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The Impact of Internet Pornography on Adolescents: A Review of the Research

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The recent proliferation of Internet-enabled technology has significantly changed the way adolescents encounter and consume sexually explicit material. Once confined to a personal computer attached to a telephone line, the Internet is now available on laptops, mobile phones, video game consoles, and other electronic devices. With the growth of the Internet has come easier and more ubiquitous access to pornography. The purpose of this article was to review the recent (i.e., 2005 to present) literature regarding the impact of Internet pornography on adolescents. Specifically, this literature review examined the impact of Internet pornography on sexual attitudes, beliefs, behaviors, and sexual aggression. The authors also discuss the literature related to the influence of sexually explicit Internet material on self-concept, body image, social development, as well as the expanding body of research on adolescent brain function and physical development. Finally, recommendations for future research were discussed, based on this literature review.

The proliferation and mainstreaming of pornography over the last 2 decades, especially through the Internet, have influenced youth culture and adolescent development in unprecedented and diverse ways (Löfgren-Mårtenson

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& Månsson, 2010; McNair, 2002; Paul, 2005; Peter & Valkenburg, 2007). Internet-enabled devices have indiscriminately allowed people of all ages to encounter, consume, create, and distribute sexually explicit content, and a growing body of data reveal these phenomena are increasingly common for adolescents worldwide (Flood, 2007; Häggström-Nordin, Sanberg, Hanson, & Tydén, 2006; Lo & Wei, 2005; Wolak, Mitchell, & Finkelhor, 2007). Relative to other media, the Internet is considered a highly sexualized environment (Cooper, Boies, Maheu, & Greenfield, 1999; Peter & Valkenburg, 2006a), and research has shown significant increases in the number of youth who are intentionally or accidentally encountering pornographic material online (Mitchell, Wolak, & Finkelhor, 2007; Wolak et al., 2007).

Given these circumstances, one may assume that adolescents' access to pornography via the Internet is unmatched by any other medium (Mitchell, Wolak, & Finkelhor, 2007); the volume and range of sexually explicit content available on the Internet is remarkable. The evolving nature of technologically mediated pornographic content (e.g., real-time and interactional) provides novelty and variety at unprecedented speeds (Coopersmith, 2006). Additionally, the risk of cyberbullying, sexual victimization, or harassment from others is real and pervasive (Federal Bureau of Investigation, 2011).

Furthermore, the Internet is present and prioritized in the lives of many youth (Lenhart, Ling, Campbell, & Purcell, 2010; Lenhart, Purcell, Smith, & Zickur, 2010; Mitchell et al., 2007). For example, in the United States, 93% of all adolescents ages 12 to 17 use the Internet; 63% go online daily and 36% are online several times a day (Lenhart, Purcell et al., 2010). The World Internet Report surveyed 12 to 14 year olds from thirteen different countries and found that 100% of British youth, 98% of Israeli youth, 96% of Czech youth, and 95% of Canadian youth reported using the Internet regularly (Lawsky, 2008). Given that the average American teen owns 3.5 mobile devices (Lenhart, Purcell et al., 2010), it can be assumed a great deal of their online activity is portable, and therefore, largely unmonitored (Roberts, Foehr, & Rideout, 2005).

This increasingly ubiquitous access to the Internet can be positive; for example, people of all ages are turning to this medium for information on sexual education and sexual health (Barak & Fisher, 2001), social connection (Cooper, Boies, Maheu, & Greenfield, 1999), work, shopping, entertainment, news, and academics. On the other hand, unmonitored access for youth raises genuine concerns in light of the potential risks (Federal Bureau of Investigation, 2011); adolescents often lack the risk attenuation needed to discern and manage online dangers and content in safe and healthy ways (Delmonico & Griffin, 2008). There is also a small, but growing, body of research that indicates adolescents are increasingly struggling with compulsive Internet use (CIU) and compulsive behaviors related to Internet pornography and cybersex (Delmonico & Griffin, 2008; Lam, Peng, Mai, & Jing, 2009;

Rimington & Gast, 2007; van den Eijnden, Spijkerman, Vermulst, van Rooij, & Engels, 2010).

A review of the literature during this period indicates significant increases in the volume of research examining CIU and compulsive adolescent sexual behavior related to pornography, as well as a diversity in the areas of the world studying these phenomenon, such as: China (Fu, Chan, Wong, & Yip, 2010), the Netherlands (van den Eijnden et al., 2010), the United Kingdom (Gillespie, 2008), the United States (Sussman, 2007), and Taiwan (Yen et al., 2009). Consequently, it may be inferred that the impact of Internet pornography on adolescents, including compulsive, addictive, and even criminal behavior, is a global trend not isolated to any one particular culture or region.

As their Internet use increases, it is important to understand the systemic impact of this medium, and specifically exposure to pornographic stimuli, on adolescent development. Adolescent development, for the purposes of this article, is understood to involve critical and significant changes across a multitude of domains: physical, emotional, cognitive, social, spiritual, and sexual. Consequently, adolescents are considered one of the most susceptible audiences to sexually explicit content.

OBJECTIVE

While it is developmentally normal for adolescents to have sexual curiosity, the extent of easy, free, and unmonitored access to pornography on the Internet begs the question: what impact, if any, does exposure to Internet pornography have on adolescents? The goal of this article is to examine recent literature (i.e., 2005 to present) related to the impact of pornography on adolescents.

