Sex Roles
DOI 10.1007/s11199-016-0581-6

ORIGINAL ARTICLE

Exposure to Sexualized Advertisements Disrupts Children's Math Performance by Reducing Working Memory

Maria Giuseppina Pacilli[1] · **Carlo Tomasetto**[2] · **Mara Cadinu**[3]

Abstract Despite the recommendations from the American Psychological Association's (APA, 2007) task force on the sexualization, no known research has shown the effects of sexualized advertisements on children's cognitive abilities. The present experiments address this question with a sample of 8–10 year-olds. Primary school children were exposed to advertisements that portrayed sexualized vs. non-sexualized children and then were asked to complete a math test (Study 1 and Study 2) preceded by a working memory test (Study 2). As predicted, exposure to sexualized images of girls hampered girls', but not boys', math performance (Study 1, $N = 79$). Findings from Study 2 ($N = 102$) replicated Study 1's results for girls and demonstrated that sexualized ads of boys disrupted boys' math performance as well, thus indicating that same-gender sexualized images are disruptive for both girls' and boys' cognitive performance. Moreover, the detrimental effect of same-gender sexualized images on both girls' and boys' math performance was mediated by a reduction in working memory resources. These findings clearly demonstrate the damaging effects of sexualized advertisements on children's cognitive performance and suggest the urgency of implementing interventions aimed at combating sexualization in early childhood, which transmits the cultural message that having a sexy (young or adult) body is extremely important.

✉ Maria Giuseppina Pacilli
maria.pacilli@unipg.it

[1] Department of Scienze Politiche, University of Perugia, 06123via elce di sotto, Perugia, Italy

[2] Department of Psychology, University of Bologna, Bologna, Italy

[3] Department of General Psychology, University of Padova, Padova, Italy

Published online: 30 January 2016

Keywords Body image · Sexualization of children · Objectification · Cognitive performance · Mathematics · Working memory capacity

In Western societies, the amount of hyper-sexualized representations of both adults and children in advertising and media has increased tremendously over the last few decades (APA 2007; Zurbriggen and Roberts 2012). Sexualization, defined as making or depicting someone into a thing for others' sexual use (APA 2007), is marked by a number of complex, interacting factors, such as the extent of nudity and revealing clothing and poses that are suggestive of sexual activity or availability (Goodin et al. 2011; Hatton and Trautner 2011). In their content analysis of two U.S. magazines targeting teenagers (and increasingly read by preteens), Graff et al. (2013) showed that girls' sexualized representation (e.g., wearing sexy dresses, high-heeled shoes, adult makeup and jewelry) has increased up to fifteen fold in the last 30 years. Widespread sexualization characterizes not only how media depict girls, but also the market for female clothing sold in popular stores, which increasingly offers sexualized items from push-up bras to high-heeled shoes for pre-teens (Goodin et al. 2011).

In Italy, the country where the present research was conducted, some authors have denounced the increasing sexualization of women (Zanardo 2010) and children (Giomi 2013) in the national media. For instance, Guastini et al. (2014) pointed out that in 2013, about 81 % of young women (compared to the 30.61 % of young men) pictured in almost 20.000 Italian advertisements were portrayed as sexually available characters and more generally as sexual objects. Furthermore, it is noteworthy that Italy is the country where the Winx Club cartoon, a cartoon targeting and popular with children, was conceived and realized, obtaining a huge

domestic and international success. The main characters of this cartoon are young girls whose bodies, behaviors, and clothing are extremely sexualized. This cartoon is a remarkable example of how children's entertainment products contribute to the spreading and legitimation of early sexualization of girls, in line with the well-documented trend in Italian culture and media (Zanardo et al. 2009).

Despite the multitude of negative outcomes associated with adults' sexualization, relatively little is known about the consequences of being exposed to sexualized images prior to adolescence (Starr 2015). For this reason the American Psychological Association's (APA 2007) task force on the sexualization of girls has urged researchers to conduct more research on this topic. To fill this gap, the goal of the present study was to experimentally test the consequences of being exposed to sexualized advertisements of children in a group of 8–10 year-old girls and boys.

Sexual Objectification with Adults

Objectification theory posits that when women are treated only as bodies that exist for the use and pleasure of others, multiple negative consequences from body image disturbances to depression can result (Fredrickson and Roberts 1997). It is now well-established that sexualizing a target increases the extent to which that target is sexually objectified and perceived as less than fully human (for a review, see Loughnan and Pacilli 2014; Vaes et al. 2014). Moreover, cultural practices of sexual objectification lead individuals not only to objectify others but also to self-objectify, that is, to view themselves as objects whose value is mainly based on appearing sexy (Bartky 1990).

Individuals may experience the negative consequences of self-objectification in multiple contexts. For example, research has shown that objectifying word primes (Roberts and Gettman 2004, with a sample of U.S. undergraduates), anticipation of the male gaze (Calogero 2004, with U.S. undergraduates), or exposure to sexually objectified images of same-gender individuals (Halliwell et al. 2011, with British undergraduates; Harper and Tiggemann 2008, with Australian undergraduates) can trigger weight-related appearance anxiety, negative mood and body dissatisfaction in adult women (Aubrey 2006, with U.S. undergraduates; Prichard and Tiggemann 2012, with Australian undergraduates). Self-objectification affects people's lives by exerting negative consequences not only on their psychological wellbeing, but also on their cognitive functioning (APA 2007; Quinn et al. 2011; Smolak and Murnen 2011). Sexual objectification theory proposes that being the object of sexualization leads individuals to focus their attention on their body and aesthetic appearance, thus resulting in a reduction of executive resources that thwarts optimal cognitive efficiency (Fredrickson et al. 1998; Gay and Castano 2010; Saguy et al. 2010).

As a case in point, Fredrickson et al. (1998) found that U.S. college women who were induced to focus on their own body by wearing a swimsuit (vs. a sweater) in front of a full-length mirror underperformed on a math test. Comparable performance decrements were also found in tests tapping into logical reasoning and spatial skills (Gapinski et al. 2003, with U.S. undergraduates) and executive resources (Gay and Castano 2010, with American graduate and undergraduate students), as well as other domains that are not affected by stereotype threat such as attention (Quinn et al. 2006, with 19–28 year-old U.S. women). Other studies showed that American men are also vulnerable to self-objectification (Hebl et al. 2004). By consequence, in a culture that objectifies the body, individuals' cognitive resources are constantly at risk of being depleted, because "the potential always exists for thoughts and actions to be interrupted by images of how their bodies appear" (Fredrickson and Roberts 1997, p. 180).

