Cognitive Processing

Now You See Me, Now You Don't: Detecting Sexual Objectification through a Change Blindness Paradigm

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Now You See Me, Now You Don't:

Detecting Sexual Objectification through a Change Blindness Paradigm

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Abstract

The goal of this work is to provide evidence for the cognitive objectification of sexualized targets via a change blindness paradigm. Since sexual objectification involves a fragmented perception of the target in which individuating features (i.e., the face) have less information potential than sexualized features (i.e., body parts), we hypothesized that changes in faces of sexualized targets would be detected with less accuracy than changes in faces of nonsexualized targets. Conversely, we expected that changes in body parts would be detected with higher accuracy for sexualized than nonsexualized targets. These hypotheses were supported by the results of two studies that employed a change blindness task in which stimuli with changes both to faces and bodies of sexualized and nonsexualized images were presented. Unexpectedly, the hypothesized effects emerged both for female and male targets.

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Literally, objectification refers to perceiving (and treating) others as objects (Code, 1995). Although objectification concerns different social groups (e.g., factory employees, Andrighetto et al. 2017), most research focused on sexual objectification of women (see Gervais 2013 for a review), given its pervasiveness in today's western societies. Initial studies in this field have been inspired by objectification theory (Fredrickson and Roberts 1997), which posits that the cultural emphasis on women's physical appearance may lead them to adopt a self-view as objects that are valued for use by others. In particular, hundreds of studies focused on the detrimental consequences due to women's internalization of the observer's perspective of their bodies (i.e., self-objectification), such as eating disorders, sexual dysfunction or impaired cognitive functioning (see Calogero et al. 2011; Moradi and Huang 2008 for reviews). More recent approaches to sexual objectification adopted the perceiver's perspective (Heflick and Goldenberg 2014) and revealed the consequences of viewing sexually objectified targets. These studies reported that exclusively focusing on a woman's physical appearance (i.e., objectifying her) leads to a denial of her moral status (Loughnan et al. 2010), decreased attributions of human traits (Heflick et al. 2011; Vaes et al. 2011), and undermined agency perception (Cikara et al. 2011).

In parallel, a considerable amount of research is shedding light on the specific nature of this objectifying gaze and the underlying cognitive processes (see Bernard et al. 2018 for a review). Overall, these works are suggesting that the salience of women's sexualization leads people to perceive them as objects-like even at a basic cognitive level. More specifically, this research is indicating that the recognition of sexualized (vs. non-sexualized) targets follows an analytical (vs. configural) processing, which is typically involved in object-recognition and does not require information about the spatial relations among the stimulus parts (Reed et al. 2003;

Tanaka and Farah 1993). This cognitive bias has been mainly demonstrated through a picture recognition task detecting the inversion effect, i.e., the impaired cognitive performance occurring for inverted human images – but not for most object images – compared to upright human images (see Reed et al. 2003; Reed et al. 2006). In this task, target sexualization was triggered by exposing participants with a series of images commonly taken by online advertisements and portraying young, well-shaped and attractive models with revealing clothing and exhibiting sexually suggestive postures. In doing so, consistent evidence (Bernard et al. 2012; Civile and Obhi 2016; Cogoni et al. 2018) revealed that images of sexualized images of women were recognized at the same extent when presented inverted and upright, thus indicating an analytic, object-like processing. Instead, recognition of sexualized images of men (Bernard et al. 2012) or nonsexualized images of women (Cogoni et al. 2018) is impaired when these images are inverted (vs. upright), thus suggesting a configural processing. A further evidence of the objectifying gaze has been provided by Gervais et al. (2012) who examined recognition for sexualized body parts and found that women's – but not men's – body parts were better recognized when presented in isolation than in the context of entire bodies, reflecting a local (vs. global) processing which is commonly used in objects recognition.

Despite the relevance of these first evidence, research on cognitive processing of sexually objectified targets needs to be expanded and corroborated by further works that employ cognitive paradigms different than those used so far. The main goal of the present work is to provide a further evidence about the cognitive occurrence of the objectifying gaze by merging sexual objectification literature with cognitive research on change blindness (Rensink 2002; Simons and Levin 1997; Simons and Rensink 2005).

Perceiving (Objectified) Social Stimuli

In an unbiased process of social perception, people gaze at others' faces primarily than at any other body part (e.g., Hansen and Hansen 1988; Hewig et al. 2008; Stangor et al. 1992). Faces are indeed of particular importance for human interactions, as they convey important and immediate information not only about gender or ethnic membership but also about emotions or behavioral intentions (e.g., Ekman 1993; Ekman and Oster 1979). This primary focus on others' faces should not emerge when perceiving sexually objectified targets. Indeed, when a person is sexually objectified, his/her body or body parts are singled out and separated from him/her as a person, and he/she is viewed primarily as a physical object of sexual desire (Bartky 1990; Szymanski et al. 2011). That is, sexualized parts (e.g., chest, waist) of the target are perceived separately from the other body parts and would capture more attention than individuating features like faces. Gervais and colleagues (2013) provided the first evidence for this assumption. By using eye-tracking technology, they demonstrated that when women's appearance (vs. personality) was made salient, perceivers gazed at women's faces for shorter durations and gazed at body parts for longer durations, especially when the images of women fit cultural standards of beauty. Crucially, the same findings emerged for both male and female perceivers, suggesting that the objectifying gaze emerges regardless of any individual motivation due to perceivers' gender.

