


Reduced shared emotional representations toward women revealing more skin

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ABSTRACT

Extensive experimental research has been conducted to investigate how individuals empathise with others depending on contextual and motivational factors. However, the effect of sexual objectification (i.e. focus on the individual's physical appearance over his/her mental state) on empathy is scarce at best thus far. The aim of this work is to shed light on whether objectification modulates empathic responses toward humans and human-like objects. In Experiment 1, participants either underwent visuo-tactile stimulation or witnessed another person (a mannequin, a sexualized or a non-sexualized female confederate) being stimulated with pleasant or unpleasant objects. Participants were then asked to report either their own or the other's emotional experience. Results showed that shared representations (i.e. similarity between self-other emotional ratings) are significantly lower for the mannequin, intermediate for the sexualized woman, and reach the highest values for the non-sexualized woman. In Experiment 2, shared representations were assessed during a ball-tossing game in which the participants or one of the two confederates (sexualized or non-sexualized woman) were excluded from the game. Again, results showed reduced similarity between self-other emotional ratings toward sexualized as compared to non-sexualized women. The findings suggest that interacting with sexually objectified women reduces empathic responses typically observed within human relations.

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According to estimates by the United Nations Organization for Women, every third woman worldwide becomes a victim of either physical and/or sexual violence by men at least once in their lifetime. Violence against women is a violation of human rights, that has been acknowledge as a worldwide public health problem (Oram et al., 2017; World Health Organization, 2013). This phenomenon is aggravated by the fact that the violence is often accompanied by violence-supportive attitudes, creating a culture where violence is not explicitly condemned, but even subtly condoned or encouraged (ANROWS, 2018) It has been proposed that reduced empathy for the

victim is a key factor for enabling violence (Baron-Cohen, 2011) as well as preventing helping behaviours (Decety et al., 2016).

The ability to empathetically share and understand the feelings of others is of crucial importance for successful social interaction. A widely recognised model is the *shared representations account of empathy*. This account proposes that cognitive, perceptual and affective processes engaged in the first-hand experience of a certain emotion are recruited when showing empathy for another person experiencing that emotion (Decety & Jackson, 2004; Lamm et al., 2016; Zaki et al., 2016 for review). Social neuroscience

research has strongly supported this model, as a substantial number of neuroimaging and electrophysiological studies have consistently demonstrated that neural networks engaged in first-hand emotion experiences are also active during empathy [e.g. Singer et al., 2004 and Wicker et al., 2003 for initial evidence]. Hence, theoretical accounts and empirical evidence conjointly suggest that humans rely on their own emotion representations to simulate and thus empathetically share the emotions of others [but see also Krishnan et al., 2016].

It has also been extensively documented that empathy is modulated by a variety of individual, contextual and motivational factors (Zaki, 2014). For example, empathy diminishes if the target is perceived as dissimilar from the self (Majdandzic et al., 2016), pertains to a social or ethnic outgroup (Avenanti et al., 2010; Han, 2018; Hein et al., 2010) and/or is perceived as inferior in terms of power (Magee & Smith, 2013; van Kleef et al., 2008). Importantly, and in the context of the present study, recent research has shown that empathy can be reduced toward persons who are processed on the basis of their physical appearance and denied of their mental states, namely who are sexually objectified¹ (Bernard et al., 2020; Cogoni, Carnaghi, and Silani, 2018; Loughnan et al., 2013). According to Bartky (Bartky, 1990), sexual objectification can be conceived both as a process: symbolically separating the sexual parts of a person's body or her/his sexual functions from the rest of the person; and as an outcome: perceiving (attitudes) and treating (behaviour) the persons as if they had the status of an object. In terms of *process*, it has been observed that a more analytical (object-like) vs. configural (person-like) visual processing style is applied when scrutinising sexually depicted individuals (i.e. with sexually appealing bodily parts such as hip and breast prominently displayed) (Bernard et al., 2012; Cogoni, Carnaghi, Mitrovic, et al., 2018). In terms of *outcomes*, it has been documented that attractive and sexualized persons tend to be subject to the *dehumanising aspects* of sexual objectification. This was indicated by being perceived as less agentic, i.e. to possess a decreased capacity to act intentionally, less able to make plans and exhibit self-control (Gray et al., 2011), less competent (Heflick & Goldenberg, 2009), less moral (Loughnan et al., 2013), and generally "less human" (Cikara et al., 2011; Loughnan et al., 2010). Hence, this pattern of results suggests a misattribution of uniquely human attributes solely due to the physical appearance of the target [see Loughnan & Pacilli, 2014 for review] and/or by a shift of the perceivers' attention

from the thoughts and feelings of the target to her/his physical attributes, body parts or sexual functions (Bartky, 1990; Heflick & Goldenberg, 2009).

More crucial for this research is the impact of sexual objectification on perceivers' social emotions and behaviours (Haslam & Loughnan, 2014). Indeed, it has been shown that sexualized women (i.e. images of women in bikinis) are perceived as less able to act but with greater ability to experience emotions and bodily sensations than non-sexualized women (i.e. images of women fully clothed (Gray et al., 2011)). However, participants are more prone to allegedly administer painful tablets to sexualized women compared to non-sexualized ones (Loughnan et al., 2010). Together, these findings suggested that reduced empathic feelings, rather than a misattribution of reduced sensitivity to pain in sexualized individuals, may be responsible for the observed behaviour.

In line with this hypothesis, the first neuroscientific evidence of reduced empathic brain responses toward sexualized women has been recently provided by our group (Cogoni, Carnaghi, & Silani, 2018). Using fMRI, we were able to show decreased activity in brain areas coding for empathic responding when participants witnessed ostracism toward women wearing a dress that revealed larger areas of their body and skin (i.e. sexualized women), compared to when the same women wore non-revealing clothing (i.e. non-sexualized women). These findings suggest that outfit and physical appearance can gravely affect how we emotionally respond to an individual, and the study provided the first evidence of the neural processes involved in this.

In order to corroborate and extend these findings, the present study aimed to assess whether shared representations in terms of *subjective emotional experience* are modulated by the degree of sexualization of the target. Two different albeit related experiments were carried out: the first experiment addresses participants' responses to affective touch, while the second investigates participants' responses to social exclusion.

