

# The Effects of Exposure to Virtual Child Pornography on Viewer Cognitions and Attitudes Toward Deviant Sexual Behavior

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Assumptions regarding the harmful effects of exposure to virtual child pornography are tested in a laboratory experiment. Based on a lexical decision-making task, participants exposed to sexually explicit depictions of females who appear to be minors (“barely legal” pornography) were faster to recognize sexual words after being primed with neutral depictions of girls compared to participants who were preexposed to adult pornography. Trend analysis showed that participants took longer to recognize sexual words after exposure to neutral depictions of underage females the older the models they saw in the exposure condition. Contrary to predictions, male and female participants exposed to barely legal pornography estimated lower rather than higher prevalence and popularity of barely legal depictions than those in other conditions. Implications of evidence of a child-sex cognitive schema following exposure to barely legal pornography and explanations for the failure to support predictions concerning Web-based barely legal pornography are discussed.

**Keywords:** *virtual child pornography; deviant sexual behavior; lexical decision making*

Virtual child pornography includes two distinct yet related forms of sexually explicit content. The first of these involves computer-generated images in which a child’s head is digitally placed onto the body of an adult who is involved in some form of sexually explicit conduct. The second type of virtual child pornography involves depictions of adults over the age of 18 (the age of legal sexual consent in the United States) who are portrayed as being younger than 18 years of age. This genre is often called “barely legal” pornography because models appear to be under, or just barely over, the age of legal sexual consent.

The U.S. Congress attempted to regulate this form of pornography and other forms of “virtual” child pornography by passing the Child Pornography Prevention Act (CPPA) of 1996. The 1996 CPPA addressed both types of virtual child pornography. The law prohibited the shipment, distribution, receipt, reproduction, sale, or

possession of any visual depiction that “appears to be of a minor engaging in sexually explicit conduct” (CPPA, 1996, 2252A, 2256(8)(B)). The Act contained a similar prohibition concerning any visual depiction that is “advertised, promoted, presented, described, or distributed in such a manner that conveys the impression that the material is or contains a visual depiction of a minor engaging in sexually explicit conduct” (CPPA, 1996, 2252A, 2256(8)(D)).

In *Ashcroft v. Free Speech Coalition* (2002), the Supreme Court found the CPPA to be overly broad and therefore an illegal restriction of freedom of speech. The Court feared the law, as written, would prohibit not only the dissemination of actual child pornography (depictions of children under the age of 18) but would also criminalize all forms of speech that attempted to associate youth with sexuality. This might include forms of pornography that employed models who were of legal age but portrayed as younger (the barely legal genre) as well as mainstream films such as *American Beauty* and *Lolita*.

Although the Court’s *Ashcroft v. Free Speech Coalition* (2002) ruling declared the CPPA unconstitutional, it also stated that scientific evidence of harms from exposure to depictions that appear to be of minors engaging in sexually explicit conduct alleged in the government’s case will be relevant to future attempts to regulate virtual child pornography. In arguments before the Court, the government claimed that virtual child pornography is often used by pedophiles and child sexual abusers to “stimulate” and “whet their own appetites” for sex with children. Furthermore, the government claimed that exposure to such content can result in the “sexual abuse or exploitation of minors becoming acceptable to and even preferred by the viewer” (*Ashcroft v. Free Speech Coalition*, 2002, pp. 4-5). The present study empirically tests these assumptions within an information processing and social learning theoretical perspective.

## **Information Processing, Spreading Activation, and Priming**

Media effects scholars have focused their attention on information processing models of human behavior (e.g., Berkowitz, 1984, 1993; Crick & Dodge, 1994; Dodge, 1986; Huesmann, 1988; Huesmann, Moise, & Podolski, 1997). According to Huesmann (1998), “An information processing model is a description of the cognitive data structures a person utilizes and the sequence of cognitive operations the person executes in order to generate the cognitions and behaviors that are output from given input” (p. 74). Information processing theories view human cognitive processes as a network of nodes, and links among these nodes, that represent encoded propositions. The meaning of each node is defined by the links associated with it (Huesmann, 1998). A *schema* is a group of linked nodes encoded in memory that refers to either a general or specific concept. As a particular schema is activated,

other related schemas are likely to be as well. This process of stimulating nodes semantically related to other nodes has been termed *spreading activation*. Empirical research has found support for the idea that the activation of one thought may spread to other related thoughts (e.g., see Berkowitz, 1993; Graham & Hudley, 1994; Jo & Berkowitz, 1994; Josephson, 1987). Once an individual has been primed through presentation of a particular concept, other related concepts are more easily and therefore more quickly accessed.

## **Cognitive Schemas and Barely Legal Pornography**

Barely legal pornography contains depictions of females who, despite appearing to be under the legal age of sexual consent, seem particularly sexually suggestive or promiscuous. Though in reality the models in these depictions are at least 18 years old, previous research reported in the alcohol literature has demonstrated that models who are 25 years old or older can be perceived as substantially younger than 18 by media consumers (Slater et al., 1996). The primary conceptual association underlying barely legal pornographic depictions is youth and sexual suggestiveness. This combination may result in individuals exposed to barely legal pornographic depictions developing a network of associations or schema that includes eroticism and/or sexuality and youth. In other words, viewing barely legal pornography may build up an associative network of nodes involving sexual attractiveness, arousal, and youth. Later, viewers may come to associate sexuality with youthful depictions despite the fact that these depictions are not in and of themselves overtly sexual.

### **Testing the Effects of Exposure to Barely Legal Pornography**

Lexical decision-making tasks—a commonly used method of testing whether a cognitive association between two or more nodes or schemas exists—involves measuring the speed with which a person is capable of recognizing certain words and/or concepts (Liebold & McConnell, 2002; Meyer & Schvaneveldt, 1971; Neely, 1976, 1977; Shrum, 2002). Substantial experimental evidence demonstrates that lexical decisions for concepts associated with a particular prime are facilitated by exposure to the prime. This research supports the idea that the faster a person is able to recognize a set of letters as a word, the stronger and more accessible the schema may be related to that word in the person's mind.

If exposure does indeed result in a cognitive association between youth and sexuality, then men and women exposed to barely legal pornographic depictions should be faster to recognize words of a sexual nature than unexposed individuals when such words are presented after a nonsexual youthful depiction. Stated formally, the following hypothesis may be formulated as follows:

*Hypothesis 1:* Compared to individuals exposed to control depictions, individuals preexposed to sexually explicit depictions of females who appear to be minors will be faster to recognize sexual words presented directly after sexually neutral images of female minors.

The spreading activation notion implies that the closer the cognitive associations or the less the distance between two concepts in the viewer's mind, the more easily one of those concepts should activate the other. The greater the similarity, the faster that activation should occur. On the other hand, unrelated concepts would be harder to access. Thus, once primed with one concept, a longer period of time may be required to recognize an unrelated concept. This idea has important implications for the current study because it is necessary to demonstrate that it is exposure to sexually explicit depictions of youth that is driving the effect, not merely exposure to any sexually explicit stimuli. We would expect that as the models in the sexually explicit stimulus materials to which individuals are exposed increase in apparent age, they should be perceived as less similar to any subsequent neutral youthful depictions. This implies that people who view older models in a sexually explicit context would not be as quick to recognize sexual concepts when primed with a youthful image as part of the postexposure lexical decision-making task. Therefore, a positive linear relationship is expected between perceived age of the models in the sexually explicit stimulus materials and the time it takes individuals to recognize words with sexual connotations when presented after neutral youthful depictions in a subsequent lexical decision-making task. This prediction is stated more formally below:

*Hypothesis 2:* There will be a positive linear relationship between the age of models to which individuals are exposed and the time it takes those individuals to recognize words with sexual connotations when these words are presented directly after neutral images of female minors in a lexical decision-making task.

### **Priming and Estimates of the Prevalence and Popularity of Barely Legal Materials**

Another potential cognitive effect of exposure to barely legal pornographic depictions involves the estimates people make regarding the amount and popularity of such content subsequent to exposure. Tversky and Kahneman (1973) have shown that people tend to infer the frequency of a class or the likelihood that an event will occur on the basis of the ease with which a relevant example can be recalled. Working from a spreading activation perspective, a number of researchers have shown that individuals who are heavy television viewers demonstrate greater cognitive accessibility of constructs more frequently portrayed on television (Busselle, 2001; Busselle & Shrum, 2000; Manis, Shedler, Jonides, & Nelson, 1993; O'Guinn & Shrum, 1997; Shrum, 1996). Shrum (1996), for example, found that individuals'

level of television viewing was related to construct accessibility, which in turn was related to the magnitude of their estimates for various demographic categories, such as the percentage of women in the U.S. population.

By analogy we would expect that individuals exposed to particularly youthful-looking sexually explicit depictions are likely to more easily access a construct involving barely legal content. Those exposed are therefore likely to estimate the prevalence of such content, as well as its popularity, to be higher than those who have not been exposed.