Change Blindness as a Paradigm for Detecting Sexual Objectification

Change blindness (Simons and Levin 1997; Simons and Rensink 2005) refers to observer's scarce ability to detect changes made to scenes or images when those changes are contingent with a brief disruption in visual continuity (Simons 2000), which is for example caused by eye blinks, eye movements (McConkie and Currie

1996), or distractors that are partly superimposed over the scene (i.e., "mudsplashes"; O'Regan et al.1999). Among the different techniques adopted to study change blindness, the gap-contingent techniques (i.e., the one-shot and flicker paradigms) are the most common (e.g., Rensink et al. 1997; Simons 1996). In these techniques, a transient screen is introduced between two presentations of images which differ in some ways. This transition creates a global motion signal that overlaps with the localized signal associated with the change, by making it remarkably difficult to detect, even when it is very large (e.g., Rensink et al. 1997).

However, the perceiver's ability in detecting (or not detecting) the change in the presence of a visual disturbance depends on several factors. Specifically, the information potential (IP; Bracco and Chiorri 2009) of the changing element is of central importance. The IP is generally defined as the informativeness level of a target in a scene and derives from the joint effects of bottom–up saliency and top–down relevance. Of particular relevance to the present work, some studies (Bracco and Chiorri 2009; Ro et al. 2001) demonstrated that changes in elements holding high IP are easier to detect than changes in elements holding low IP, regardless of other aspects of the changing element, such as its salience or position in the scene.

Guided by this framework, in the present study we used a change blindness gap-contingent paradigm to further investigate the cognitive bias involved in the objectifying gaze. We assumed that changes in body parts would be noticed with higher accuracy in sexualized than nonsexualized targets, as in sexualized targets body parts hold a greater IP. According to this rationale, we hypothesized that in a change detection task changes in body parts of sexualized targets would be detected more accurately than changes in the body parts of nonsexualized targets. We expected opposite effects for an individuating feature such as the face: changes in sexualized targets' faces (lower IP) would be detected with less accuracy than changes in nonsexualized targets' faces (higher IP).

We aimed at testing this pattern of change detection by considering both female and male targets. Consistent with most of previous research in this field (Bernard et al. 2012; Gervais et al. 2012, 2013), we expected that the objectifying gaze would be primarily directed toward women and thus especially emerge for sexualized female images rather than for sexualized male images. Further, we hypothesized that these effects would not be moderated by perceivers' gender and emerge both for male and female perceivers. This latter prediction is supported by a lot of studies (e.g., Heflick et al. 2011; Loughnan et al. 2010; Vaes et al. 2011), which robustly demonstrated that both genders engage in objectifying gaze and behaviors toward women.

Study 1

Method

We report below how we determined our sample size, all data exclusions, all manipulations and all measures in the study.

Participants. We planned to recruit a total of 60 undergraduate participants balanced across gender. Using this information, we computed that in a 2×2×2×2 mixed design the interaction effects would have 1 degree of freedom at the numerator and 58 at the denominator. Since the noncentrality parameter lambda needed to compute expected power in G*Power 3.1 can be computed as f^*N. we computed that we could expect a power of .673, .968, and .998 for small, medium, and large effects, respectively. As small effects could be of limited replicability, we decided not to increase the sample size in order to reach a power of at least .80 also for these effects. Due to the large availability of undergraduate participants in the semester of the study, our data collection stopped at 64 participants (32 females; $M_{age} = 21.61$, $SD = 2.06$) who were voluntary recruited. Of these, 5 reported not being heterosexual[1].

Material. Stimulus materials were selected and developed in two steps.

In the first step, we selected 24 photos of 24 men and 24 photos of women from a large pool of images retrieved by online advertisements. All targets were young, well-shaped, portrayed from the knees up and gazing at the camera. Target sexualization was manipulated similar to previous research (e.g., Bernard et al. 2017; Civile and Obhi 2016; Cogoni et al. 2018): the 12 sexualized targets wore revealing clothing (i.e., underwear or lingerie) and exhibited suggestive postures, whereas the 12 nonsexualized targets wore ordinary and non-revealing clothing. All pictures were uniformed in a grey scale, their size was standardized (230×341 pixels) and they were resized to have similar face-ism indexes (Archer et al. 1983) between male and female targets. Further, we pre-tested the perceived familiarity and attractiveness of the selected images (see the Supplementary Material for detailed analyses of this pre-test).

In the second step, the pool of the pretested images served as the basis for the set of stimuli employed in our change blindness task. By using Adobe Photoshop 12.0, we modified each image by replacing the targets' face or body parts with faces or body parts randomly extracted from other images portraying same-gender targets. From the large set of modified images ad hoc created, we selected 120 images that were equally distributed across the four categories of stimuli (30 for each category; see the Supplementary Material for details about a further test conducted on this stimuli). Figure 1 shows examples of original and modified images for each category.

Procedure. Upon arrival in the laboratory, participants first provided the informed consent to participate in the study and background information. Then, they completed an adapted version of the one-shot change detection task (Luck and Vogel 1997; Phillips 1974; see also Pailian and Halberda 2015).

