions, pictures of the participant and the confederates were taken. The participant was told that these would serve as stimuli during the experiment. The pictures were taken separately in a different room. Participants were asked to act three different expressions with simulating different levels of pain for the pictures. Next the actual participant was handed over to another supervisor who was responsible to fill out the MR-safety questionnaire before the participant entered the room in front of the scanner. The participant was told beforehand, during the instructions that he will not see the confederates again, as the scanning takes even more time at the end and the confederates can then already leave, as this does not apply to them. Afterwards the first supervisor went back to the preparation room with the confederates to perform the task at the computers. In fact, the confederates, as they were models, were then free to leave. After the questionnaire was filled out and checked by a trained and certified researcher (qualified user), the participant was instructed to the task which he performed inside the scanner.

Since the task included receiving electrical stimulation for the pain condition, the intensity of given shocks was calibrated before the task. The participant was guided to the scanner and connected to the fMRI compatible electric shock device. Shocks were short-lasting (500ms) and delivered using Digitimer DS5 Isolated Bipolar Constant Current Stimulator (Digitimer Ltd, Clinical & Biomedical Research Instruments). The participant received the shocks through electrodes on the back of their hands. Shocks were only delivered in a specific condition of the task, which will be explained in more detail below. For the calibration, very weak electric shocks were delivered initially, which then became stronger over time. The participant was asked to rate the intensity of each received shock on a scale up to eight. Shocks rated as eight were taken as the limit and were not delivered within the experiment. That way the maximum level of tolerable pain was rated by each participant individually (Rütgen, Seidel, Silani, et al., 2015). A rating of 1 was therefore just noticeable, but not painful while a rating of 7 meant that the pain is painful but still bearable.

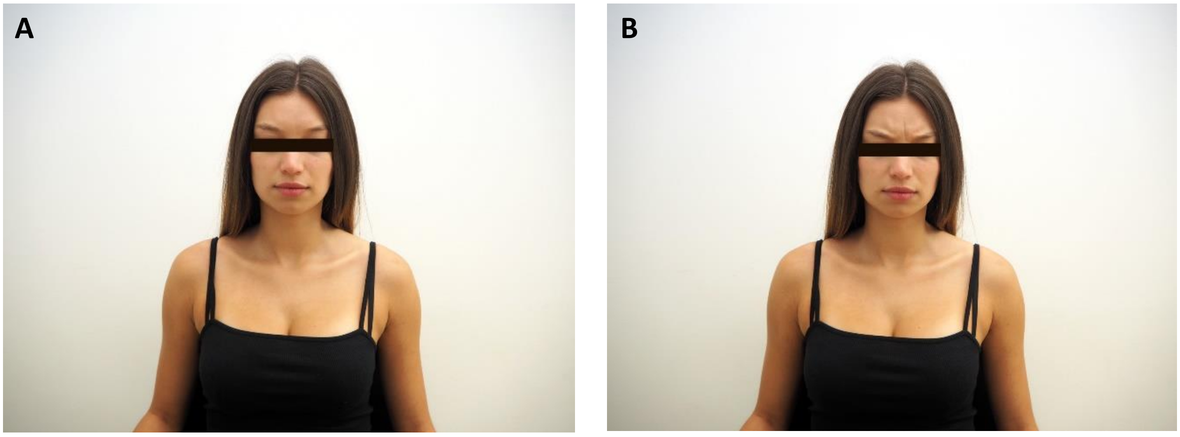
The actual task was oriented to the empathy for pain paradigm originally introduced by Singer et al. (2006) and later adapted by Hein et al. (2010). The participant performed the task in the MRT scanner with the belief that the confederates were in the preparation room and participated simultaneously. A 3 Tesla Siemens MAGNETOM Skyra scanner equipped with a 32-channel head coil was used. Before the task started, the exact instructions for the task were displayed again. Using an MRI-compatible button box, the participant could confirm or give ratings during the task. In order to maintain the deception of a joint task, the participant was asked to wait a short time after confirming until all participants had confirmed.

A fixation cross is shown at the beginning of the task. This is followed by an anticipation in which it was indicated which person will then receive an electric shock and at what intensity. Either a neutral full-body photo of one of the models (confederate) was shown (other-condition), or a pixelated image suggesting a full-body photo (self-condition). In addition, this image was surrounded by a green or red frame. This indicated whether the following shock would be weak (green) or strong (red). This was followed by a short black screen and then another stimulus-shock picture of the person who had been indicated in the anticipation. This was the time at which the participant received a shock with the previously announced intensity (self-condition) or assumed that the respective confederate received a shock (other condition). In the low pain condition, the facial expression of the person was relatively neutral; In the high pain condition, facial expressions indicated that the person felt pain (Figure 2). In the self-condition, the participant was again shown a heavily pixelated photo on which a person was depicted.

It was said that the pictures of the participant and the confederates seen during the task as stimuli were the pictures which were previously taken. In fact, the models' pictures were taken in advance and evaluated for the strength of the painful expression displayed in order to ensure that the viewed facial expressions represent a suitable reaction to the provided shocks in terms of intensity. Since the participant themself received those shocks and felt the intensity, it was important that the depicted facial expressions as reactions to those shocks were neither too weak nor too extreme.

Figure 2.

Example of the Stimulus Pictures used in the task

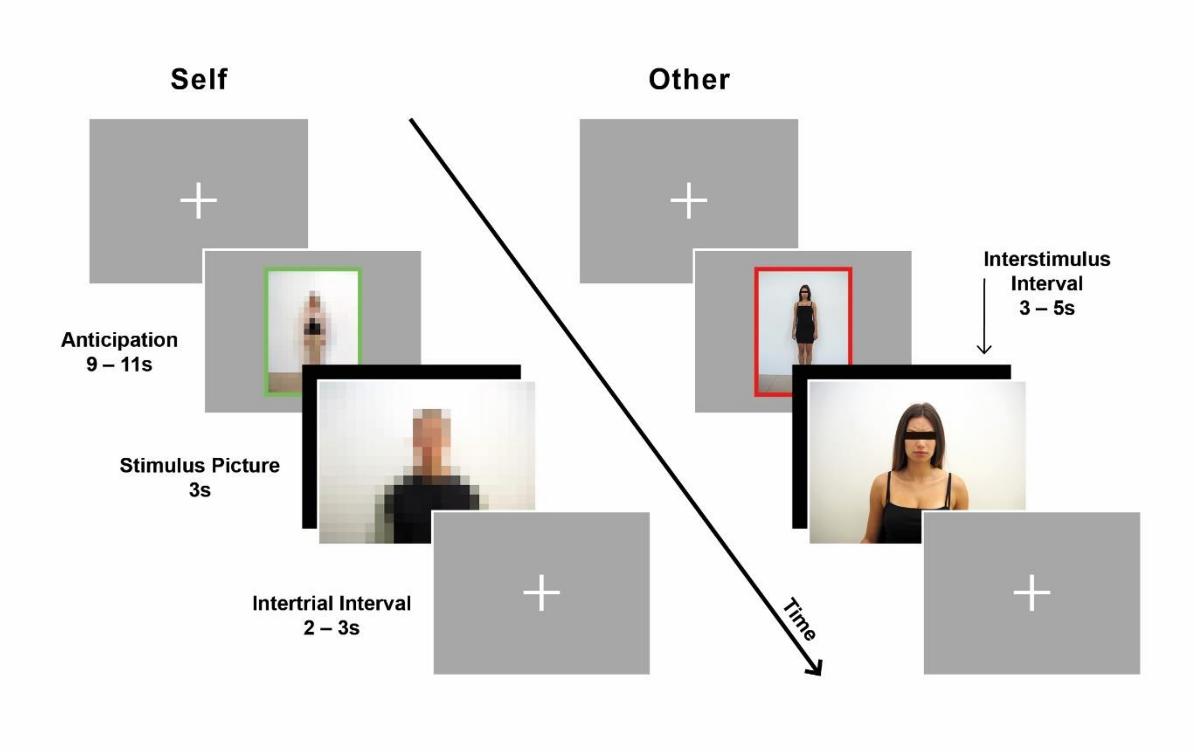


Note. The pictures show a confederate of the sexualized condition. A is an example for the low-pain condition (green), B for the high-pain condition (red). Note that in the experiment, the pictures were displayed without the black bar on the face.

The order of the trials in terms of the exact conditions (self-high pain, self-low pain, personalized-high pain, personalized-low pain, sexualized-high pain, sexualized-low pain) within the task was pseudorandom. One-third of the trials were followed by either one or two short questions regarding the empathic response of the participant, which were answered by using the button box and served to collect additional behavioral data. As these are not considered in this thesis, they will not be discussed in detail. The stimulus-shock image was followed either by the ratings or directly by a fixation cross if it was a trial without ratings. Then the next trial began. A run consisted of 5 trials for each condition, resulting in 30 trials in total. There were 2 runs. After the scanning sessions the participants filled out a few more questionnaires. At the end they were asked if they have noticed something regarding the study. Finally, the participants were unblinded.

Figure 3.

Schematic Illustration of the Empathy for Pain Task.



Note. In the self-condition, the participants did not see pictures of themselves, instead they saw pixelated characters. Participants received a shock at the beginning of the stimulus picture. The intensity was either weak (green frame) or strong (red frame). The other-conditions showed one of the confederate (sexualized or personalized) and the stimulus picture was an actual picture of the confederate showing a weak or strong painful expression. In a third of all trials another interstimulus interval (3-5s) and a rating (6-12s) followed the stimulus picture in order to collect behavioral data, which will not be considered in this thesis. Note that in the experiment, the pictures were displayed without the black bar on the face.

Analysis

Dark Triad Data

The Dark Triad data was collected via online survey before the actual testing. The items were assigned to the respective constructs (narcissism, psychopathy and Machiavellianism). The results were recoded as there were some reversed items. Subsequently, a mean value for the respective construct was calculated for each participant. Of the 31 participants scanned, only 27 (13 male, 14 female) completed the questionnaire.