The research has described a number of indirect effects that pornography may have on children (Manning, 2006), such as parents' compulsive use of the Internet for sexual arousal (Schneider, 2003) and the quality of family relationships (Perrin et al., 2008; Schneider, 2003). For example, on-line sexual activity has been linked to marital dissatisfaction, divorce, and other challenges and stresses on the family system (Reid, Carpenter, Draper, & Manning, 2010; Schneider, 2003). However, the goal of this article is not to examine indirect effects; instead, the purpose of this review is to describe direct relationships between adolescents' consumption of Internet pornography and associated phenomena. Our goal is to highlight the current body of research in an objective, succinct, and coherent way, making it accessible to educators, counselors, policy makers, parents, and other vested stakeholders.

Our purpose is not to make moral judgments regarding the consumption of pornography, but rather to highlight the direct influences pornography has

on the developmental processes of children, and on adolescents specifically. Due to the ubiquitous nature of the Internet as well as online sexually explicit material, this review is warranted and long overdue. There is a wealth of research on the influence of online sexually explicit material on adults; however, there is a similar dearth of literature on children and adolescents, in part, due to the legal and ethical considerations involved. In the United States, as in many other countries, it is illegal to distribute sexually explicit material to minors or knowingly expose them to it, thereby making many types of scientific inquiry difficult.

The goal of this review is to examine the research related to the impact of online sexually explicit material on adolescents; specifically we examine their attitudes, beliefs, behaviors, self-concept, social development, and brain development. These areas were selected due to their repetition in the current literature, and in the case of brain development, because of the obvious and central role the brain plays in the cognitive, behavioral and emotional responses commonly cited in the research. Finally, we will provide recommendations for future research based on this review.

Two issues regarding this literature review are worthy of note; first, we have included research in which the authors may not have examined online pornography specifically, but pornography in various media. We did this with the assumption that the Internet has become a universally accepted source of information, especially for adolescents, and that exposure to pornography may be assumed to occur on the Internet as frequently, if not more frequently, than through any other medium. Also, there are other topics that could be explored; however, the current body of research provided the parameters for this review, and emphasis has been placed on research that examines non-clinical and non-compulsive Internet pornography exposure.

TERMINOLOGY

Before examining the impact of Internet pornography on adolescents, it is first necessary to provide definitions of the terminology used in the literature, and in this review. Researchers who have studied the influence of pornography on youth have examined a wide range of ages; however, there are some commonalities regarding the definition of the term adolescent. Studies of this type have examined the impact of pornography on individuals as young as 10 (Ybarra & Mitchell, 2005) and as old as 22 (Braun-Courville & Rojas, 2009). However, the majority of authors have focused their definition of adolescent to those 13–18 years of age (e.g., Hunter, Figueredo, & Malamuth, 2010; Mesch, 2009; Peter & Valkenburg, 2006a, 2006b, 2008a, 2008b).

Another critical definition is the term pornography, or sexually explicit material. Through a review of the literature, it becomes clear there are almost

as many definitions for sexually explicit material as there are individuals who have studied it. The challenge in defining the term pornography was, perhaps, most famously described by the United States Supreme Court Associate Justice, Potter Stewart. In his concurring opinion in *Jacobellis v. Ohio* (1964), Justice Stewart described his effort to define hard core pornography when he wrote, "I shall not today attempt further to define the kinds of material I understand to be embraced within that shorthand description; and perhaps I could never succeed in intelligibly doing so. But I know it when I see it" ("Concurring Opinion of Mr. Justice Stewart," para. 1).

There are various descriptions of the term pornography throughout the literature. Peter and Valkenburg (2009) defined sexually explicit material as content "that depicts sexual activities in unconcealed ways, often with close-ups with (aroused) genitals and of oral, anal, or vaginal penetration" (p. 408). Tsitsika et al. (2009) defined pornographic Internet sites as "illicit Internet sites portraying sexual behaviors and practices" (p. 546). Braun-Courville and Rojas (2009) defined sexually explicit websites as those that "describe people having sex, show clear pictures of nudity or people having sex, or show a movie or audio that describes people having sex" (p. 157). Reid and colleagues (2011) defined pornography as material that (a) creates or elicits sexual feelings or thoughts, and (b) contains explicit images or descriptions of sexual acts involving the genitals (e.g., vaginal or anal intercourse, oral sex, masturbation, etc.). However, for the purpose of this review, we will use the definition provided in the 1986 Attorney General Commission on Pornography. In that document, pornography was defined as any material that "is predominantly sexually explicit and intended primarily for the purpose of sexual arousal" (McManus, 1986, p. 8).

Finally, some attention should be given to the concept of the Internet. As technology advances faster than academics can study it, our notion of media, social networking, and the Internet is constantly changing. Not long ago, the Internet was something that could only be accessed with a computer and an Internet Service Provider. Recently, tablet computers, smart phones, and other electronic devices have added ubiquity to electronic communication and the Internet. For example, a recent study found that one in three teenagers sends more than 100 text messages a day and 15% send more than 200 a day, or 6,000 a month (Lenhart et al., 2010). Four percent of teens have sent a sexually suggestive text message, which are often nude photographs, and 15% of this age group has received a sexually suggestive text (Lenhart, 2009).