To this we may add the idea that males may have a greater degree of awareness of pornography generally and in the barely legal genre particularly. An evolutionary psychological perspective and accompanying research support the notion that males have a general propensity to be most attracted to females who possess at least minimal secondary sexual characteristics, but who also appear particularly youthful looking (Singh & Young, 1995). Barely legal pornography capitalizes on this attraction. Men are expected to be more attracted to barely legal pornography than are women. This tendency is likely reinforced by processes underlying Bem's (1983) gender schema theory. Cultural pressures have resulted in men learning that being attracted to young, fecund females is an appropriate and desirable trait for a member of their gender. Conversely, however, cultural norms are likely to have resulted in females being less likely to develop a preference for attraction to youthful yet reproductively capable females. Further still, traditional cultural norms likely encourage males more than females to find the existence of as well as exposure to pornographic content more acceptable. This likely results in a greater degree of cognitive comfort or acceptability with regard to pornography for males than would be the case for females. This greater ease in cognitive association on the part of men is expected to result in males finding it easier, and therefore more likely, to believe that such content is both available and popular than will females. Thus, the next hypothesis to be tested can be stated as follows:

*Hypothesis 3:* Men exposed to barely legal sexually explicit depictions compared to other content will estimate the amount and popularity of such content to be higher than women exposed to barely legal or other pornographic materials.

When distributed via a typical Web site, barely legal pornography content is commonly presented within a context of a seemingly endless number of advertisements offering "clickable" links to sites offering similar content. Taken as a whole, these sites present the message that this material is very prevalent. Exposure to such Web sites make the schema of "barely legal pornography on the Internet" more likely to be accessed in exposed individuals.

When questioned about the prevalence and popularity of barely legal content on the Internet, this greater ease in cognitive accessibility should result in exposed individuals giving higher estimates of the amount of such content than individuals who

have not been exposed to barely legal content or individuals who have seen barely legal content only in a non-Web format. More formally, the hypothesis may be stated as follows:

*Hypothesis 4:* Individuals exposed to barely legal sexually explicit depictions in a Web-page format will estimate the amount and popularity of such content to be higher than those exposed to the same content in a non-Web-based format and those exposed to other forms of sexually explicit content.

## **Social Learning Theory: Rewards, Punishments, and Disinhibition Among Males**

One of the primary justifications offered by the U.S. government for the CPPA was that exposure to virtual child pornographic content can result in the “sexual abuse or exploitation of minors becoming acceptable to and even preferred by the viewer” (*Ashcroft v. Free Speech Coalition*, 2002). Although the government offered no theoretical rationale nor provided any empirical support for this assumption, some commonsense version of social learning theory (SLT) appears to underlie this assumption.

### **Rewards and Punishments**

Bandura (1965, 1971, 1973) originally applied SLT to human aggression in an effort to explain how individuals (particularly children) came to exhibit aggressive behavior by observing models’ behaviors either socially rewarded or punished (see Smith & Donnerstein, 1998). Bandura (1973) also suggested this theory could also be applied to sexual behavior. Indeed, a number of studies framed by SLT have shown that by observing sexual activities and the accompanying reactions of others, individuals can learn specific amorous techniques, sexual anxieties can be diminished, and they may learn which types of sexual expression are socially permissible and which are impermissible (Allen, D’Alessio, & Brezgel, 1995; Allen, Emmers, Gebhardt, & Giery, 1995; Zillmann, 1984).

Viewing barely legal depictions may suggest that such content and related behaviors are more pleasurable for the participants than the viewer may initially have believed. Models in this material are often shown smiling, exhibiting sexual arousal, or openly experiencing sexual pleasure. Most depictions include models who appear to be happy (smiling) and/or who appear to be experiencing erotic pleasure.

### **Disinhibition**

A basic assumption underlying Bandura’s (1965, 1973) early work on SLT and aggression was that individuals have an innate propensity to behave in an antisocial

way, but that they learn, through the observation of models either in the media or in person, about the punishments and rewards associated with breaking or upholding social conventions (Bandura, 1977, 1994). Bandura (1986) later reformulated his notions about disinhibition and aggression so as to not assume that most people were predisposed to aggression (see Berkowitz, 1984).

The notion of disinhibition may still have great utility when considering the effects of exposure to sexually explicit depictions, however. Check (1984) and Malamuth, Haber, and Feshbach (1980) found that men who watched a scene in which a woman is raped and appears to become sexually aroused and experience pleasure showed a reduction of inhibitions against committing such behavior themselves. Likewise, the notion of disinhibition may also be fruitfully applied to the consumption of barely legal pornography.

As noted above, an evolutionary psychological perspective predicts that men will be attracted to models who appear particularly youthful looking (Singh & Young, 1995), and the barely legal genre of pornography capitalizes on this attraction. Most adult males, however, have built up inhibitions against accepting or acting on the feelings of sexual attraction for underage females (see Thornhill & Palmer, 2000). Exposure to barely legal pornography may break down the inhibitions male adults have in regard to sexual attraction for underage females. This prediction is stated more formally below:

*Hypothesis 5:* Male participants exposed to barely legal sexually explicit depictions will be most likely to find the idea of sexually explicit content featuring minors as well as adult sexual interaction with minors more socially acceptable compared to females and those exposed to other forms of sexually explicit content.

## **Internet-Based Presentation**

Characteristics of the medium through which barely legal pornographic depictions are disseminated may also contribute to disinhibition toward sex involving minors. Several characteristics of the presentation of barely legal pornography on the Internet may enhance the process of social learning in a manner that more traditional media formats would not. More than many other formats, the World Wide Web as a medium of pornography presentation provides information to consumers that the portrayed sexual behavior is popular and that there is social support at least for watching it, and perhaps for engaging in the behaviors portrayed on the screen. For example, seemingly countless clickable banner advertisements and hyperlinks suggest (both explicitly and implicitly) that the content to which a person is being exposed is not taboo and that it is both popular and sexually stimulating to a large number of people.

The nature of pornographic Web sites also suggests that consumers have access to a seemingly endless supply of similar rewarding activities. Text links and simple

messages promise a virtually endless supply of rewards in the form of sexual arousal from a nearly infinite number of additional links and sites. It is not uncommon, for instance, for a single site to provide thousands of original sexually explicit depictions as well as hundreds or even thousands of banner advertisements and other links to sites offering tens of thousands of additional images within the same genre.

These two attributes—apparent social support and limitless source of content—may result in lessened inhibitions concerning sexual contact with minors when viewing barely legal pornographic depictions as part of a fully functioning Web site. More formally stated, the final hypothesis regarding disinhibition and social acceptability is as follows:

*Hypothesis 6:* Individuals exposed to barely legal sexually explicit depictions in a Web-based format will be most likely to find the idea of sexually explicit content featuring minors as well as adult sexual interaction with minors more socially acceptable compared to individuals exposed to the same content presented in a non-Web-based format.

## Method

### Design

Study participants were randomly assigned to a 4 (barely legal, age 21-28, age 31-45, and over age 50)  $\times$  2 (Web vs. non-Web)  $\times$  2 (male vs. female participants) factorial design. Gender of participant was employed as a factor in the test of all but Hypothesis 2.

### Participants

A total of 154 undergraduates participated in the study. Of these, 35 were males, and 125 were females. The mean age of participants was 19.73 ( $SD = 2.25$ ), with subject ages ranging from a minimum of 18 to a maximum of 35.

### Materials

Participants were exposed to three different types of photo content as part of a “marketing and advertising” study. Each participant saw content dedicated to selling cell phones and calling plans as well as content selling used cars. Depending on the condition to which a participant was randomly assigned, the last set of content came from one of four sexually explicit Web sites created specifically for the experiment.

*Model age manipulation materials.* A separate volunteer sample of 120 undergraduate students participated in the stimulus check prior to the experiment. Each



participant viewed 100 images that were randomly chosen by a computer from a larger group of either 350 sexually explicit images or 250 nonsexually explicit images. All sexually explicit images were downloaded from Web sites that carried a disclaimer verifying that none of the models appearing on that site were less than 18 years of age. For each image, participants estimated the age the model appeared to be, rated the attractiveness of the model, and rated the overall sexual explicitness of the image. Participants were asked to estimate age in years. All other characteristics were rated using 9-point Likert-type scales ranging from 1 (lowest) to 9 (highest). All images were rated by a minimum of 15 participants.

*Grouping models by age ratings.* After students had assigned ratings and estimated the age of the models in all of the images, all sexually explicit images were placed in one of four age-based groups. These included (a) barely legal pornographic content (in which models were estimated to be under 18 years old), (b) pornographic content featuring women who appeared to be between the ages of 21 and 28, (c) pornographic content featuring women who appeared to be between the ages of 31 and 45, and (d) pornographic content featuring women who appeared to be over the age of 50.

Three one-way ANOVAs were computed to determine whether differences existed between experimental groups regarding perceptions of age, attractiveness, and image explicitness. The results of these analyses are presented in Table 1. Statistically significant differences were found between groups for perceived age of models between all four types of stimulus materials. Significant differences were also found between groups for attractiveness of models. A Scheffe's post hoc analysis indicated significant differences between the barely legal condition and both the age 31-45 and over age 50 conditions. The barely legal condition was judged equally as attractive as the age 21-28 model condition. No difference was found between conditions regarding perceptions of sexual explicitness of the images,  $F(3, 56) = 1.898, p = .140$ .