Stimuli were administered using PsychoPy v1.83. Each trial began with a fixation cross, which was displayed for 500ms at the center of the screen. When the fixation cross disappeared, the first image was shown for 400ms within a centered rectangular area, designated as the stimulus presentation area and corresponding to 16% of the total screen area. The center of the image was fixed in a randomly chosen position inside this stimulus presentation area. After the first stimulus presentation, a transient black screen was displayed for 250ms. The second image of the same category as the first one was then shown for 400ms, again randomly positioned within the stimulus presentation area[2]. For each trial, participants were required to press a left button of the computer keyboard ("E") if they detected a change between the first and second image, and a right button ("I") if they did not detect any change. They were instructed to provide their response from the onset of the second image, without time limit. Once participants had provided their response, the next trial followed. For each trial, participants' performance accuracy was recorded[3]. Accuracy feedback was not provided, except during the training session (see Figure 2 for a schematic representation of the experimental trials).

Participants were presented the 120 trials (30 for each category of stimuli) twice and in a random order, for a total of 240 experimental trials. These were preceded by 12 practice trials. For the 30 experimental trials of each category, 10 trials presented the second image with a change to target's face (80 trials total), 10 the second image with a change to target's body parts, and 10 the second image with no changes. Accordingly, two-thirds of the trials were change-trials, and one-third were no change-trials.

Results

For each trial, participants' accuracy scores of change detection were computed by assigning 1 for each correct response and 0 to incorrect responses. These scores were then averaged across the different type of trials. Thus, mean scores close to 1 indicate higher levels of accuracy, mean scores close to 0 indicate lower levels of accuracy[4]. Participants' accuracy scores for no-change trials were not included in the main analyses (for a similar procedure see, e.g., Boot et al. 2006)[5].

The change-trial scores were submitted to a 2 (target gender: male vs. female) × 2 (target sexualization: sexualized vs. nonsexualized) × 2 (type of change: face vs. body parts) × 2 (participant gender: male vs. female) mixed-model ANOVA, in which the first three factors were within-subjects. Table 1 summarizes the main and interactive effects of the considered factors on participants' accuracy scores. Sensitivity power analysis that assumed a standard power criterion (.80) yielded an effect size of .27, indicating that the minimal detectable effect was a small-sized effect.

Data analyses revealed that the main effects of target gender and participants' gender did not significantly impact accuracy scores. Instead, the main effect of type of change was significant, indicating that participants were more accurate in detecting changes in targets' body parts (M = .95; SD = 0.08) than faces (M = .77; SD = 0.16). The main effect of target sexualization was also significant: changes in nonsexualized targets (M = .89; SD = 0.13) were detected with greater accuracy than those in sexualized targets (M = .84; SD = 0.11). However, these main effects were qualified by the two-way significant interactions Target gender×Target Sexualization, Target gender×Type of change and Type of Change×Target sexualization, $F_s(1,62) \geq 14.43$, $p_s < .001$, $\eta_{ps}^2 \geq .19$. Of crucial interest to our hypotheses, Bonferroni-corrected pairwise post-hoc comparisons on the Type of Change×Target sexualization interaction effect revealed that when the changes were in targets' body parts participants were more accurate in detecting the change for sexualized (M = .97; SD = 0.06) than nonsexualized targets (M = .93; SD = 0.10), $F(1,62) = 27.45$, $p < .001$, $\eta_p^2 = .31$, 95%CI[.022,.050], whereas when the changes were in targets' faces participants' accuracy was greater for nonsexualized (M = .84; SD = 0.16) than sexualized targets (M = .70; SD = 0.17), $F(1,62) = 168.29$, $p < .001$, $\eta_p^2 = .73$, 95%CI[.118,.161].

In turn, all these two-way interactions were qualified by the three-way interaction Target gender×Type of change×Target sexualization. To shed light on this interaction effect, we first carried out Bonferroni-corrected post-hoc tests for the two-way interaction Target gender×Target sexualization when the changes were in targets' body parts vs. targets' faces. With regard changes in body parts, pairwise comparisons revealed that participants were more accurate when the target was a sexualized (M = .96; SD = .08) than a nonsexualized woman (M = .91.; SD = .13), $F(1,62) = 17.24$, $p < .001$, $\eta_p^2 = .22$, 95%CI[.023,.067]. An inverse pattern of findings emerged for changes in female targets' faces (see Figure 3): participants were more accurate in detecting changes in nonsexualized (M = .83.; SD = .19), than sexualized women (M = .73.; SD = .18), $F(1,62) = 52.12$, $p < .001$, $\eta_p^2 = .46$, 95%CI[.073,.129]. A similar pattern of findings emerged for male targets (see Figure 4). When the changes were in body parts, accuracy scores were higher for sexualized (M = .98.; SD = .05) than nonsexualized male targets (M = .95.; SD = .08), $F(1,62) = 15.72$, $p < .001$, $\eta_p^2 = .20$, 95%CI[.013,.040], whereas when the changes were in targets' faces, accuracy scores were higher for nonsexualized (M = .85.; SD = .16) than sexualized male targets (M = .67.; SD = .18), $F(1,62) = 129.91$, $p < .001$, $\eta_p^2 = .68$, 95%CI[.147,.210]. A further inspection of this three-way interaction revealed that changes in body parts of sexualized male targets were detected with more accuracy than those of sexualized female targets, $F(1,62) = 7.73$, $p = .007$, $\eta_p^2 = .11$, 95%CI[.006,.035], and that changes in faces of sexualized male targets were detected with less accuracy than those of sexualized female targets, $F(1,62) = 11.12$, $p = .001$, $\eta_p^2 = .15$, 95%CI[.022,.086].