The studies found in the literature largely fail to define the term Internet, in part because these new technologies are continuously evolving and growing in prominence. For the purpose of this review, it can be assumed that the term Internet largely refers to the use of a personal computer or similar device to access the World Wide Web. However, it should be noted that some adolescents who have participated in the studies reviewed in this

article may have accessed the Internet from a mobile phone, tablet computer, video game console, or other electronic device.

IMPACT ON ATTITUDES AND BELIEFS

Recent research suggests a relationship exists between adolescents who are exposed to Internet pornography and the acquisition of a variety of sexual beliefs. Peter and Valkenburg (2008b) argue that sexually explicit material can offer numerous sexual attitudes to viewers, and that these beliefs may differ from those instilled in adolescents by their families and schools. This dissonance, or conflict in sexual beliefs, is attributed to increased sexual uncertainty (Peter & Valkenburg, 2008b).

Tsitsika et al. (2009) conducted a cross-sectional study among Greek adolescents ($N = 529$) in an effort to explore potential implications for the use of sexually explicit material; findings suggested that Greek adolescents who are exposed to sexually explicit material may develop “unrealistic attitudes about sex and misleading attitudes toward relationships” (p. 549). Additionally, Peter and Valkenburg (2010) used data from a three-way panel study among 959 Dutch adolescents to address two dimensions of perceived realism: social realism and utility. The authors defined social realism as, “the extent to which the content of SEIM [sexually explicit Internet material] is perceived to be similar to real-world sex” (pp. 376–77) and utility as, “the extent to which adolescents perceive SEIM as a useful source of information about sex and as applicable to the real world” (p. 377). They also examined the influence of sexually explicit material on instrumental attitudes toward sex, that is, “the notion of sex as primarily physical and casual rather than affectionate and relational” (p. 375). This study suggests that as adolescents are more frequently exposed to sexually explicit material, their perceptions of the social realism and the utility of sexually explicit material increase. The study also suggests that the greater adolescents’ perceptions of social realism and utility of sexually explicit material, the greater their instrumental attitudes toward sex.

However, a qualitative study conducted by Löfgren-Mårtenson and Månsson (2010) contradicts Peter and Valkenburg’s findings. Löfgren-Mårtenson and Månsson collected data from an adolescent population ($N = 51$) in Sweden; these data indicated the majority of participants were able to distinguish between the fantasy of sexually explicit material and real-life sexual interaction. However, the research participants acknowledged that the ideals and pornographic scripts presented in sexually explicit material do influence young people.

Additional research has shown that exposure to sexually explicit material is a normative experience among adolescents who are following traditional developmental trajectories regarding sexual curiosity (Sabina, Wolak,

& Finkelhor, 2008; Svedin, Åkerman, & Prieve, in press; Ybarra & Mitchell, 2005). In a study of emerging adults in the United States ($N = 813$; $M = 20$ -years-old), Carroll et al. (2008) found that 67% of males and 49% of females agreed that viewing sexually explicit material is an acceptable way to express one's sexuality. Löfgren-Mårtenson and Månsson (2010) argued that the cultural context surrounding pornography use had been significantly normalized in recent years, having shifted from something that was "regarded as shameful and morally reprehensible to something socially accepted" (p. 576). In light of these findings, it is interesting to note that Löfgren-Mårtenson and Månsson (2010) found the participants' views and beliefs about pornography differed greatly depending on the degree to which they related to societal norms regarding sex, gender, relationships, and sexual violence. In this study, the authors found no difference related to the age or gender of the participants.

In a recent study of male Swedish high school students ($N = 2015$), Svedin et al. (in press) supported the findings that frequent male viewers of sexually explicit material had more liberal or positive attitudes towards sexually explicit material than those who viewed pornography less frequently or not at all. This study also suggested that frequent viewers of sexually explicit material believed using such material could create a more stimulating sex life for those consumers.

Peter and Valkenburg (2008a) were the first in this review to investigate the relationship between adolescents' exposure to sexually explicit material and sexual preoccupation, defined as "a strong cognitive engagement in sexual issues, sometimes at the exclusion of other thoughts" (p. 208). Peter and Valkenburg (2008a) surveyed 962 Dutch adolescents three times over the course of 1 year. Their study found that "the more frequently adolescents used SEIM, the more often they thought about sex, the stronger their interest in sex became, and the more frequently they became distracted because of their thoughts about sex" (Peter & Valkenburg, 2008a, p. 226). The results of this study further suggested that "sexual arousal as a result of exposure to SEIM may cue sex-related cognitions in memory. . . and may eventually lead to chronically accessible sex-related cognitions, that is, sexual preoccupation" (p. 227).

In a study examining connections between the use of sexually explicit material and attitudes of Taiwanese adolescents, Lo and Wei (2005) used hierarchical regression analyses to determine that exposure to sexually explicit material on the Internet had a greater influence on permissive sexual attitudes than all other forms of pornographic media. In the United States, a similar study was conducted by Braun-Courville and Rojas (2009) that examined the influence of sexually explicit material on adolescents' sexual attitudes and behaviors. Braun-Courville and Rojas found that the more frequently an adolescent is exposed to sexually explicit material, the greater their sexually permissive attitudes.

In 2009, Brown and L'Engle conducted a longitudinal study that confirmed a relationship between permissive sexual attitudes and exposure to sexually explicit material. In addition, the authors also found a relationship between adolescent exposure to sexually explicit material and less progressive gender role attitudes for both males and females. For example, Brown and L'Engle's study indicated that male dominance and female submission are gender roles that are reinforced through sexually explicit material.