In both experiments, empathic shared representations were operationalised as the similarity (i.e. self-other overlap) between the affective ratings attributed to the self, and the target of the empathic judgment (either a sexualized or non-sexualized woman) during the first person and vicarious experience of positive and/or negative emotions. In the first experiment,² a control condition consisting of a human-like object was introduced, thus allowing us to estimate the extent to which empathic responses toward a

sexualized target resemble the processing of an object. Across the two experiments, we hypothesised a reduction of shared empathic representations toward sexualized women compared to non-sexualized ones.

Experiment 1

In Experiment 1, self and other-related affective judgments were measured after positive and negative visuo-tactile stimulation (Lamm et al., 2015). Importantly, the target of empathic responses was a real female individual, presented in a sexualized or non-sexualized fashion. Furthermore, a human-like object (mannequin) was used as a control comparison, in order to assess to what extent empathic responses toward sexualized women resemble the processing of real objects. The task consisted of one session comprising a 2 within-subject factor (Target: Self, Other) and a 3 between-subject factor (Group: sexualized, non-sexualized, mannequin).

We hypothesised that the lowest level of empathy (and therefore self-other overlap), would be displayed by participants interacting with human-like objects (mannequin), while the highest level of empathy would be shown by participants interacting with non-sexualized women. Moreover, we expected the levels of empathy in the sexualized group to be higher than the mannequin group, but to be lower than the non-sexualized group.

Methods

Participants

One hundred eighty healthy participants took part in the study in exchange for monetary reward. All participants gave written informed consent before participating in the study, which was approved by the Ethics Committee of the International School for Advanced Studies (SISSA-ISAS, Trieste, Italy) and treated in accordance with the declaration of Helsinki (2013). Data from 10 participants was removed from analyses due to technical problems during the execution or recording of the experiment. Hence, the final sample included 170 participants ($N = 85$ female and $N = 85$ male), with ages ranging from 18 to 38 ($M = 23.45$, $SD = 3.40$). A total of 50 participants were assigned to the sexualized group ($N = 24$ female and $N = 26$ male; age $M = 23.35$, $SD = 4.00$); 61 participants were assigned to the non-sexualized group ($N = 32$ female and $N = 29$ male; age $M = 23.56$, $SD = 3.4$); 59 participants

were assigned to the mannequin group ($N = 29$ female and $N = 30$ male; age $M = 23.42$, $SD = 2.85$).³

All measures, manipulations, and exclusions in the study are disclosed.

Experimental procedure

Empathy for affective touch task

In this experiment, a paradigm tailored to investigate first person and vicarious affective responses elicited via visuo-tactile stimulation of the participant and a confederate (Lamm et al., 2015) was employed. Depending on the experimental group, the confederate was either a mannequin or a female individual. Two young adult women, one with blonde hair and the other with brunette hair participated as confederates in the experiment. The confederate could either be dressed in a sexualized fashion (sexualized condition) or in a non-sexualized fashion (non-sexualized condition), with the former generally characterised by having more skin revealed and heavier makeup than the latter (see Janssens et al., 2011, for a similar manipulation). The sexualized outfit consisted of a short skirt, stockings, a tight t-shirt, and heels. The non-sexualized outfit consisted of pants, a sweater, and low-heeled shoes (Figure 1). Half of the participants in the sexualized group performed the task with the brunette confederate dressed in the sexualized fashion, while the other half performed the same task with the blonde confederate dressed in the sexualized fashion. A similar procedure was applied to the non-sexualized group, with either the brunette or the blond confederate dressed in a non-sexualized fashion.

Following the same procedure of Lamm et al. (2015), the participant and the confederate were unknown to each other and met (except for the mannequin condition) briefly before starting the task. In the mannequin group, participants were told that due to an error in the booking system, the participant that was supposed to perform the experiment with them did not show up, and for this reason a mannequin available in the laboratory was placed as a substitute in the chair of the other participant. They were instructed afterwards to imagine its reactions as those of a real person. After the encounter with the confederate, participants were asked to sit in front of a touch screen PC monitor (800×600 pixel resolution, 15 inch, viewing distance 40 cm), back to back with their left hand under a black curtain, and perform a few training trials. Two subsequent runs, which differed for the target of the stimulation (i.e. the participant or the confederate/



Figure 1. Representation of the “other” targets of the empathic judgment: sexualized confederates (A), non-sexualized confederates (B), mannequin (C). Note that the real person/object was present in the room during the entire execution of the task.

mannequin), were performed. The self-run, always performed first, consisted of the presentation of pictures of different objects on the screen for 1 s. At the same time and for the same duration, participants were touched on their left hand with a material resembling the image on the screen. The visuo-tactile stimulation could be pleasant (e.g. feather), unpleasant (e.g. spider) or neutral (e.g. branch). A total number of 30 trials were used, with 10 trials for every possible valence (see Lamm et al., 2015 for the complete list of the stimuli used). For each stimulation, participants were asked to judge on a continuous vertical rating scale ranging from a happy female face (very pleasant) to a disgusted female face (very unpleasant) the emotion associated with the stimulation by tapping a

point on the bar with their right index finger (Figure 2). Ratings were subsequently rescaled to range from -10 to $+10$.

In the other-run, participants were presented with the same stimuli on the screen, but this time the confederate was touched, while the participants underwent no tactile stimulation. Immediately afterwards, they were asked to judge the confederate’s emotions associated with the stimulation on the same continuous scale.

Pretest

A pretest was conducted to assess the efficacy of our experimental manipulation. Twenty participants ($N = 10$ female and $N = 10$ male, selected from an independent pool issued from the same population of the