Importantly, neither the three-way interactions nor the four-way interaction including participants' gender were significant, suggesting that male and female respondents perceived changes in face and body parts of sexualized and nonsexualized targets similarly.

Summarizing, findings of Study 1 were consistent with study hypotheses and revealed that both female and male participants detected changes in body parts with more accuracy when the target was sexualized (vs. nonsexualized). Inversely, changes in faces were detected with more accuracy when the target was nonsexualized (vs. sexualized). Unexpectedly, this pattern of findings emerged both for female and male targets and it was even stronger for male than female targets.

Study 2

Study 2 was designed to replicate the results of Study 1 by employing a similar paradigm. However, in this Study we introduced two relevant changes aimed at making the task more difficult and thus avoiding possible ceiling effects that in Study 1 especially concerned change-body trials. In particular, we first considered an equal number of change and no-change trials to increase participants' cognitive load throughout the task. Second, for each trial we lengthened the exposure duration of the transient black screen to increase the temporal disruption and thus the possible attentional interference between the first and second image.

Method

We report below how we determined our sample size, all data exclusions, all manipulations and all measures in the study.

Participants. As the experimental design was the same as in Study 1, we determined a similar sample size. Two participants were not considered because experienced a computer failure during the task. The final sample was composed by 67 undergraduates (32 females; M_{age} = 21.73, *SD* = 1.87) who were voluntarily recruited and did not participate to Study 1. Of these, three reported not being heterosexual.

Material and Procedure. We used the same pre-tested 120 images (30 for each category) of Study 1. The procedure was similar to Study 1, except for the length of the transient black screen appearing for each trial between the first and second image, which in this Study was set at 600ms. Further, we increased the number of experimental trials (*N* = 260), in order to have an equal number of change and no-change trials.

Results

As in Study 1, participants' accuracy scores were computed by assigning 1 for each correct response and 0 to incorrect responses and then averaged across the different type of trials. The scores were then submitted to a 2 (target gender: male vs. female) × 2 (target sexualization: sexualized vs. nonsexualized) × 2 (type of change: face vs. body parts) × 2 (participant gender: male vs. female) mixed-model ANOVA. Similar to Study 1, sensitivity power analyses indicated that the minimal detectable effect was a small-sized effect (.26).

As shown in Table 2, data analysis revealed that the main effect of type of change was significant: changes in targets' body parts (*M* = .94; *SD* = 0.06) were detected with greater accuracy than those in targets' faces (*M* = .67; *SD* = 0.21). Further, the main effect of target sexualization was significant: changes in nonsexualized targets (*M* =.83; *SD* = 0.14) were detected with greater accuracy than those in sexualized targets (*M* = .77; *SD* = 0.11). However, these main effects were qualified by the significant Type of Change×Target Sexualization interaction. Supporting again our hypotheses, pairwise comparisons revealed that changes in body parts were detected with greater accuracy when the target was sexualized (*M* = .96; *SD* = 0.05) rather than nonsexualized (*M* = .91; *SD* = 0.09), $F(1,65) = 22.84$, $p < .001$, $\eta_p^2 = .26$, 95%CI[.025,.060]. Conversely, changes in faces were detected with greater accuracy when the target was nonsexualized (*M* = .75; *SD* = 0.23) rather than sexualized (*M* = .58; *SD* = 0.22), $F(1,65) = 106.49$, $p < .001$, $\eta_p^2 = .62$, 95%CI[.138,.204]. Instead, the remaining two-way interactions were not significant. Further, in this Study the three-way interaction Target gender×Type of change×Target sexualization was nonsignificant. It indicates that the same pattern of findings emerged both for female and male targets and that, unlike Study 1, changes in sexualized male and female targets were perceived with a similar accuracy, both when occurring in body parts, $F(1,65) = 3.13$, $p = .082$, , $\eta_p^2 = .05$, and faces, $F(1,65) = 0.01$, $p = .990$, $\eta_p^2 = .001$.

General Discussion

Through two studies we explored the objectifying gaze by integrating research on sexual objectification (see Gervais 2013; Pacilli and Loughnan 2014 for reviews) with a change blindness paradigm commonly employed in cognitive psychology research (e.g., Luck and Vogel 1997; Rensink 2002). The general pattern of the results of our studies showed that male and female perceivers were more accurate in detecting changes occurring in body parts of sexualized rather than nonsexualized targets. Conversely, perceivers were less accurate in detecting changes occurring in faces of sexualized than nonsexualized targets.

These results meaningfully contribute to the growing literature on the attentional and cognitive basis of the objectifying gaze (see Bernard et al. 2018 for a first review). First, they provide further evidence about the assumption that the attentional processing involving objectified social stimuli follows a peculiar path, in which sexualized body parts have a greater importance than individuating features such as faces. In fact, we assumed that the participants' higher accuracy in detecting changes of sexualized (vs. nonsexualized) targets' bodies reflected an attentional bias according to which people, when exposed to objectified targets, primarily process their sexual body parts, as they hold a greater IP than other more individuating body parts. This increased focus on sexual body parts presumably comes at the cost of attention to objectified targets' faces, with a consequent lower accuracy in detecting changes in their faces.