Beliefs of women as sex objects are defined by Peter and Valkenburg (2009) as "ideas about women that reduce them to their sexual appeal in terms of their outer appearance and their body (parts)" (p. 408). Peter and Valkenburg (2009) state that "such notions also entail a strong concern with women's sexual activities as a main criterion of their attractiveness and focus on women as sexual playthings that are eager to fulfill male sexual desires" (p. 408). Peter and Valkenburg (2007) published a study of Dutch adolescents ($N = 745$) that investigated the relationship between exposure to sexually explicit material and perceptions of women as sex objects. Their study found that increased exposure to sexually explicit material increased the likelihood that adolescents, regardless of gender, would view women as sex objects. In a later study designed to clarify these findings, Peter and Valkenburg (2009) determined that viewing women as sex objects was related to increased frequency in the consumption of sexually explicit material. It is unclear how adolescent females are impacted by viewing other females, and possibly even themselves, as sex objects. In short, these findings suggest that "adolescents' exposure to SEIM was both a cause and a consequence of their beliefs that women are sex objects" (p. 425).

Lo and Wei's (2005) study of 2,001 Taiwanese students demonstrated a relationship between adolescents' exposure to sexually explicit material and positive attitudes toward premarital and extramarital sexual relations. Later studies conducted in Europe and the United States supported these findings. A 2005 quantitative study by Häggström-Nordin, Hanson, and Tydén examined the use of sexually explicit material and attitudes about casual sex among Swedish adolescents ($N = 718$). This study found participants who consumed sexually explicit material possessed positive attitudes toward casual sex. These findings were supported again a year later in a qualitative study among Swedish adolescents ($N = 18$). In this study, Häggström-Nordin et al. (2006) found that Swedish adolescents who consumed sexually explicit material expressed positive attitudes about having causal sex with a friend.

Peter and Valkenburg (2006a) also surveyed Dutch adolescents ($N = 471$) in order to explore the use of sexually explicit material and the formation of sexual attitudes. The authors found that adolescents with more positive attitudes toward recreational sex used sexually explicit material more frequently. Within this study, however, it remains unclear if "adolescents with more recreational attitudes toward sex use sexually explicit online material more frequently, or that recreational attitudes and exposure to sexually

explicit online material influence each other reciprocally” (Peter & Valkenburg, 2006a, p. 654). A subsequent study by Peter and Valkenburg (2008b) also indicated a relationship between adolescent exposure to sexually explicit material and positive attitudes related to engaging in uncommitted sexual exploration. Finally, in the United States, Braun-Courville and Rojas (2009) posit that adolescents who are more frequently exposed to sexually explicit material are more likely to accept the notion of casual sex.

SEXUAL BEHAVIOR

There is agreement in the literature suggesting that adolescents can learn sexual behaviors from observing the behaviors depicted in sexually explicit material (Alexy, Burgess, & Prentky, 2009; Häggström-Nordin et al., 2006; Häggström-Nordin, Tydén, Hanson, & Larsson, 2009; Hunter et al., 2009). Häggström-Nordin et al. (2006) supported previous findings that adolescents believe sexually explicit material might serve as a source of knowledge but, at the same time, distorts their images of sexuality. This study “extended these findings by revealing that pornographic media conveyed expectations and demands regarding what to do” (p. 391).

A 2005 study, conducted by Lo and Wei, examined the relationship between exposure to sexually explicit material and sexual behaviors of 2,001 Taiwanese adolescents. This study indicated that exposure to sexually explicit material increased the likelihood that adolescents will accept and engage in sexually permissive behaviors. These findings are further supported by Braun-Courville and Rojas (2009), Brown and L’Engle (2009), Lam and Chan (2007), and Peter and Valkenberg (2006a, 2007, 2008b).

Häggström-Nordin et al. (2005) examined the sex lives and pornography consumption of high school students ($N = 718$) in Sweden. Ninety-eight percent of male and 76% of female respondents reported having consumed pornography, 75% of the overall sample had engaged in sexual intercourse, and 71% had used a contraceptive at first intercourse. Having intercourse with a friend, group sex, oral sex, and anal sex were all associated with frequent exposure to sexually explicit material. In addition, 71% of adolescents believed that sexually explicit material influenced the sexual behaviors of peers but only 29% of adolescents believed that sexually explicit material influenced their own sexual behaviors. This study also suggested that adolescents who were more frequently exposed to sexually explicit material had their first experience of sexual intercourse at an earlier age than adolescents who were not frequently exposed.

Several years later, Kraus and Russell (2008) expanded on the research regarding exposure to sexually explicit Internet material and the age of first sexual experience, as well as the number of sexual partners. Participants ($N = 437$) who had Internet access reported significantly younger ages of

first sexual experiences than those without Internet access; however, there was no significance when comparing the number of sexual partners. The authors argue that “the Internet, which often promotes and sells sexually explicit material, may be acting as an accelerant for earlier reported ages for first oral sex and first sexual intercourse” (p. 166).

In 2009, Brown and L'Engle's findings supported the studies of Häggström-Nordin et al. (2005) and Kraus and Russell (2008), specifically, that early exposure to sexually explicit material increases the likelihood that both male and female adolescents will engage in oral sex and sexual intercourse earlier than their non-exposed peers. In this study, 66% of male and 39% of female adolescents ($N = 967$) reported that by the age of 14, they had been exposed to sexually explicit material in the previous year. In addition, 90% of the adolescent males reported having oral sex and 88% reported having sexual intercourse.