Objectification theory also points to the media and artwork, which tend to portray women with an emphasis on their sexy bodies versus their face. Thus, media are also responsible for the widespread portrayals of sexualized women, as exposure to such images has important social consequences. For example, exposure to sexual and sexist media content may be associated with greater acceptance of stereotypical attitudes. Indeed, exposure to magazine ads featuring women as sexual objects leads to stronger acceptance of gender-role stereotyping and rape myth acceptance among Canadian male undergraduates (Lanis and Covell 1995; MacKay and Covell 1997). Consistently, survey research indicates that regular exposure to TV genres such as soap operas and music videos—which typically emphasize sexual content and sexual feelings or impulses (Gruber and Grube 2000; Media Report to Women 2001)—is associated with stereotypical sexual attitudes, dysfunctional beliefs about relationships, and greater acceptance of sexual advances among American women and adolescent girls (Strouse et al. 1994). In addition, Ward (2002) found that, regardless of exposure levels, American young women exposed to primetime TV images depicting men as sex-driven and women as sexual objects showed stronger endorsement of such stereotypes than did women exposed to control clips. More recently, Galdi et al. (2014) found that Italian men exposed to objectifying TV increased their endorsement of traditional masculine norms, which led to higher sexual harassment behavior.

More relevant to the present work, the effects of sexualized media have also been shown on adults' cognitive performance. Over a decade ago, research with adult women demonstrated that media content portraying women as incompetent impaired cognitive performance of female viewers (Davies et al. 2002, with a Canadian sample). Specifically, Davies et al. (2002) showed that female (but not male)

undergraduates performed worse on a math test after watching a television commercial portraying a negatively stereotyped woman (e.g., being tremendously excited about trying a new product), even though the commercial made no explicit reference to the stereotype that women lack math ability.

Sexualization of Children

As APA (2007) task force report pointed out, sexualization that involves children is particularly worrisome because it is more likely to be imposed upon them rather than to be chosen by them. In spite of its social relevance, research conducted in this field is scant; nevertheless, research from close areas has shown that children not only acquire cultural and media values of beauty prior to adolescence (Feldman et al. 1988), but also experience body dissatisfaction as early as age 9 (Thompson et al. 1997). As a case in point, a study conducted with Australian children (aged about 9) found that both girls and boys were vulnerable to self-objectification, with no gender differences in their levels of body surveillance and body shame (Jongenelis et al. 2014).

Also regarding sexualization in childhood, Graff et al. (2012) showed that a young girl portrayed in a sexualized way was devalued and perceived as less competent by U.S. college students than a non-sexualized child. Using correlational research, Grabe and Hyde (2009) documented that self-reported exposure to sexualized music videos was related not only to lower psychological well-being (e.g., body dissatisfaction and anxiety), but also to lower confidence in math ability among 13-year-old American girls. Results from this pioneering study are important because they extend the negative consequences of sexualized media representations to the way in which girls feel about their intellectual abilities. However, the results from their study leave three questions unanswered. The first is whether sexualized images can thwart not only teenagers' confidence in their cognitive ability in math, but also their cognitive ability itself. Second, given that in the last decades, sexualized advertisement has more conspicuously targeted even girls younger than 13 years-old, it becomes important to investigate the detrimental effects of sexualized images on pre-teen girls' cognitive abilities. Although not addressing cognitive abilities directly, an important study in this direction has shown that the range of future occupational aspirations was significantly reduced in 4–7 year-old American girls who played with sexualized (vs. non-sexualized) dolls (Sherman and Zurbriggen 2014).

The third open question from Grabe and Hyde's (2009) study relates to the increasing sexualization of men/boys in the media (Vandenbosch and Eggermont 2013). It is important to test the consequences associated with such exposure and whether these effects differ from exposure to sexualized girls and women in the media. Given that, to our knowledge, there is no research on this topic with pre-teens, a central goal of the present study was to test boys' and girls' math performance after exposure to same-gender sexualized ads. Therefore, adopting an experimental research design in the present study, we addressed these three unexplored questions with a sample of 8–10 year-old children.

The Present Research

An important consequence of being exposed to sexualized media representations is a decrease in confidence in one's cognitive abilities (Grabe and Hyde 2009). However, up until now no known research has investigated the consequence for such media on pre-teens' actual performance on cognitive tasks. Because negative cognitive performance would likely have detrimental repercussions on children's school abilities, self-esteem, and more generally their well-being, (Marsh et al. 2006), it is of primary importance to fill this gap in the literature. Therefore, the first goal of the present study is to experimentally test the consequences of being exposed to sexualized advertisements in a group of 8–10 year-old girls and boys.

In Study 1, children were exposed to sexualized vs. non-sexualized advertisement pictures of girls, and then asked to complete a math test. Because young children tend to be influenced and imitate attitudes and behaviours of same-gender characters in the media (Hoffner 1996; Starr and Ferguson 2012), we expected the performance of girls, but not boys, to be negatively affected by the sexualized ads. In Study 2, we extended the goals of Study 1 by also testing the hypothesis that boys' performance would be negatively affected when exposed to sexualized vs. non-sexualized pictures of boys. Thus, we expected both boys and girls to underperform in the presence of same-gender sexualized vs. non-sexualized ads. Finally, in line with previous research with adults linking working memory depletion to under-performance in math tests, in Study 2 we also tested the hypothesis that math under-performance would be mediated by a decrease in working memory resources.

Study 1

In the present research, we aimed at extending the study of the detrimental effects of sexualized media contents to children. Considering that children's fashion advertising is predominantly feminine, with girls' pictures surrounding the environment of both girls and boys (Gunter 2014), in our first study we used pictures of girls and investigated whether children's cognitive performance could be hampered following exposure to media portrayals of sexualized children of the same and other gender. Therefore, we used the same research paradigm

previously used by Davies et al. (2002), who investigated the detrimental impact of media portrayals of women on women's cognitive performance by also including a group of men exposed to the same advertising. Thus we exposed both girls and boys to sexualized or non-sexualized pictures of girls, and subsequently asked them to complete a math test. Consistent with previous findings with Canadian and American adult women (Davies et al. 2002; Fredrickson et al. 1998; Hebl et al. 2004), we hypothesized that only girls would underperform on the math test when exposed to the sexualized versus non-sexualized pictures of girls. Given that boys were not exposed to sexualized pictures of members of their own gender, in line with Davies' results, we expected their performance not to be affected by the sexualized versus non-sexualized condition.