Second, our findings suggest that the objectifying gaze may not be directed only toward women but also involve men. In fact, a similar pattern of change detection performance emerged both for sexualized female and male targets. Although not replicated in Study 2, Study 1 provided evidence that this pattern was even stronger for male than female targets (but see also Supplementary Analyses). Even if this was an unexpected result, it could represent an important theoretical advancement for research on cognitive sexual objectification that, since the advent of the objectification theory (Fredrickson and Roberts 1997), has conceived this process as exclusively concerning sexualized female targets. However, it is also noteworthy that empirical evidence that explored this process by considering both male and female targets reported somewhat contrasting results. In particular, the most recent evidence (e.g., Bernard et al. 2017; Civile and Obhi 2016; Cogoni et al. 2018) that investigated this issue by employing the body-inversion paradigm found a similar pattern of findings for male and female sexualized targets. Together with this latter evidence, our results may strengthen the idea that male objectification should deserve more attention, as it could be more common and pervasive (Aubrey 2006) than commonly thought. Further, this finding may align with the increased male objectification in mainstream media, that more and more portray ideal men’s bodies and body parts to display products (Rohlinger 2002).

Third, our results provided further evidence that the objectifying gaze occurs independently from perceivers’ gender (see e.g., Heflick and Goldenberg 2009; Gervais et al. 2012, 2013). This might imply that the objectifying gaze is primarily driven by cultural beliefs that are shared by both men and women at a basic cognitive level, rather than sexual attraction motives that may emerge when processing an other-gender objectified target or social comparison motives that may arise when processing same-gender objectified targets.

Last but not least, our studies employed a cognitive paradigm to measure the objectifying gaze. Beyond representing a methodological advance to objectification research, the change blindness paradigm allowed us to measure the objectifying gaze in an indirect manner, without participants’ conscious awareness. This is particularly important within a sensitive topic such as sexual objectification, which is presumably affected by people’s desirability concerns.

Limitations and Future Directions

There are a few limitations to the present research that could also be addressed through future research. First, it is noteworthy that in both studies the accuracy of body-change trials, although varied significantly across conditions, was high and much higher than the accuracy of face-change trials. The modifications made to the change blindness task in Study 2 led only to a slight decrease of the overall accuracy of change-body trials (M=.95, Study 1; M=.93, Study 2). At the same time, we argue that the differences in the overall accuracy between body- and face-change trial are unlikely to affect the interpretation of our findings. In fact, we tested our main hypothesis through the significant interaction Type of Change×Target sexualization and, most importantly, through pairwise comparisons that considered the changes in targets' body parts separately from the changes in targets' faces.

Second, although our operationalization of sexualized (vs. nonsexualized) condition was consistent with previous literature, we acknowledge that more stringent criteria are needed to a priori establish which features (e.g., the extent of nudity, the pose and the target's attractiveness) define a target stimulus as sexualized or nonsexualized, and the distinct impact of each of these features. A more systematic investigation about these criteria would guide researchers in a more appropriate selection of sexualized (vs. nonsexualized) stimuli and their consequent translation into the different experimental conditions. Partially related with this issue, it also noteworthy that our stimuli considered only male and female images retrieved by online advertisements, that thus presumably fit with cultural ideals of beauty. Future studies should investigate whether the objectifying gaze emerged in our change blindness task may also be directed toward targets with average or low ideals of beauty. Third, our study did not examine whether the participants' performance in the change blindness task was related to explicit measures of objectification. Although it is plausible to imagine correlations between our task and self-report measures would be weak, given the different structural fit of the two measures (see, e.g., Payne et al. 2008 for a discussion on this issue), a possible relation between them would provide us with a more stringent test for our findings. For example, future studies should correlate participants' performance on the change blindness task with the Mental State

Attribution Task (Loughnan et al. 2010), a self-report measure commonly used in social psychological research to detect explicit objectification. Fourth, our hypotheses have been verified by employing a specific change blindness technique, i.e., the one-shot change detection task. Replicating the pattern of our results with different change blindness techniques would increase our confidence in the reliability and generalizability of our results and possibly give us more information about the mechanisms underlying the emerged effects.

Concluding remarks

The use of sexual imagery of women in media advertising not only has detrimental consequences for women’s psychological and physical well-being (Report of the APA Task Force on the Sexualization of Girls Executive Summary 2007) but also deeply shapes the way which people gaze at women, even at a basic cognitive level. Our study contributes to the understanding of the cognitive processes underlying this objectifying gaze. Further, it suggests that this objectifying gaze may also be directed toward male sexualized images. This latter aspect may have important implications and pose an important question for future research.

Compliance with Ethical Standards

All procedures performed in studies were in accordance with the ethical standards of the local Ethical Research Committee, with the APA ethical guidelines and with the 1964 Helsinki declaration and its later amendments.

Full informed consent was obtained before participants started the studies.