*Web-based versus non-Web-based conditions.* The experimental design also included a manipulation of the format in which all sexually explicit images were presented. Every participant saw all of the images from the two groups of filler images (i.e., cell phone images and used car images) and one group of images from the four types of sexually explicit content mentioned above (i.e., under age 18, age 21-28, age 31-45, and over age 50). In the Web-based condition, participants saw all of the experimental and filler images nested in screen shots of Web pages that were designed specifically for this study. These Web-based screen shots included banner advertisements, lines of text, and groups of what appeared to be links to other similar content and were presented in a Microsoft Internet Explorer Web browser window. The screen shots were not active Web pages. Participants could not manipulate or click on any of the banner ads or apparent links. In addition, none of the screen

**Table 1**  
**Cell Means for Experimental and Control Stimulus Materials**

Under Age 18	Age 21-28	Age 31-45	Over Age 50
Age = 16.72 (0.97) <sub>a</sub>	Age = 23.30 (1.87) <sub>b</sub>	Age = 37.83 (1.95) <sub>c</sub>	Age = 56.58 (7.17) <sub>d</sub>
Attract = 4.74 (0.98) <sub>a</sub>	Attract = 4.94 (2.09) <sub>bc</sub>	Attract = 3.32 (1.18) <sub>bd</sub>	Attract = 1.66 (0.52) <sub>acd</sub>
Explicit = 5.81 (0.93)	Explicit = 5.87 (0.98)	Explicit = 6.11 (1.14)	Explicit = 5.78 (0.95)

Note: Values enclosed in parentheses represent standard deviations. Age was estimated in years. Image explicitness was rated on a 1-9 scale (1 = *no sexual explicitness* and 9 = *highest level of sexual explicitness*). Model attractiveness was rated on a 1-9 scale (1 = *not at all attractive* and 9 = *very attractive*). For age, within a row different subscripts following group means indicate a significant comparison between groups ( $p < .05$ ). For attraction, within a row common subscripts following group means indicate a significant comparison between groups ( $p < .05$ ).

shots included any moving animation. Each image was a frozen shot of a Web page. Each participant saw 19 screen shots from the cell phone site, 18 screen shots from the used car site, and 20 screen shots from Web sites dedicated to one of the six types of sexually explicit content.

In the non-Web-based conditions, all of the Web-like characteristics in the screen shots for each of the six types of sexually explicit content were digitally removed using Adobe Photoshop, Version 7.0. The images in each screen shot remained in the same position in which they had been for the Web-based condition. However, all banner advertisements, text messages, and groups of links were removed. In addition, the Microsoft Internet Explorer Web browser window was erased. The resulting images contained only non-Web-related content on a white background. To clarify, the only difference between the images seen in the two conditions is that those in the Web-based condition appeared in the context of a Web page and those in the non-Web-based conditions appeared on the screen with no surrounding contextual materials. Participants in the non-Web conditions saw the same number of images as those in the Web condition. The only difference between these two groups was whether or not the experimental and filler images were presented as part of a Web site.

## Procedures

*Informed consent and initial instructions.* The experiment was advertised to potential participants as a marketing and advertising study that would include likely exposure to intense pornographic sexual depictions. Mention was made that volunteers would possibly be seeing graphic sexual depictions as part of the study. Participants arriving at the laboratory were asked by a lab monitor to read, sign, and date an informed consent statement. The statement included a warning that subjects were likely going to view and be asked to respond to intense sexual depictions and

that certain of these depictions might include individuals who appeared either quite young or quite old. Participants were then told that they would answer a series of questions on a desktop computer. The computer instructed participants to type in their age, gender, and year in school. In addition, participants were asked to estimate how likely they were to buy a new cell phone or a new car or to look at Internet pornography in the next 6 months. After participants provided this information, they were instructed to click the "submit" button at the bottom of the screen. The computer recorded participants' responses and instructed them to sit in front of the laptop computer that was on a nearby table and to follow the instructions on the screen.

The laptop computer was running SuperLab Pro 2.0 (Cedrus Corporation, 1999) experimental lab software. The first screen participants saw depended on the condition to which they had been assigned. Those participants in the Web-based conditions were told that the tasks they would perform on the laptop were intended to investigate their attitudes toward different types of Internet content. Participants in the non-Web-based conditions were told that the tasks they would perform on the laptop were aimed at investigating their attitudes toward different types of content used in marketing and advertising. Participants were instructed to press the space bar when they had finished reading the page and were prepared to continue to the next page.

*Obtaining baseline response latencies for target words presented in the lexical decision-making task.* Participants next received instructions for a task that would provide baseline response latency measures required for later analyses. Fazio (1990) suggests that when utilizing response latency measures, one of the best ways to reduce error variance caused by individual differences in general speed of responding is to obtain initial baseline response speeds for participants. These baseline assessments were used to calculate change scores for each participant by comparing pre- and postexperimental manipulation response latencies.

For this task, participants first saw a series of asterisks flash across the screen for 315 milliseconds. Next, the screen became blank for 150 milliseconds. Finally, a series of letters that represented either a real word or a nonsense word appeared on the screen. Participants were instructed to press the "W" key if they recognized the letters they saw as a word or the "N" key if they thought the letters formed a nonword. Participants were told not to think about each word for very long because the researcher was more interested in their initial gut reactions, and, as such, they should answer as fast as possible. They were informed that many of the words they would see would be repeated several times and that the researcher was primarily interested in seeing how quickly and accurately individuals were able to recognize certain words used by marketers and advertisers in various media. Finally, participants were instructed to press the space bar when they were ready to do a quick 10 practice decision tasks.

Practice trials were incorporated in an effort to reduce the variability in the response latency data (see Fazio, 1990, for a discussion). After pressing the space bar, participants saw the series of asterisks briefly flash upon the screen followed by

one of three words (jacket, opener, pretty) or one of two nonwords (triblon, bartey). When participants saw a group of letters, they pressed either the “W” or “N” key. The set of letters immediately disappeared and were followed by another series of asterisks and, eventually, another group of letters. The SuperLab Pro software randomly presented the groups of letters until each had been seen and rated two times. Participants then saw a screen telling them that the process was “just that simple” and that they should press the space bar when they were ready to move on to the actual task.

The dependent measure lexical decision-making task measured the speed and accuracy with which participants were able to recognize three neutral words (window, basket, cloudy), four words with sexual connotations (sexy, erotic, arousing, beauty), and four nonsense words (werlof, kurstoe, recazy, serty). Participants were asked to recognize each of the 11 words and nonwords three times each. A single mean baseline reaction time value was calculated from individual reaction times in order to protect against the possibility that a single extreme response time measure might unduly influence later analyses. The order in which all groups of letters appeared was randomly determined for each participant by the computer software.

*Exposure to filler and experimental stimuli.* When participants had completed the initial lexical decision-making task, the computer informed them that they had finished the first task and instructed them to press the space bar when they were ready to move on to the next part of the study. Depending on whether participants were in the non-Web or Web conditions, the next page instructed participants that they were about to see either a series of screen shots from three different types of Web sites (for those in the Web-based conditions) or three series of related images (for those in the non-Web-based conditions). They were informed that each screen shot or image would appear for 10 seconds and that each would be followed by a question asking them to rate some aspect of the content on the preceding page. The duration that each image appeared on screen was held constant in order to control for possible selective exposure effects. Participants were instructed to view each screen shot or image and to answer the question that followed using the numbers on the keyboard. These questions were asked in an effort to ensure that participants continued to pay attention to the content of the Web pages and images. Having the participants respond to these items was simply a device to ensure that they were paying attention to the pages they were being shown. Responses to these items were not used as covariates or entered into any regression equation in which the studied dependent variables (DVs) were considered.

Participants in the Web-based and non-Web-based conditions were asked slightly different questions after each screen shot. For those participants in the Web-based conditions, a screen containing one of three different questions asked them to rate the Web page on the preceding page. Participants were asked to use a 1-7 scale to rate either the overall quality of the preceding page (where 1 = *low* and 7 = *high*),

the general layout of the preceding page (where 1 = *poor* and 7 = *outstanding*), or the overall uniqueness of the content on the preceding page (where 1 = *low* and 7 = *high*). Participants in the non-Web-based conditions were asked to rate the overall quality of the images on the preceding screen (where 1 = *low* and 7 = *high*), the general organization of the images on the preceding screen (where 1 = *poor* and 7 = *outstanding*), or the overall uniqueness of the images on the preceding screen (where 1 = *low* and 7 = *high*).

Participants first saw all of the screen shots or images related to cell phones. Next, they saw all of the screen shots or images related to used cars. Finally, participants saw all of the sexually explicit content. The order by which the images or screen shots were presented within each content group was randomly determined for each participant by the computer software.

*Poststimulus exposure lexical decision-making task.* Once participants had seen and rated each image or screen shot, they were presented with instructions for another lexical decision-making task. The procedures for this task differed from those in the one discussed earlier in one important way. This time the asterisks presented during the first lexical decision-making task were replaced by 14 different images. Participants were informed that they were about to see images of models, animals, and objects that will be, or have been, used in advertisements or marketing campaigns. These included three nonhuman images (flower, violin, tiger cub), two images of women who appeared to be over 50 years of age, two images of women who appeared to be between the ages of 31 and 45, two images of women who appeared to be between the ages of 21 and 28, and five images of females who were estimated by pretest participants to be between the ages of 10 and 16.

All images of individuals were taken from Web sites operated by professional modeling agencies. The five images of minors were taken from online portfolios of individuals who the agency operating the site stated were below 16 years of age. Although it is impossible to ensure that these age claims were valid, it is unlikely that they are inaccurately low. The nature of the modeling industry is such that older models who appear younger looking are particularly highly sought after (they can work longer hours and are expected to be more mature and easier to work with). Therefore, it seems more likely that agencies would overstate the ages of their young models than understate them. The average perceived age of models was 12.34 ( $SD = 1.22$ ).