These data suggest that adolescents are being exposed to sexually explicit material and engaging in a variety of sexual behaviors; some of which are considered risky and problematic. Braun-Courville and Rojas' (2009) study of 433 adolescents indicated that those who use sexually explicit material are more likely to engage in risky sexual behaviors such as anal sex, sex with multiple partners, and using drugs or alcohol during sex. This study was supported by Brown, Keller, and Stern (2009) who indicated that adolescents who witness high risk sexual practices in sexually explicit material in the absence of education on the potential negative consequences, are more likely to engage in some form of high-risk sexual behavior themselves.

However, research published the next year found contradictory results, specifically noting evidence that exposure to sexually explicit material was unrelated to high-risk sexual behavior (Luder et al., 2010). Using a subpopulation of Swiss adolescents ($n = 6054$), these researchers found that “the majority of risky sexual behaviors, such as early sexual initiation, multiple sexual partners or a history of pregnancy were not associated with sexually explicit material exposure whether it was voluntary or not” (p. 6).

SEXUAL AGGRESSION

Ybarra and Mitchell (2005) used data from the Youth Internet Safety Survey to examine the pornographic seeking behavior of adolescents ($N = 1,501$) for cross sectional linkages in the use of sexually explicit material and psychosocial characteristics. Their findings suggest that, for the majority of males, frequent exposure to sexually explicit material cannot be linked to increased levels of sexual aggression. However, among males “who have ‘predisposing risk levels’ towards aggressive sexual behavior, those who frequently consume pornography have more than four times greater levels of sexual

aggression compared to their peers who infrequently seek out pornography” (p. 483).

A 2005 study by Malamuth and Huppert also focused on sexually explicit material and its relationship to sexual aggression. They found that a male adolescent who “possesses certain combinations of risk factors determines how likely he is to be sexually aggressive following pornography exposure” (p. 316). Focusing directly on violent sexually explicit material, Malamuth and Huppert (2005) suggest that, not only are these higher risk adolescent males “more likely to be exposed to such media but when they are exposed, they are likely to be changed by such exposure, such as changes in attitudes about the acceptance of violence against women” (p. 323–24).

A similar study was conducted by Alexy et al. in 2009. These authors studied 160 sexually reactive children and adolescents (SRCA) and their associations between sexually explicit material and sexually aggressive behavior. “The SRCA population consists of high-risk individuals, specifically, young individuals with a predisposition for aggression” (p. 450). Using a descriptive, exploratory design, this study found that SRCAs who used sexually explicit material were more likely “to engage in coerced vaginal penetration and forced sexual acts such as oral or digital penetration, to express sexually aggressive remarks (obscenities), and to engage in sex with animals” (p. 450) than those who did not.

Brown and L’Engle (2009) conducted a longitudinal study of adolescents ($N = 967$) regarding sexual harassment as a manifestation of sexual aggression. Seventy-six percent of the adolescent male respondents acknowledged having committed some form of sexual harassment and having used some type of sexually explicit material. This study also found that males who were exposed to sexually explicit material in early adolescence were more likely to engage in sexual harassment in middle adolescence.

Using path analysis on data collected from adolescent males with a history of physical sexual offenses ($N = 256$), Hunter et al. (2010) found childhood exposure to sexually explicit material may contribute “to antagonistic and psychopathic attitudes, likely the depiction of distorted views of human sexuality and glorification of promiscuity” (p. 146). Moreover, these authors argued that because adolescents do not always have the opportunity to counterbalance “real-life experiences with sexual partners... they are especially susceptible to internalization of distorted pornographic images of human sexuality and may act accordingly” (p. 147). The most recent study concerning sexually aggressive behavior was a longitudinal study by Ybarra, Mitchell, Hamburger, Diener-West, and Leaf (2011). Using data from the Growing up with Media Survey, the authors examined longitudinal linkages between exposure to sexually explicit material and sexually aggressive behavior. Data were collected over a span of 36 months and collected in three waves. This study suggests that adolescents who are intentionally exposed to violent sexually explicit material were six times more likely to be

sexually aggressive than those who were not exposed. In contrast, adolescents who were exposed to nonviolent sexually explicit material “are statistically equally likely to report sexually aggressive behavior compared to those who report no consumption of nonviolent” (p. 14) sexually explicit material.

SELF-CONCEPT AND BODY IMAGE

There are limited data in the recent literature regarding the influence of Internet pornography on adolescents’ self-concept and body image. While they do not address the issue of pornography, Valkenburg and Peter (2011) asserted that communicating with others online may provide adolescents with increased degrees of self-esteem. The Internet can provide three essential elements of self-regard: control over one’s environment, approval from others, and acceptance by others. These factors may speak to adolescents’ frequent use of the Internet as a means of communication.

Häggström-Nordin et al. (2006) employed qualitative methodology to explore and describe the use of pornography by adolescents in an attempt to gain a greater understanding of how this population uses pornography, as well as its influence on them. Eighteen participants, 10 females and 8 males, shared their perceptions through individual interviews. The participants ranged in age from 16 to 23, and were recruited from a local youth center in Sweden.