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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Footnotes

1. In both studies, the exclusion of non-heterosexual participants did not affect our pattern of findings.
2. The images were presented in a random position within the stimulus presentation area so that participants could not anticipate their exact occurrence in the display area.
3. In one-shot change detection tasks, participants' performance is primarily measured via accuracy of response than response times, that are instead primarily used in flicker tasks (see Rensink, 2002).
4. In both studies, the distribution of the dependent variables in the conditions were negatively skewed. We thus repeated the analyses by transforming the data using the formula recommended in these cases by Tabachnick and Fidell (1996). The results were substantially the same (see the Supplementary Analyses), suggesting that little or no bias was introduced in using the original values.
5. In both studies, a similar pattern of findings emerged by employing signal detection analyses and d' as a measure of performance that also considered no-change trials (see the Supplementary Analyses). We decided not to consider these analyses as the main statistical approach for our data because the complexity of our experimental design and the consequent high number of cells makes our approach more reliable than the signal detection one, as the total frequency of the implied cross-tabulations that we considered to obtain d's was relatively low. Secondly, we felt that reporting the signal detection analyses approach would make the Results section relatively difficult to follow and understand for the interested reader.

Figure Captions

Figure 1. Examples of original (a) and modified images with change to face (b) and other body parts (c) for each category stimuli.

Figure 2. A schematic representation of an experimental trial used in the one-shot change detection task.

Figure 3. Participants' accuracy scores of change detection as a function of the type of change (body parts vs. faces) and target sexualization (sexualized vs. nonsexualized). Female targets. Study 1

Figure 4. Participants' accuracy scores of change detection as a function of function of the type of change (body parts vs. faces) and target sexualization (sexualized vs. nonsexualized). Male targets. Study 1