Method

Participants

Seventy-nine children (45 girls, 57 %) attending third ($n = 23$), fourth ($n = 34$), and fifth ($n = 22$) elementary grades took part in our study. Based on previous research in this area (Gay and Castano 2010), both in Study 1 and Study 2, we targeted cell sizes of 20–25 participants. However, cell sizes necessarily varied according to school procedures and availability of participants so that 18 boys and 22 girls viewed sexualized images and 16 boys and 23 girls were exposed to non-sexualized ads. All participants were of typical age for their grade ($M_{age} = 9.29$ years, $SD = .99$), with no difference in age between girls and boys, $t(77) = -.67$, $p = .50$. All students were recruited from primary schools located in a middle-size town in Central Italy. In exchange for their participation, the schools received a media literacy workshop aimed at enabling children to recognize and analyse sexualization in advertising.

Materials

To select the images for Study 1 and maximize the ecological validity of the stimuli, we conducted a web-based search for media and advertising images portraying Caucasian girls of apparent age ranging from 8–10 years with no visible signs of breast development. Based on the coding schemes developed by Goodin et al. (2011) and Graff et al. (2013), we classified as sexualized those pictures in which girls wore "revealing" clothing, evidenced make-up, and/or were portrayed with provocative facial expressions or body postures. Images of girls dressed in a child-like way playing or laughing with no evident sexual intent were classified as non-sexualized. Only one child was included in each picture, and no written text was present.

To assess the perceived age and level of sexiness of images, 31 Italian graduate students (54.8 % women; $M_{age} = 23.97$, $SD = 2.07$, range = 21–29) from two different psychology classes were asked to rate the age of the girls portrayed in eight pictures (four sexualized and four non-sexualized) and to rate the extent to which "the girls' clothing allude to sexiness," "the image draws attention to sexualized body parts," and "the image draws attention to expressions (glance, position, etc.) that allude to sexiness" on 5-point Likert scales from 1 (*completely disagree*) to 5 (*completely agree*). Based on a preliminary check on perceived age, four of the pre-selected pictures were discarded because three of pictured children (two sexualized and one non-sexualized) were perceived to be over the age of 10 and one of them (non-sexualized) was perceived as under the age of 8. The final set of materials included two pictures for each type (sexualized vs. non-sexualized). Participants' responses on the three sexiness scales were averaged to create a composite score of sexiness (Cronbach's $\alpha = .77$). A within-participants analysis of variance (ANOVA) on perceived sexiness showed a significant effect of type of picture, $F(3, 28) = 116.65$, $p < .001$, $\eta_p^2 = .94$. Post hoc tests with Bonferroni corrections showed that the perceived sexiness of each of the two sexualized pictures ($M = 4.69$, $SE = .65$; $M = 4.66$, $SE = .59$) was significantly higher than the sexiness of each of the two non-sexualized pictures ($M = 1.81$, $SE = .62$; $M = 1.76$, $SE = .72$,), all $ps < .001$. Moreover, within each type of picture (sexualized or non-sexualized), the two pictures did not differ from each other with regard to perceived sexiness, all $ps > .90$.

The final pictures in each condition were also balanced in terms of level of nudity/clothing, with one girl fully clothed and the other wearing a bikini/underwear. In the sexualized condition, one picture portrayed a girl with visible make-up on her eyes and lips, a fashionable hairstyle, a short dress, and some jewels and heeled shoes; the girl was lying on a couch with blankets featuring leopard prints. The second sexualized image showed a girl laughing with her hand partially covering her mouth; she had pink-polished nails, had loose hair, wore adult-like underwear, and was lying on a bed reading a fashion magazine. In the non-sexualized condition, one picture portrayed a smiling girl wearing a violet overcoat apparently walking in a park; her long hair was tied in two braids. The second non-sexualized picture portrayed a girl wearing a bikini; her hair was tied back in a ponytail and she was playing with beach toys.

Procedure

After obtaining approval from the University Ethics Committee, permission to conduct the study from school boards and teachers, as well as parental consent (98 %), a female experimenter interviewed the children at their school individually. Adopting a between-participants research design, children were randomly assigned to one of two experimental conditions (sexualized or non-sexualized). According

to the condition, two pictures of the same type (sexualized or non-sexualized) were presented in random order. The pictures were in colour, on single pages, did not include any text, and portrayed only one girl each. Participants were invited to carefully observe the pictures, which were presented as advertising images, to be remembered for an allegedly subsequent task. As a cover story, to become more familiar with the images, participants were also instructed to leave the pictures on the desk in front of them while taking a brief math test.

Children were then asked to complete a calculation test from an age-appropriate standardized measure of math performance validated in Italy (AC-MT 6–10; Cornoldi et al. 2002), which consisted of 12 calculations (3 additions, 4 subtractions and 5 multiplications) to be solved in 5 s each (Cronbach $\alpha = .75$). The overall score was calculated by summing the responses (0 = incorrect, 1 = correct) across the 12 calculations.

Subsequently, the experimenter asked the child whether s/he had ever seen the pictures before. At the end of the session, the experimenter thanked the child, and complimented him/her for completing the task well (regardless of actual performance). None of the participants expressed any concern or suspicion about the procedure. Six children (1 boy and 5 girls) reported to have seen one of the two pictures presented. Because reported familiarity with the picture did not affect the main dependent variable, we will not discuss this variable further. When the data collection was completed, participants were debriefed through a collective session.