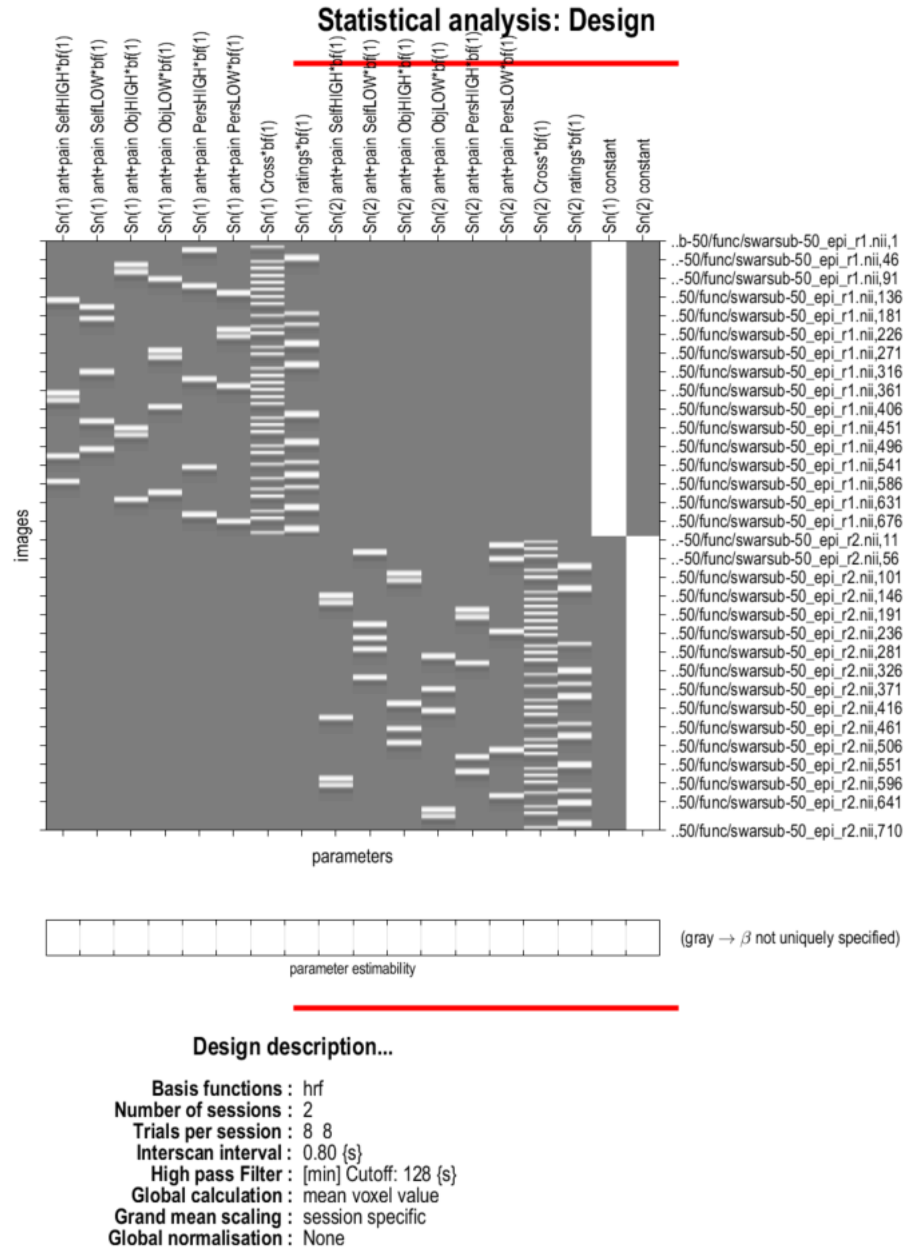
fMRI Data

Pre-Processing was performed using the Satistical Parametric Mapping software package (SPM12; Wellcome Trust Centre for Neuroimaging, UCL, London, UK) implemented in MATLAB (The MathWorks Inc., Natick, MA). It included slice-timing correction (Sladky et al., 2011), spatial realignment, head motion correction, normalization into MNI space (Montreal Neurological Institute, (Evans et al., 1994)) and spatial smoothing. All functional brain scans were initially aligned with the first functional image, co-registered to the structural MRI scan for each participant, and segmented into gray matter, white matter, and cerebrospinal fluid regions. These scans were then normalized to a standard template derived from 152 brains from the Montreal Neurological Institute (MNI). Finally, the data was smoothed using an 8 mm Gaussian kernel with a full-width at half-maximum (FWHM) of 8 mm.

After the pre-processing was finished, data were analyzed using the general linear modeling framework (Kiebel & Holmes, 2003). The first step was to perform a first level analysis separately for each participant. For this, two first level regressor representing the pain level (high pain and low pain) were defined for each condition (self, other-sexualized, other-personalized). Also, the ratings and intertrial intervals (fix crosses) were defined as regressors. In total, the design matrix consisted of 8 regressors for each run (Figure 4). At the second level analysis a one-way analysis of variance (ANOVA) was performed to assess main effects and interactions. Differences in the experience of pain (self) and empathy for pain (other) were calculated as contrasts (high pain versus low pain) for each main condition. Additionally, conjunctions of the whole-brain analyses of the conditions self and other-personalized and self and other-sexualized was calculated to reveal shared activation patterns. For the second hypothesis these contrasts were used within a multiple regression design with the Dark Triad scores of each participant added as covariates in order to test their contribution to the explained variance. This analysis was computed for each of the three Dark Triad constructs as main covariate while controlling for the two remaining covariates. Whole brain analyses are reported with a threshold of $p < .005$ uncorrected. The MRIcron software package (Rorden, Karnath, & Bonilha, 2007) was used for anatomical and cytoarchitectonic interpretation.

Figure 4.

Design Matrix of the First Level Analysis



Note. Six regressor for each run were defined representing the main condition (self, other personalized, other objectified), the level of pain (high pain, low pain), intertrial intervals and ratings.

Results

Main Effect of Experience of Pain: Self (high pain > low pain)

The effects of pain induced by electroshocks in oneself was analyzed by comparing the hemodynamic responses between low-pain and high-pain stimuli trials in the self-condition. Contrasts revealed enhanced activation in the high-pain condition in comparison to the low-pain condition in the following regions: areas associated with the mentalizing network: Left Precuneus, Left Medial Superior Frontal Gyrus (Cogoni et al., 2018); areas belonging to the somatosensory component of pain: right Rolandic operculum, bilateral precentral gyrus; areas related to the affective component of pain: bilateral insula, right medial cingulum (Price, 2000); other areas: bilateral lingual gyrus, left middle temporal gyrus, bilateral supramarginal gyrus, bilateral hippocampus, right superior temporal gyrus, bilateral cerebellum ($p < 0.005$ uncorrected, see Table 1).

Table 1

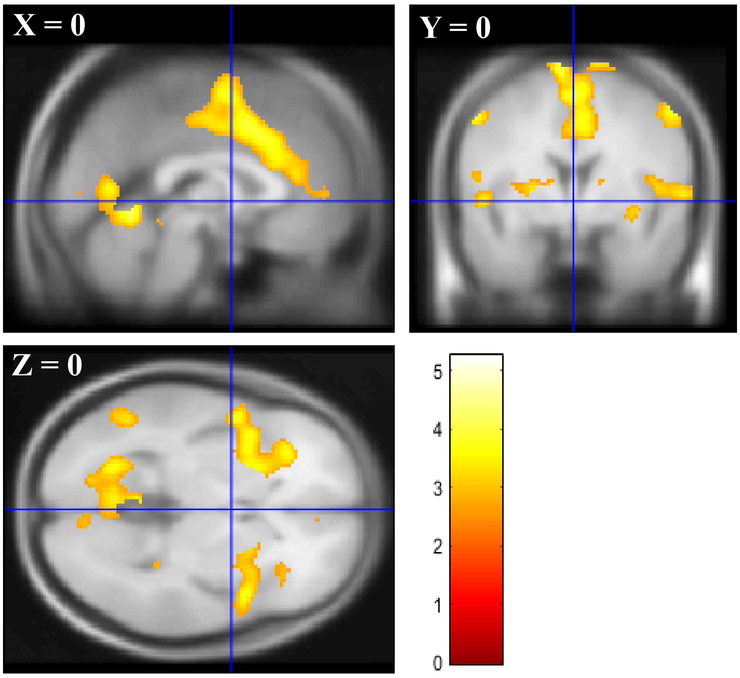
Main effect for empathy for pain: self (high pain > low pain)

	Anatomical region	cluster K	p (uncorrected)	T	Z score	x,y,z [mm]
L	Lingual gyrus	3060	< 0.001	5.25	4.89	-30 -48 -30
R	Insula	1787	< 0.001	4.59	4.34	46 6 6
R	Anterior cingulate cortex	4324	< 0.001	4.47	4.23	10 10 42
L	Insula	1942	< 0.001	4.17	3.98	-40 10 4
R	Precentral gyrus	1315	< 0.001	4.09	3.90	28 -14 74
L	Precuneus	32	< 0.001	4.06	3.88	-14 -52 72
L	Precentral gyrus	218	< 0.001	3.78	3.63	-54 0 46
L	Middle temporal gyrus	529	< 0.001	3.67	3.53	-46 -62 8
L	Supramarginal gyrus	266	< 0.001	3.60	3.47	-48 -38 26
R	Rolandic operculum	217	< 0.001	3.50	3.38	44 -22 18
R	Hippocampus	21	0.001	3.38	3.27	24 -38 8
R	Superior temporal gyrus	57	0.001	3.28	3.18	66 -40 20
L	Cerebelum	11	0.001	3.14	3.05	-18 -66 -42
L	Hippocampus	10	0.002	2.93	2.86	-30 -10 -12
R	Lingual gyrus	50	0.002	2.93	2.86	20 -62 4
L	Cerebellum	11	0.002	2.90	2.82	-8 -64 -40
R	Supramarginal gyrus	18	0.003	2.85	2.78	52 -36 26
L	Medial superior frontal gyrus	17	0.004	2.72	2.66	-18 54 4

Note. One-way ANOVA: Whole brain analysis Peak level (p uncorrected < 0.005)

Figure 5

Main Effect of Experience of Pain: Self (high pain > low pain)



Note. Differences in the neural activation between high and low pain electric stimulation in the self-condition. Statistical maps are derived with a threshold of p < .005 uncorrected and superimposed on a standard T1 template.

Main Effect of Empathy for Pain: Other Personalized (high pain > low pain)

Differences in the hemodynamic response while watching the personalized confederate receiving high pain shocks versus low pain shocks were analyzed. Enhanced activity in the high pain condition was found in the following areas: areas belonging to the empathy for pain network: bilateral supplementary motor area, left insula, inferior frontal gyrus (Betti & Aglioti, 2016); other areas: left angular gyrus, right precentral gyrus, bilateral frontal superior medial gyrus, bilateral superior frontal gyrus, left precuneus, bilateral frontal inferior orbital gyrus, right frontal superior medial gyrus, left frontal inferior triangular gyrus, left middle frontal gyrus, right superior temporal gyrus ($p < 0.005$ uncorrected, see Table 2 and Figure 6).

Table 2

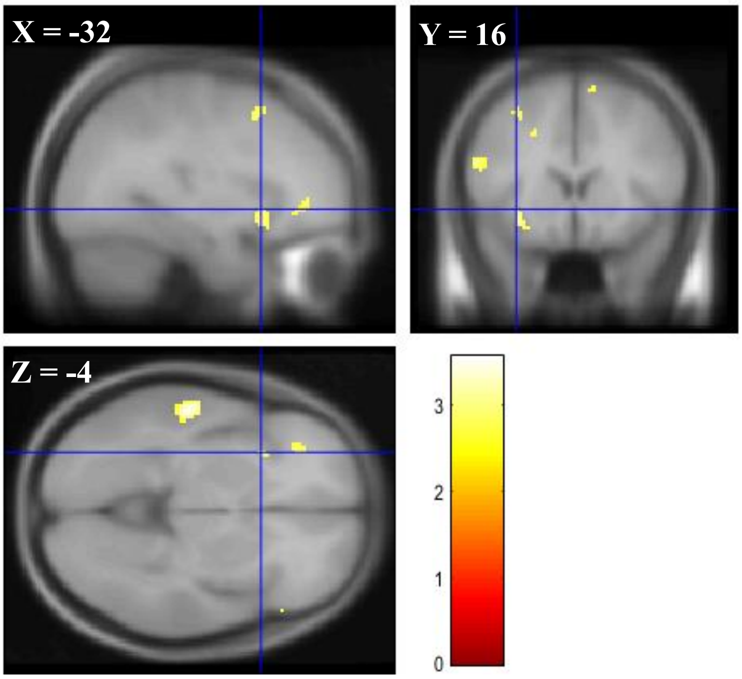
Main effect for empathy for pain: other personalized (high pain > low pain)

	Anatomical region	cluster K	p (uncorrected)	T	Z score	x,y,z [mm]
L	Angular gyrus	230	< 0.001	3.56	3.44	-56 -64 32
R	Precentral gyrus	34	< 0.001	3.48	3.37	60 8 38
L	Middle temporal gyrus	118	< 0.001	3.48	3.37	-56 -24 -4
L	Frontal superior medial gyrus	64	0.001	3.28	3.18	-10 26 64
L	Insula	73	0.001	3.25	3.15	-26 20 -14
R	Superior frontal gyrus	54	0.001	3.22	3.12	24 42 50
L	Inferior frontal gyrus	70	0.001	3.13	3.04	-54 18 22
L	Superior frontal gyrus	28	0.001	3.11	3.02	-24 36 52
L	Superior frontal gyrus	46	0.002	3.03	2.94	-16 34 34
L	Precuneus	68	0.002	2.98	2.91	0 -60 38
L	Supplementary motor area	12	0.002	2.89	2.82	-4 8 72
L	Frontal inferior orbital gyrus	24	0.003	2.87	2.80	-34 36 -4
R	Frontal superior medial gyrus	14	0.003	2.87	2.80	4 30 64
L	Frontal inferior triangular gyrus	12	0.003	2.86	2.79	-36 32 20
L	Middle frontal gyrus	73	0.003	2.84	2.77	-32 14 48
R	Frontal inferior orbital gyrus	10	0.003	2.79	2.73	56 30 -2
R	Supplementary motor area	30	0.003	2.79	2.73	8 12 62
R	Superior temporal gyrus	10	0.003	2.78	2.72	62 -12 -8

Note. One-way ANOVA: Whole brain analysis Peak level (p uncorrected < 0.005)

Figure 6

Main Effect of Empathy for Pain: Other Personalized (high pain > low pain)



Note. Differences in the neural activation between the observation of high and low pain electric stimulation in the other-personalized condition. Statistical maps are derived with a threshold of $p < .005$ uncorrected and superimposed on a standard T1 template.