One theme identified in the interviews was how consumption of pornography led young people to accept traditional gender roles, specifically that of the male being in a position of power and the female being subservient (Häggström-Nordin et al., 2006). Participants discussed the double-standard reinforced in pornographic material; that is, women with multiple partners are considered promiscuous, while men with multiple partners are revered (Häggström-Nordin et al., 2006). Participants also discussed messages that are inferred from sexually explicit material as they relate to female body image. One participant described this theme when she said, “well, the girl should be small, thin, and you know . . . inferior . . . while the guy should be muscular and superior” (Häggström-Nordin et al., 2006, p. 390).

Löfgren-Mårtenson and Månsson (2010) also discussed these issues in their qualitative study that examined the consequences of sexually explicit material consumption on young adults. The study consisted of focus groups and individual interviews with 51 participants aged 14–20, who were recruited from schools in Southern Sweden. This study revealed a number of themes related to the self-concept of emerging adults, one of which was that young men are not necessarily interested in women who resemble women in sexually explicit material. One female participant described this theme when she stated, “there are guys who are sick and tired of silicon breasts and do get tired of all this plastic” (Löfgren-Mårtenson & Månsson, 2010, p. 572).

This study revealed a number of other pertinent results. The authors described what they called a “pornographic script” for body type and sexual performance that was reinforced by consumption of sexually explicit material (Löfgren-Mårtenson & Månsson, 2010, p. 574). This script created unrealistic and concerning expectations for both the males and females who participated in this study. The men expressed insecurities about their ability to perform sexually; the women expressed insecurities about body image (Löfgren-Mårtenson & Månsson, 2010). For example, the males in the study discussed their concerns about being able to perform as well sexually, and for the same duration, as the men in the pornography they viewed. In contrast, the women in the study felt that the women they saw in sexually explicit material represented the ideal body type. One female participant replied that she felt “very unattractive . . . you can say that you aren’t influenced by this, but no one can resist. You do want to have these ideal bodies” (p. 574).

Two other themes emerged that are of interest here. First, respondents described a decrease in the consumption of sexually explicit material as individual self-confidence increased (Löfgren-Mårtenson & Masson, 2010). Participants also described an increased ability to “handle pornography satisfactorily” if they had developed positive relationships with others, specifically friends and family (Löfgren-Mårtenson & Masson, 2010, p. 575). “It is important to have someone to talk with. . . . Friends are very important!” said one male participant (Löfgren-Mårtenson & Masson, 2010, p. 575).

SOCIAL DEVELOPMENT

A number of studies address the impact of sexually explicit material on adolescents’ social development, attachment, and interpersonal relationships. For example, Mesch (2009) used a 2004 sample of Israelis aged 13–18 in an effort to describe social characteristics of pornography consumers. Using quantitative methodology, the study found that adolescents with higher degrees of social interaction and bonding were not as likely to consume sexually explicit material as were their less social peers (Mesch, 2009). Additionally, Mesch found that greater quantities of pornography consumption were significantly correlated with lower degrees of social integration, specifically related to religion, school, society, and family. The study also found a statistically significant relationship between pornography consumption and aggressiveness in school, with higher degrees of consumption related to higher levels of aggressiveness (Mesch, 2009).

The aforementioned study by Tsitsika et al. (2009) examined the implications of consuming Internet pornography. The data indicated a significant relationship between consumption of Internet pornography and social maladjustment (Tsitsika et al., 2009). Specifically, adolescents who indicated infrequent use of pornography were twice as likely have conduct issues as

those who did not consume pornography at all. Also, frequent consumers were significantly more likely to indicate abnormal conduct issues as well as borderline addictive Internet use (Tsitsika et al., 2009).

Ybarra and Mitchell (2005) not only examined the quantitative relationships between consumption of pornography and behavioral problems, but also with depressive symptoms and emotional bonding with caregivers. The study found a statistically significant relationship between exposure to sexually explicit material and delinquent behavior during the preceding 12 months (Ybarra & Mitchell, 2005). However these data also suggested a difference between consumers of online pornography and those who use other pornographic media. Specifically, children who consume sexually explicit material on the Internet are more likely to exhibit clinical symptoms of depression and lesser degrees of bonding with caregivers than those who consume pornography through other means (Ybarra & Mitchell, 2005).

Hunter et al. (2010) examined the relationship between exposure to pornography prior to age 13 and four negative personality constructs. This study surveyed 256 adolescent males with a history of sexual criminal behavior; the authors found a relationship between early exposure to pornography and antisocial behavior, likely the result of a distorted view of sexuality and the glorification of promiscuity (Hunter et al., 2010). In a similar study discussed previously, Alexy et al. (2009) studied the pornography consumption patterns of juvenile sexual offenders as they related to various forms of aggressive behavior. Those who were consumers of pornography were more likely to display forms of aggressive behaviors such as theft, truancy, manipulating others, arson, and forced sexual intercourse.

Finally, a study published by Lenhart (2009) conducted focus group research with adolescents aged 12–18 regarding “sexting,” or sending sexual text and images via mobile devices. During three focus groups, participants were asked to describe the circumstances in which adolescents engage in sexting, and their opinions of the practice. Three themes emerged from the data, specifically that it is used: (a) as an exchange between romantic partners, especially younger children who are not engaged physically; (b) as an exchange between romantic partners, but the message is then sent to others outside the relationship; and (c) as an exchange from one adolescent to another in hopes of encouraging the formation of a romantic relationship (Lenhart, 2009). Participants’ opinions ranged widely from a belief that it is safer than engaging in a physical relationship, to the notion that it is dangerous and potentially illegal (Lenhart, 2009).