Results

We conducted a 2 (gender) x 2 (condition: sexualized or non-sexualized) analysis of variance (ANOVA) with math score as the dependent measure. The results showed a significant main effect of gender ($M_{boys} = 10.04$, $SE = 0.37$; $M_{girls} = 8.82$, $SE = 0.32$), $F(1,75) = 6.27$, $p = .014$, $\eta_p^2 = .08$, a nonsignificant effect of condition, $F(1,75) = 3.32$, $p = .073$, $\eta_p^2 = .04$, and the expected significant interaction between gender and condition, $F(1,75) = 9.09$, $p = .004$, $\eta_p^2 = .11$. As expected, simple-effect tests confirmed that girls in the sexualized condition ($M = 7.64$, $SE = 0.46$) performed more poorly than girls in the non-sexualized condition ($M = 10.00$, $SE = 0.45$), $F(1, 75) = 13.61$, $p = .000$, $\eta_p^2 = .174$. In contrast, boys were unaffected by condition ($M_{non\text{-}sexualized} = 9.75$, $SE = 0.54$; $M_{sexualized} = 10.33$, $SE = 0.51$), $F(1,75) = .63$, $p = .432$.

To ensure that the relation between gender and condition in predicting math performance was equivalent across grades, we performed a supplementary 2 (gender) x 2 (condition: sexualized or non-sexualized) x 3 (grade: third vs. fourth vs. fifth) ANOVA with math score as the dependent measure. The pattern of results was the same: The interaction between gender and condition remained significant, $F(1,67) = 9.18$, $p = .003$, $\eta_p^2 = .12$, whereas the grade x condition interaction and the three-way interaction of grade x condition x gender were not significant ($Fs < 1$, $p = .760$ and $p = .703$, respectively).

Discussion

Results from Study 1 strongly confirmed our predictions. Being exposed to sexualized same-gender pictures had a detrimental effect on girls' math performance, as compared to the exposure to same-gender childlike images. In addition, as predicted, boys' math performance was not affected by the exposure to girls' sexualized versus non-sexualized pictures. However, given the increasing sexualization of men/boys in the media (Vandenbosch and Eggermont 2013), it is still possible that boys' performance would be disrupted by exposure to sexualized boys' ads. Because in Study 1 only sexualized pictures of girls were included, it remained to be tested whether viewing same-gender sexualized pictures would also disrupt boys' performance. In addition, because in Study 1 it was not clear what processes underlied math under-performance, in Study 2 we tested depletion of working memory resources as a potential mechanism through which exposure to sexualized images may undermine children's math performance.

Study 2

The goals of Study 2 were twofold. First, we aimed at investigating whether same-gender sexualized images of children would affect not only girls' but also boys' cognitive performance. Second, we aimed at investigating the process underlying the hypothesized math performance deficit. Because previous research has shown that female targets of objectification suffered impairment in working memory (Gay and Castano 2010) and working memory has been shown to be an antecedent of math performance (Raghubar et al. 2010), we predicted that depletion of working memory in children exposed to sexualized (vs. non-sexualized) images would be responsible for predicted math under-performance.

Method

Participants

Participants were 102 children (51 girls, 50 %) attending third ($n = 21$), fourth ($n = 31$) and fifth elementary grade ($n = 50$) in a primary school different from Study 1. Twenty-four boys and 23 girls viewed sexualized images, and 27 boys and 28 girls were exposed to non-sexualized ads. All participants were of typical age for their grade ($M_{age} = 9.25$, $SD = 0.83$) with no difference in age between girls and boys, $t(100) = -.24$, $p = .81$.

Materials

To select boys' images for Study 2, we carried out a web-based search of media and advertising pictures of children portraying boys of apparent ages ranging from 8 to 10 years-old. It is noteworthy that results for boys' sexualized pictures were far more limited in number and extent of sexualization as compared to girls' sexualized pictures. Moreover, to the best of our knowledge, no formalized coding system has been developed to analyze the degree of early sexualization of young boys' images, whereas for adult men the available coding systems for sexualized images emphasize physical strength and social dominance as prominent aspects of masculinity (Rohlinger 2002). Consequently, we proceeded tentatively to pre-select one sexualized and one non-sexualized image of boys from children's fashion advertising.

We conducted a pilot test in which 51 undergraduate Psychology students (80.4 % women, $M_{age} = 21.36$, $SD = 1.07$, range = 20–27) were presented with two Caucasian boys' pictures and asked to rate their apparent age and their degree of perceived sexiness according to the same scales used in Study 1. The sexualized picture portrayed a boy dressed in jeans and a bomber jacket looking at the camera with a haughty gaze as he rests his thumbs in his pockets. His posture is expansive, and his clothing is very adult-like. The non-sexualized image portrayed a boy with short hair wearing a shirt, trousers, and a cotton scarf; his arms rest on his hips while he smiles at the camera. As expected, both boys were rated as 8–9 years-old. Moreover, in order to make boys' pictures comparable to the girls' ones, the clothing in both pictures was not revealing. The paired-sample *t*-test on perceived sexiness confirmed that the perceived sexiness was significantly lower for the non-sexualized image ($M = 2.60$, $SD = .91$) than the sexualized image ($M = 4.03$, $SD = .72$), $t(50) = 13.26$, $p < .001$, Cohen's $d = 1.74$.

Procedure

The procedure in Study 2 was the same as in Study 1 except for two important exceptions. First, the materials presented to participants included in each condition only one same-gender and fully clothed picture. For girls we chose the two fully clothed pictures from Study 1 (one for the sexualized; the other for the non-sexualized condition). For boys, pictures were selected also with the goal of keeping the level of nudity/clothing constant across both boys' and girls' sexualized and non-sexualized pictures.

Second, to assess the hypothesized reduction of executive resources in the sexualized versus non-sexualized condition, the forward and backward digit span subtest from the Wechsler Intelligence Scale for Children—Third Edition (WISC-III; Wechsler 1991) was administered before the same math test employed in Study 1. The forward digit span test requires children to repeat a sequence of digits verbatim, whereas the backward digit span test requires participants to repeat the digits in reverse order. In both tasks, the experimenter read aloud sequences of digits of increasing length (from 3 to 9 in the forward digit test and from 2 to 8 in the backward digit test) at the pace of one digit per second; the experimenter asked participants to repeat each sequence back immediately. Two sequences were administered for each digit length. If participants were successful at any given length at either trial, the experimenter advanced to the next sequence which was one unit longer. Tasks were interrupted if participants failed on both trials at any digit length. Separate scores were computed for the forward and the backward digit span tests by summing up the total number of successfully remembered sequences of each task. Whereas the forward digit span test is commonly considered as a measure of immediate verbal short-term memory, the backward digit span test is widely considered as a measure of working memory span because it requires both the maintenance and manipulation of information (Engle 2002). Consequently, only the backward digit span score was used for the purpose of the present work.