Main Effect of Empathy for Pain: Other Sexualized (high pain > low pain)

A whole brain analysis was performed to investigate differences in the hemodynamic responses of the participants while observing the sexualized confederate receiving high versus low painful electric stimulation. Increased brain activity was found in the following brain areas: brain regions associated with motor planning and visual processing: right caudate nucleus, left lingual gyrus ($p < 0.005$ uncorrected, see Table 3 and Figure 7).

Table 3

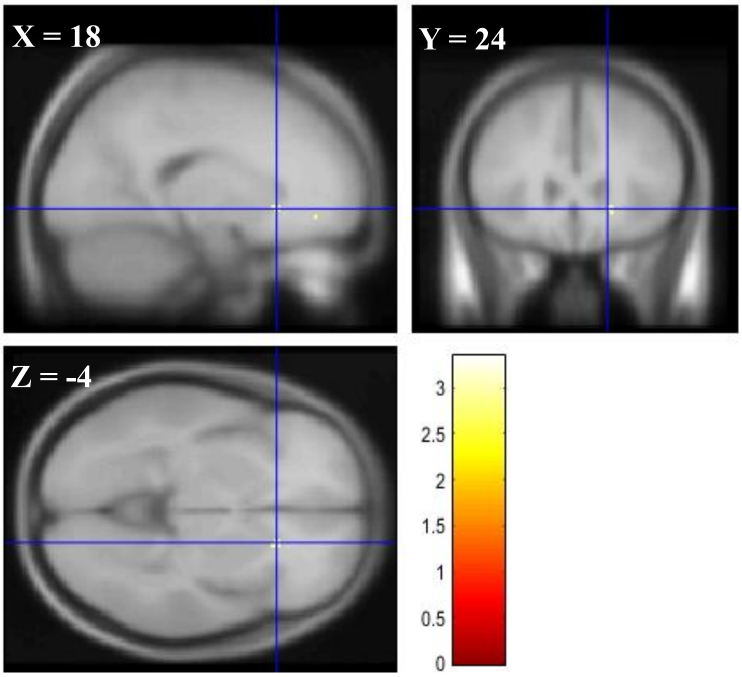
Main effect for empathy for pain: other sexualized (high pain > low pain)

	Anatomical region	cluster K	p (uncorrected)	T	Z score	x,y,z [mm]
R	Caudate nucleus	12	0.002	2.93	2.86	18 24 -4
L	Lingual gyrus	15	0.002	2.91	2.84	-14 -74 -10

Note. One-way ANOVA: Whole brain analysis Peak level (p uncorrected < 0.005)

Figure 7

Main effect for empathy for pain: other sexualized (high pain > low pain)



Note. Differences in the neural activation between the observation of high and low pain electric stimulation in the other-sexualized condition. Statistical maps are derived with a threshold of p < .005 uncorrected and superimposed on a standard T1 template.

Main Effect of Empathy for Pain: Conjunction of Self and Other Personalized (high pain > low pain)

Following the a priori hypothesis that neural responses regarding empathy for pain will be stronger in the personalized condition, a conjunction of the two whole-brain analyses of the conditions self- and other-personalized was calculated to reveal shared activation patterns. Participants displayed greater activity in both conditions in the following areas: left insula and left frontal inferior orbital gyrus ($p < 0.005$ uncorrected, see Table 4 and Figure 8).

Table 4

Main effect for empathy for pain: conjunction of self and other personalized (high pain > low pain)

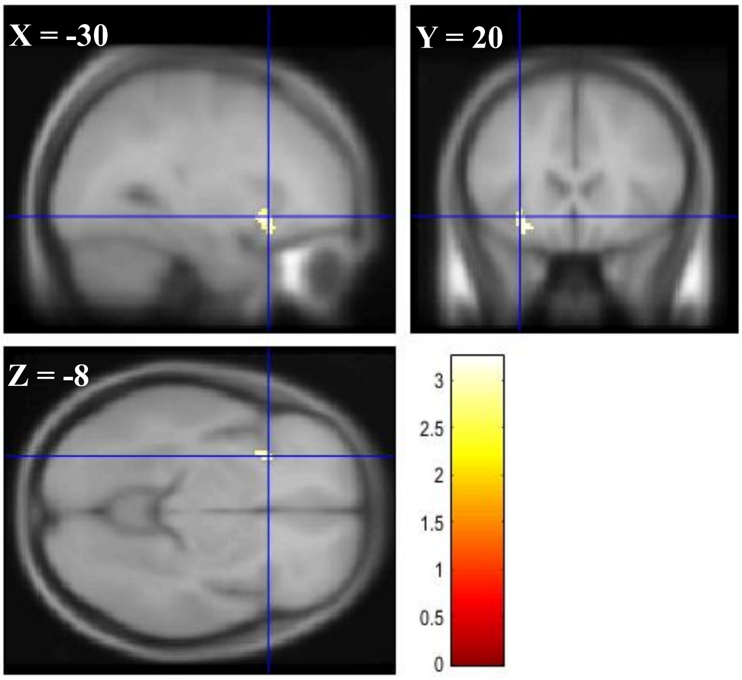
Anatomical region	cluster K	p (uncorrected)	T	Z score	x,y,z [mm]

L	Insula	65	0.001	3.25	3.15	-26 20 -14
L	Frontal inferior orbital gyrus	12	0.003	2.87	2.80	-34 36 -4

Note. One-way ANOVA: Whole brain analysis Peak level (p uncorrected < 0.005)

Figure 8

Main Effect of Empathy for Pain: Conjunction of Self and Other Personalized (high pain > low pain)



Note. Conjunction of the contrasts self (high pain > low pain) and other-personalized (high pain > low pain). Shared activation of both conditions was found in the left insula and frontal inferior orbital gyrus. Statistical maps are derived with a threshold of p < .005 uncorrected and superimposed on a standard T1 template.

Main Effect of Empathy for Pain: Conjunction of Self and Other Sexualized (high pain > low pain)

Also, a conjunction of the two whole-brain analyses of the contrasts for the conditions self (high pain > low pain) and other-sexualized (high pain > low pain) was computed. No voxel survived the statistical threshold of p < 0.005 uncorrected.

Multiple Regression with Dark Triad Traits

As a final step, whole-brain multiple regression analyses were performed to investigate the association between neural activation during the empathy for pain task and the self-reported Dark Triad scores of the participants. For this, the contrast of other-personalized (high pain > low pain) versus other-sexualized (high pain > low pain) was computed. A multiple regression analyses was performed with the dark triad traits as covariates. The analysis was done for each trait while controlling for the other two. For Machiavellianism and narcissism no voxel survived the threshold of $p < 0.005$ uncontrolled. Results in connection with psychopathy scores show activation in the following areas: areas related to emotion and empathy processing: left precuneus, bilateral middle frontal gyrus. Brain regions linked to cognitive and executive functions: right frontal middle orbital gyrus, right superior parietal lobule, bilateral superior frontal gyrus, right frontal middle gyrus and left opercular frontal inferior gyrus. Brain areas associated with language and multimodal processing: right middle temporal gyrus and right angular gyrus. Areas related to primary sensorimotor and visual processing: left calcarine sulcus and right precentral gyrus. Other areas: left hippocampus (see Table 5 and Figure 9).

Table 5

Multiple Regression with Dark Triad Traits: Psychopathy

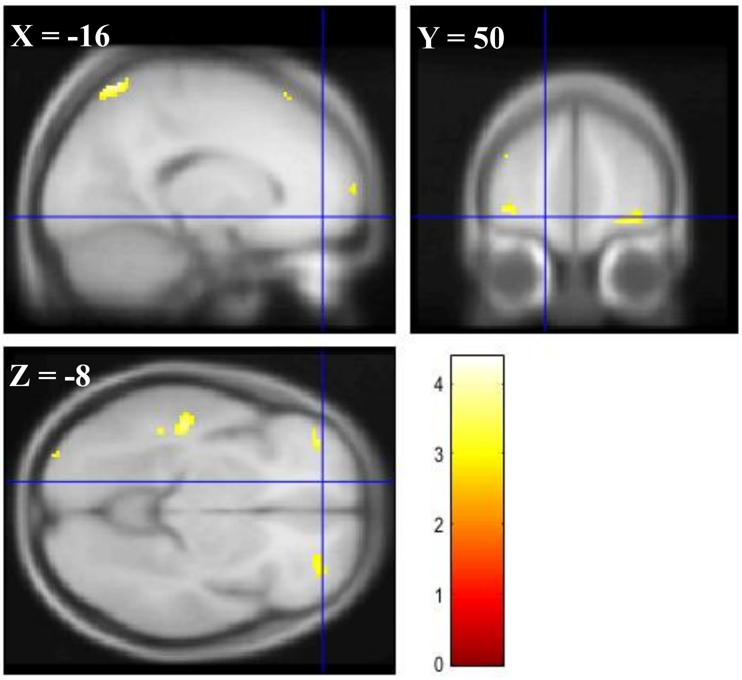
	Anatomical region	cluster K	p (uncorrected)	T	Z score	x,y,z [mm]
L	Precuneus	224	< 0.001	4.38	3.69	-12 -66 66
L	Middle frontal gyrus	50	< 0.001	3.85	3.35	-42 46 28
R	Middle frontal gyrus	152	< 0.001	3.78	3.30	38 40 16
L	Inferior temporal gyrus	39	0.001	3.71	3.25	-50 -40 -22
R	Frontal middle orbital gyrus	81	0.001	3.63	3.19	30 48 -12
L	Frontal middle orbital gyrus	67	0.001	3.59	3.16	-38 48 -8
R	Middle temporal gyrus	23	0.001	3.55	3.14	66 -34 -12
R	Superior parietal lobule	31	0.001	3.41	3.04	28 -66 60

L	Superior frontal gyrus	41	0.001	3.40	3.03	-20 68 10
R	Frontal middle gyrus	70	0.002	3.31	2.97	40 44 34
R	Angular gyrus	23	0.002	3.31	2.96	54 -64 40
R	Superior frontal gyrus	53	0.002	3.30	2.96	22 66 6
L	Opercular frontal inferior gyrus	90	0.002	3.25	2.91	-48 22 34
L	Superior frontal gyrus	12	0.002	3.21	2.88	-14 32 60
R	Superior frontal gyrus	14	0.002	3.12	2.82	16 64 24
L	Angular gyrus	10	0.003	3.01	2.73	-48 -68 42
L	Calcarine sulcus	15	0.003	3.01	2.73	-4 -88 -12
R	Precentral gyrus	12	0.003	2.99	2.72	30 -20 56
L	Hippocampus	10	0.004	2.92	2.67	-32 -36 -2

Note. Multiple Regression: Whole brain analysis Peak level (p uncorrected < 0.005)

Figure 9

Multiple Regression with Dark Triad Traits: Psychopathy



Note. Association between neural activation during the empathy for pain task (contrast of the whole-brain hemodynamic response of the other-personalized (high pain > low pain) > other-sexualized (high pain > low pain)) and the self-reported dark triad scores of the participants. Statistical maps are derived with a threshold of $p < .005$ uncorrected and superimposed on a standard T1 template.