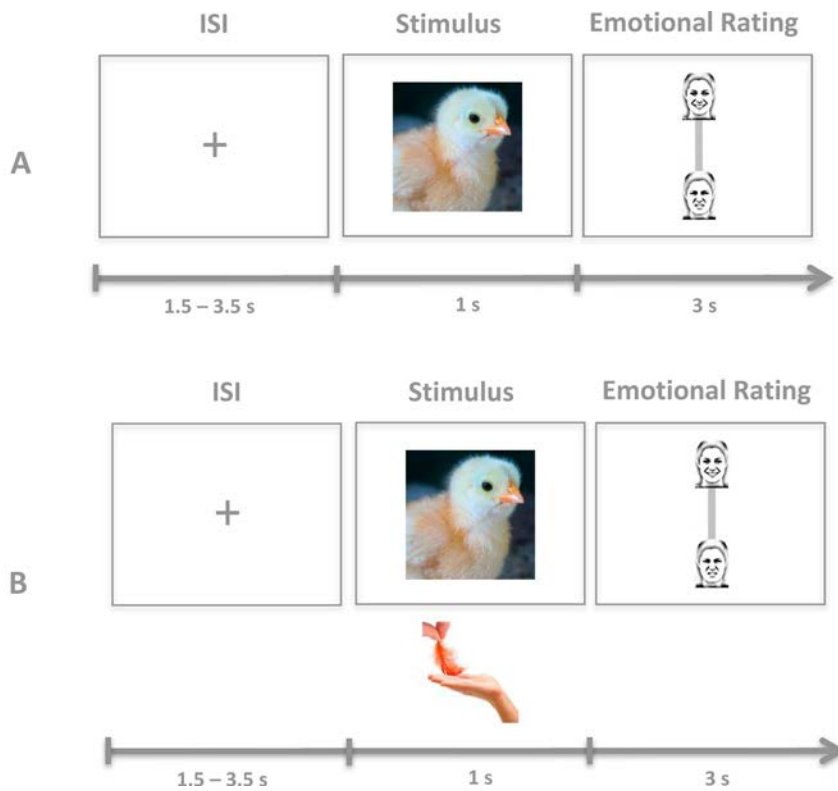


Figure 2. Timeline of one trial of the empathy for touch task for the “other” (A) and the “self” runs (B). Every stimulus was preceded by a fixation cross presented in the middle of the screen which was randomly jittered between 1500 and 3500 ms, the stimulation (visual and tactile, or visual only) then occurred for a period of 1 s, and the rating scale was displayed afterwards for 3 s.

experimental sample) were tested. Participants rated the full body pictures of the two confederates wearing the different outfits, and mannequin on intelligence, attractiveness and sexiness on a 6 point scale, ranging from 1 (= not at all) to 6 (= completely). Each participant rated a total number of three pictures (a confederate in the sexualized outfit, a confederate in the non-sexualized outfit and the mannequin), presented in a random order. Therefore, half of the participants rated one combination of confederate (e.g. the sexualized brunette confederate and the non-sexualized blonde confederate) while the other rated the opposite combination of pictures.

We decided to measure intelligence and attractiveness/sexiness since those attributes operationalise a non-physical/inner state and the appearance/physical state of the target, respectively (see Loughnan et al., 2010 for a similar operationalisation). Moreover, familiarity with the other-target was also measured by means of the same 6-point scale as above. Finally, given that objectification can reshape the perceived mind (i.e. reducing agency and increasing experience),

the targets were also rated on the 12 items of the Mental State Attribution Scale (Gray et al., 2011). The scale assessed their capacity in terms of agency (e.g. self-control, communication) and experience (e.g. feeling pain, feeling pleasure).

Statistical analyses

Pretest

The two dimensions of the physical appearance (i.e. Sexiness and Attractiveness) were highly correlated $r(19) = .81, p < .001$, and hence were averaged as a single indicator of physical appearance.

Physical appearance and intelligence rating scores were analysed by means of 2 (Dimension: Physical Appearance, Intelligence) by 3 (Target: sexualized, non-sexualized, mannequin) repeated measures ANOVA.

Agency and experience ratings were analysed by means of a 2 (Dimension: Agency, Experience) by 3 (Target: sexualized, non-sexualized, mannequin) repeated measures ANOVA. Familiarity was analysed

by means of a one-way ANOVA with the factor Target (sexualized, non-sexualized, mannequin).

Empathy for affective touch task

The similarity between ratings in the self run and in the other run (from now on self-other overlap score) were computed as within-subject correlations for each participant (for similar procedure, see Cadinu et al., 2013 and Latrofa et al., 2010). Correlation coefficients were Fisher Z-transformed (McNemar, 1962) to reach a normal distribution. The order of the presentation of the stimuli in the other run was used as a fixed order to sort the ratings in the self run. The ratings were then grouped in three subsets composed of ten consecutive trials, according to an initial (trial 1–10), middle (trial 11–20) and final (trial 21–30) part of the task (See Tables 1 and 2 for values). In doing so, we gathered information about the overall similarity between self- and other-emotional ratings, while also controlling for possible fatigue effects.⁴ Replicating previous research in the objectification domain (Gray et al., 2011; Heflick et al., 2011; Heflick & Goldenberg, 2009; Loughnan et al., 2010, 2013; Vaes et al., 2011), participants' gender did not show a main effect and did not interact with any of the independent variables, and was therefore not considered further in the analyses.

Self-other overlap scores were analysed by means of a 3 (Group: sexualized, non-sexualized, mannequin) × 3 (Time: 1–10, 11–20, 21–30) ANOVA, with the former variable as a between-participant factor, and the latter as within-participant factor.

Results

Pretest

Results of the pretest indicate that the sexualized outfit led to a higher sexual objectification of the target, as greater physical appearance was attributed

to the sexualized woman compared to intelligence, while greater intelligence was attributed to the non-sexualized woman compared to physical appearance (Bartky, 1990; Vaes et al., 2011). This differential attribution is absent for the mannequins. Notably, sexualized and non-sexualized women did not differ in terms of experience and agency (i.e. uniquely human attributes), but both differed from the mannequins, the former being more agentic and able to experience than the mannequin. See detailed analyses in the Supplementary Material.

Empathy for affective touch task

Results revealed a significant main effect of Time $F(2,334) = 6.91, p = .001, \eta_p^2 = .04$, indicating that the self-other overlap scores were similar between the 1–10 ($M = .68, SE = .04$) and the 11–20 trials ($M = .64, SE = .04, p = .37$), but lower in the 21–30 trials ($M = .53, SE = .04, p < .01$). Moreover, and in line with our hypotheses, a significant main effect of Group was observed $F(2,167) = 9.6, p < .001, \eta_p^2 = .10$ (See Figure 3).

In particular, the mannequin group displayed the lowest self-other overlap scores, while the non-sexualized group displayed the highest, and the sexualized group was positioned in the middle. These three different levels of self-other overlap scores allowed us to test for a linear trend, which was indeed found to be significant ($p < .001$). Pairwise-comparisons (one-tailed) confirmed this interpretation, indicating that the self-other overlap scores are lower in the mannequin ($M = .46, SE = .05$) compared to both the sexualized ($M = .64, SE = .05; p = .01$) and the non-sexualized ($M = .75, SE = .05; p < .001$) groups. Importantly, the self-other overlap scores for the sexualized group are lower than the non-sexualized group, albeit this difference fell short of significance ($p = .06$). The interaction between Group and Time was not significant $F(4, 334) = .52, p = .72, \eta_p^2 = .01$, indicating that the above mentioned effect of Group was not moderated by Time.