Figure 1

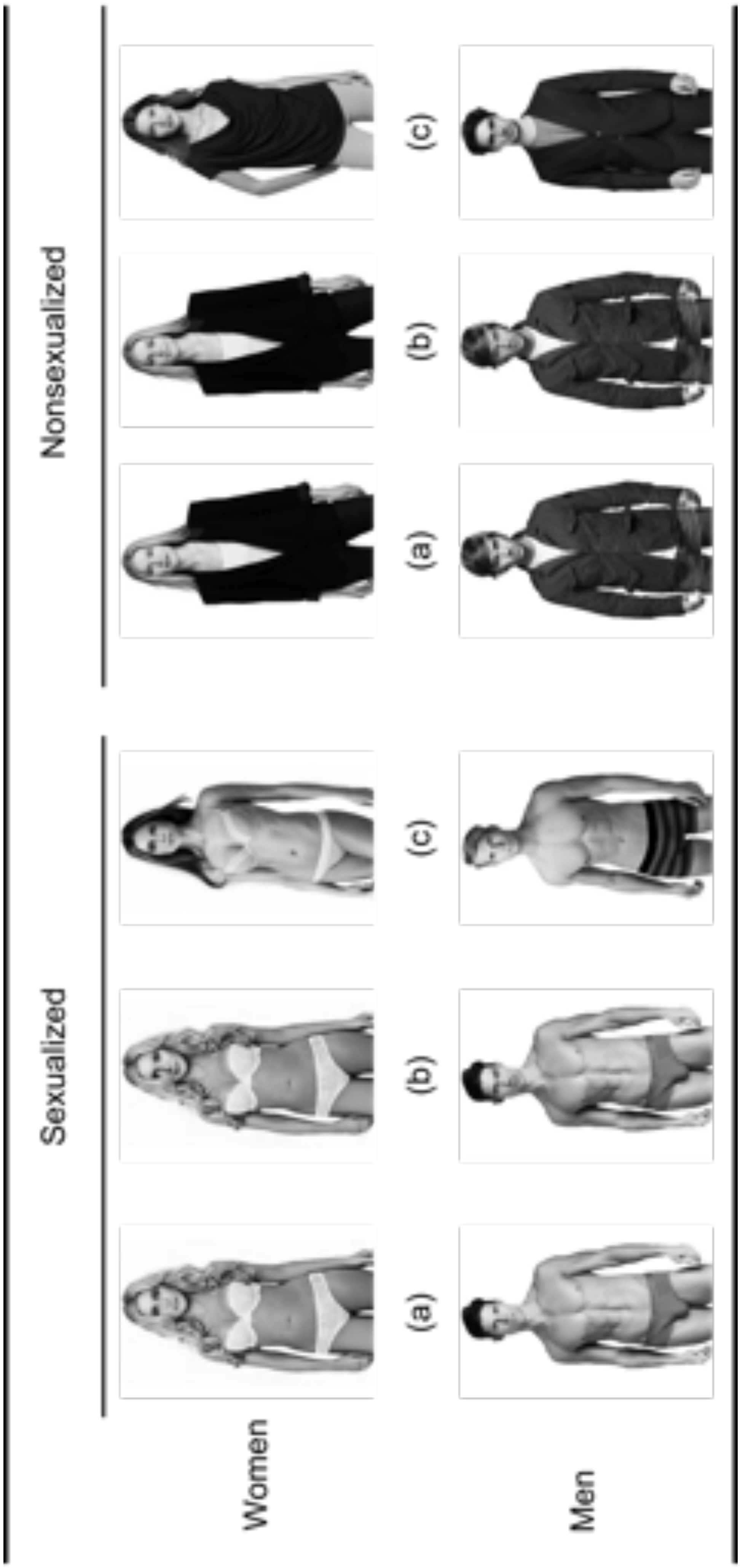


Figure 2

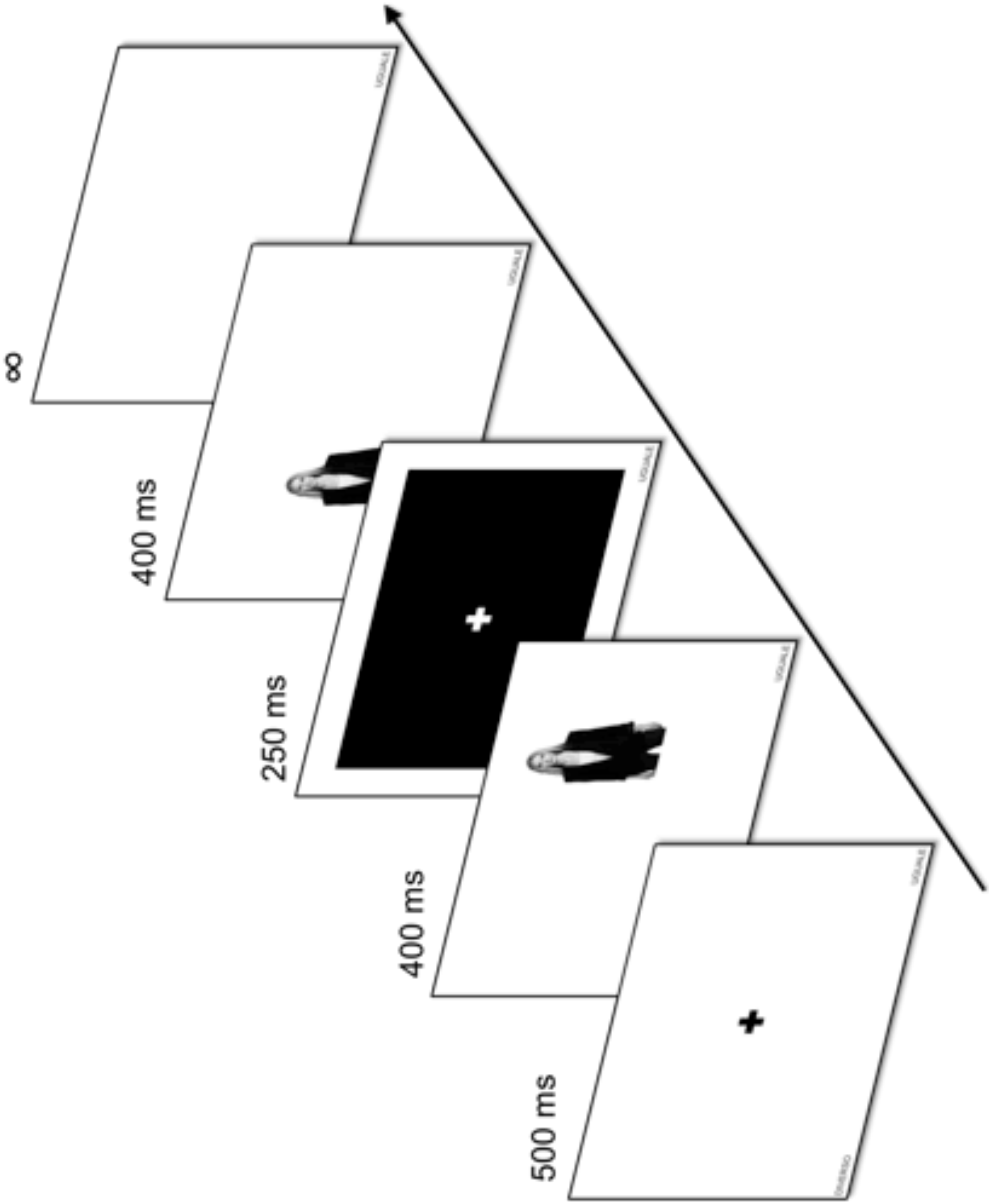
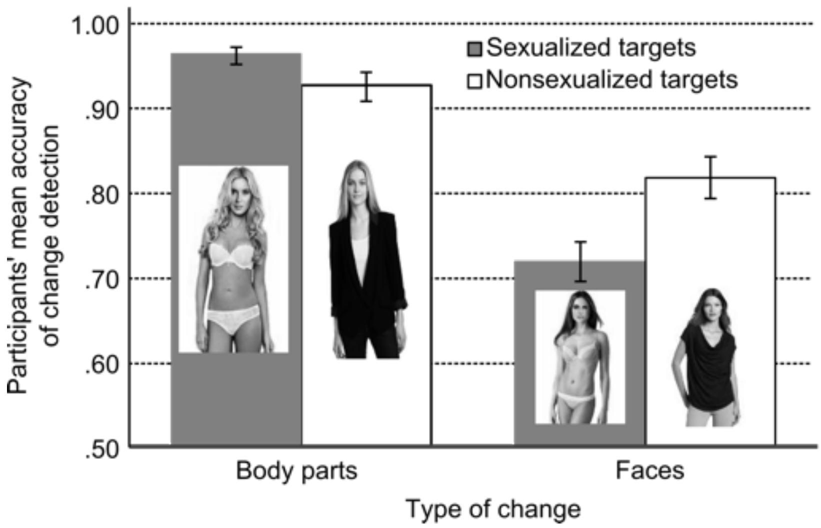
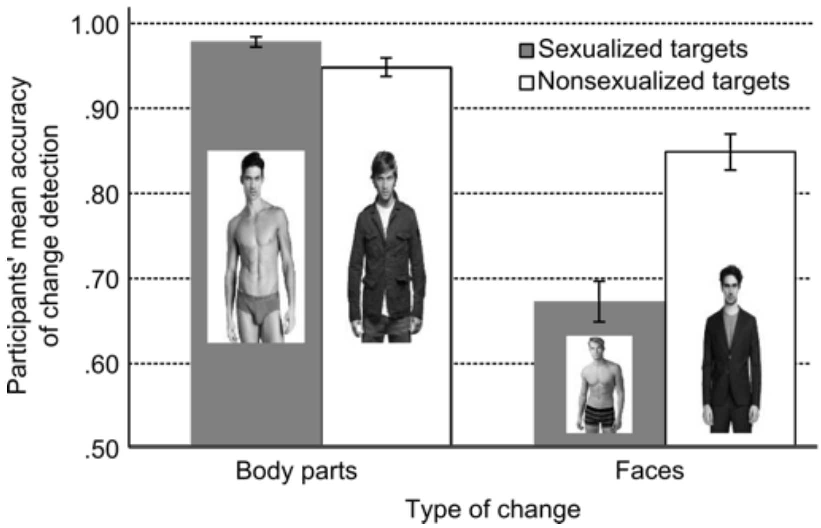