The images of individuals used in the older postexposure stimuli were also taken from online modeling portfolios. In addition to pretest age and explicitness estimates, models were used as primes in each stimulus group only if their portfolio listed an age that fell within the appropriate range for group inclusion. The two models in the age 21–28-year-old images were 21 and 26 years old. The two models in the age 31–45-year-old images were 38 and 41. The two models in the over age 50 stimuli were 59 and 63. Individuals in the images were fully clothed. All images received a mean sexual explicitness rating on a 1–9 scale (1 = *lowest*, 9 = *highest*) of 1.8 or lower.

The same groups of letters representing words and nonwords as those used in the first lexical decision-making task followed each image. Participants were instructed to view each image, wait for the group of letters to appear, and then press either the “W” key if they recognized the letters they saw as a word or the “N” key if they thought the letters formed a nonword. They were informed that the researcher was trying to see if the different images affected people’s ability to recognize certain words often found in advertising and marketing content. They were instructed that they should therefore perform the task as quickly and as accurately as possible. Both the speed and accuracy with which they recognized the words and nonwords were recorded.

After reading the initial instructions, participants were told to press the space bar when they were ready to do a “quick 10 practices.” After completing the 10 practice image views/word recognitions, participants saw a screen telling them that the process “just was that simple” and that they should press the space bar when they were ready to move on to the actual task. For the actual task, all 14 images were crossed with each of the 11 groups of letters, such that every participant saw a total of 154 image/letter group combinations. The order by which these 154 combinations were presented was randomly determined for each participant by the computer software.

Upon completing the last word-recognition task, participants were presented with a screen informing them that they had completed the preceding section and instructing them to press the space bar when they were ready to move on to the next section.

*Measuring the frequency of barely legal pornography and the social acceptability of sexual behaviors involving minors.* Hypotheses 4 to 6 required measurement of participants’ attitudes concerning the amount of barely legal pornography and perceived social acceptability of sexually explicit depictions of minors and adult sexual interaction with minors. This phase of the study was designed to measure these and other related attitudes. The section began with a screen informing participants that research has found that people’s attitudes toward different behaviors influence their choices as consumers. They were then advised that for the next part of the study they would be asked about their attitudes toward different types of behaviors. Each page presented to participants described a different behavior. Participants were instructed to rate the social acceptability of each described behavior using a scale of 1-7, where 1 meant they found the behavior completely unacceptable and 7 meant they found the behavior completely acceptable. They were told to enter their ratings using the numbers on the keyboard. They were instructed to press the space bar when they had finished reading the section instructions and were ready to begin rating behaviors.

Participants considered 51 different behaviors from three general areas: cell phone use and purchase, automobile driving and buying, and behaviors of a sexual nature. These three areas were intentionally related to the three content areas participants saw in the two sets of filler materials and one set of experimental stimuli. The

order by which all 51 questions were presented was randomly determined for each participant by the computer software.

Each of the three groups included descriptions of behaviors involving age. For example, all participants were asked to consider how appropriate they thought it was to buy a used car from someone in his or her teens, someone in his or her 20s, someone in his or her 30s, someone in his or her 40s, someone in his or her 50s, and someone who was over 60 years old. Similarly, participants were asked to rate the appropriateness of a person under the age of 10 owning a cell phone, a person between the ages of 11 and 17, a person in his or her 20s, a person in his or her 30s, a person in his or her 40s, a person in his or her 50s, and a person over 60 years old. Finally, participants were asked to consider the appropriateness of possessing sexually explicit depictions featuring people less than 10 years of age, people between the ages of 12 and 16, people who were 17, people who were in their 20s, people who were in their 30s, people who were in their 40s, people who were in their 50s, and people who were over 60 years of age. Participants were also asked to rate the acceptability of behaviors involving sexual interaction between adults and people in each of these age groups.

Participants also considered other behaviors in each of the three general areas that were unrelated to age. With regard to cell phone-related behaviors, these included talking on a cell phone in a movie theater, causing a car accident while talking on a cell phone, and stealing a person's cell phone and running up extensive charges. Automobile-related behaviors included intentionally running someone down with a car, lying about a car's maintenance record in order to sell it, and buying a used car online. Sex-related behavior items included sending unsolicited pornographic emails, operating a pornographic Web site, and having sex with a person on the first date.

After responding to the last behavior, participants were informed that they were finished with all of the tasks on the laptop computer. They were directed to return to the desktop computer, scroll down to the bottom of the page, click the "next page" button, and follow the directions for the final section of the study.

In the final phase of the study, participants were told that they were going to be asked to estimate the behavior patterns of other people with regard to used cars, cell phones, and pornography. For example, participants were asked to estimate the percentage of all people they thought were in the market for a used car in the next 6 months as well as the percentage who were in the market for a new cell phone in the next 2 months. Nested among the filler questions were items asking participants to estimate the percentage of all people who view barely legal sexually explicit depictions, the percentage of all Web content that is composed of barely legal sexually explicit depictions, and the percentage of total time spent online by Web users viewing barely legal sexually explicit depictions. For the two estimates regarding online barely legal content, participants were shown a banner advertisement that had appeared on the barely legal site used in the manipulation. They were asked to

estimate what percentage of Internet content is of a similar nature and what percentage of Internet users' time is dedicated to consuming content similar to that portrayed in the advertisement.

Participants were asked to click the "submit" button at the bottom of the page after they had given estimates for each of the behaviors. Once they clicked this button, a message appeared on the screen informing them that they had finished the study and instructing them to alert the lab monitor.

*Debriefing.* Participants were informed that all of the depictions they looked at were of adults who are over 18 years old. Furthermore, the lab monitor told them that it is not legal, nor is it socially acceptable, for an adult to act on any feelings of sexual attraction they might have toward a minor. Finally, each participant was given a piece of paper with the phone numbers for the university's Counseling Services Center and Crisis Hotline. They were reminded that acting aggressively in response to sexual arousal is totally socially unacceptable and illegal and were asked to call either or both of the numbers on the paper if they felt they might act sexually aggressively as a result of viewing any of the content they had just seen.

## Results

A total of 154 undergraduates participated in the study.

### Calculating Response Latencies

Following calculation procedures developed by Liebold and McConnell (2002), several steps were taken to calculate the response latency scores that were used to test Hypotheses 1 through 3. First, a preexposure response latency mean was calculated for each of the four target words: sexy, erotic, arousing, and beauty. For each word, all correct recognition reaction times (a maximum total of three) were summed and divided by the number of total correct recognitions (also a maximum of three). Reaction times for which participants miscoded the letters as a nonword were not included in the reaction time sums, nor were they included when summing the number of total correct recognitions. The appropriate preexposure mean response latency value was then subtracted from the postexposure reaction times for each of the four words in response to each of the five images containing models who were under 18 years of age and the two images each of models in their 20s, 30s, and 60s. This resulted in the calculation of 56 separate response latency difference scores for each participant (i.e., 4 words  $\times$  14 images). A mean value replacement procedure was undertaken for participants who were missing individual difference scores.



**Table 2**  
**Factor Loadings and Eigenvalues for the Five Difference**  
**Scores on Each of the Four Sexually Connotted Words**

Item	Sexy <sup>a</sup>	Arousing <sup>b</sup>	Erotic <sup>c</sup>	Beauty <sup>d</sup>
Picture 1	.872	.805	.893	.850
Picture 2	.849	.865	.897	.744
Picture 3	.768	.738	.907	.880
Picture 4	.884	.864	.833	.890
Picture 5	.701	.743	.902	.910

a. Eigenvalue = 3.202.

b. Eigenvalue = 2.686.

c. Eigenvalue = 3.933.

d. Eigenvalue = 3.412.

Four separate factor analyses were undertaken to determine whether it would be appropriate to combine the reaction time difference scores across all five underage model images for each of the four target words. All analyses found that for each word, the five difference scores all loaded on a single factor (see Table 2). Therefore, a composite response latency difference score was calculated for each of the target words by adding the individual image reaction time difference scores. In addition, the factor analyses found that all component loadings for each target word were virtually equal. It was therefore deemed acceptable simply to add the scores together for each subject rather than to calculate four new composite values based on factor loadings. Alphas for each of the target word composites were then computed. For the word *sexy*,  $\alpha = .85$ ; for the word *erotic*,  $\alpha = .93$ ; for the word *arousing*,  $\alpha = .88$ ; and for the word *beauty*,  $\alpha = .78$ . These four composite scores served as dependent measures in the tests of Hypothesis 1.

Mean reaction times were also calculated for each of the two images in the other three age-based stimulus groups and for the control images. Alphas for the older age-based groups and the control images were not calculated because too few items were included for each mean.

Hypothesis 2 required that a trend analysis be run on the composite reaction time difference scores. However, running such an analysis on all four composites separately would have unduly increased the probability of making a Type I error. In an effort to curb this probability, another factor analysis was run to determine whether it would be appropriate to combine all four composite scores into one general reaction time composite score for use in the trend analysis. The analysis found all four composite scores loaded strongly on a single factor. Therefore, it was considered appropriate to combine the four composite scores for each of the four target words into a single general composite response latency difference score ( $\alpha = .93$ ) for use in the trend analysis required to test Hypothesis 2.