Table 1. Mean values, standard deviations (in brackets), and confidence intervals for the affective ratings for each group in the three parts of the two different runs.

Target	Group	Time					
		1–10		11–20		21–30	
		<i>M</i> (SD)	95% CI	<i>M</i> (SD)	95% CI	<i>M</i> (SD)	95% CI
Self	Non-sexualized	4.56 (1.46)	[4.20, 4.92]	4.92 (1.54)	[4.54, 5.31]	4.77 (1.60)	[4.39, 5.15]
	Sexualized	4.73 (1.26)	[4.34, 5.13]	4.84 (1.42)	[4.42, 5.27]	4.76 (1.51)	[4.34, 5.18]
	Mannequin	4.43 (1.49)	[4.07, 4.80]	4.55 (1.57)	[4.16, 4.94]	4.17 (1.39)	[3.78, 4.55]
Other	Non-sexualized	4.82 (1.29)	[4.46, 5.19]	5.46 (1.30)	[5.11, 5.81]	5.41 (1.50)	[5.00, 5.82]
	Sexualized	4.79 (1.42)	[4.39, 5.20]	5.18 (1.39)	[4.80, 5.57]	5.24 (1.69)	[4.79, 5.69]
	Mannequin	4.57 (1.60)	[4.20, 4.94]	4.96 (1.47)	[4.61, 5.32]	5.25 (1.66)	[4.83, 5.66]

Table 2. Mean values, standard deviations (in brackets), and confidence intervals for the Fisher-Z transformed correlation coefficient (i.e. self-other overlap scores) for each group in the three parts of the task.

Group	Correlation coefficients					
	1–10		11–20		21–30	
	<i>M</i> (SD)	95% CI	<i>M</i> (SD)	95% CI	<i>M</i> (SD)	95% CI
Non-sexualized	.81 (.57)	[.69, .94]	.81 (.46)	[.69, .93]	.63 (.47)	[.51, .76]
Sexualized	.74 (.41)	[.60, .87]	.65 (.36)	[.52, .78]	.54 (.50)	[.40, .68]
Mannequin	.50 (.48)	[.37, .63]	.48 (.54)	[.36, .60]	.41 (.53)	[.29, .54]

These data provide support to our initial hypothesis of different empathic responses displayed toward sexualized and non-sexualized women. In order to examine the robustness and replicability of the findings of Experiment 1, a second independent within-subject experiment was performed, aimed at exploring the effect of sexual objectification on share representations during a different emotional experience: social pain.

Experiment 2

Experiment 2 allowed us to measure empathic responses toward sexualized or non-sexualized women during inclusion or exclusion from a ball-tossing game. Unlike Experiment 1, a human-like object was not used, given that it is not possible to perform the game with an inanimate target. Therefore, the task consisted of one session entailing four runs, all performed on the same day. Each run comprised a 3 (Target: Self, Other sexualized, Other non-sexualized) within-subject factor.

We hypothesised that the lowest level of empathy, corresponding to a reduced similarity between self

and other emotional scores, would be displayed by participants witnessing the experiences of the sexualized women compared to the non-sexualized ones.

Methods

Participants

Forty-one healthy participants (20 females)⁵ between the ages of 18 and 34 ($M = 23.2$ years, $S.D. = 3.51$) were recruited via an online recruitment platform and took part in an fMRI experiment in exchange for monetary reward. All participants gave written informed consent. The study was conducted according to the principles in the Declaration of Helsinki (2013) and approved by the Ethics Committee of the Hospital “Santa Maria della Misericordia” (Udine, Italy). Data from 2 participants were excluded from the final analysis due to acquisition problems during fMRI scanning, thus reducing the number of participants included in the final analysis to thirty-nine (19 females).

This dataset was collected in a previous study (Cogoni, Carnaghi, & Silani, 2018) in which participants performed the task (i.e. empathy for social pain task) while functional magnetic resonance imaging data were acquired. Since the fMRI analyses were part of another project and published in Cogoni, Carnaghi, & Silani, 2018 paper, the fMRI data are not reported in the current work. The behavioural data collected in the empathy for social pain task are analysed differently here by using a different statistical approach in order to specifically test for the shared representation account of empathy, which is the main dependent variable of the current study. All measures, manipulations, and exclusions in the study are disclosed.

Experimental procedure

Empathy for social pain task

While lying in the scanner, participants performed a new version of the original Cyberball task (Williams et al., 2000), in which the animated cartoons were replaced by more ecologically valid videos of real

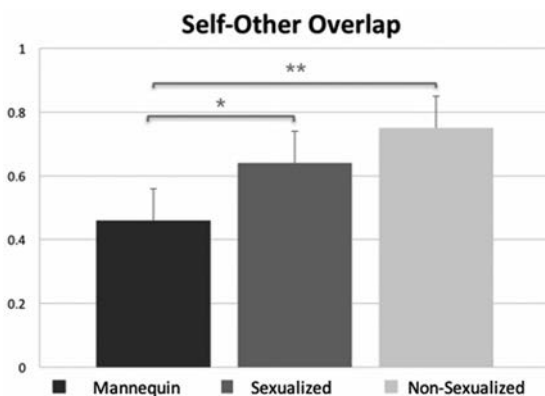


Figure 3. Correlation coefficients means, representing the total overlap between self and other, divided by the three groups. Error bars indicate ± 1 SD; the asterisks indicate a significant difference of the self-other overlap between groups (* $p < .05$; ** $p < .001$).

people tossing the ball to each other (see also Novembre et al. (2015), for a similar version of the cyberball game). Two young adult women (different from Experiment 1), one blonde and one brunette, unknown to the participants were recruited as confederates and displayed in the videos (depending on the experimental condition). The confederate was either dressed in a sexualized (Other sexualized) or in a non-sexualized fashion (Other non-sexualized), as described in Experiment 1 (Figure 4).

Each participant saw the same combination of confederates through the entire game (i.e. if the brunette confederate was wearing the sexualized outfit, the blonde was wearing the non-sexualized ones and vice versa). This combination was randomised across participants. Stimuli and procedure are described in detail in Cogoni et al. (2018).