As in Study 1, the experimenter asked the child whether s/he had ever seen the pictures before. Ten children (6 boys and 4 girls) reported having seen the pictures before outside the laboratory context. Again, because previous familiarity with the pictures did not affect the results, we will not discuss this variable further.

Results

Working Memory

A 2 (gender) x 2 (condition: sexualized or non-sexualized) ANOVA was conducted on the backward digit span test scores. The results revealed a main effect of condition, $F(1, 98) = 8.58$, $p = .004$, $\eta_p^2 = .080$, confirming that participants exposed to same-gender sexualized images had poorer working memory performance ($M = 4.05$, $SE = .23$) relative to those exposed to non-sexualized images ($M = 5.03$, $SE = .25$). Neither the main effect of gender, $F(1,98) = 1.89$, $p = .172$, nor the gender x condition interaction, $F(1,98) = 1.11$, $p = .295$, was significant. A supplementary 2 (gender) x 2 (condition: sexualized or non-sexualized) x 3 (grade: third vs. fourth vs. fifth) ANOVA also confirmed that the effect of condition on working memory remained significant, $F(1,90) = 7.28$, $p = .008$, $\eta_p^2 = .075$, and was further qualified neither by grade ($F < 1$, $p = .99$) nor by the three-way interaction with grade x gender, $F(4,90) = 1.91$, $p = .116$.

Math Test Performance

To test whether exposure to sexualized images impaired participants' cognitive performance, we conducted a 2 (gender) x

2 (condition: sexualized or non-sexualized) ANOVA, using the math score as the dependent measure. A significant main effect of condition emerged, $F(1,98) = 46.21$, $p < .001$, $\eta_p^2 = .32$, confirming that children exposed to sexualized images ($M = 8.43$, $SE = 0.21$) underperformed relative to those exposed to non-sexualized images ($M = 10.57$, $SE = 0.23$). Moreover, a significant effect of gender was found, $F(1, 98) = 10.12$, $p = .002$, $\eta_p^2 = .094$, with girls ($M = 8.99$, $SE = 0.22$) showing lower math scores relative to boys ($M = 9.99$, $SE = 0.22$). The gender x condition interaction was not significant, $F(1,98) = .47$, $p = .494$, suggesting that the effects of condition were the same for boys and girls. Importantly, the pattern of math performance findings remained strikingly similar when controlling for participants' grade. Again, the results of a supplementary 2 (gender) x 2 (condition: sexualized or non-sexualized) x 3 (grade: third vs. fourth vs. fifth) ANOVA confirmed that the effect of condition remained significant, $F(1,90) = 42.47$, $p < .001$, $\eta_p^2 = .32$, whereas the grade x condition $F(2,90) = 1.55$, $p = .22$, and the grade x condition x gender, $F(4,90) = 1.48$, $p = .22$, interactions were not significant.

The Mediating Role of Working Memory on Math Performance

Finally, we tested whether the negative impact of exposure to same-gender sexualized images on math performance was mediated by a reduction in available executive resources. To do so, we assessed the indirect effect of condition (0 = non-sexualized, 1 = sexualized) on math score through working memory span, controlling for grade and gender. The analysis was carried out following Preacher and Hayes (2008) recommendations, and a bias-corrected 95 % confidence interval (CI) for the indirect effect was calculated using a bootstrapping technique with 5000 re-samples. The results of the mediation analysis revealed that the total effect of condition on math performance, $b = -2.08$, $SE = 0.30$, $t(101) = -6.86$, $p < .001$, was reduced when controlling for working memory, $b = -1.77$, $SE = 0.29$, $t(101) = -5.98$, $p < .001$. Because the 95 % confidence interval for the indirect effect did not include zero ($M = -0.31$; 95 % CI [−0.656, −0.112]), results demonstrated the partial indirect effect of sexualized images on math performance through depletion of working memory resources.

General Discussion

The present research comprised two experimental studies aimed at investigating the detrimental consequences of being exposed to sexualized advertisement on children's cognitive performance. Study 1 demonstrated that being exposed to sexualized ads of young girls reduced girls' math performance relative to that of girls exposed to non-sexualized images. As predicted and in line with adults' research, boys' performance did not vary according to the type (sexualized or not) of girls' advertisement viewed.

Although sexualization of boys and men is far less pervasive than the female parallel, recent evidence among adults has shown that the harmful consequences of sexualization are not confined to women (Martins et al. 2007, with Australian men). Therefore, in Study 2, we aimed at investigating the consequences of sexualized media contents for boys as well girls by exposing both girls and boys to advertising portraying of children of their own gender. For girls, Study 2 findings replicated results from Study 1. In addition, the negative effects of sexualized media contents were demonstrated on boys. Specifically, boys exposed to pictures of sexualized (vs. non-sexualized) boys also showed a decrement in math performance, similarly to girls' results in both Studies 1 and 2.

Theoretically, the present results are consistent with objectification theory (Fredrickson and Roberts 1997). Importantly, like Quinn et al.'s (2006) findings with adults, our findings cannot be explained under the framework of stereotype threat theory (Steele and Aronson 1995) because boys' performance was also disrupted after watching sexualized versus non-sexualized pictures of boys (but not of girls). Had the gender stereotype about math and girls been active, this activation would have caused specifically girls, but not boys, to underperform, consistent with stereotype threat theory. Therefore, Study 2 represents an important step toward understand the role of sexualized media images in cognitive underperformance.

Limitations and Future Research Directions

Despite our promising results, some important questions remain. By demonstrating working memory depletion as a mediator, the present findings show substantial preliminary evidence regarding this chain of processes. Because this mediation was partial, an important issue for future research is to further probe this chain by testing what else stands between viewing sexualized ads, working memory depletion, and math under-performance. In line with objectification theory, self-objectification might play a role and cause girls, boys, or both, to under-perform. As Quinn et al. (2011) emphasized, greater attention should be devoted to investigating the chain of processes through which sexual objectification negatively interferes with cognition. Future studies should also examine other mediators (e.g., physiological arousal, negative emotions, attentional deficit, intrusive thoughts) that may also be responsible for the difference in performance. Research should also focus on specific individual characteristics (e.g., familiarity with sexualized media contents, extent of chronic media exposure, trait anxiety, and individual working memory

capacity) or parental factors (e.g., importance parents attributed to physical attractiveness and sexiness) that may exacerbate or buffer the situational impact of sexualized images on young children.