## Lexical Decision-Making Task Results: Hypothesis 1

*Under age 18 primes.* Hypothesis 1 predicted that in a lexical decision-making task individuals preexposed to sexually explicit depictions of females who appear to be minors would be faster to recognize words with sexual connotations when these words were subsequently presented directly after neutral images of female minors compared to individuals exposed to depictions featuring models in all other age groups. A 2 (under age 18 vs. all other age groups)  $\times$  2 (male participants vs. female participants) between-subjects multivariate analysis of variance (MANOVA) was performed on four DVs: reaction time difference scores for *arousing*, *beautiful*, *sexy*, and *erotic*. Comparing responses from the under age 18 condition with those of a collapsed combination of all other conditions was done to enhance the clarity of the findings. With the use of Wilks's criterion, the combined DVs were significantly affected by the apparent age of the model,  $F(4, 153) = 2.705, p < .05$ .

To investigate the impact of the age of model main effect on the individual DVs, a Roy-Bargmann stepdown analysis was performed on the prioritized DVs. The results of this analysis are displayed in Table 3a. In a stepdown analysis each DV was analyzed, in turn, with higher priority DVs treated as covariates, and with the highest priority DV tested in a univariate ANOVA. Priority was based on the size of the univariate  $F$  values for each of the four DVs with relation to each independent variable separately.

A unique contribution to predicting differences between those in the under age 18 and all other age conditions was made by response latencies in recognizing the word *erotic*. Subjects in the under age 18 condition showed a decrease in the time it took them to recognize the word *beautiful* when presented with a neutral image of an underage female (mean difference in response time =  $-96.21$  milliseconds,  $SD = 109.47$  milliseconds), whereas subjects in the three other conditions combined showed a significantly smaller mean decrease in response time (mean difference in response time =  $-24.78$ ,  $SD = 201.73$  milliseconds). Subjects in the barely legal models condition showed a decrease in the time it took to recognize the word *arousing* when it was presented after a neutral image of an underage female (mean difference in response time =  $-82.07$  milliseconds,  $SD = 108.95$  milliseconds) while participants in the combined adult models conditions showed only a slight decrease (mean difference in response time =  $-5.67$  milliseconds,  $SD = 259.26$  milliseconds). After the pattern of differences measured by responses to the word *erotic* was entered, however, a significant difference was no longer found on responses to the word *beautiful*. The same trend was found for reaction time measures in response to the terms *arousing* and *sexy*. Although univariate comparisons revealed that subjects in the barely legal model condition showed a significant decrease in the time it took them to recognize the word *arousing* (mean difference in response time =  $-57.75$  milliseconds,  $SD = 82.41$  milliseconds) and those in the combined adult model conditions showed a slight increase (mean difference in response time =  $18.54$  milliseconds,

**Table 3a**  
**Roy-Bargmann Stepdown Analysis for Barely Legal and Adult Conditions and Gender for Reaction Times**

Independent Variable	Dependent Variable	Univariate <i>F</i>	<i>df</i>	Stepdown <i>F</i>	<i>df</i>	<i>p</i>
Age of model	Erotic	9.892**	1/156	9.892**	1/156	.002**
	Beautiful	8.982**	1/156	0.800	1/155	.373
	Arousing	8.864**	1/156	0.610	1/154	.436
	Sexy	7.940**	1/156	0.001	1/153	.970

\*\* $p < .01$ .

$SD = 231.52$  milliseconds), this difference was already represented in the stepdown analysis by higher priority DVs. Similarly, although univariate comparisons revealed that subjects in the barely legal model condition showed a decrease in the time it took them to recognize the word *sexy* (mean difference in response time =  $-84.51$  milliseconds,  $SD = 123.29$  milliseconds) and those in the combined adult model conditions showed a slight increase (mean difference in response time =  $7.46$  milliseconds,  $SD = 286.93$  milliseconds), this difference was also already represented in the stepdown analysis by higher priority DVs.

MANOVAs showed no significant general effects for gender of participant on reaction times,  $F(4, 153) = 1.218$ ,  $p = ns$ . There was also no interaction effect between age of models and gender of participant,  $F(4, 153) = 0.887$ ,  $p = ns$ .

*Age 21-28 primes.* Next, preexposure mean response latency values were subtracted from postexposure reaction time means for each of the four words in response to the two images containing models who were between 21 and 28 years of age. A 2 (age 21-28 vs. all other age groups)  $\times$  2 (male participants vs. female participants) between-subjects MANOVA was then performed on mean response latency differences on responses for *arousing*, *beautiful*, *sexy*, and *erotic*. Again, with the use of Wilks's criterion, the combined DVs were significantly affected by the apparent age of the model,  $F(4, 153) = 3.272$ ,  $p < .01$ .

A Roy-Bargmann stepdown analysis (see Table 3b) showed that a unique contribution to predicting differences between those in the age 21-28 and all other age conditions was made by response latencies in recognizing the word *beautiful*. Subjects in the age 18-21 condition showed a significantly greater decrease in the time it took them to recognize the word *beautiful* when presented with a neutral image of a female age 21-28 (mean difference in response time =  $-102.06$  milliseconds,  $SD = 113.83$  milliseconds) than subjects in the three other conditions combined (mean difference in response time =  $-20.29$  milliseconds,  $SD = 102.99$  milliseconds). Subjects in the barely legal models condition also showed a significantly greater decrease in the time it took to recognize the word *erotic* when presented after a neutral image of a female age 21-28 (mean difference in response time =  $-115.99$  milliseconds,

**Table 3b**  
**Roy-Bargmann Stepdown Analysis for Age 21-28 and Adult Conditions and Gender for Reaction Times**

Independent Variable	Dependent Variable	Univariate <i>F</i>	<i>df</i>	Stepdown <i>F</i>	<i>df</i>
Age of model	Beautiful	12.866**	1/156	12.866**	1/156
	Erotic	11.012**	1/156	8.409***	1/155
	Sexy	1.092	1/156	0.788	1/154
	Arousing	0.368	1/156	0.283	1/153

\*\**p* < .01. \*\*\**p* < .001.

*SD* = 111.45 milliseconds) than those in the other three combined conditions (mean difference in response time = -31.47 milliseconds, *SD* = 123.38 milliseconds). This difference remained significant even after the pattern of differences measured by responses to the word *beautiful* was entered into the stepdown analysis. Neither univariate nor stepdown analyses showed any significant differences between participant reaction time difference scores for those in the age 21-28 condition and those in all other conditions for either *arousing* or *sexy*.

Again, MANOVAs showed no significant general effects for gender of participant on reaction times,  $F(4, 155) = 0.753, p = ns$ . There was also no interaction effect between age of models and gender of participant,  $F(4, 155) = 0.479, p = ns$ .

*Age 31-45 primes.* A 2 (age 31-45 vs. all other age groups) × 2 (male participants vs. female participants) between-subjects MANOVA was also performed to determine whether individuals preexposed to sexually explicit depictions of females who appear to be between the ages of 31 and 45 would be faster to recognize words with sexual connotations when these words were subsequently presented directly after neutral images of females aged 31-45 compared to individuals exposed to depictions featuring all other age groups. Based on Wilks’s criterion, the combined DVs were not significantly affected by the apparent age of the model,  $F(4, 153) = 1.198, p = ns$ ; gender of participant,  $F(4, 153) = 1.035, p = ns$ ; or an interaction between model age and gender of participant,  $F(4, 153) = 0.602, p = ns$ .

*Over age 50 primes.* Another 2 (age 50+ vs. all other age groups) × 2 (male participants vs. female participants) MANOVA was performed to determine whether individuals preexposed to sexually explicit depictions of females who appear to be over age 50 would be faster to recognize words with sexual connotations when these words were subsequently presented directly after neutral images of females over the age of 50 compared to individuals exposed to control depictions. Again, based on Wilks’s criterion, this analysis showed the combined DVs were not significantly affected by the apparent age of the model,  $F(4, 153) = 1.313, p = ns$ ; gender of

**Table 4a**  
**Mean Difference Scores for Response Latencies in Recognizing the Words**  
***Sexy, Arousing, Erotic, and Beauty* Presented After Neutral Depictions of**  
**Underage Females**

	Under Age 18	Age 21-28	Age 31-45	Over Age 50
Difference scores in milliseconds	-320.55 <sup>abc</sup> (274.92)	-121.32 <sup>a</sup> (261.79)	18.42 <sup>b</sup> (236.46)	-91.14 <sup>c</sup> (216.85)

Note: Values enclosed in parentheses represent standard deviations. Means with common superscripts differ at the  $p < .001$  level.

participant,  $F(4, 153) = .868$ ,  $p = ns$ ; or an interaction between model age and gender of participant,  $F(4, 153) = 1.075$ ,  $p = ns$ .

Finally, a one-way ANOVA was performed on the means of all 56 combined response latency difference scores for each of the four age group conditions. Although the mean difference score for those in the under age 18 condition (mean difference =  $-243.75$  milliseconds,  $SD = 202.85$  milliseconds) decreased more than those for participants in the age 21-28 (mean difference =  $-196.70$  milliseconds,  $SD = 188.43$  milliseconds), age 31-34 (mean difference =  $-147.80$  milliseconds,  $SD = 138.14$  milliseconds), or over age 50 conditions (mean difference =  $-169.61$  milliseconds,  $SD = 165.92$  milliseconds), these differences were not statistically significant,  $F(3, 151) = 1.836$ ,  $p = ns$ . This suggests there was no general priming effect on the recognition of sexual words as a result of any of the exposure conditions.