During the experiment, participants believed that they were connected via an internal network to three other participants located in another university building outside the hospital scanning unit; these other participants controlled the decisions of the players visible in the videos, and thus participants

would not meet the other players. This ensured that reputational and image concerns would not contaminate their responses toward the targets. The videos could belong to one of the three possible conditions (Self, Other sexualized, Other non-sexualized).

The trials characterised by the presence of a pair of hands in front of the camera were those in which participants were directly involved in the game (self condition). During such trials, participants had to decide to whom to throw the ball every time they were in possession of it by pressing either the left or the right keys on the pad that they held in their right hand. In the other sexualized and the other non-sexualized conditions, participants watched the game played by the three other participants located in the university building (in reality all the ball tosses were pre-recorded). They were told that due to the small size of the university room, the camera would be able to record only one participant in the full body size while only the hands of the other two participants would be visible in the video. The trials in which either the participant or the confederate received the ball constituted the “social inclusion” trials, while the “social exclusion” trials were characterised by no tosses to the participant/confederate. In each video, the ball was tossed every two seconds for 10 or 11 passes, with a total average duration of 18.18 s (range 15–21 s). Participants performed four different runs in total. Each run consisted of 12 trials administered in a pseudo-randomised order, with two videos for each of the three targets (Other sexualized, Other non-sexualized, Self) in both the “social inclusion” and “social exclusion” trials, resulting in a total number of 48 trials for the entire session. Response ratings were collected at the end of each trial, when the participant was asked to judge the valence of their own emotion in the self condition or of the other person in the other condition, using a horizontal Likert-type rating scale going from -10 = “very negative” over 0 to $+10$ = “very positive”. The same keys used for throwing the ball were also used to give the response, within a maximum period of 4 s (Figure 5).

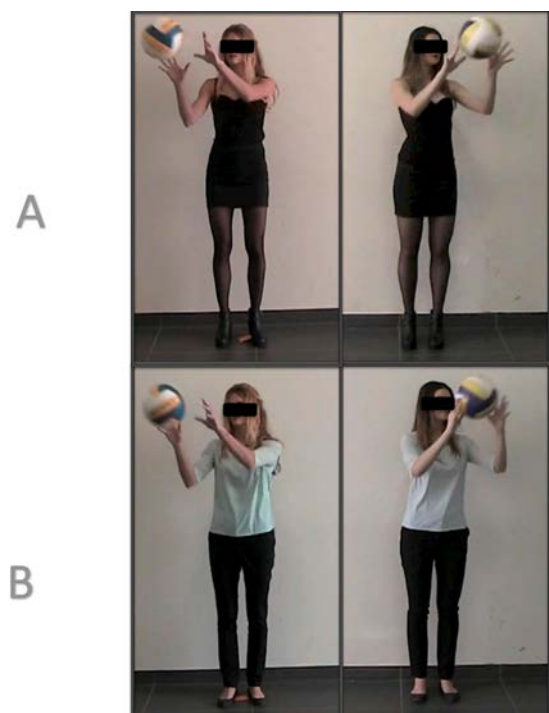


Figure 4. Exemplar frame images of the “other condition” videos. Sexualized confederates in the upper part of the figure (A), non-sexualized confederates in the lower part of the figure (B). Note that participants saw videos of the confederates without the black bar on the face.

Pretest

Similarly to Experiment 1, a pilot test was carried out to test the efficacy of our experimental manipulation. Twenty participants ($N = 10$ female), selected from an independent pool issued from the same population as the experimental sample, rated the full body pictures of the two confederates wearing the different

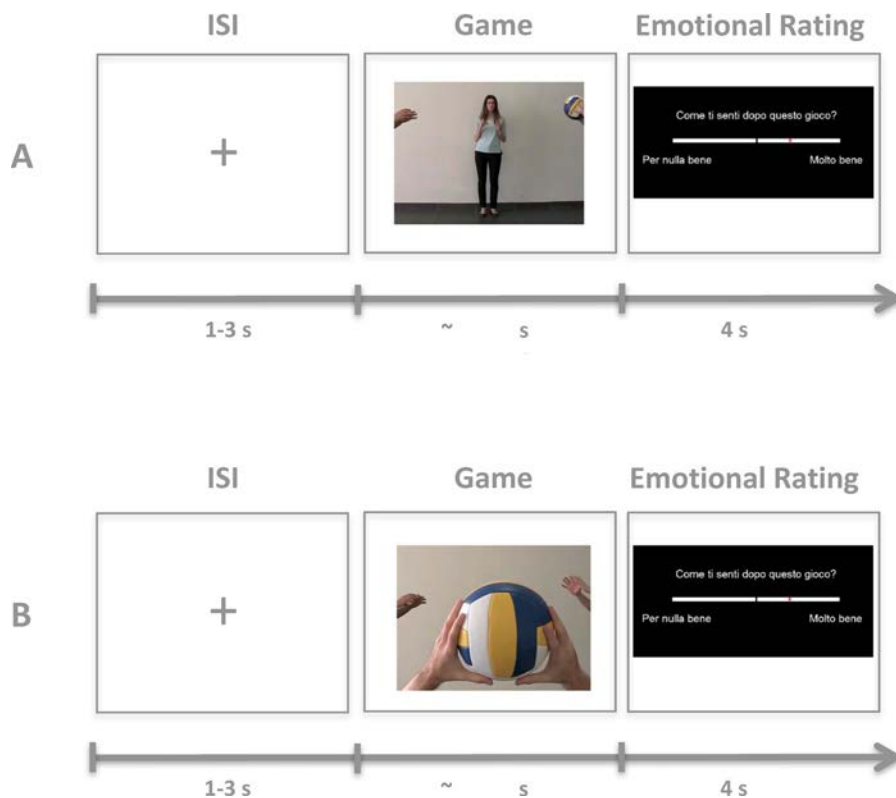


Figure 5. Timeline of one trial of the empathy for social pain task for the “other” (A), or “self” (B) runs. Every video was preceded by a fixation cross presented in the middle of the screen, jittered between 1 and 3 s. The ball-tossing game was then performed for a period of ~18 s, followed by the rating scale displayed for 4 s.

outfits, with respect to their capacity in terms of agency and experience through the 12 items of the Mental State Attribution scale (Gray et al., 2011). The confederates were also rated on physical appearance (i.e. attractiveness and sexiness), intelligence, and familiarity by means of a 6-point scale, ranging from 1 (= not at all) to 6 (= completely) (see Cogoni, Carnaghi, & Silani, 2018 for further details).