A novel aspect of the present findings was to demonstrate that cognitive performance can be impaired in a vicarious way via the exposure to sexualized images of same-gender individuals. This preliminary result with children is important, and future research both with children and older populations should study both the objectification of others and being self-objectified as individuals as two specific, possibly complementary experiences.

Results from Study 1 showed that boys performance was unaffected by girls' sexualized pictures. However, a limitation of the present study is that we did not test whether being exposed to sexualized boys would affect girls' math performance. Future studies should address this point. Moreover, although the current memory cover story did not raise any expressed suspicions in our elementary school participants, future studies should improve the present research design by also showing a larger number of pictures per condition, in line with the protocols adopted in media exposure studies. Future studies should also examine whether sexualized pictures of adult women/men would have similar effects on young girls'/boys' cognition. Importantly, as the degree of pre-teens' sexualization in the media is expected to vary across countries, the present study should be replicated in other Western countries as well as tested in more diverse cultural contexts.

Practice Implications

The findings of our research studies also entail important implications for future practice. In the last decades, in Italy and in Western countries, the portrayal of women by media has become increasingly sexualized with women often depicted as sexual objects rather than as human beings (Calogero et al. 2011; Guastini et al. 2014; Zanardo 2010). As a consequence, sexualization has been pointed to as a "background noise" (Coy 2009, p. 374) directed at adults but clearly perceivable by children as well (Giomi 2013; Gunter 2014). Raising social awareness about the existence of this phenomenon is a necessary but not sufficient step to fight it. Even when children's sexualization is recognized as a negative phenomenon in the public debate, it is often approached in terms of moral panic, and it is merely blamed because children's "innocence" is threatened too early by "sexual contamination." However, the problem is broader and more serious: Sexualization is worrisome because it implies equating people's personal value mainly to their sexual appearance.

Our research provides the first known empirical evidence about the negative effects of sexualization on very young children by showing that the mere exposure of children to images of sexualized same-gender peers interferes with their cognitive performance. Therefore, it is critical to reflect upon the short- and long-term risks associated with sexualization as a chronic experience in children's daily life and to work at developing targeted interventions aimed at fighting it. Currently, the majority of school-based interventions are concerned with promoting positive body images in adolescents, but they tend to overlook reducing risk factors in pre-adolescent girls and boys (Bird et al. 2013). Along with body image interventions, our research findings suggest that interventions should combat sexualization in early childhood. These interventions should be aimed at making children as young as 8–10 years-old aware that it is not human sexuality per se that constitutes a problem, but rather sexualization, meant as the cultural message that the sexy appearance of the (young and adult) body is an extremely important part of individuals' lives. Interventions should also aim at sensitizing children and their parents, as well as teachers and school professionals, about the commodification of people's bodies in contemporary society.

Despite the fact that boys have been shown to be susceptible to the same detrimental effects of sexualized advertising as girls, it should not be overlooked that the current amount of sexualized ads of girls in the media is much higher than the corresponding amount of images of boys. Therefore, results from the present study suggest that in Western countries the current (mainly female) sexualized media environment surrounding children is still more dangerous for girls than for boys. Moreover, sexualization is a gendered phenomenon. It involves hyper-femininity for defining women's and young girls' identities and hyper-masculinity for defining men's and young boys' identities, which respectively correspond to an exaggeration of stereotypical female and male sexy characteristics. Even if partially different from each other, hyper-femininity and hyper-masculinity both narrow individuals' range of opportunities by forcing them to adhere to a one-dimensional identity model. Reflecting upon how clothing choices model and affect people's social roles should be a prominent goal in interventions with children, letting them know how sexualization can narrow their space for action, namely the range of possible identities that they can develop, as well as the array of personal and social goals that they can aspire to and ultimately achieve (Coy 2009).

Conclusions

In Western media, sexualization has become a widespread phenomenon not only for adults but for children as well. Although a multitude of studies have shown the severity of the negative effects of sexual objectification on adults (Calogero et al. 2011; Daniels 2009; Loughnan et al. 2010; Moradi and Huang 2008), research has largely overlooked its impact on children. Our research findings documented the detrimental effects of sexualized media contents for young

children. Thus, we need to treat sexualization, not as an inescapable phenomenon, but as a harmful part of a sexual objectification system that it is urgent to fight actively (Calogero and Tylka 2014) by promoting alternative representations of girls and boys and by denouncing its dangers in terms of opportunities that our societies offer or deny to children.

References

American Psychological Association. (2007). *Report of the APA task force on the sexualization of girls*. Washington, DC: Author.

Aubrey, J. S. (2006). Effects of sexually objectifying media on self-objectification and body surveillance in undergraduates: Results of a 2-year panel study. *Journal of Communication, 56*, 366–386. doi:10.1111/j.1460-2466.2006.00024.x.

Bartky, S. (1990). *Femininity and domination: Studies in the phenomenology of oppression*. New York: Routledge Press.

Bird, E. L., Halliwell, E., Diedrichs, P. C., & Harcourt, D. (2013). Happy Being Me in the UK: A controlled evaluation of a school-based body image intervention with pre-adolescent children. *Body Image, 10*, 326–334. doi:10.1016/j.bodyim.2013.02.008.

Calogero, R. M. (2004). A test of objectification theory: The effect of male gaze on appearance concerns in college women. *Psychology of Women Quarterly, 28*, 16–21. doi:10.1111/j.1471-6402.2004.00118.x.

Calogero, R. M., & Tylka, T. L. (2014). Sanctioning resistance to sexual objectification: An integrative system justification perspective. *Journal of Social Issues, 70*, 763–778. doi:10.1111/josi.12090.

Calogero, R. M., Tantleff-Dunn, S., & Thompson, J. K. (2011). *Self-objectification in women: Causes, consequences, and directions for research and practice*. Washington, DC: American Psychological Association.