## Lexical Decision-Making Task Results: Hypothesis 2

Hypothesis 2 predicted there would be a positive linear relationship between the perceived age of models to which individuals were exposed and the time it took those individuals to recognize words with sexual connotations when these words were presented directly after neutral images of female minors in a lexical decision-making task.

A one-way ANOVA showed scores on the combined reaction time measure in response to the neutral depictions of underage females varied significantly between exposure condition groups (see Table 4a). A Scheffe's post hoc analysis found significant differences between subjects in the under age 18 conditions and subjects in the age 21-28 condition, subjects in the age 31-45 condition, and subjects in the over age 50 condition. No differences were found between any of the other model condition groups.

A trend analysis found the data regarding underage model response latencies to exhibit an overall linear trend (see Table 5). That is, there was a significant tendency for participants to take longer to recognize sexual words after exposure to neutral

**Table 4b**  
**Mean Difference Scores for Response Latencies in Recognizing the Words**  
***Sexy, Arousing, Erotic, and Beauty* Presented After Neutral Females Aged 21-28**

	Under Age 18	Age 21-28	Age 31-45	Over Age 50
Difference scores in milliseconds	-52.33 (57.69)	-72.57 <sup>ab</sup> (66.81)	-17.92 <sup>a</sup> (43.27)	-11.80 <sup>b</sup> (82.74)

Note: Values enclosed in parentheses represent standard deviations. Means with common superscripts differ at the  $p < .001$  level.

**Table 5**  
**Trend Analysis for Perceived Age of Model Condition**

Trend	SS	SS	<i>t</i> value	<i>p</i>
Linear	859.03	356.50	2.56*	.015
Quadratic	638.35	324.09	1.97	.058
Cubic	-1181.83	961.21	1.23	.229

\* $p < .05$ .

depictions of underage females the older the models they saw in the exposure condition. Although it seems somewhat quadratic in appearance (see Figure 1), the trend analysis showed that the data did not exhibit an overall quadratic trend. Thus, despite the curvilinear appearance of the data (caused primarily by participant scores in the age 31-45 condition), the relationship between the reaction time measures and the apparent age of models in the exposure condition is best described as linear in nature. Hypothesis 2 is therefore supported.

An additional one-way ANOVA showed that scores on the combined reaction time measure in response to neutral depictions of females aged 21-28 also varied significantly between exposure condition groups,  $F(3, 156) = 7.127, p < .001$  (see Table 4b). A Scheffe's post hoc analysis found significant differences between subjects in the age 21-28 condition, subjects in the age 31-45 condition, and subjects in the over age 50 condition. No significant differences were found between subjects in the under age 18 condition and any of the other conditions.

### **Constructing Dependent Measures With Principal Component Analyses**

In order to devise dependent measures to use in a test of the remaining hypotheses, a principle factors extraction with varimax rotation was first performed using SPSS factor analysis on the 7 items that measured participants' estimates of sexual behaviors and the 13 items that measured participants' perceived acceptability and

**Figure 1**  
**Trend in Mean Response Differences for Age of Model Conditions**



legitimacy of various sexual behaviors. Five factors were extracted (see Table 6). Factor 1 relates to estimates of the amount and popularity of online sexually explicit content and included the 7 items assessing participant predictions regarding both barely legal pornographic content and pornographic content in general. Factor 2 consists of participants' beliefs regarding the social acceptability and legitimacy of sexually related behaviors involving adults. It included items related to the acceptability of possessing materials depicting legal, explicit sexual portrayals between adults of various ages, operating a pornographic Web site, and the actual act of sex between adults of different ages (i.e., clearly legal sexual activities). Factor 3 is composed of items measuring the acceptability of sexual behaviors occurring between adults and adolescent minors (i.e., statutory rape). Factor 4 contains items measuring the acceptability of possession of sexually explicit content depicting individuals between the ages of 12 and 17 (i.e., possessing teen sexually explicit materials). Factor 5 contained 1 item that measured the perceived acceptability of possessing sexually explicit material depicting children under the age of 10 (i.e., possessing child sexually explicit materials).

The factor loadings are shown in Table 6. The items are ordered and grouped by size of loading to facilitate interpretation. Five factor scores were then estimated for each subject and used as DVs. Factor scores were used in the analyses instead of raw scores in order to weight by the influence of the individual items within each factor.

Although the items in Factor 1 all loaded together in the initial principal component analysis, they measured perceptions of acceptability regarding barely legal content as well as content containing older, more obviously legal models. In order to differentiate between judgments of barely legal models and models who were clearly older looking, two additional principle factors extractions were performed. The first

**Table 6**  
**Factor Loadings for Items Assessing the Acceptability of Sexual Behaviors**

Item	Factor 1 <sup>a</sup>	Factor 2 <sup>b</sup>	Factor 3 <sup>c</sup>	Factor 4 <sup>d</sup>	Factor 5 <sup>e</sup>
% of Web time spent looking at barely legal porn	.868				
% of time online spent looking at porn in general	.836				
% of Web content that is barely legal porn	.826				
% of Web content that is porn	.821				
% of Web users who view porn online	.742				
% of consumers of barely legal porn	.719				
% of consumers of porn in general	.581				
Sex between people in their 20s and 50s		.801			
Possess porn featuring 30-45 year olds		.763			
Sex between people in their 20s and 40s		.754			
Sex between people in their 20s and 60s		.737			
Operate pornographic Web site		.704			
Possess porn featuring models over age 50		.697			
Possess porn featuring 20-29 year olds		.686			
Sex between 18 or 19 year old and 17 year old			.764		
Committing statutory rape			.764		
A 20 year old having sex with a 16-17 year old			.606		
Possess porn featuring children between 12 and 16				.760	
Possess porn featuring 17 year olds				.701	
Possess porn featuring children under 10					.751

Note: Superscripts represent reliability coefficients: <sup>a</sup> $\alpha = .91$ , <sup>b</sup> $\alpha = .89$ , <sup>c</sup> $\alpha = .88$ , <sup>d</sup> $\alpha = .83$ , <sup>e</sup> $\alpha = .79$ . \*Eigenvalue = 5.304. \*\*Eigenvalue = 2.096. \*\*\*Eigenvalue = 1.638. \*\*\*\*Eigenvalue = 1.280. \*\*\*\*\*Eigenvalue = 1.049.

included the raw scores for the three items measuring estimates of amount and popularity of online barely legal sexually explicit content. The second included the raw scores for the four items measuring estimates of amount and popularity of online pornography in general. Single factors were extracted in both analyses (see Tables 7 and 8). Two separate factor scores—one relating to barely legal pornography and one relating to pornography in general—were then estimated for each subject and used as DVs (higher scores represent greater content estimates).

**Estimates of Amount and Popularity of Barely Legal Pornography: Hypotheses 3 and 4**

Hypothesis 3 predicted that men exposed to barely legal sexually explicit depictions would estimate the amount and popularity of such content to be higher than individuals exposed to other forms of sexually explicit content. Hypothesis 4 predicted that men exposed to barely legal sexually explicit depictions in a Web-page format would estimate the amount and popularity of such content to be higher than individuals exposed to the same content in a non-Web-based format and/or individuals exposed to other forms of sexually explicit content. To test Hypotheses 3 and 4, a 2 (under age 18 vs. all other age conditions)  $\times$  2 (Web format vs. non-Web format)



**Table 7**  
**Factor Loadings for Items Assessing Estimates of Amount and Popularity of Online Barely Legal Content**

Item	Factor Score <sup>a</sup>
% of Web time spent looking at barely legal porn	.892
% of Web content that is barely legal porn	.872
% of consumers of barely legal porn	.750

a. Eigenvalue = 2.120.

**Table 8**  
**Factor Loadings for Items Assessing Estimates of Amount and Popularity of Online Barely Legal Content**

Item	Factor Score <sup>a</sup>
% of time online spent looking at porn in general	.852
% Web content that is porn	.817
% of Web users who view porn online	.811
% of consumers of porn in general	.742

a. Eigenvalue = 2.601.

× 2 (female vs. male) between-subjects MANOVA was performed with participants' two prevalence and popularity factor scores as DVs.

A significant main effect was found for age of model,  $F(2, 144) = 3.158, p = .045$ , and participant gender,  $F(2, 144) = 3.042, p = .051$ . Univariate comparisons indicated the effects of gender were nonsignificant for both the barely legal pornography DV,  $F(1, 144) = .019, p = .89$ , and the general pornography DV,  $F(1, 144) = 2.547, p = .113$ , however. A significant interaction effect was found between age of model and content presentation format,  $F(2, 144) = 4.601, p = .011$ .

To investigate the impact of the age of model main effect and the Age of Model × Presentation Format interaction effect on the individual DVs, a Roy-Bargmann stepdown analysis was performed on the prioritized DVs. Each DV was analyzed, in turn, with the higher priority DV treated as a covariate and with the highest priority DV tested in a univariate ANOVA. Priority was based on the size of the univariate  $F$  values for each of the two DVs with relation to each independent variable separately. The results of this analysis are displayed in Table 9.