The same ratings were also collected immediately after neuroimaging data acquisition (from now on “post-scan Exp2”) to verify that the sexualized and the non-sexualized targets were perceived in line with the experimental purpose.

Statistical analyses

Pretest

Similarly to Experiment 1, physical appearance and intelligence ratings were analysed by means of a 2 (Dimension: Physical Appearance, Intelligence) by 2 (Target: sexualized, non-sexualized) repeated

measures ANOVA. Agency and experience rating scores were analysed by means of a 2 (Dimension: Agency, Experience) by 2 (Target: sexualized, non-sexualized) repeated measures ANOVA. Familiarity ratings were analysed by means of a one-way ANOVA with the factor Target (sexualized, non-sexualized).

In addition, in order to assess the replicability of the findings between the two experiments (Experiment 1 and 2), ratings were analysed by means of the previously reported ANOVAs, introducing an additional between-subject factor: Experiment (Pretest Exp1, Pretest Exp2, post-scan Exp2).

Empathy for social pain task

Within-subject correlations were computed on the ratings in the self and in the others trials, with the same procedure described in Experiment 1. For each participant, the ratings were grouped into two subsets according to an initial (run 1 and 2) and a final (run 3 and 4) moment of the task (See Tables 3 and 4 for values). This resulted in two groups of

within-subject correlations: one between the self and the other sexualized, and another one between the self and the other non-sexualized. Within-subject correlation coefficients were Fisher Z-transformed (McNemar, 1962), (from now on self-other overlap scores) to reach a normal distribution. In doing so, we gathered information about the overlap between the self- and other-emotional ratings, controlling for the time of the experiment. Participant gender did not show a significant main effect and did not significantly interact with any of the independent variables, thus it was not further considered in the analyses. The self-other overlap scores were analysed by means of a 2 (Target: Other sexualized, Other non-sexualized) \times 2 (Time: 1–2, 3–4) within-subject repeated measures ANOVA.

Meta-analysis of the two empathy tasks

To integrate the quantitative findings from the two independent but similar studies (Experiment 1 and 2), a meta-analysis approach was used in order to provide a numerical estimate of the overall effect of interest (Petrie et al., 2003).

As the focus of this paper is on self-other overlap differences between sexualized and non-sexualized targets, the effect size statistic that was deemed most appropriate for the meta-analysis was the standardised mean difference (the difference between the mean scores expressed in standard deviation units). To calculate a standardised mean difference for each study, statistics such as the means, standard deviations, and sample size of the self-other overlap measures for each group were utilized.

A fixed effects model was used, assuming that the two studies share a common true effect, and the summary effect is an estimate of the common effect size.

Analyses were performed with the software package *Exploratory Software for Confidence Intervals* (ESCI) Version 3. The method of examining overlapping confidence intervals (Cumming & Finch, 2005) was used to

Table 3. Mean values and standard deviations (in brackets) for the affective ratings for each group in the different runs.

Group	Time			
	1–2		3–4	
	M (SD)	95% CI	M (SD)	95% CI
Self	5.28 (2.18)	[4.58, 6.00]	5.31 (2.35)	[4.55, 6.08]
Non-sexualized	4.70 (2.13)	[4.02, 5.40]	4.85 (2.32)	[4.09, 5.60]
Sexualized	3.47 (2.74)	[2.59, 4.37]	3.78 (2.90)	[2.85, 4.72]

Table 4. Mean values and standard deviations (in brackets) for the Fisher-Z transformed correlation coefficients (i.e. self-other overlap scores) for each group in the two moments of the task.

Group	Correlation coefficients			
	1–2		3–4	
	M (SD)	95% CI	M (SD)	95% CI
Non-sexualized	.55 (.80)	[.29, .81]	.51 (.85)	[.24, .79]
Sexualized	.18 (.94)	[–.13, .48]	.21 (1.01)	[–.12, .54]

determine if the mean effect sizes (Cohen's *d*) from different groups of studies differed significantly.

Results

Pretest

The pretest data suggest that our experimental manipulation was effective and stable across Experiment 1 and 2, as indicated by: (1) higher focus on physical appearance for the sexualized women as opposed to higher focus on intelligence for the non-sexualized women; and (2) higher agency attributed to the non-sexualized women as opposed to higher experience attributed to the sexualized ones. Overall, the results indicate that the revealing outfits were able to induce sexual objectification and dehumanisation of the target. See Supplementary Material for the detailed analysis.

Empathy for social pain task

Results revealed a significant main effect of Target $F(1,38) = 6.39, p = .02, \eta_p^2 = .14$, indicating that the self-other overlap scores were higher in the Other non-sexualized ($M = .53, SE = .12$) than in the Other sexualized ($M = .19, SE = .15$), see Figure 6. No effect of Time was found $F(1,38) = .00, p = 1.00, \eta_p^2 < .001$, indicating that runs 1–2 ($M = .36, SE = .12$) and runs 3–4 ($M = .36, SE = .13$) did not influence the self-other overlap. Moreover, the Target by Time interaction was not significant $F(1,38) = .35, p = .56, \eta_p^2 = .01$.

Meta-analysis

Results revealed a small (Cohen, 2013) estimated effect size of .14 (95% CI = [.01, .26]). Bearing that a mean effect size is significantly different from zero when zero is outside the range of its 95% confidence interval, this small-scale meta-analysis confirms that a statistically significant difference was detected between the self-other overlap of sexualized and non-sexualized women.

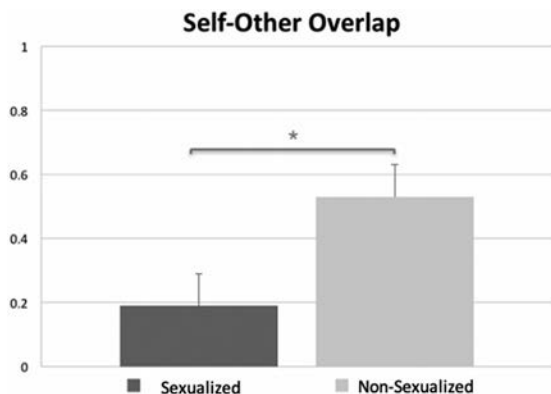


Figure 6. Correlation coefficients means, representing the total overlap between self and other, divided by the two groups. Error bars indicate ± 1 SDM; the asterisk indicates a significant difference of the self-other overlap between groups ($*p < .05$).