Discussion

The aim of this study was to contribute to research on the effect of sexual objectification on empathy and to extend existing research by examining the influence of socially aversive personality traits on this effect. It is important to mention that found effects are reported with a weak statistical threshold of < 0.005 uncorrected since the sample size was small at the time of this data analysis. Nevertheless, there are weak effects that are discussed in the following section. Implications for future research and strengths and limitations of this study will be addressed.

Reduced Empathy for Sexualized Targets

As part of the experimental procedure, stimulation in the form of electric shocks was delivered to the participants. This was done to obtain recordings of the brain's reactions while participants were experiencing first-hand pain. Previous research has shown that the brain's reactions in terms of neural responses and neurotransmitter activity when experiencing pain are very similar to the reactions that occur while observing people in pain (Rütgen, Seidel, Silani, et al., 2015b). Therefore, neural responses in the self-condition were measured to see whether pain is experienced and to provide a measure for comparing brain activity between conditions. Brain responses to the perception of pain are complex and include wider networks, also depending on factors like pain sensitivity (Brodersen et al., 2012; Coghill et al., 2003). Some brain regions that are associated with pain sensation include bilateral insula, anterior cingulate cortex, bilateral inferior parietal lobule, cingulate gyrus and bilateral superior frontal gyrus (Brodersen et al., 2012; Tanasescu et al., 2016). It was expected to find higher neural responses in those areas in the self-condition.

Regarding the perception of pain, results show enhanced hemodynamic responses in the bilateral Insula and right anterior cingulate cortex (see Table 1 and Figure 5). The Insula is an important brain region for pain perception and processing. It serves as a sensory integration hub as it is responsible, among other things, for discriminating between pain stimuli and judging the significance of pain - but is also essential for the emotional component of pain like pain-related emotional responses (Wiech et al., 2010; Zamorano et al., 2019). The anterior cingulate cortex also plays a crucial role in the perception of pain. It contributes to the experience of pain by amplifying the emotional distress associated with painful stimuli. It also serves as a monitoring and regulatory center for pain perception by helping to evaluate the meaning of pain and modulating the overall pain experience through cognitive and emotional processes (Koyama et al., 2005). In particular, the interaction of the Insula and the anterior cingulate cortex is essential for the processing and evaluation of pain stimuli. A study conducted by Wiech et al. (2010) investigated functional connectivity of the anterior cingulate cortex and the Insula using a pain prediction paradigm. Their findings indicated that the anterior cingulate cortex and Insula comprise a *salience network*, which integrates information about the relevance of an impending stimulation into pain-related perceptual decision-making (Wiech et al., 2010). Apart from this, increased activation of the precuneus was also noted under higher pain. In a study, Goffaux et al. (2014) explored the role of the precuneus in relation to pain. The results of the study suggest that different responses of the precuneus region of the brain were associated with differences in pain sensitivity. The authors assume, that since the precuneus is known for its role in processing information that is relevant to one's sense of self, individual variations in pain sensitivity may be linked to how the brain prioritizes and brings information to conscious awareness that has personal significance (Goffaux et al., 2014).

Other regions that showed higher activation during the high pain condition (self) are related to sensory processing and integration: right Rolandic operculum, the right superior temporal gyrus, bilateral supramarginal gyrus and left middle temporal gyrus. Additionally, brain areas with enhanced activity included motor control and coordination areas: bilateral precentral gyrus. Also, increased responses were found in brain regions linked to visual processing: bilateral lingual gyrus. Finally, higher activation during high pain in comparison to low pain in the self-condition was found in the bilateral hippocampus, which are areas important for memory and learning. These are basically brain regions that are not directly related to the processing of pain, but their activation is reasonable considering the experimental procedure.

To give an example, the activation of the lingual gyrus with the perception of pain has been found in previous research. It is assumed that the lingual gyrus facilitates both the control of emotion and the encoding of visual imagery according to the stimuli presented to it (Palejwala et al., 2021). Also, the link between pain stimuli and activation of the hippocampus has also been found in previous studies, but results are contradictory and therefore difficult to interpret. It is assumed that the hippocampus might be involved in controlling the negative consequences of pain (Liu & Chen, 2009).

The first hypothesis of this thesis states that empathic responses towards sexualized targets will be reduced in comparison to personalized targets. Considering the empathy for pain paradigm it was therefore expected that activation patterns related to pain perception of the high pain versus low pain contrast in the other-personalized condition would be similar to those of the self condition while there should not be a significant similarity between the other-sexualized and the self condition. This would indicate that, on a neural level, participants experience similar pain responses as when they experience pain themselves, which would mean that there is an empathic response to the target.

Results of the second-level analysis for the other-personalized condition (high pain > low pain) confirm those expectations. Increased hemodynamic responses of the left insula and bilateral supplementary motor area indicate that there were empathic responses towards the targets in the other-personalized condition (see Table 2). As mentioned previously, the insula is an important structure when it comes to first-hand experience of pain as well as empathy for pain. The supplementary motor area is associated with the affective component of pain (Cogoni et al., 2018). Also, like in the self-condition, higher activation in the left precuneus was found. Additionally, other areas that showed higher activation in this study were previously connected to empathy processing. A study by Hooker et al. (2010) investigated the association of self-reports of cognitive and affective empathy with specific brain areas. They found the frontal inferior triangular gyrus to be linked with cognitive empathy in terms of enhanced brain responses when using social signals to understand another person's mental and emotional condition. They also highlighted the precentral gyrus as being involved in empathy processing. The precentral gyrus was found to be associated with affective empathy (Hooker et al., 2010).

Besides those areas that are directly related to pain and empathy processing, other brain regions showed higher hemodynamic responses for high painful stimulation in the other-personalized condition. Some of those activation patterns are related to language and cognitive processing: left angular gyrus, left middle temporal gyrus and right superior temporal gyrus. Also, there was enhanced activation found in areas responsible for cognitive control and executive functions: right frontal superior medial gyrus, bilateral superior frontal gyrus and left middle frontal gyrus. Lastly, higher activation was found in areas linked to decision making and emotional processing: the right frontal inferior orbital gyrus and the right frontal superior medial gyrus (see Table 2 and Figure 6).

To better illustrate which brain areas overlap in their joint activation for the conditions self (high pain > low pain) and other-personalized (high pain > low pain) a conjunction of those contrasts was computed (see Table 4 and Figure 8). Shared activation of both conditions was found in the left insula and frontal inferior orbital gyrus. The activation of the frontal inferior orbital gyrus is not directly linked to empathy for pain. A study from Heatherton et al. (2006) investigated neural responses in the medial prefrontal brain areas during a task, in which participants had to decide whether presented stimuli represent themselves or a related other. In both cases higher activation in the frontal inferior orbital gyrus was found (Heatherton et al., 2006). Therefore, it might be assumed that this is a brain region involved in social cognitive processes. Findings regarding increased activation in the insula are consistent with previous research and indicate that the participants empathized with the personalized confederates.

Considering the hypothesis, it is further expected that there are less or no comparable activation patterns of empathy for pain processing in the other-sexualized condition. Second level analysis results of the contrasts for other-sexualized (high pain > low pain) show enhanced neural responses in the right caudate nucleus and the left lingual gyrus (see Table 3 and Figure 7). As mentioned previously, the higher activation of the left lingual gyrus might be due to the control of emotion and the encoding of the visual stimuli of the task. However, increased caudate nucleus activity has been associated with pain perception in past research. The caudate nucleus was found to play a modulatory role in pain perception in terms of suppressing the feeling of pain (Wunderlich et al., 2011). Using a neuroimaging approach, Freund and colleagues (2009) did research on brain regions involved in the experience and suppression of pain. They conducted two studies in total: in the first study, participants underwent brain imaging while experiencing varying levels of thermal stimuli. In the second study, participants had to suppress the feeling of pain. During the successful suppression of pain, enhanced activation in the caudate nucleus was found. The authors conclude that the caudate nucleus is involved in the initiation of pain suppression (Freund et al., 2009). Apart from this, there was no increased activity in brain regions that could indicate empathy for pain. Accordingly, it can be concluded that the participants did not show any empathic reactions to the sexualized targets.

In conclusion, the overall findings support the first hypothesis. Participants were found to show increased activation in areas related to empathy for pain for the condition with the personalized confederate, whereas this did not occur for the sexualized confederate. More specifically, the increased neuronal response of the insula only in the other-personalized condition suggests that empathic responses occurred towards the target. These findings are consistent with previous research demonstrating reduced empathy towards sexualized women on the one hand (Bernard et al., 2020; Cogoni et al., 2018, 2021, 2023) and the involvement of the insula in empathy for pain processing on the other (Cogoni et al., 2018; Corradi-Dell'acqua et al., 2011; Lamm et al., 2011; Rütgen, Seidel, Riečanský, et al., 2015; Rütgen, Seidel, Silani, et al., 2015). Another interesting finding of this study is the association of increased activity of the caudate nucleus with the observation of sexualized targets in pain. According to previous research, it could be assumed that objectification of women is not only accompanied by generally reduced empathy, but possibly even by the suppression of it (Freund et al., 2009; Wunderlich et al., 2011). The findings of this study provide additional evidence that objectification of women has serious consequences for how people see affected women. Empathy has a great influence on behavioral and attitudinal levels. For example, it has been shown that lower neural activity related to empathy due to sexualization also leads to less empathic behavior toward sexualized women (Bernard et al., 2020). Empathy is also related to helping behaviors such as standing up for victims of bullying and sexual violence (Galdi & Guizzo, 2020). In contrast, the lack of empathy may result in the absence of such behavior. Thus, if sexually objectified women are affected by sexual violence, it is likely that they will receive less support. Furthermore, the nature of empathy leads directly to moral, pro-social behaviors such as altruism (De Waal, 2008) and altruism is strongly linked to morality and fairness (Schmidt & Sommerville, 2011). Understanding such interrelationships may be useful, particularly when dealing with sensitive areas like the legal system. Specifically, since the growing body of evidence due to studies researching the implications of sexual objectification against women is providing more and more insight into the issue's pervasiveness. Given that sexual objectification of victims in rape cases leads to them being perceived as more responsible for being raped (Loughnan et al., 2013) and less blame being attributed to the rapists (Bernard et al., 2015), being aware of such effects can, for example, contribute to making more rational decisions and judgments in cases of crimes where women may have been subjected to sexual objectification.