A unique contribution to predicting differences between those in the under age 18 and all other age conditions was made by participant estimates of the prevalence and popularity of general online pornographic content. The effect was not in the hypothesized direction, however. Participants exposed to sexually explicit depictions featuring barely legal models estimated lower prevalence and popularity

**Table 9**  
**Roy-Bargmann Stepdown Analysis for Barely Legal and Adult Conditions and Gender for Reaction Times**

Independent Variable	Dependent Variable	Univariate <i>F</i>	<i>df</i>	Stepdown <i>F</i>	<i>df</i>	<i>p</i>
Age of model	General content	6.453*	1/156	6.453*	1/156	.012*
	Barely legal content	4.930*	1/156	0.137	1/155	.712
Age of Model × Presentation Format	General content	10.779***	1/156	10.779*	1/156	.001***
	Barely legal content	3.832	1/156	0.445	1/158	.506

\**p* < .05. \*\*\**p* < .001.

of barely legal depictions than those in all other conditions combined. After the pattern of differences measured by respondents’ estimates regarding general online pornographic content was entered, a difference was no longer found regarding estimates of the prevalence and popularity of online barely legal pornography. Participants in the barely legal content condition estimated less prevalence and popularity than those in all other groups combined.

For the interaction effect between age of model and presentation format, a unique contribution to predicting group differences was again made by participant estimates of the prevalence and popularity of general online pornographic content. Again, however, the effect is not in the hypothesized direction (see Tables 10 and 11 for all cell means). A Scheffe’s post hoc analysis indicates that participants in the adult model/non-Web condition scored significantly higher than those in both the barely legal/non-Web and adult/Web conditions. After the pattern of differences measured by respondents’ estimates regarding general online pornographic content was entered, a difference was again no longer found regarding estimates of the prevalence and popularity of online barely legal pornography.

**Social Acceptability: Hypotheses 5 and 6**

Hypothesis 5 predicted that male participants exposed to barely legal sexually explicit depictions would be more likely to find the idea of sexually explicit content featuring minors as well as adult sexual interaction with minors more socially acceptable than females exposed either to barely legal or to other forms of sexually explicit content. Hypothesis 6 predicted that participants exposed to barely legal sexually explicit depictions in a Web-based format would be more likely to find the idea of sexually explicit content featuring minors as well as adult sexual interaction with minors more socially acceptable than individuals exposed to the same content presented in a non-Web-based format.

To test these two hypotheses, a 2 (barely legal vs. all other age conditions) × 2 (Web vs. non-Web) × 2 (gender of participant) was performed with the four factor

**Table 10**  
**Means for Estimated Prevalence and Popularity of Web-Based**  
**General Sexually Explicit Content**

Age of Model	Under Age 18	All Other Model Groups	Marginals
Presentation Format			
Non-Web	-.327 <sup>a</sup> (0.748) <i>N</i> = 23	.411 <sup>ab</sup> (0.988) <i>N</i> = 50	.179 (0.997) <i>N</i> = 73
Web	-.001 (0.966) <i>N</i> = 30	-.168 <sup>b</sup> (1.013) <i>N</i> = 50	-.105 (0.993) <i>N</i> = 80
Marginals	-.141 <sup>c</sup> (0.855) <i>N</i> = 53	.122 <sup>c</sup> (1.037) <i>N</i> = 100	

Note: Values enclosed in parentheses represent standard deviations. Means with common superscripts differ at the  $p \leq .05$  level.

scores described above that represent behaviors other than those related to estimating prevalence and popularity of sexually explicit content serving as DVs. Specifically, this included Factor 2 (clearly legal sexual activities), Factor 3 (statutory rape), Factor 4 (possessing teen pornography), and Factor 5 (possessing child pornography). With the use of Wilks's criterion, the combined DVs were significantly affected only by participant gender,  $F(4, 155) = 3.475, p = .01$ . Gender's influence was limited to only one variable: clearly legal sexual activities, univariate  $F(1, 158) = 10.114, p = .002$ . Male participants ( $M = .475, SD = 1.029$ ) found clearly legal sexual behaviors more socially acceptable than female participants ( $M = -.131, SD = 0.955$ ). No other main effects or interaction effects were found. For these analyses, with the significance level set at  $p < .10$ , observed power for the age effects of respondent on the DVs ranged from = .33 to .54, and observed power for format of presentation ranged from = .21 to .34, indicating either a particularly weak effect or that a larger number of subjects may have produced more apparent group differences (see Stevens, 2002).

## Discussion

### Summary of Findings

It was predicted that in a lexical decision-making task men and women exposed to sexually explicit depictions of females who appear to be minors (barely legal pornography) would more quickly recognize words with sexual connotations when these words were subsequently presented after neutral images of female minors compared to individuals exposed to depictions featuring models in all other age groups.

**Table 11**  
**Means for Estimated Prevalence and Popularity of Web-Based Barely Legal Sexually Explicit Content**

Age of Model	Under Age 18	All Other Model Groups	Marginals
Presentation Format			
Non-Web	-.255 (0.817) <i>N</i> = 23	.273 (1.184) <i>N</i> = 50	.107 (1.103) <i>N</i> = 73
Web	-.003 (0.889) <i>N</i> = 30	-.129 (0.943) <i>N</i> = 50	.058 (0.945) <i>N</i> = 80
Marginals	-.112 <sup>a</sup> (0.859) <i>N</i> = 53	.072 <sup>a</sup> (1.084) <i>N</i> = 100	

Note: Values enclosed in parentheses represent standard deviations. Means with common superscripts differ at the  $p = .014$  level.

We found that men and women who were exposed to barely legal pornography were faster to recognize sexual words, most notably the term *erotic*, after being primed with neutral depictions of girls (mean perceived age = 12.34) compared to participants who were preexposed to adult pornography. We also found that participants exposed to *both* barely legal pornography and to pornography with models who appeared to be between the ages of 21 and 28 showed significantly greater decreases in their response latencies to sexual words following 21–28-year-old primes than participants exposed to older age sexually explicit content.

Participants preexposed to pornography wherein females appeared to be age 31–45 did not recognize words with sexual connotations any faster when primed with neutral images of females age 31–45 compared to individuals exposed to pornography featuring all other age groups. Likewise, participants preexposed to pornography wherein females who appeared to be over age 50 were also no faster in recognizing words with sexual connotations when primed with neutral images compared to those exposed to control depictions.

There were no differences in responses to neutral primes between male and female participants for any of the pornography conditions.

The second hypothesis predicted a positive linear relationship between perceived age of models in the pornography and the participant sexual word recognition when the words were presented after neutral images of female minors in a lexical decision-making task. A trend analysis on response latency scores showed a significant effect. Mean values of all four sexual words combined showed that participants took longer to recognize sexual words after exposure to neutral depictions of underage females the older the models they saw in the exposure condition.

Third, it was predicted that men exposed to barely legal sexually explicit depictions would estimate the amount and popularity of such content to be higher than women exposed to sexually explicit materials depicting barely legal or older models. Furthermore, an interaction effect between the apparent age of models in sexually explicit content and the format in which such content is presented (Web vs. non-Web) was also predicted. Contrary to predictions, male and female participants exposed to sexually explicit depictions featuring barely legal models estimated lower prevalence and popularity of barely legal depictions than those in other conditions.

The interaction effect between age of model and presentation format was also not in the hypothesized direction. Participants in the adult model/non-Web condition scored significantly higher in their estimations of the popularity of barely legal pornography than those in both the barely legal/non-Web and adult/Web conditions. The results for social acceptability of sexual interaction with minors were also not expected. Contrary to expectations, gender's influence was limited to only one variable: clearly legal sexual activities. Male participants found clearly legal sexual behaviors more socially acceptable than female participants. No other main effects or interaction effects were found. Each of these findings, or the failure to find an anticipated outcome, is discussed in further detail below.

### **Age of Models and Conceptual Associations Between Youth and Sexuality**

The results of this study provide support for a spreading activation cognitive model of effects of exposure to barely legal sexually explicit depictions. As evidenced by shorter response latencies in a lexical decision-making task, men and women exposed to virtual child pornography or barely legal pornography showed a stronger cognitive association between youth and sexuality than subjects exposed to materials featuring older-looking models.

The positive linear relationship found between perceived age of the females in the pornography and response latencies on the lexical decision-making task lends further support to a spreading activation explanation. Although postexposure response latencies decreased for all subjects exposed to pornography, the magnitude of that decrease grew as the age of the models in the sexually explicit content to which subjects were exposed rose. As predicted, the more similar in age the models in the pornography appeared to be to the post-barely legal exposure primes (neutral minors), the greater the decrease in response latency. This finding of a linear relationship lends confidence to the idea that it is exposure to sexually explicit depictions of youth per se that is driving the observed effects, not merely exposure to any sexually explicit stimuli that might have sexualized any subsequent priming situation. Compared to other participants in the study, those in the under age 18 experimental condition were uniquely more likely to associate sex with subsequent youthful, neutral primes.

Although no difference was found for response latency differences between participants in the under age 18 condition and the 21–28-year-old condition, both of these groups showed significantly greater decreases in response latency than participants in either of the two older pornography exposure conditions. Thus, it appears that while only exposure to virtual child pornography significantly increased the cognitive association between sex and youth, both virtual child pornography and pornography featuring women who appear to be in their 20s resulted in such an increase for images of women who appeared to be between the ages of 21 and 28.