PORNOGRAPHY USE AND THE ADOLESCENT BRAIN

Studies examining the impact of pornography consumption in the cortical substrates in the brains of healthy control adolescent subjects are

non-existent at this time. However, neuroscience research has advanced several findings in the literature that have potential implications for work with adolescents who are regularly exposed to sexually explicit material, and who may be at risk for abnormal developmental trajectories. Some perspectives on adolescent neurocortical vulnerability to pornography consumption are drawn from the work of researchers in medicine and pathological gambling, and from neuroscientists studying developmental psychology (Casey et al., 2008; Chambers et al., 2003); these may be limited in their application to adolescent consumption of pornography. Nevertheless, these perspectives can provide a basis for hypothesis generation and avenues for future research in the area of adolescent use of pornography.

A constellation of significant change occurs during adolescence and many of these changes are influenced by rewards (Somerville et al., 2010). For adolescents, reward-seeking behaviors commonly occur in the pursuit of money, novelty, excitement, and social connection, including peer-group acceptance, sexual activity, and substance use (Steinberg, 2008). Developmentally, risk-taking and reward-seeking decision-making behaviors promote growth and learning for a majority of adolescents. However, evidence from the field of neuroscience suggests that these tendencies may also be associated with a vulnerability to excess in high risk behaviors (Casey & Jones, 2010; Chambers et al., 2003; Doremus-Fitzwater, Varlinskaya, & Spear, 2010).

Differences in neurobiology between adolescent and adult brain systems have been well documented (e.g., Asato, Terwilliger, Woo, & Luna, 2010; Gogtay, et al., 2004). Although cortical dimensions of brain size in 6-year-old children have reached approximately 90% of those found in adults (Casey, Galvan, & Hare, 2005), changes continue to emerge for gray and white matter substrates during adolescence and continue well into young adulthood (Giedd, 2004; Gogtay et al., 2004; Sowell et al., 2003). For example, significant neuroanatomical differences emerge between adults and adolescents in the frontal cortices and in the striatum (Sowell et al., 1999), the regions generally presumed to be associated with executive control and affect regulation (Alvarez & Emory, 2006; Costafreda, Brammer, David, & Fu, 2008; Yurgelun-Todd, 2007). These differences, often measured through functional magnetic resonance imaging (fMRI), have also been the impetus for explanations about how adolescents may process reward stimuli in the brain as compared to adults (e.g., Casey et al., 2008; Ernst, Romeo, & Andersen, 2009).

Research suggests that deficits in cognitive control and delayed maturation in the prefrontal cortex of adolescents is responsible for poor decision making, impulsivity, and affective challenges during teenage years (Yurgelun-Todd, 2007). However, such models are incomplete and lack convincing explanatory power related to high-risk adolescent behavior, especially given that most adolescents are capable of reasoning and understand the risks associated with their behaviors (Reyna & Farley, 2006).

An alternative and emerging neurobiological model argues subcortical limbic systems and prefrontal top-down control regions must both be considered in order to fully understand vulnerability and poor decision making among adolescents (Casey et al., 2008). In support of this model, a number of studies provide evidence that adolescents may have hyper-activation of the ventral striatal motivational circuit in response to rewards (Chambers et al., 2003; Galvan et al., 2006) with one study showing greater striatal activation irrespective of reward receipt (Van Leijenhorst et al., 2010). Collectively, research supporting this position suggests limbic systems mature much earlier than prefrontal cortices throughout adolescent years, creating a bias for emotionally salient stimuli over inhibitory control (Casey et al., 2008; Casey, Jones, & Somerville, 2011; Galvan et al., 2006). Subsequently, protracted integration of prefrontal-striatal and inter-hemispheric connections associated with a growing body of empirical literature may place adolescents at a higher risk for developing problematic pornography use if exposed to sexually explicit content during teenage developmental years.

The rationale suggesting adolescent cortical vulnerability to pornography misuse is, in part, based on the notion that sexual arousal elicited by visual stimuli activates a constellation of neuropathways associated with cognition, motivation, emotional arousal, and somatosensory experience (Redoute et al., 2000). The participation of the amygdala and other limbic structures in imaging studies of sexual arousal is believed to be associated with emotional appraisal of sexual stimuli (Ferretti et al., 2005). Given these observations, one may assume that pornography represents provocative and emotionally salient stimuli that appeal to the adolescent brain. These stimuli, in turn, disproportionately attend to opportunities for satiation of appetitive reward at the expense of delayed gratification often required for long-term goal attainment. Unlike adults, adolescents are believed to lack sufficient maturation and integrity in frontal cortices necessary to exert cognitive control required to suppress sexual cravings, thoughts, and behaviors elicited by pornographic content. This perspective is consistent with the belief that cognitive control of impulses can be compromised in adolescents when self-regulation interacts with salient motivation drives (Casey & Jones, 2010). Further support for this position has been recently noted in a study where adolescents exhibited enhanced sensitivity to appetitive cues as measured by differential activation in the ventral striatum compared to prefrontal cortical regions, and this sensitivity varied with appetitive load (Somerville, Hare, & Casey, 2011).