Cornoldi, C., Lucangeli, D., & Bellina, M. (2002). *AC-MT: Test di valutazione delle abilità di calcolo [AC-MT: Test for the assessment of calculation skills]*. Trento: Erickson.

Coy, M. (2009). Milkshakes, lady lumps and growing up to want boobies: How the sexualisation of popular culture limits girls' horizons. *Child Abuse Review, 18*, 372–383. doi:10.1002/car.1094.

Daniels, E. (2009). Sex objects, athletes, and sexy athletes: How media representations of women athletes can impact adolescent girls and college women. *Journal of Adolescent Research, 24*, 399–422. doi:10.1177/0743558409336748.

Davies, P. D., Spencer, S. J., Quinn, D. M., & Gerhardstein, R. (2002). Consuming images: How television commercials that elicit stereotype threat can restrain women academically and professionally. *Personality and Social Psychology Bulletin, 28*, 1615–1628. doi:10.1177/014616702237644.

Engle, R. W. (2002). Working memory capacity as executive attention. *Current Directions in Psychological Science, 11*, 19–23. doi:10.1111/1467-8721.00160.

Feldman, W., Feldman, E., & Goodman, J. T. (1988). Culture versus biology: Children's attitudes toward thinness and fatness. *Pediatrics, 81*, 190–194.

Fredrickson, B. L., & Roberts, T. (1997). Objectification theory: Toward understanding women's lived experiences and mental health risks. *Psychology of Women Quarterly, 21*, 173–206. doi:10.1111/j.1471-6402.1997.tb00108.x.

Fredrickson, B. L., Roberts, T. A., Noll, S. M., Quinn, D. M., & Twenge, J. M. (1998). That swimsuit becomes you: Sex differences in self-objectification, restrained eating, and math performance. *Journal of Personality and Social Psychology, 75*, 269–284. doi:10.1037/0022-3514.75.1.269.

Galdi, S., Maass, A., & Cadinu, M. (2014). Objectifying media: Their effect on gender role norms and sexual harassment of women. *Psychology of Women Quarterly, 38*, 398–413. doi:10.1177/0361684313515185.

Gapinski, K. D., Brownell, K. D., & LaFrance, M. (2003). Body objectification and "fat talk": Effects on emotion, motivation, and cognitive performance. *Sex Roles, 48*, 377–388. doi:10.1023/A:1023516209973.

Gay, R. K., & Castano, E. (2010). My body or my mind: The impact of state and trait objectification on women's cognitive resources. *European Journal of Social Psychology, 40*, 695–703. doi:10.1002/ejsp.731.

Giomi, E. (2013). Stereotipi di genere, pubblicità e infanzia. Quale immaginario? [Gender stereotypes, advertisements and childhood]. In A. M. Venera (Ed.), *Genere, educazione e processi formativi. Riflessioni teoriche e tracce operative* [*Gender and education. Theoretical considerations and practical implications*]. Bergamo: Edizioni junior.

Goodin, S. M., Van Denburg, A., Murnen, S. K., & Smolak, L. (2011). "Putting on" sexiness: A content analysis of the presence of sexualizing characteristics in girls' clothing. *Sex Roles, 65*, 1–12. doi:10.1007/s11199-011-9966-8.

Grabe, S., & Hyde, J. S. (2009). Body objectification, MTV, and psychological outcomes among female adolescents. *Journal of Applied Social Psychology, 4*, 2840–2858. doi:10.1111/j.1559-1816.2009.00552.x.

Graff, K. A., Murnen, S. K., & Smolak, L. (2012). Too sexualized to be taken seriously? Perceptions of a girl in childlike vs. sexualizing clothing. *Sex Roles, 66*, 764–775. doi:10.1007/s11199-012-0145-3.

Graff, K. A., Murnen, S. K., & Krause, A. K. (2013). Low-cut shirts and high-heeled shoes: Increased sexualization across time in magazine depictions of girls. *Sex Roles, 69*, 571–582. doi:10.1007/s11199-013-0321-0.

Gruber, J. E., & Grube, J. W. (2000). Adolescent sexuality and the media: A review of current knowledge and implications. *Western Journal of Medicine, 172*, 210–214. doi:10.1136/ewjm.172.3.210.

Guastini, M., Cosenza, G., Colombari, J., & Gasparri, E. (2014). *Come la pubblicità racconta gli uomini e le donne in Italia* [*How advertisments describe men and women in Italy*]. Retrieved from http://www.datamediahub.it/wp-content/uploads/2014/11/Come-la-pubblicit%C3%A0-racconta-gli-italiani.pdf

Gunter, B. (2014). *Media and the sexualization of childhood*. New York: Routledge.

Halliwell, E., Malson, H., & Tischner, I. (2011). Are contemporary media images which seem to display women as sexually empowered actually harmful to women? *Psychology of Women Quarterly, 35*, 38–45. doi:10.1177/0361684310385217.

Harper, B., & Tiggemann, M. (2008). The effect of thin ideal media images on women's self-objectification, mood, and body image. *Sex Roles, 58*, 649–657. doi:10.1007/s11199-007-9379-x.

Hatton, E., & Trautner, M. N. (2011). Equal opportunity objectification? The sexualization of men and women on the cover of Rolling Stone. *Sexuality and Culture, 15*, 256–278. doi:10.1007/s12119-011-9093-2.

Hebl, M. R., King, E. B., & Lin, J. (2004). The swimsuit becomes us all: Ethnicity, gender, and vulnerability to self-objectification. *Personality and Social Psychology Bulletin, 30*, 1322–1331. doi:10.1177/0146167204264052.

Hoffner, C. (1996). Children's wishful identification and parasocial interaction with favorite television characters. *Journal of Broadcasting and Electronic Media, 40*, 398–402. doi:10.1080/08838159609364360.

Jongenelis, M. I., Byrne, S. M., & Pettigrew, S. (2014). Self-objectification, body image disturbance, and eating disorder symptoms in young Australian children. *Body Image, 11*, 290–302.

Lanis, K., & Covell, K. (1995). Images of women in advertisements: Effects on attitudes related to sexual aggression. *Sex Roles, 32*, 639–649. doi:10.1007/BF01544216.