The findings of no differences between any of the sexually explicit content exposure conditions with regard to response latency differences for the age 31–45 or over age 50 neutral primes may be a function of the lack of attractiveness associated with the older models in the pornographic images included in these conditions. Pretest attractiveness ratings for the images in the age 30–34 and over age 50 conditions were significantly lower than those for the images in the other two age group conditions. It is possible that the images presented in the two older exposure groups were so removed from participants experience or imagination that these images were not perceived by participants as sexual during exposure. Consequently, the subsequent likelihood of spreading activation in response to exposure to subsequent presentation of neutral images of members of these age groups was less likely.

It should be noted that the mean age of participants in this study was below the age of 20. It may be simply more difficult for such young participants to associate sex with models who are as much as 30 years older than themselves. Alternatively, it may in fact be the case that participants of any age would have a similar difficulty associating sex and sexuality with older looking women. Unfortunately, the current data do not allow us to test for this.

### **Estimates of Prevalence and Popularity of Barely Legal Pornography**

Although exposure to barely legal sexually explicit content did appear to make the concepts of youth and sexuality more easily accessible, as evidenced by reaction times, this increase in accessibility did not result in an increase in participants' estimates of either the amount or popularity of such content.

An explanation for this finding is the possibility that the brevity of the exposure to sexually explicit depictions of youth, rather than increasing the availability of constructs related to youth and sex, resulted in the formation of a construct regarding the rarity of such content. Participants in the under age 18 condition were presented with only a small amount of content from a genre with which they may have been somewhat surprised to see. Perhaps this brief exposure served merely to remind them of the social stigma that has been attached to the idea of adults having sex with individuals under age 18. Once a novelty construct was activated, participants estimated lesser levels of prevalence and popularity than participants for whom such construct

activation had not occurred. It is likely that after extended exposure to barely legal sexually explicit depictions, a person would associate less and less novelty with such content. Once the sense of novelty was diminished, one would expect continued exposure to result in strengthening of the sex-youth construct and therefore an increase in its availability. This increase in cognitive availability should then result in increased estimates of prevalence and popularity as originally expected.

The unexpected findings regarding the interaction effect on perceptions of prevalence of general pornographic content should also be addressed. As reported, participants in the adult/non-Web condition estimated significantly greater prevalence of general pornographic content than those in the adult/Web or barely legal non-Web condition. It seems possible that the fact that there is simply more overall information on the page in the Web-based condition than in the non-Web-based condition served to distract participants from the pornographic content on the page. The findings might therefore be explained as the result of some form of limited capacity model of information processing. Future research in this area should address this possibility.

Lack of sufficient exposure time to barely legal pornography may also explain the failure to obtain effects for the format of presentation manipulation. Participants in the Web-based conditions were also exposed to only 19 still images embedded in what they believed was a single sexually explicit Web site. It seems likely that greater exposure to a larger amount of barely legal content, particularly in Web formats, might eventually result in the predicted effects.

### **Acceptability of Child Pornography and Sexual Behavior Involving Minors**

No support was found for the prediction that participants exposed to barely legal content would subsequently find sexually explicit material featuring actual minors, or sexual interaction between adults and minors, to be more socially acceptable or legitimate than participants preexposed to older looking sexually explicit depictions. Furthermore, no support was found for the predicted interaction effect of apparent model age and format of presentation resulting in the greatest levels of acceptability or legitimization.

Hypotheses regarding social acceptability and legitimization were based largely on the idea that exposure to barely legal sexually explicit depictions, particularly when presented in a Web-based format, would serve to disinhibit viewers. There are three assumptions underlying these predictions. The first, drawn from the evolutionary psychological perspective, is that adults have a natural predisposition to view females who appear particularly youthful and who exhibit some degree of secondary sexual characteristics as sexually attractive. The second assumption was that through presentation of barely legal models a schema wherein sex and arousal would be associated with youth would be formed in the viewer. The third assumption was that the

features of the Web-based presentation, particularly indications of social support for the sexualization of underage adults present on the Web, would break down inhibitions associated with this type of sexual activity.

It is possible that male adults may find barely legal pornography attractive and, with exposure to it, form a cognitive link between youth and sex that would not exist but for such exposure. However, it is also possible that the inhibitions associated with this clearly taboo form of sexual behavior in contemporary Western society would not easily break down. Men have learned to react with discomfort to stimuli that may be sexually arousing because such arousing potential may have serious negative social repercussions.

Such a disinhibitory effect was expected for several reasons. First, it was assumed that most participants would come to the experimental situation believing that the sexualization of minors was relatively unpopular and therefore unacceptable among most members of society. It was assumed that simply seeing the 20 sexually explicit depictions of apparently underage females would imply to viewers that such content, and related behaviors, were more socially acceptable than they had originally thought. Exposure would suggest to participants that there was both more of, and therefore a larger market for, such content. Participants would thus instantly learn that there is more social support for the sexualization of youth than they had initially estimated.

It also seemed likely that individuals exposed to depictions of apparently underage models who appear to be experiencing joy or erotic pleasure would come to think that related behaviors were more acceptable than individuals who had not seen such content. Participants might therefore have also learned that minors involved in sexually explicit conduct actually enjoy it more than they had originally estimated. The result would be that participants exposed to barely legal content would come to rate conduct involving the sexualization of minors to be more acceptable than participants exposed to depictions featuring older appearing models.

These are all cognitive learning processes. Perhaps emotions are also involved. Viewing barely legal content may have a disinhibitory effect on the legitimacy of sexual behavior with underage youth if viewers are emotionally desensitized so that the feelings of anxiety and disgust associated with these taboo behaviors are decreased.

Desensitization occurs when, through a process of repeated exposure, one becomes habituated to a particular stimulus that initially evoked strong emotional or behavioral reactions (Gunter, 2002). These strong reactions have been found to weaken as a result of repetitive exposure to certain media images. Linz and his colleagues (Donnerstein, Linz, & Penrod, 1987; Linz, Donnerstein, & Penrod, 1984, 1988; Linz, Adams, & Donnerstein, 1989; Linz & Malamuth, 1993; Mullin & Linz, 1995) found that repeated exposure to depictions that juxtaposed violence and sex resulted in diminished affective reactions and the tendency to judge behaviors such as sexual assault and domestic violence as less harmful to women.



Viewers exposed to sexually explicit depictions featuring models who appear to be minors may be expected to become more habituated to such content and therefore to have a less negative emotional response when asked to consider related behaviors. Participants less emotionally bothered by the consideration of such behavior would be expected to rate them as more acceptable than participants experiencing greater emotional distress. Thus, more extensive exposure would desensitize participants to related content and behaviors, which would, in turn, have a disinhibitory effect on their attitudes toward them.

Furthermore, as initial negative emotional reactions wane, we might see participants come to recognize the sexually arousing nature of such content. This suggests that exposure would have a sort of twofold impact. First, viewers may become less offended by the content; then, once relaxed and somewhat disinhibited, they would realize that it is appealing and arousing. This disinhibitory effect would be most pronounced when all images were presented as part of a cohesive Web site with links, banner advertisements, and text messages all informing consumers of the popularity and prevalence of such content. The minimal exposure to pornography in the current study did not result in increases in the estimates of the popularity of content or behaviors that involve the sexualization of minors. Repeated exposure over time may be more likely to desensitize subjects to such content and related behaviors. This desensitization may result in the predicted disinhibition effect.

## Conclusions and Policy Implications

This study was designed to empirically test assumptions underlying claims made by the U.S. government, as a rationale for the CPPA (1996), that virtual child pornography stimulates and whets adults' appetites for sex with children and that such content can result in the sexual abuse or exploitation of minors becoming acceptable to and even preferred by the viewer (*Ashcroft v. Free Speech Coalition*, 2002). Findings from this study indicate that exposure to virtual child pornography, in the form of barely legal sexually explicit depictions, did result in a cognitive effect. Exposure to sexually explicit depictions featuring underage-looking models results in viewers being more likely to associate sex and sexuality to subsequent non-sexual depictions of minors.

It is important to recognize that the response latency findings in this study may say little about the likelihood that exposed individuals will act on such cognitive associations. We found no evidence of a direct causal relationship between exposure to barely legal pornography and the likelihood that adults will estimate greater prevalence and popularity of such content among others in the population. Likewise, we found no evidence that exposure causes adults to be more accepting of actual child pornography or of sexual interaction between adults and minors.

The results of this study suggest that the relationship between strengthened sex-youth cognitions as indicated by response latencies and the likelihood of acting on

such cognitive associations is complex. Endorsement of deviant sexual behavior involving minors may include the formation of a sex-youth cognitive schema, but the mere formation of such a schema does not by any means guarantee deviant action.

It would seem that once the cognitive association is made, the viewer's evaluation of this cognition as good or bad, or acceptable or unacceptable, must be taken into account. It is quite possible that a cognitive schema that includes youth and sexiness will be formed by viewing barely legal pornography but that the individual will find such thoughts disturbing or appalling and work hard to avoid making such associations in the future or to develop attitudes that reinforce the inappropriateness of these thoughts, making future deviant sexual behavior unlikely.

The first step in any intentional behavior, however, may be a cognitive consideration of performing that behavior. Therefore, exposure to any stimuli that makes the consideration of a particular behavior more likely to occur also seems likely to increase the probability that an individual will participate in that behavior. Thus, while it does not seem reasonable to claim, based on the totality of the current results, that the government's claims of effects relating to exposure to virtual child pornography are valid, the support found for Hypotheses 1 and 2 suggest that it would also be inappropriate to reject these claims outright.

## Note

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