Reduced Empathy for Sexualized Targets: The Role of Socially Aversive Personality Traits

Regarding previous research on the Dark Triad personality traits, it was hypothesized that all traits will show a moderating effect on the impact of sexual objectification on empathy, and that the effect of psychopathy will be the strongest. To investigate this, a whole-brain contrast was calculated, showing in which areas neural activity was increased in the personalized condition compared to the sexualized condition (high pain > low pain). Using multiple regression approach with the dark triad traits as covariates, the individual contribution of each trait to this neuronal activity could be investigated. Considering this, it was expected that the analysis would show that higher Dark Triad scores are associated with increased activation of brain regions associated with empathy for pain processing. This would mean that identified brain areas are in turn associated with lower activation in the sexualized condition.

The results of this study did not find any effect of narcissism and Machiavellianism. With respect to narcissism, these results are not coherent with previous findings of neurological studies on the relationship with empathy. In their research, Jankowiak-Siuda & Zajkowski (2013) assumed a dysfunction in the *salience network* of affected people, which impairs the activation of the anterior cingulate cortex and the anterior insula. No reduced activation in relation to narcissism scores was found in this study. It is possible that this is because the relationship investigated here was somewhat more complex due to the connection to sexual objectification, resulting in no effects being found. It was not investigated whether a higher expression of narcissism is generally associated with a lower activation of these areas; this relation was only examined within the comparison of the experimental conditions. In addition, previous research on the relationship between Dark Triad traits and the tendency to objectify women did find a positive relationship, however, for narcissism the effects were the smallest. In general, scientific evidence for an existing effect is minor. This investigation was also unsuccessful in providing any evidence. Focusing on Machiavellianism, previous research has been inconclusive in terms of the relationship with empathy. There is evidence of negative associations with empathy (Heym et al., 2019; Jonason & Krause, 2013; Pajevic et al., 2018). Nevertheless, Bagozzi et al. (2013) found a positive link to perspective-taking. They argue that this might be helpful in terms of socially manipulative behavior (Bagozzi et al., 2013). In the context of this study, it might be that this ability interfered with the expected effect. About objectification behavior, correlations have so far only been found with self-objectification behavior (Carrotte & Anderson, 2018; Fox & Rooney, 2015). Sexual objectification of women is not yet clearly known to correlate with higher scores in Machiavellianism. Again, the present study found no association. It is also possible that limitations of this study may have had an impact on the effects found. These will be addressed in more detail in the further course of the discussion.

Although the present study failed in finding an association between Machiavellianism and narcissism and decreased empathy for sexualized targets, the corresponding analysis revealed a relation to higher psychopathy scores. Several brain regions were found to be more active in dependence of individuals psychopathy scores while observing the personalized confederate in comparison to observing the sexualized one. Table 9 shows in which exact brain areas hemodynamic response was enhanced in this condition in association with higher psychopathy scores. Enhanced activation was found in areas linked to cognitive and executive functions: right frontal middle orbital gyrus, right superior parietal lobule, bilateral superior frontal gyrus, right frontal middle gyrus and left opercular frontal inferior gyrus. Additionally, brain regions associated with language and multimodal processing were found to show increased neural responses: right middle temporal gyrus and right angular gyrus. Besides, areas related to primary sensorimotor and visual processing showed higher activation: left calcarine sulcus and right precentral gyrus. Lastly, higher activation was found in the left hippocampus. As discussed before, the hippocampus is important when it comes to memory and learning, furthermore there is evidence indicating a link to pain processing (Liu & Chen, 2009). No associations were found with brain regions that have already been discussed in relation to empathy for pain processing such as the insula or the anterior cingulate cortex. Nevertheless, enhanced activation while observing personalized confederates in comparison to sexualized confederates in dependence of the psychopathy scores was found in other brain regions that were associated with pain or empathy for pain processing in previous studies: left precuneus and bilateral middle frontal gyrus.

The left precuneus was already discussed as being part of the mentalizing network (Cogoni et al., 2018) and associated with differences in pain sensitivity (Goffaux et al., 2014). In their study, Goffaux and colleagues conclude that that higher activity in the precuneus is necessary for integrating functionally important experiences into our understanding of own body and self-awareness. This is particularly relevant when these experiences involve salient events, such as painful stimuli (Goffaux et al., 2014). Lower activation may imply a decreased ability to integrate self-relevant sensations or experiences into one's sense of self or self-awareness, which could result in reduced awareness or connection to significant events or sensations. The results show that people with higher psychopathy scores had lower activation of the precuneus when they saw sexualized confederates in pain. Since empathy for pain appears to underlie same processes as self pain (Rütgen, Seidel, Silani, et al., 2015), this might indicate that individuals with higher trait psychopathy are less aware of the observed pain and therefore they also empathize less. Other evidence for the involvement of the precuneus in empathy for pain processing comes from Naor et al. (2020). They used an empathy for pain task, in which participants, among other things, saw pictures depicting painful or non-painful scenarios. The researchers found the right precuneus to be significantly more active during the condition with the painful scenarios (Naor et al., 2020). It can be assumed, that less activation in turn might be related with a lack of empathy. Another study conducted by Farrow et al. (2001) using functional MRI focused on neural responses related to empathic judgments. Participants were asked to read social scenarios describing crimes and make judgements about emotional states and forgivability. Both empathic and forgivability judgements activated the precuneus (Farrow et al., 2001). Research by Harvey et al. (2013) revealed similar results. They compared the empathic accuracy of healthy participants to that of people with schizophrenia. Empathy accuracy was defined as the ability to accurately judge the amount and kind of emotions or thoughts experienced by another person. They found that healthy participants showed a positive correlation of empathy accuracy and increased activation in the left precuneus (Harvey et al., 2013). Taken together, those findings indicate that reduced activation of the precuneus may affect empathy in terms of judgements regarding emotions of others. Considering that in this study increased psychopathy scores were associated with lower precuneus activation towards sexualized targets, it can be assumed that this may have led to impaired judgement of emotions, which in turn led to lower understanding of the observed pain.

Besides the precuneus, the role of the middle frontal gyrus in empathy for pain processing has been addressed in previous research. The already mentioned studies by Naor et al. (2014) and Harvey et al. (2013) also considered changes in activation of the middle frontal gyrus. Positive correlation with empathy accuracy was likewise found for increased activation of the left middle frontal gyrus (Harvey et al., 2013). Furthermore, a higher neural response in the middle frontal gyrus was found during the previously mentioned empathy for pain task during empathic watch. The authors suggest that the middle frontal gyrus is critically associated with the process of feeling empathy for the pain of others (Naor et al., 2020). Additionally, activation in the middle frontal gyrus has been associated with up-regulation of emotions (Frank et al., 2014; Grecucci et al., 2013). This means that increased neuronal activity is associated with more intense emotional experience. At the same time, the absence of neuronal activity in the middle frontal gyrus could also be related to the absence of an emotional response. Another study conducted by Gu & Han (2007) focused on brain activity during the rating of pain intensity while watching painful cartoons and painful pictures. They found the right middle frontal gyrus to be active during both conditions. The authors conclude that the right middle frontal gyrus is engaged in cognitive evaluation of pain of others (Gu &

Han, 2007). This also supports the assumption that the middle frontal gyrus plays a role in the assessment and evaluation of emotions in the empathic process.

In summary, the precuneus and middle frontal gyrus are thought to be less involved in the affective component in the processing of empathy for pain, but rather to play an important role in the appraisal of observed pain. In the context of this study, it was found that participants with higher trait psychopathy showed lower activation of the precuneus and middle frontal gyrus when observing the sexualized confederate in the high pain condition compared to when observing the personalized confederate. No differences were found in the activation of other brain areas related to the affective component of empathy for pain, such as the insula or the anterior cingulate cortex. The results suggest that people with a higher level of psychopathy experience decreased empathy with sexualized targets compared to personalized targets than people with a lower level of psychopathy. Considering the found activation patterns and associated previous findings, the results at the neural level suggest that reduced empathy for pain did occur because the sexualized confederate's emotional experience of pain was evaluated as less significant or relevant depending on the psychopathy scores of the participant. This is consistent with previous findings reporting lower levels of empathy for pain in individuals with higher psychopathy (Decety et al., 2013). In comparison to the effect of empathy for pain, which was investigated in the context of the first hypothesis, this is not shown on the affective level through the involvement of the insula. This seems contradictory to the results of past studies that have found negative correlations of psychopathy with activity in the insula (Seara-Cardoso et al., 2016; Sutherland & Fishbein, 2017). It is important to note, however, that the findings described here arised through the comparison of empathy for pain for sexualized and for personalized targets. This means that findings here represent only areas that showed different responses depending on the appearance of the confederates. Maybe this has no influence on the activation of the insula in individuals with higher psychopathy scores. This could mean that affective component of empathy for pain might in general be low for people with higher psychopathy traits independent from their appearance. However, these are only assumptions, it may also be due to the limitations of this study that no effects were found in other areas of the empathy for pain network like the insula or anterior cingulate cortex.

Because of the absence of effects on the influence of narcissism and Machiavellianism on the relationship between sexual objectification and empathy, the second hypothesis of this study could not be supported. However, effects could be found regarding psychopathy. The findings suggest that individuals with higher psychopathy scores show less activation of brain areas connected to emotion evaluation and empathy for pain processing for sexualized targets in comparison to personalized targets. These findings support the hypothesis that the expected influence of the dark triad traits on the investigated effect would be the strongest for psychopathy. This result is also of high relevance considering the consequences that sexual objectification of women can have. Returning to the previously discussed example of victim blaming and, for example, decisions on crimes against women, being aware of this effect of psychopathy can also help in making more rational decisions. For example, in testimonies, increased psychopathy in witnesses can lead to an underestimation of the emotional experience of sexualized women and their suffering. This could also lead to bias in the evaluation of crimes like judging them as less severe. Also, previous research has found that activation in the middle frontal gyrus - which was found to be decreased in individuals with higher psychopathy scores in this study – is associated with the processing of moral emotions, which is associated with moral behavior and moral decision-making (Moll et al., 2002; Tangney et al., 2007). It is important to keep in mind that the short dark triad trait does measure those traits on a non-clinical level. People might not stand out in terms of their expression of these traits. Therefore, it might be reasonable to test witnesses for their psychopathy scores.

Limitations and Strengths

When interpreting the results presented above, the limitations of this study should be considered. The main limitation of this study is the small sample size. Found effects were reported with a weak statistical threshold of $p < 0.005$ uncorrected. Almost no reported findings survived a commonly reported threshold of $p < 0.05$ FEW-uncorrected. With only 31 participants for testing the first hypothesis and 27 for the others, the present sample size is smaller than recommended. For neuroimaging studies, small sample sizes reduce the probability of detecting effects in functional magnet resonance imaging, why a sample size of 50 or more is suggested (Mumford, 2012; Turner et al., 2018). A higher sample size might have resulted in stronger findings and more insight to the research question.

Another thing to consider lies in the measurement of the Dark Triad traita. The used German version of the Short Dark Triad is a validated tool for research (Wehner et al., 2021), nevertheless it still can be criticized that the given constructs are measured very broadly. To give an example, definitions for narcissism vary and there is research recommending to use more specific measurements then the Short Dark Triad questionnaire (Urbonaviciute & Hepper, 2020). Additionally, the Short Dark Triad questionnaire is based on self-reports about socially aversive personality trait. It has been shown that social desirability does impact questionnaires with socially sensitive items (Van de Mortel, 2008). Even though participants filled out the questionnaire anonymously before the actual testing, it can still not be assumed that socially desirable responding did not happen.

Lastly it should be mentioned that the whole procedure of this study was very complex, and it cannot totally be guaranteed that no mistakes happened during each of the session. Therefore, it might be that the circumstances were not always perfectly the same for all participants and that the manipulation may did not always have the same effect. Also, a lot of people were involved in each scanning session (models and multiple supervisors) which also changed from session to session. There was a consistent script for all supervisors, However, it cannot be ruled out that there were occasional deviations. Manipulation checks could have been considered in this study to control for possible errors.