Loughnan, S., & Pacilli, M. G. (2014). Seeing (and treating) others as sexual objects: Towards a more complete mapping of sexual objectification. *Testing, Psychometrics, Methodology in Applied Psychology, 21*, 1–17.

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

MacKay, N. J., & Covell, K. (1997). The impact of women in advertisements on attitudes toward women. *Sex Roles, 36*, 573–583. doi:10.1023/A:1025613923786.

Marsh, H. W., Trautwein, U., Lüdtke, O., Köller, O., & Baumert, J. (2006). Integration of multidimensional self-concept and core personality constructs: Construct validation and relations to well-being and achievement. *Journal of Personality, 74*, 403–456. doi:10.1111/j.1467-6494.2005.00380.x.

Martins, Y., Tiggemann, M., & Kirkbride, A. (2007). Those speedos become them: The role of self-objectification in gay and heterosexual men's body image. *Personality and Social Psychology Bulletin, 33*, 644–647. doi:10.1177/0146167206297403.

Media Report to Women. (2001). More TV shows include sexual content; safe sex messages target teens. *Media Report to Women, 29*, 2–3.

Moradi, B., & Huang, Y. O. (2008). Objectification theory and psychology of women: A decade of advances and future directions. *Psychology of Women Quarterly, 32*, 377–398. doi:10.1111/j.1471-6402.2008.00452.x.

Preacher, K. J., & Hayes, A. F. (2008). Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models. *Behavior Research Methods, 40*, 879–891. doi:10.3758/BRM.40.3.879.

Prichard, I., & Tiggemann, M. (2012). The effect of simultaneous exercise and exposure to thin-ideal music videos on women's state self-objectification, mood and body satisfaction. *Sex Roles, 67*, 201–210. doi:10.1007/s11199-012-0167-x.

Quinn, D. M., Kallen, R. W., Twenge, J. M., & Fredrickson, B. L. (2006). The disruptive effect of self-objectification on performance. *Psychology of Women Quarterly, 30*, 59–64. doi:10.1111/j.1471-6402.2006.00262.x.

Quinn, D. M., Chaudoir, S. R., & Kallen, R. W. (2011). Performance and flow: A review and integration of self-objectification research. In R. M. Calogero, S. Tantleff-Dunn, & J. K. Thompson (Eds.), *Self-objectification in women: Causes, consequences, and counteractions* (pp. 23–49). Washington, DC: American Psychological Association.

Raghubar, K. P., Barnes, M. A., & Hecht, S. A. (2010). Working memory and mathematics: A review of developmental, individual difference, and cognitive approaches. *Learning and Individual Differences, 20*, 110–122. doi:10.1016/j.lindif.2009.10.005.

Roberts, T., & Gettman, J. Y. (2004). Mere exposure: Gender differences in the negative effects of priming a state of self-objectification. *Sex Roles, 51*, 17–27. doi:10.1023/B:SERS.0000032306.20462.22.

Rohlinger, D. A. (2002). Eroticizing men: Cultural influences on advertising and male objectification. *Sex Roles, 46,* 61–74. doi: 0360-0025/02/0200-0061/0

Saguy, T., Quinn, D. M., Dovidio, J. F., & Pratto, F. (2010). Interacting like a body: Objectification can lead women to narrow their presence in social interactions. *Psychological Science, 21*, 178–182. doi:10.1177/0956797609357751.

Sherman, A. M., & Zurbriggen, E. L. (2014). "Boys can be anything": Effect of barbie play on girls' career cognitions. *Sex Roles, 70*, 195–208. doi:10.1007/s11199-014-0347-y.

Smolak, L., & Murnen, S. K. (2011). The sexualization of girls and women as a primary antecedent of self-objectification. In R. M. Calogero, S. Tantleff-Dunn, & J. K. Thompson (Eds.), *Self-objectification in women: Causes, consequences, and counteractions* (pp. 23–49). Washington, DC: American Psychological Association.

Starr, C. R. (2015). An objective look at early sexualization and the media. *Sex Roles, 72*, 85–87. doi:10.1007/s11199-014-0422-4.

Starr, C. R., & Ferguson, G. M. (2012). Sexy dolls, sexy grade-schoolers? Media & maternal influences on young girls' self-sexualization. *Sex Roles, 67*, 463–476. doi:10.1007/s11199-012-0183.

Steele, C. M., & Aronson, J. (1995). Stereotype threat and the intellectual test performance of African Americans. *Journal of Personality and Social Psychology, 69*, 797–811.

Strouse, J. S., Goodwin, M. P., & Roscoe, B. (1994). Correlates of attitudes toward sexual harassment among early adolescents. *Sex Roles, 31*, 559–577.

Thompson, S. H., Corwin, S. J., & Sargent, R. G. (1997). Ideal body size beliefs and weight concerns of fourth-grade children. *International Journal of Eating Disorders, 21*, 279–284.

Vaes, J., Loughnan, S., & Puvia, E. (2014). The inhuman body: When sexual objectification becomes dehumanizing. In P. Bain, J. Vaes, & J.-P. Leyens (Eds.), *Advances in understanding humanness and dehumanization* (pp. 186–204). New York: Psychology Press.

Vandenbosch, L., & Eggermont, S. (2013). Sexualization of adolescent boys: Media exposure and boys' internalization of appearance ideals, self-objectification, and body surveillance. *Men and Masculinities, 16*, 1–24. doi:10.1177/1097184X13477866.

Ward, L. M. (2002). Does television exposure affect emerging adults attitudes and assumptions about sexual relationships? Correlational and experimental confirmation. *Journal of Youth and Adolescence, 31*, 1–15. doi:10.1023/A:1014068031532.

Wechsler, D. (1991). *Wechsler Intelligence Scale for Children* (3rd ed.). San Antonio: The Psychological Corporation.

Zanardo, L. (2010). *Il corpo delle donne [Women's bodies]*. Milano: Feltrinelli.

Zanardo, L., Malfi Chindemi, M., & Cantu, C. (2009). *Il corpo delle donne [Women's bodies]*. Retrieved from http://www.ilcorpodelledonne.net/?page_id=91

Zurbriggen, E. L., & Roberts, T. A. (Eds.). (2012). *The sexualization of girls and girlhood. Causes, consequences, and resistance*. New York: Oxford University Press.