Figure 3



1.00
.90
.80
.70
.60
.50
Sexualized targets
Nonsexualized targets
Participants' mean accuracy of change detection
Body parts
Faces
Type of change

Figure 4



Participants' mean accuracy of change detection
1.00
.90
.80
.70
.60
.50
Sexualized targets
Nonsexualized targets
Body parts
Faces
Type of change

Table 1. Main and interactive effects of target gender (male vs. female), target sexualization (sexualized vs. nonsexualized), type of change (face vs. body parts) and participant gender (male vs. female) on participants' accuracy scores. Study 1.

Source	$F(1,62)$	*p-value*	η_p^2	95% CI
Main effects				
Target gender	1.17	.283	.019	[.000, .127]
Participant gender	1.73	.194	.027	[.000, .144]
Type of change	135.78	<.001	.687	[.547, .766]
Target sexualization	57.17	<.001	.480	[.295, .605]
Two-way interactions				
Target gender × Participants' gender	0.34	.565	.005	[.000, .091]
Target gender × Type of change	14.43	<.001	.189	[.044, .349]
Target gender × Target sexualization	14.99	<.001	.195	[.047, .355]
Participants' gender × Type of change	3.71	.059	.056	[.000, .193]
Participants' gender × Target sexualization	0.02	.883	.000	[.000, .013]
Type of change × Target sexualization	225.15	<.001	.784	[.681, .839]
Three-way interactions				
Target gender × Type of change × Target sexualization	6.98	.010	.101	[.006, .252]
Target gender × Target sexualization × Participants' gender	2.90	.094	.045	[.000, .175]
Target gender × Type of change × Participants' gender	0.49	.487	.008	[.000, .099]
Type of change × Target sexualization × Participants' gender	0.08	.929	.000	[.000, .051]
Four-way interaction				
Target gender × Type of change × Target sexualization × Participant gender	0.62	.435	.010	[.000, .105]

Note. p = two tailed p; η_p^2 = partial eta-squared; 95% CI = 95 per cent confidence intervals

Table 2

Table 2. Main and interactive effects of target gender (male vs. female), target sexualization (sexualized vs. nonsexualized), type of change (face vs. body parts) and participant gender (male vs. female) on participants' accuracy scores. Study 2

Source	F(1,65)	*p-value*	η_p^2	95%CI
Main effects				
Target gender	3.21	.078	.047	[0.000, 0.175]
Participant gender	0.18	.669	.003	[0.000, 0.075]
Type of change	135.78	<.001	.675	[0.538, 0.757]
Target sexualization	42.34	<.001	.394	[0.211, 0.533]
Two-way interactions				
Target gender × Participants' gender	0.50	.482	.008	[0.000, 0.096]
Target gender × Type of change	1.24	.270	.019	[0.000, 0.124]
Target gender × Target sexualization	1.26	.267	.019	[0.000, 0.125]
Participants' gender × Type of change	0.28	.600	.004	[0.000, 0.083]
Participants' gender × Target sexualization	0.07	.797	.001	[0.000, 0.043]
Type of change × Target sexualization	143.86	<.001	.689	[0.554, 0.766]
Three-way interactions				
Target gender × Type of change × Target sexualization	0.26	.613	.004	[0.000, 0.082]
Target gender × Target sexualization × Participants' gender	0.58	.448	.009	[0.000, 0.099]
Target gender × Type of change × Participants' gender	0.72	.398	.011	[0.000, 0.105]
Type of change × Target sexualization × Participants' gender	0.39	.534	.006	[0.000, 0.090]
Four-way interaction				
Target gender × Type of change × Target sexualization × Participant gender	1.01	.319	.015	[0.000, 0.116]

Note. p = two tailed p; η_p^2 = partial eta-squared; 95% CI = 95 per cent confidence intervals