Regarding the strengths of this study, the previous mentioned complexity of the study design also has advantages. The manipulation can be considered as natural by using present models in each of the scanning session. Participants spent several minutes with the models in a realistic setting. Comparable studies that find similar effects often use more abstract stimuli. For example, a very recent study by Cogoni et al. (2023) also investigated the effects of sexual objectification on empathy using an empathy for pain paradigm. In their study, they used pictures of female models appearing in underwear for the sexualized condition and pictures of fully clothed models for the personalized condition. They manipulated the pain-conditions by adding either a hand with a q-tip (non-pain) or a syringe (pain) on height of the neck of the women (Cogoni et al., 2023). Compared to this manipulation, the whole scenario in the present study is more naturally since the participants truly experience the appearance of the models. Furthermore, in the sexualized conditions the models wore a black dress, heeled shoes and light make-up, which is also more common than only underwear. Taken together, the experimental manipulation in this study makes it more generalizable.

Conclusion

The present thesis aimed to gain further insights to existing research on the influence of sexual objectification on empathy by supporting previous findings and extending the field of research by investigating the role of socially aversive personality traits on this influence. While research focusing on sexual objectification and empathy already found that empathic responses on behavioral and neural level are reduced towards sexualized targets, a possible influence of personality traits on this effect has not been addressed yet. This is the first study to examine the effects of sexual objectification on empathy using functional magnetic resonance imaging and an empathy for pain paradigm. Findings indicate reduced neural responses in areas related to empathy for pain processing towards sexualized targets in comparison to personalized targets. Lower activation was found in the insula, indicating reduced empathy. Additionally, an increased neural response in the caudate nucleus was found while participants observed the sexualized target in pain. According to previous research this could imply a suppression of the affective component of pain. More research on the role of the caudate nucleus in empathy for pain processing would be necessary for a validation of the found effect, since the found effect was weak. Nevertheless, this finding may contribute to the understanding of the underlying mechanisms of reduced empathy for pain. This study also tested whether Machiavellianism, narcissism and psychopathy as non-clinical personality traits had a moderating effect on the found association of sexual objectification and empathy. No effects in relation to Machiavellianism and neuroticism were found. It has been shown that higher psychopathy scores were associated with decreased hemodynamic responses towards sexualized targets in comparison to personalized targets in areas that were previously related to empathy for pain processing, emotion evaluation and judgement. Those findings indicate that psychopathy might have a moderating role on the influence of sexual objectification on empathy. It might be suggested that this moderation affects specific aspects of empathy related to the evaluation of observed emotions. All findings were reported with a weak statistical threshold, why findings should be interpreted carefully. This might be due to the small sample size. Future research should review the found effects with bigger sample sizes, as these results can contribute to gain more insight into the background of the influence of sexual objectification on empathy. Given the wide-ranging consequences of sexual objectification, additional research might help in raising awareness and, potentially, preventing injustice.

Bibliography

American Psychological Association. (n.d.). Empathy. In *APA dictionary of psychology*. Retrieved August 26, 2023, from https://dictionary.apa.org/empathy.

Amodio, D. M., & Frith, C. D. (2006). Meeting of minds: The medial frontal cortex and social cognition. In *Nature Reviews Neuroscience* (Vol. 7, Issue 4, pp. 268–277). https://doi.org/10.1038/nrn1884

Bagozzi, R. P., Verbeke, W. J. M. I., Dietvorst, R. C., Belschak, F. D., van den Berg, W. E., & Rietdijk, W. J. R. (2013). Theory of Mind and Empathic Explanations of Machiavellianism: A Neuroscience Perspective. *Journal of Management*, *39*(7), 1760–1798. https://doi.org/10.1177/0149206312471393

Batson, C. D., Polycarpou, M. R., Harmon-Jones, E., Imhoff, H. J., Mitchener, E. C., Bednar, L. L., Klein, T. R., & Highberger, L. (1997). Empathy and Attitudes: Can Feeling for a Member of a Stigmatized Group Improve Feelings Toward the Group? In *Journal of Personality and Social Psychology* (Vol. 72, Issue 1).

Beck, V., & Rose, C. (2021). Is Sexual Objectification and Victimization of Females in Video Games Associated With Victim Blaming or Victim Empathy? *Journal of Interpersonal Violence*, *36*(5–6), NP3196–NP3221. https://doi.org/10.1177/0886260518770187

Bernard, P., Cogoni, C., & Carnaghi, A. (2020). The Sexualization–Objectification Link: Sexualization Affects the Way People See and Feel Toward Others. *Current Directions in Psychological Science*, *29*(2), 134–139. https://doi.org/10.1177/0963721419898187

Bernard, P., De Laet, M., & Gervais, S. J. (2021). Is body inversion effect a valid measure of women’s objectification? Yes, it is! *Personality and Individual Differences*, *175*(January), 110708. https://doi.org/10.1016/j.paid.2021.110708

Betti, V., & Aglioti, S. M. (2016). Dynamic construction of the neural networks underpinning empathy for pain. In *Neuroscience and Biobehavioral Reviews* (Vol. 63, pp. 191–206). Elsevier Ltd. https://doi.org/10.1016/j.neubiorev.2016.02.009

Blair, R. J. R. (2008). The Cognitive Neuroscience of Psychopathy and Implications for Judgments of Responsibility. *Neuroethics*, *1*(3), 149–157. https://doi.org/10.1007/s12152-008-9016-6

Brodersen, K. H., Wiech, K., Lomakina, E. I., Lin, C. shu, Buhmann, J. M., Bingel, U., Ploner, M., Stephan, K. E., & Tracey, I. (2012). Decoding the perception of pain from fMRI using multivariate pattern analysis. *NeuroImage*, *63*(3), 1162–1170. https://doi.org/10.1016/j.neuroimage.2012.08.035

Carrotte, E., & Anderson, J. R. (2018). A systematic review of the relationship between trait self-objectification and personality traits. *Personality and Individual Differences*, *132*, 20–31. https://doi.org/10.1016/j.paid.2018.05.015

Coghill, R. C., McHaffie, J. G., & -Fen Yen, Y. (2003). *Neural correlates of interindividual differences in the subjective experience of pain*. www.pnas.orgcgidoi10.1073pnas.1430684100

Cogoni, C., Carnaghi, A., & Silani, G. (2018). Reduced empathic responses for sexually objectified women: An fMRI investigation. *Cortex*, *99*, 258–272. https://doi.org/10.1016/j.cortex.2017.11.020

Cogoni, C., Carnaghi, A., & Silani, G. (2021). Reduced shared emotional representations toward women revealing more skin. *Cognition and Emotion*, *35*(2), 225–240. https://doi.org/10.1080/02699931.2020.1826409

Cogoni, C., Monachesi, B., Mazza, V., Grecucci, A., & Vaes, J. (2023). Neural dynamics of vicarious physical pain processing reflect impaired empathy toward sexually objectified versus non-sexually objectified women. *Psychophysiology*. https://doi.org/10.1111/psyp.14400

Corradi-Dell'acqua, C., Hofstetter, C., & Vuilleumier, P. (2011). Felt and seen pain evoke the same local patterns of cortical activity in insular and cingulate cortex. *Journal of Neuroscience*, *31*(49), 17996–18006. https://doi.org/10.1523/JNEUROSCI.2686-11.2011

Costello, T. H., Watts, A. L., Murphy, B. A., & Lilienfeld, S. O. (2020). Extending the Nomological Network of Sexual Objectification to Psychopathic and Allied Personality Traits. *Personality Disorders: Theory, Research, and Treatment*, *11*(4), 237–248. https://doi.org/10.1037/per0000377

Cox, C. L., Uddin, L. Q., Di martino, A., Castellanos, F. X., Milham, M. P., & Kelly, C. (2012). The balance between feeling and knowing: Affective and cognitive empathy are reflected in the brain's intrinsic functional dynamics. *Social Cognitive and Affective Neuroscience*, *7*(6), 727–737. https://doi.org/10.1093/scan/nsr051

Craig, A. D. (2009). How do you feel - now? The anterior Insula and human awareness. *Nature Reviews. Neuroscience*, *10*(1), 59–70. doi: 10.1038/nrn2555

De Waal, F. B. M. (2008). Putting the altruism back into altruism: The evolution of empathy. *Annual Review of Psychology*, *59*, 279–300. https://doi.org/10.1146/annurev.psych.59.103006.093625

de Zavala, A. G., & Bierwiaczonek, K. (2021). Male, National, and Religious Collective Narcissism Predict Sexism. *Sex Roles*, *84*(11–12), 680–700. https://doi.org/10.1007/s11199-020-01193-3

Decety, J., Chen, C., Harenski, C., & Kiehl, K. A. (2013). An fMRI study of affective perspective taking in individuals with psychopathy: Imagining another in pain does not evoke empathy. *Frontiers in Human Neuroscience*, *SEP*. https://doi.org/10.3389/fnhum.2013.00489

Del Gaizo, A. L., & Falkenbach, D. M. (2008). Primary and secondary psychopathic-traits and their relationship to perception and experience of emotion. *Personality and Individual Differences*, *45*(3), 206–212. https://doi.org/10.1016/j.paid.2008.03.019

Evans, A. C., Kamber, M., Collins, D. L., & MacDonald, D. (1994). An MRI-based probabilistic atlas of neuroanatomy. *Magnetic resonance scanning and epilepsy*, 263-274.

Farrow, T. F., Zheng, Y., Wilkinson, I. D., Spence, S. A., Deakin, J. W., Tarrier, N., ... & Woodruff, P. W. (2001). Investigating the functional anatomy of empathy and forgiveness. *Neuroreport*, *12*(11), 2433-2438.

Ferraro, S., Klugah-Brown, B., Tench, C. R., Yao, S., Nigri, A., Demichelis, G., Pinardi, C., Bruzzone, M. G., & Becker, B. (2022). Dysregulated anterior insula reactivity as robust functional biomarker for chronic pain—Meta-analytic evidence from neuroimaging studies. *Human Brain Mapping*, *43*(3), 998–1010. https://doi.org/10.1002/hbm.25702

Fox, J., & Rooney, M. C. (2015). The Dark Triad and trait self-objectification as predictors of men's use and self-presentation behaviors on social networking sites. *Personality and Individual Differences*, *76*, 161–165. https://doi.org/10.1016/j.paid.2014.12.017

Frank, D. W., Dewitt, M., Hudgens-Haney, M., Schaeffer, D. J., Ball, B. H., Schwarz, N. F., Hussein, A. A., Smart, L. M., & Sabatinelli, D. (2014). Emotion regulation: Quantitative meta-analysis of functional activation and deactivation. In *Neuroscience and Biobehavioral Reviews* (Vol. 45, pp. 202–211). Elsevier Ltd. https://doi.org/10.1016/j.neubiorev.2014.06.010

Freund, W., Klug, R., Weber, F., Stuber, G., Schmitz, B., & Wunderlich, A. P. (2009). Perception and suppression of thermally induced pain: a fMRI study. *Somatosensory & motor research*, *26*(1), 1-10.