Discussion

The goal of this study was to assess the impact of perceived sexualization of a female individual on empathy for affective touch and social exclusion. This was achieved by directly comparing online self-related and other-related affective ratings for women wearing more or less revealing clothing. Results of two independent studies consistently showed a modulation of self-other overlap (i.e. an index of shared representations) by the level of sexualization of the target. In line with our hypothesis, the self-other overlap reaches its highest value when the target is a non-sexualized woman compared to a sexualized woman or an object. This effect (which was estimated to be small) also emerged when meta-analytically combining the two studies, suggesting its replicability with the use of different tasks.

Experiment 1 and 2 represent a new approach in the objectification field. First, having real women acting as confederates enabled the investigation of the effect of sexualization of the individual in its natural setting, thus permitting the understanding of the actual consequences that the phenomenon has on the perceiver. Second, the assessment of empathic responses by including both the self and the other condition is more in line with recent models of empathy based on the shared representation account (Bastiaansen et al., 2009; Mitchell, 2009; Singer & Lamm, 2009). Moreover, for the first time within the research on objectification, in Experiment 1 empathic feelings toward a sexually objectified woman and a human-like object have been addressed, thus shedding light on the differences

between reactions toward these two categories. As expected, participants displayed a lower similarity between the scores attributed to self and the other when a mannequin was the target of the empathic judgments, in comparison to both sexualized and non-sexualized women. Importantly, the use of the mannequin as a control condition allowed for a deeper understanding of how appraisal of human vs. non-human entities occurs.

The comparison between emotional responses to the mannequin and the sexualized woman is important in order to address the core statement of the objectification theory, namely whether the appraisal of sexualized women is similar to the appraisal of objects (Over, 2020). Our results indicate that the two categories indeed display a different degree of shared representations: self-other overlap toward sexualized women is greater than the one toward an object, possibly suggesting that a failure to detect a mind in the mannequin prevents participants from fully empathising with it. Notably, the fact that sexualized women and mannequins are perceived differently along the continuum of mind attribution (Intelligence, Experience and Agency), suggests that the appraisal of a sexualized woman is not equivalent to the appraisal of an object, as the terminology “objectified woman” appears to suggest (see also Over, 2020). These results are in apparent contradiction to the findings on visual exploration of sexualized women. Indeed, we demonstrated that at a neural level, when a woman is sexualized because of her revealing clothing, she is perceived as truly similar to objects (Vaes et al., 2019) at a first visual inspection. However, despite sexualized women first automatically being processed as object-like, they are then correctly categorised as humans by a controlled and effortful process, following dynamic interactive models. Specifically, “human” and “object” categories are simultaneously activated at earlier stages, and these categories dynamically compete until the target (i.e. sexualized woman) is deliberately categorised as human and not as object (Vaes et al., 2020). Therefore, the findings of the present research are more likely to describe high-level cognitive processes occurring when the human–object divide has already been resolved.

The comparison between mannequins and non-sexualized women is also relevant for the study of humanisation of non-human entities. Despite the perceiver’s tendency to humanise an entity according to the degree of the displayed human-like features

(Krach et al., 2008), and the fact that the mannequin displayed woman-like features, the effects of the mannequin on the variables of interest still differed from the observed effects triggered by the interaction with a “real” woman. Hence, as described by the uncanny valley theory (Mori, 1970; Mori et al., 2012), the emotional responses elicited by the mannequins are similar but do not overlap with the responses elicited by real humans. The fact that a stronger self-other emotional overlap was detected when participants interacted with a woman than an object confirms previous assumptions about the different empathic feelings toward humans and non-humans (Suzuki et al., 2015).

Our results showed that the effect of time modulated the self-other overlap in Experiment 1. In particular, at the beginning of the task, self and other scores for sexualized and non-sexualized targets were highly similar, while such overlap decreased with the progress of the task. Hence, the self was used as a reference to evaluate the emotional state of the other target, especially at the beginning of the task. Notably, the change over time in the self-other overlap was similar across groups, as revealed by the absence of a Time \times Group interaction, indicating that regardless of the type of target that participants had to evaluate, shared representations were reduced in the later trials. A possible explanation could be attributed to fatigue increase with the performance of the task. It is worth noting that the results of Experiment 2 did not corroborate this pattern, as no change in terms of shared representation occurred in the initial compared to the final part of the task. The discrepancy in terms of time effect between the two experiments could be attributed to a different variability of the stimuli in the two tasks. Indeed, in the affective touch task, the trials continuously change; giving rise to different affective responses every time a stimulus (pleasant, neutral or unpleasant) is presented. By contrast, in the case of the social pain task, the trials of social inclusion and exclusion are almost similar throughout the entire task. This stimuli variability could have resulted in a more demanding (and therefore affected by time) simulation in the affective touch task.

An additional result of the present work is the absence of gender differences in empathic responses toward sexualized and non-sexualized targets, in line with our previous work (Cogoni, Carnaghi, & Silani, 2018; Cogoni, Carnaghi, Mitrovic, et al., 2018; Vaes et al., 2019, 2020). Similar results have been reported

in studies on mind attribution and dehumanisation of sexualized targets (Gray et al., 2011; Heflick et al., 2011; Heflick & Goldenberg, 2009; Loughnan et al., 2010, 2013; Vaes et al., 2011; but see Kellie et al. (2019) for evidence on gender differences). Notably, it may be possible that participants of different genders show similar empathic feelings toward a sexualized woman, although guided by different motivations. Considering the case of an equal level of dehumanisation of sexualized women (measured through the IAT), Vaes et al. (2020; but see also Morris & Goldenberg, 2015) showed that this phenomenon was driven by a combination of dehumanisation/instrumental processes applied by men, and by a dehumanisation/avoidance processes applied by women. Namely, sexual attraction for the sexualized target led to a shift of the interest from the personality to the physical appearance of the woman in male participants, resulting in a dehumanisation of the target. On the contrary, female participants dehumanised sexualized women because they perceived them as out-group members of which they feel disconnected from. In fact, although in these studies both male and female participants displayed a similar empathic response toward the same target, we can speculate that the male decreased empathic reaction toward sexualized women could be driven by an increased sexual attraction and enhanced focus of attention on the woman’s physical appearance, thus hampering the shared representation process. On the other hand, the decreased empathic reaction toward sexualized women in female participants could be guided by an avoidance reaction from a typology of women that they want to be differentiated from. Further studies should systematically investigate the processes behind such empathic responses in both genders.