Research in the field of information processing also provides insight in to how pictorial stimuli such as pornography may be encoded in cortical regions in a more indelible manner when compared to other stimuli (McBride & Doshier, 2002). This effect, known as the picture-superiority effect, has been well established in adults and more recently, evidence for this phenomenon has been found in a study of adolescents (Whitehouse, Maybery,

& Durkin, 2006). The essential notion of this phenomenon is that greater levels of cortical processing and encoding occur, which favor recognition and retention of pictures over other stimuli such as spoken words (Arieh & Algom, 2002; Stenberg, 2006). Although the mechanisms of action for this effect are unclear and likely differ based on the salience of the stimuli (Amrhein, McDaniel, & Waddill, 2002), it is likely that pornographic images are processed differently by the brain and leave a deeper impression compared to verbal or word stimuli. Subsequently, it is important to note that adolescents may process pictorial images quite differently than they do other stimuli, which may have lasting implications for the field of sexual education.

The structural deficits in brain maturation of adolescents, and theories such as the picture-superiority effect, offer insights into the ways adolescents may be disproportionately vulnerable to negative consequences when exposed to sexually explicit material. Additionally, research indicates that the lack of experience and familiarity with novel adult behavior poses a great risk (Romer, 2010). There is likely merit to the constellation of these perspectives, and these differences in opinion highlight the need for additional research about the impact of pornography on the adolescent brain.

FUTURE RESEARCH

Although the literature does indicate inquiry into issues of Internet pornography use among adolescents, the research is sparse and leaves more questions than answers. Before tackling the *content* of what is lacking in the literature, we must first turn our attention toward the *process* of conducting this research, specifically research design and the protection of human subjects through Institutional Review Boards (IRBs). Part of this process involves collecting data on the risks and benefits of this research in order to establish a scientifically informed approach that can be used to educate IRB members as they review studies that may fall outside their areas of expertise (Caskey & Rosenthal, 2005; Mustanski, 2011).

Future studies would benefit from research that incorporates more sophisticated methodologies that move beyond simple correlational analysis and cross-sectional designs. For example, studies assessing mediating and moderating variables, as well as causal effects, will add significantly to the existing body of knowledge. The inclusion of greater specificity about the themes, content, and messages portrayed in pornography is needed and such studies may be conducted using qualitative methods that offer greater depth and rich data sources. It will also be necessary to conduct research that provides greater understanding of differences related to gender, cultural factors, minority status, and understudied populations such as lesbian, gay, bisexual, and transgendered adolescents. As technological advances continue, researchers should consider the various electronic media (e.g., smart phones, game consoles, tablet computers) used to consume pornography

and the emerging trends toward technology use production and distribution of one's own pornography (e.g., sexting, podnography, YouTube videos, etc.).

Although some work has been done to understand the characteristics associated with adolescents who consume pornography, future studies may consider typologies among this population and whether pornography is viewed accidentally or intentionally. Thresholds may enhance understanding about youth who could be vulnerable to problematic pornography use, and outcome studies highlighting clinical methodologies would make a significant contribution to the field. Future research should continue to investigate pornography consumption among adolescents in the context of developing attitudes and beliefs about human sexuality (e.g., sex education or sexual identity). Sexual health and sexual risks should also be considered with an increased focus on neurobiological development and the emotional and psychological well-being of adolescents who consume pornography. Finally, global studies are greatly needed to understand how these various relationships impact society from a systemic perspective.

CONCLUSION

Increased access to the Internet by adolescents has created unprecedented opportunities for sexual education, learning, and growth. Conversely, the risk of harm that is evident in the literature has led researchers to investigate adolescent exposure to online pornography in an effort to elucidate these relationships. Collectively, these studies suggest that youth who consume pornography may develop unrealistic sexual values and beliefs. Among the findings, higher levels of permissive sexual attitudes, sexual preoccupation, and earlier sexual experimentation have been correlated with more frequent consumption of pornography. Researchers have had difficulty replicating these results, however, and as a result the aggregate literature has failed to indicate conclusive results. Nevertheless, consistent findings have emerged linking adolescent use of pornography that depicts violence with increased degrees of sexually aggressive behavior.

The literature does indicate some correlation between adolescents' use of pornography and self-concept. Girls report feeling physically inferior to the women they view in pornographic material, while boys fear they may not be as virile or able to perform as the men in these media. Adolescents also report that their use of pornography decreased as their self-confidence and social development increase. Additionally, research suggests that adolescents who use pornography, especially that found on the Internet, have lower degrees of social integration, increases in conduct problems, higher levels of delinquent behavior, higher incidence of depressive symptoms, and decreased emotional bonding with caregivers.

Research in the domain of neuroimaging, neuroscience, and neuropsychology can only offer speculation regarding the impact of adolescent use of pornography at this time. However, based on hypotheses deduced from other populations, pornography use among vulnerable groups appears contraindicated. The long term impact of these effects and trends requires further investigation. Given that children and adolescents are widely considered the most vulnerable audiences to sexually explicit material, and that the rate, manner and type of exposure is categorically different from that of pre-Internet generations, this is certain to be a relevant area of study for some time. The effects of Internet pornography use might be better described through pertinent, vigorous research. Such research will assist parents, educators, policy makers, health professionals and law enforcement in fostering and supporting the healthy development of youth, while minimizing the risk potential for negative effects related to Internet pornography.

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