Galdi, S., & Guizzo, F. (2020). *Media-Induced Sexual Harassment: The Routes from Sexually Objectifying Media to Sexual Harassment*. https://doi.org/10.1007/s11199-020-01196-0/Published

Gervais, S. J., Vescio, T. K., Förster, J., Maass, A., & Suitner, C. (2012). Seeing women as objects: The sexual body part recognition bias. *European Journal of Social Psychology*, *42*(6), 743–753. https://doi.org/10.1002/ejsp.1890

Goffaux, P., Girard-Tremblay, L., Marchand, S., Daigle, K., & Whittingstall, K. (2014). Individual differences in pain sensitivity vary as a function of precuneus reactivity. *Brain Topography*, *27*(3), 366–374. https://doi.org/10.1007/s10548-013-0291-0

Graff, K., Murnen, S. K., & Smolak, L. (2012). Too Sexualized to be Taken Seriously? Perceptions of a Girl in Childlike vs. Sexualizing Clothing. *Sex Roles*, *66*(11–12), 764–775. https://doi.org/10.1007/s11199-012-0145-3

Grecucci, A., Giorgetta, C., Bonini, N., & Sanfey, A. G. (2013). Reappraising social emotions: The role of inferior frontal gyrus, temporo-parietal junction and insula in interpersonal emotion regulation. *Frontiers in Human Neuroscience*, *SEP*. https://doi.org/10.3389/fnhum.2013.00523

Gu, X., & Han, S. (2007). Attention and reality constraints on the neural processes of empathy for pain. *NeuroImage*, *36*(1), 256–267. https://doi.org/10.1016/j.neuroimage.2007.02.025

Hare, R. D. (1999). *Without conscience: The disturbing world of the psychopaths among us*. Guilford Press.

Hart, W., Breeden, C. J., & Kinrade, C. (2021). Re-conceptualizing Machiavellianism and Social-Cognitive Skills: Machiavellianism Blends Deficient, Proficient, and Average Social-Cognitive Skills. *Journal of Individual Differences*, *42*(3), 140–147. https://doi.org/10.1027/1614-0001/a000340

Harvey, P. O., Zaki, J., Lee, J., Ochsner, K., & Green, M. F. (2013). Neural substrates of empathic accuracy in people with schizophrenia. *Schizophrenia Bulletin*, *39*(3), 617–628. https://doi.org/10.1093/schbul/sbs042

Heatherton, T. F., Wyland, C. L., Macrae, C. N., Demos, K. E., Denny, B. T., & Kelley, W. M. (2006). Medial prefrontal activity differentiates self from close others. *Social Cognitive and Affective Neuroscience*, *1*(1), 18–25. https://doi.org/10.1093/scan/nsl001

Hein, G., Silani, G., Preuschoff, K., Batson, C. D., & Singer, T. (2010). Neural responses to ingroup and outgroup members' suffering predict individual differences in costly helping. *Neuron*, *68*(1), 149–160. https://doi.org/10.1016/j.neuron.2010.09.003

Hein, G. ;, & Singer. (2008). *Understanding others: empathy and cognitive perspective taking in the human brain*. https://doi.org/10.5167/uzh-17275

Heym, N., Firth, J., Kibowski, F., Sumich, A., Egan, V., & Bloxsom, C. A. J. (2019). Empathy at the heart of darkness: Empathy deficits that bind the dark triad and those that mediate indirect relational aggression. *Frontiers in Psychiatry*, *10*(MAR), 1–10. https://doi.org/10.3389/fpsyt.2019.00095

Hooker, C. I., Verosky, S. C., Germine, L. T., Knight, R. T., & D'Esposito, M. (2010). Neural activity during social signal perception correlates with self-reported empathy. *Brain Research*, *1308*, 100–113. https://doi.org/10.1016/j.brainres.2009.10.006

Jankowiak-Siuda, K., & Zajkowski, W. (2013). A neural model of mechanisms of empathy deficits in narcissism. In *Medical Science Monitor* (Vol. 19, pp. 934–941). https://doi.org/10.12659/MSM.889593

Jonason, P. K., & Krause, L. (2013). The emotional deficits associated with the Dark Triad traits: Cognitive empathy, affective empathy, and alexithymia. *Personality and Individual Differences*, *55*(5), 532–537. https://doi.org/10.1016/j.paid.2013.04.027

Jonason, P. K., & Kroll, C. H. (2015). A multidimensional view of the relationship between empathy and the dark triad. *Journal of Individual Differences*, *36*(3), 150–156. https://doi.org/10.1027/1614-0001/a000166

Jonason, P. K., Lyons, M., Bethell, E. J., & Ross, R. (2013). Different routes to limited empathy in the sexes: Examining the links between the Dark Triad and empathy. *Personality and Individual Differences*, *54*(5), 572–576. https://doi.org/10.1016/j.paid.2012.11.009

Jones, D. N., & Mueller, S. M. (2022). Is Machiavellianism Dead or Dormant? The Perils of Researching a Secretive Construct. *Journal of Business Ethics*, *176*(3), 535–549. https://doi.org/10.1007/s10551-020-04708-w

Kiebel, S., & Holmes, A. (2003). The General Linear Model. In *Human Brain Function: Second Edition* (pp. 725–760). doi: 10.1016/B978-012264841-0/50039-1

Koyama, T., Mchaffie, J. G., Laurienti, P. J., & Coghill, R. C. (2005). *The subjective experience of pain: Where expectations become reality*. www.pnas.orgcgidoi10.1073pnas.0408576102

Lachowicz-Tabaczek, K., Lewandowska, B., Kochan-Wójcik, M., Andrzejewska, B. E., & Juszkiewicz, A. (2021). Grandiose and Vulnerable Narcissism as Predictors of the Tendency to Objectify Other People. *Current Psychology*, *40*(11), 5637–5647. https://doi.org/10.1007/s12144-019-00569-3

Lamm, C., Decety, J., & Singer, T. (2011). Meta-analytic evidence for common and distinct neural networks associated with directly experienced pain and empathy for pain. *NeuroImage*, *54*(3), 2492–2502. https://doi.org/10.1016/j.neuroimage.2010.10.014

Leigh, R., Oishi, K., Hsu, J., Lindquist, M., Gottesman, R. F., Jarso, S., Crainiceanu, C., Mori, S., & Hillis, A. E. (2013). Acute lesions that impair affective empathy. *Brain*, *136*(8), 2539–2549. https://doi.org/10.1093/brain/awt177

Liu, M. G., & Chen, J. (2009). Roles of the hippocampal formation in pain information processing. In *Neuroscience Bulletin* (Vol. 25, Issue 5, pp. 237–266). https://doi.org/10.1007/s12264-009-0905-4

Loftus, S. T., & Glenwick, D. S. (2001). Machiavellianism and empathy in an adolescent residential psychiatric population. *Residential Treatment for Children and Youth*, *19*(2), 39–57. https://doi.org/10.1300/J007v19n02_04

Loughnan, S., Haslam, N., Murnane, T., Vaes, J., Reynolds, C., & Suitner, C. (2010). Objectification leads to depersonalization: The denial of mind and moral concern to objectified others. *European Journal of Social Psychology*, *40*(5), 709–717. https://doi.org/10.1002/ejsp.755

Loughnan, S., & Pacilli, M. G. (2014). Seeing (and treating) others as sexual objects: Toward a more complete mapping of sexual objectification. *TPM - Testing, Psychometrics, Methodology in Applied Psychology*, *21*(3), 309–325. https://doi.org/10.4473/TPM21.3.6

Loughnan, S., Pina, A., Vasquez, E. A., & Puvia, E. (2013). Sexual Objectification Increases Rape Victim Blame and Decreases Perceived Suffering. *Psychology of Women Quarterly*, *37*(4), 455–461. https://doi.org/10.1177/0361684313485718

Lyons, M., Rowe, A., Waddington, R., & Brewer, G. (2022). Situational and Dispositional Factors in Rape Cognitions: The Roles of Social Media and the Dark Triad Traits. *Journal of Interpersonal Violence*, *37*(11–12), NP10345–NP10361. https://doi.org/10.1177/0886260520985499

Mayer, J. D., Salovey, P., & Caruso, D. R. (2004). Emotional intelligence: Theory, findings, and implications. In *Psychological Inquiry* (Vol. 15, Issue 3, pp. 197–215). Routledge. https://doi.org/10.1207/s15327965pli1503_02

Methot-Jones, T., Book, A., & Gauthier, N. Y. (2019). Less than human: psychopathy, dehumanization, and sexist and violent attitudes towards women. *Personality and Individual Differences*, *149*, 250–260. https://doi.org/10.1016/j.paid.2019.06.002

Miller, J. D., Back, M. D., Lynam, D. R., & Wright, A. G. C. (2022). Corrigendum: Narcissism Today: What We Know and What We Need to Learn (Current Directions in Psychological Science, (2021), 30, 6, (519-525), 10.1177/09637214211044109). In *Current Directions in Psychological Science* (Vol. 31, Issue 2, p. 202). SAGE Publications Inc. https://doi.org/10.1177/09637214221086630

Moll, J., De Oliveira-Souza, R., Eslinger, P. J., Bramati, I. E., Mourã O-Miranda, J., Andreiuolo, P. A., & Pessoa, L. (2002). *The Neural Correlates of Moral Sensitivity: A Functional Magnetic Resonance Imaging Investigation of Basic and Moral Emotions*.

Morrison, I., Lloyd, D., Di Pellegrino, G., & Roberts, N. (2004). Vicarious responses to pain in anterior cingulate cortex: Is empathy a multisensory issue? *Cognitive, Affective & Behavioral Neuroscience (Print)*, *4*(2), 270–278. doi: 10.3758/CABN.4.2.270

Mumford, J. A. (2012). A power calculation guide for FMRI studies. *Social Cognitive and Affective Neuroscience*, *7*(6), 738–742. https://doi.org/10.1093/scan/nss059

Nagler, U. K. J., Reiter, K. J., Furtner, M. R., & Rauthmann, J. F. (2014). Is there a “dark intelligence”? Emotional intelligence is used by dark personalities to emotionally manipulate others. *Personality and Individual Differences*, *65*, 47–52. https://doi.org/10.1016/j.paid.2014.01.025

Naor, N., Rohr, C., Schaare, L. H., Limbachia, C., Shamay-Tsoory, S., & Okon-Singer, H. (2020). The neural networks underlying reappraisal of empathy for pain. *Social Cognitive and Affective Neuroscience*, *15*(7), 733–744. https://doi.org/10.1093/scan/nsaa094

Navas, M. P., Maneiro, L., Cutrín, O., Gómez-Fraguela, J. A., & Sobral, J. (2020). Associations between dark triad and ambivalent sexism: Sex differences among adolescents. *International Journal of Environmental Research and Public Health*, *17*(21), 1–11. https://doi.org/10.3390/ijerph17217754

Pajevic, M., Vukosavljevic-Gvozden, T., Stevanovic, N., & Neumann, C. S. (2018). The relationship between the Dark Tetrad and a two-dimensional view of empathy. *Personality and Individual Differences*, *123*(July 2017), 125–130. https://doi.org/10.1016/j.paid.2017.11.009

Palejwala, A. H., Dadario, N. B., Young, I. M., O’Connor, K., Briggs, R. G., Conner, A. K., O’Donoghue, D. L., & Sughrue, M. E. (2021). Anatomy and White Matter Connections of the Lingual Gyrus and Cuneus. *World Neurosurgery*, *151*, e426–e437. https://doi.org/10.1016/j.wneu.2021.04.050

Palmer, J. A., & Tackett, S. (2018). An Examination of the Dark Triad Constructs with Regard to Prosocial Behavior. *Acta Psychopathologica*, *04*(01), 3–5. https://doi.org/10.4172/2469-6676.100161

Paulhus, D. L., & Williams, K. M. (n.d.). *The Dark Triad of personality: Narcissism, Machiavellianism, and psychopathy*. www.academicpress.com

Pond, R., Allen, J., Petkanopoulou, K., Dvir, M., & Nagar, M. (2022). *Would victims blame victims? Effects of ostracism, sexual objectification, and empathy on victim blaming*.