Implications of sexual objectification research

Our findings are the first steps in the direction of the current public debate on sexual assault and harassment of women. Both the “#MeToo” and “#TimesUp” movements – which support survivors of sexual assaults – have strongly highlighted the necessity to understand why sexual harassment remains such a prevalent problem.

So far, it is known that perceiving a woman in objectifying terms leads to increased sexual aggression (Pacilli et al., 2017; Rudman & Mescher, 2012), but at the same time the underlying process driving such violence is largely unknown. The current research took a step forward by demonstrating how sexual objectification shapes empathy, a possible mechanism

behind sexual harassment. Objectification and discrimination of sexual nature do not only manifest themselves in terms of physical violence, but also psychological one, in the context of gender power inequality. Social power is a prevalent feature of social relationships, and it refers to the capacity to influence other individuals (Emerson, 1962). High power has been found to both decrease emotional responses to another person's suffering (van Kleef et al., 2008) and increase objectification (Gruenfeld et al., 2008). Therefore, there is the possibility that a perceived power imbalance between the perceiver and the sexualized woman may be a common denominator of both objectification and reduced empathy. Specifically, the persistence of a power imbalance and the psychological oppression of a group of people (typically low-power women) by another more powerful group (high-power man) could be reinforced by the diminished emotional attribution to women caused by objectification.

The essential cultural shifts that ensure women are no longer the "second sex", are no longer living in societies controlled by men and are not only seen as sexual objects, has only started. For this reason, it is still fundamental to keep investigating objectification social phenomena.

Limitations and future directions

Despite the novelty of our findings, it is important to acknowledge that the two studies have several limitations that may restrict their generalizability.

First, in Experiment 1, we decided to use a female mannequin without clothes. Participants were instructed to pretend that the mannequin was an imagined prototypical woman neither sexualized nor non-sexualized. However, the mannequin's nudity could have emphasised its physical attributes and therefore may have not represented the ideal control condition. Hence, even if the results are in line with our hypothesis and with previous findings, future studies should explore if this pattern generally persists with human-like objects wearing clothes.

Moreover, a shortcoming of the study lays in the results of Experiment 1's pretest. Indeed, while we found a clear difference between intelligence and physical appearance between sexualized and non-sexualized women (more physical appearance than intelligence for the sexualized women and vice versa), we did not find either reduced agency attributed to the sexualized women compared to non-sexualized women, or reduced experience attributed to the

non-sexualized women compared to the sexualized ones. This result is not in line with the results of Experiment 2, as well as findings reported by Gray et al. (2011). However, the effect becomes statistically significant when considering Experiment 1 and 2 together (see pretest results in Supplementary Material). The partial replication of Gray and colleagues' work (2011) may be due to the experimental set-up adopted in the current study. Indeed, in Gray and colleagues' work (2011), the female targets were presented in bikinis, thus blatantly stressing the nudity and physical appearance of the targets. By contrast, in Experiment 1 and 2 the sexualization of the target was operationalised in a more ecological fashion by varying the clothing style while maintaining appropriate outfits for the specific situation (i.e. not using a bikini outfit since that would not be appropriate during an experiment, and would have invalidated the confederate cover story).

Finally, the present research was tailored to investigate the shared representations account of empathy (Bastiaansen et al., 2009; Mitchell, 2009; Singer & Lamm, 2009) in the context of sexual objectification. However, making empathic judgments requires both affective simulation and self-other distinctions operating at the same time (Lamm et al., 2016; Singer & Lamm, 2009). Future studies should address how sexual objectification affects self-other distinction in the affective domain.

Furthermore, research needs to be carried out to address the generalizability of the present pattern of results toward sexualized males and in other countries and cultures, by relying on samples with a wider and more representative range of age.

Conclusion

In an era where violence against women represents an everyday topic, the understanding of how women's emotions are perceived and represented from an observer perspective is of fundamental relevance. The current study suggests a possible explanation of a behaviour extensively described outside the laboratory, by providing an empirical account of reduced empathic shared representations: in a hypothetical assault, the diminished empathic feelings toward a sexualized woman, as compared to a non-sexualized one, can explain the tendency of the perceiver to ignore the emotions of the other person (even if able to understand them), leading to violent behaviour or omission of helping behaviour. Future

experimental work should systematically investigate the possible behavioural consequences of diminished empathy toward sexualized women.

Notes

1. Throughout the manuscript, the term *sexualized* will be used to refer to the visual presentation of the individual (outfit and posture), while the term *sexually objectified* indicates the process by which a sexualized person is visually explored and observed (e.g. attentional biases toward sexualized body parts). The term *dehumanization* finally refers to the consequences/outcomes of sexual objectification. Importantly, a sexualized representation does not necessarily lead to sexual objectification and/or dehumanization.
2. Due to the nature of the task used in the second experiment, a control condition consisting of an object was not possible to implement. See Methods section for further details.
3. Sensitivity analysis for the main effect of Group (α err. prob. = .05, Power [$1-\beta$ err. prob] = .80, $N = 170$) indicated a Minimal Detectable Effect (MDE) size $f = .21$. Hence, the smallest effect size that we can detect (at 80% power) with this sample size falls within the small to intermediate effect size area (Cohen, 2013). Sensitivity analysis for the Group \times Time interaction (α err. prob. = .05, Power [$1-\beta$ err. prob] = .80, $N = 170$) indicated a Minimal Detectable Effect (MDE) size $f = .11$. Hence, the smallest effect size that we can detect (at 80% power), with this sample size falls within the small to intermediate effect size area (Cohen, 2013).
4. Long cognitive tasks can lead to mental fatigue and changes in motivation which can affect performance (Möckel et al., 2015).
5. Sample size was determined a priori based on recommendation for power analysis on fMRI studies (Mumford, 2012). The sensitivity analysis for which the planned analyses tested for the within-subject factors Target \times Time interaction (α err. prob. = .05, Power [$1-\beta$ err. prob] = .80, $N = 39$) indicated a Minimal Detectable Effect (MDE) size $f = .19$. Hence, the smallest effect size that we would be able to detect (at 80% power) with this sample size falls within the small to intermediate effect size area (Cohen, 2013).

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Data availability

The datasets generated during and/or analysed during the current studies are available from the corresponding authors on reasonable request.

Disclosure statement

No potential conflict of interest was reported by the author(s).

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