Price, D. D. (2000). Psychological and Neural Mechanisms of the Affective Dimension of Pain. In *SCIENCE* (Vol. 288). www.sciencemag.org

Rauthmann, J. F., & Kolar, G. P. (2012). How “dark” are the Dark Triad traits? Examining the perceived darkness of narcissism, Machiavellianism, and psychopathy. *Personality and Individual Differences*, *53*(7), 884–889. https://doi.org/10.1016/j.paid.2012.06.020

Rorden, C., Karnath, H.-O., & Bonilha, L. (2007). Improving Lesion-Symptom Mapping. *Journal of Cognitive Neuroscience*, *19*(7), 1081–1088. doi: 10.1162/jocn.2007.19.7.1081

Rütgen, M., Seidel, E. M., Riečanský, I., & Lamm, C. (2015). Reduction of empathy for pain by placebo analgesia suggests functional equivalence of empathy and first-hand emotion experience. *Journal of Neuroscience*, *35*(23), 8938–8947. https://doi.org/10.1523/JNEUROSCI.3936-14.2015

Rütgen, M., Seidel, E. M., Silani, G., Riečanský, I., Hummer, A., Windischberger, C., Petrovic, P., & Lamm, C. (2015). Placebo analgesia and its opioidergic regulation suggest that empathy for pain is grounded in self pain. *Proceedings of the National Academy of Sciences of the United States of America*, *112*(41), E5638–E5646. https://doi.org/10.1073/pnas.1511269112

Rütgen, M., Wirth, E. M., Riečanský, I., Hummer, A., Windischberger, C., Petrovic, P., Silani, G., & Lamm, C. (2021). Beyond Sharing Unpleasant Affect-Evidence for Pain-Specific Opioidergic Modulation of Empathy for Pain. *Cerebral Cortex*, *31*(6), 2773–2786. https://doi.org/10.1093/cercor/bhaa385

Sáez, G., Riemer, A. R., Brock, R. L., & Gervais, S. J. (2022). The Role of Interpersonal Sexual Objectification in Heterosexual Intimate Partner Violence From Perspectives of Perceivers and Targets. *Journal of Interpersonal Violence*, *37*(3–4), 1430–1455. https://doi.org/10.1177/0886260520922348

Saxe, R., & Wexler, A. (2005). Making sense of another mind: The role of the right temporo-parietal junction. *Neuropsychologia*, *43*(10), 1391–1399. https://doi.org/10.1016/j.neuropsychologia.2005.02.013

Schmidt, M. F. H., & Sommerville, J. A. (2011). Fairness expectations and altruistic sharing in 15-month-old human infants. *PLoS ONE*, *6*(10). https://doi.org/10.1371/journal.pone.0023223

Seara-Cardoso, A., Sebastian, C. L., Viding, E., & Roiser, J. P. (2016). Affective resonance in response to others' emotional faces varies with affective ratings and psychopathic traits in amygdala and anterior insula. *Social neuroscience*, *11*(2), 140-152.

Shamay-Tsoory, S. G., Aharon-Peretz, J., & Perry, D. (2009). Two systems for empathy: A double dissociation between emotional and cognitive empathy in inferior frontal gyrus versus ventromedial prefrontal lesions. *Brain*, *132*(3), 617–627. https://doi.org/10.1093/brain/awn279

Singer, T., Seymour, B., O'Doherty, J. P., Stephan, K. E., Dolan, R. J., & Frith, C. D. (2006). Empathic neural responses are modulated by the perceived fairness of others. *Nature*, *439*(7075), 466–469. https://doi.org/10.1038/nature04271

Supplemental Material for A Meta-Analysis of the Dark Triad and Work Behavior: A Social Exchange Perspective. (2012). *Journal of Applied Psychology*. https://doi.org/10.1037/a0025679.supp

Surma-aho, A., & Hölttä-Otto, K. (2022). Conceptualization and operationalization of empathy in design research. *Design Studies*, *78*. https://doi.org/10.1016/j.destud.2021.101075

Sutherland, M. T., & Fishbein, D. H. (2017). Higher trait psychopathy is associated with increased risky decision-making and less coincident insula and striatal activity. *Frontiers in Behavioral Neuroscience*, *11*. https://doi.org/10.3389/fnbeh.2017.00245

Szabó, E., & Bereczkei, T. (2017). Different paths to different strategies? Unique associations among facets of the Dark Triad, empathy, and trait emotional intelligence. *Advances in Cognitive Psychology*, *13*(4), 306–313. https://doi.org/10.5709/acp-0230-7

Tanasescu, R., Cottam, W. J., Condon, L., Tench, C. R., & Auer, D. P. (2016). Functional reorganisation in chronic pain and neural correlates of pain sensitisation: A coordinate based meta-analysis of 266 cutaneous pain fMRI studies. In *Neuroscience and Biobehavioral Reviews* (Vol. 68, pp. 120–133). Elsevier Ltd. https://doi.org/10.1016/j.neubiorev.2016.04.001

Tangney, J. P., Stuewig, J., & Mashek, D. J. (2007). Moral emotions and moral behavior. *Annual Review of Psychology*, *58*, 345–372. https://doi.org/10.1146/annurev.psych.56.091103.070145

Turner, B. O., Paul, E. J., Miller, M. B., & Barbey, A. K. (2018). Small sample sizes reduce the replicability of task-based fMRI studies. *Communications Biology*, *1*(1). https://doi.org/10.1038/s42003-018-0073-z

Urbonaviciute, G., & Hepper, E. G. (2020). When is narcissism associated with low empathy? A meta-analytic review. *Journal of Research in Personality*, *89*. https://doi.org/10.1016/j.jrp.2020.104036

Vaes, J., Paladino, P., & Puvia, E. (2011). Are sexualized women complete human beings? Why men and women dehumanize sexually objectified women. *European Journal of Social Psychology*, *41*(6), 774–785. https://doi.org/10.1002/ejsp.824

Van de Mortel, T. F. (2008). Faking it: social desirability response bias in self-report research. *Australian Journal of Advanced Nursing, The*, *25*(4), 40-48.

Wai, M., & Tiliopoulos, N. (2012). The affective and cognitive empathic nature of the dark triad of personality. *Personality and Individual Differences*, *52*(7), 794–799. https://doi.org/10.1016/j.paid.2012.01.008

Walter, H. (2012). Social cognitive neuroscience of empathy: Concepts, circuits, and genes. In *Emotion Review* (Vol. 4, Issue 1, pp. 9–17). SAGE Publications Ltd. https://doi.org/10.1177/1754073911421379

Wehner, C., Maaß, U., Leckelt, M., Back, M. D., & Ziegler, M. (2021). Validation of the Short Dark Triad in a German Sample:Structure, Nomological Network, and an Ultrashort Version. *European Journal of Psychological Assessment*, *37*(5), 397–408. https://doi.org/10.1027/1015-5759/a000617

Wiech, K., Lin, C. S., Brodersen, K. H., Bingel, U., Ploner, M., & Tracey, I. (2010). Anterior insula integrates information about salience into perceptual decisions about pain. *Journal of Neuroscience*, *30*(48), 16324–16331. https://doi.org/10.1523/JNEUROSCI.2087-10.2010

Williams, K. M., Spidel, A., & Paulhus, D. L. (2005). *Sex, Lies, and More Lies: Exploring the Intimate Relationships of Subclinical Psychopaths*.

Wunderlich, A. P., Klug, R., Stuber, G., Landwehrmeyer, B., Weber, F., & Freund, W. (2011). Caudate Nucleus and Insular Activation During a Pain Suppression Para-digm Comparing Thermal and Electrical Stimulation. In *The Open Neuroimaging Journal* (Vol. 5).

Zamorano, A. M., Montoya, P., Cifre, I., Vuust, P., Riquelme, I., & Kleber, B. (2019). Experience-dependent neuroplasticity in trained musicians modulates the effects of chronic pain on insula-based networks – A resting-state fMRI study. *NeuroImage*, *202*. https://doi.org/10.1016/j.neuroimage.2019.116103

Appendix

Abstract

Recent research on the background of sexually violent behavior emphasizes the connection between sexual objectification and empathy. Studies have shown that sexual objectification of targets leads to reduced empathic responses at the behavioral and neural levels. At the same time, the influence of other variables, like personality traits, on sexual objectification and empathy is also highlighted. Using an empathy for pain paradigm with neural measurements for empathy towards sexualized and non-sexualized women, the effects of sexual objectification on empathy and the influence of dark triad personality traits on this effect was investigated. It was hypothesized that a) sexual objectification will lead to reduced neural empathic responses towards sexualized targets and b) dark triad traits have a moderating effect on the influence of sexual objectification on empathy. 31 participants were tested. Sexualization was manipulated by the appearance of present models that were thought to be confederates in a joint task by the participants. Pain was delivered via electric stimulation. Participants showed decreased neural activation in regions related to empathy for pain processing towards sexualized confederates. Participants filled out the German version of the short dark triad questionnaire prior to the scanning. 27 participants finished the questionnaire. Multiple linear regression revealed activation patterns related to those personality traits. No results were found regarding Machiavellianism and narcissism. Higher psychopathy was found to be associated with reduced empathy for pain in sexualized targets in comparison to personalized targets. Limitations of the study and implications of the findings are discussed.

Aktuelle Forschung zum Hintergrund von sexuell gewalttätigem Verhalten betont den Zusammenhang zwischen sexueller Objektifizierung und Empathie. Studien haben gezeigt, dass die sexuelle Objektifizierung von Zielpersonen zu verringerten empathischen Reaktionen auf der Verhaltens- und neuronalen Ebene führt. Gleichzeitig wird auch der Einfluss anderer Variablen, wie Persönlichkeitsmerkmale, auf sexuelle Objektivierung und Empathie hervorgehoben. Unter Verwendung eines Schmerzparadigmas mit neuronalen Messungen der Empathie gegenüber sexualisierten und nicht-sexualisierten Frauen wurden die Auswirkungen der sexuellen Objektifizierung auf die Empathie und der Einfluss von Persönlichkeitsmerkmalen der dunklen Triade auf diesen Effekt untersucht. Es wurden die Hypothesen aufgestellt, dass a) sexuelle Objektifizierung zu verminderten neuronalen empathischen Reaktionen gegenüber sexualisierten Zielen führt und b) Eigenschaften der

dunklen Triade einen moderierenden Effekt auf den Einfluss sexueller Objektifizierung auf Empathie haben. Es wurden 31 Teilnehmer getestet. Die Sexualisierung wurde durch das Erscheinungsbild von Modellen manipuliert, die von den Teilnehmern als weitere Versuchsteilnehmerinnen in einer gemeinsamen Aufgabe angesehen wurden. Der Schmerz wurde durch elektrische Stimulation erzeugt. Die Teilnehmer zeigten eine verringerte neuronale Aktivierung in Regionen, die mit der schmerzbezogenen Empathie gegenüber sexualisierten Zielpersonen zusammenhängen. Vor dem Scannen füllten die Teilnehmer die deutsche Version des kurzen Fragebogens zur dunklen Triade aus. 27 Teilnehmer beendeten den Fragebogen. Eine multiple lineare Regression ergab Aktivierungsmuster, die mit diesen Persönlichkeitsmerkmalen zusammenhängen. Es wurden keine Ergebnisse in Bezug auf Machiavellismus und Narzissmus gefunden. Jedoch wurde festgestellt, dass erhöhte Psychopathie mit einer geringeren Empathie für Schmerzen bei sexualisierten Zielpersonen im Vergleich zu personalisierten Zielpersonen in Verbindung steht. Die Limitationen der Studie und die Implikationen der Ergebnisse werden diskutiert.