# Effects of Exposure to Pornography on Male Aggressive Behavioral Tendencies

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**Abstract:** This study examined whether exposure to pornography lead to aggression, utilizing pornographic video excerpts and measuring participants' aggression by the number of human faces chosen as targets during a dart-throwing decision task. Male college students ($n$ = 120) were randomly assigned into one of three experimental groups who viewed the sexually explicit material (nonviolent, sadomasochistic, or violent pornography) or to a control group who viewed nonsexual, nonviolent material. Each participant could then behave aggressively, or not, in a dart-throwing decision task offering pictures of human faces as possible targets. The facilitative effect of aggression was significant for all three groups exposed to pornography. The effect was especially conspicuous for those groups exposed to violent pornography.

**Keywords:** Aggressive behavioral tendency, dart-throwing decision task, pornography, violent pornography.

## INTRODUCTION

Researchers have conducted a considerable number of studies on the connection between exposure to sexually explicit material (i.e., pornography) and aggression. Previous research principally showed that exposure to pornography increased males' aggressive behaviors and negative attitudes toward females [1-6]. Exposing males to violent pornography that presented a woman victim as responsible for her victimization or as enjoying the assault produced demonstrably more significant effects than those produced by exposing males to nonviolent pornography. Exposure to such violent pornography also increased males' acceptance of rape myths, sexual arousal in response to rape imagery, and aggression against women [7-11].

The U.S. Presidential Commission on Obscenity and Pornography [12] concluded there was no evidence of a relationship between exposure to pornography and subsequent aggression, particularly in sexual crimes. Since the Commission revealed this conclusion, numerous experimental studies have investigated causal relationships between pornography exposure and aggressive behavior [4, 13-17]. Laboratory research has indicated exposure to sexually explicit material can facilitate aggressive behavior under certain conditions causing affective responses (e.g., anger). In those studies, two variables, anger arousal and sexual arousal, seemingly facilitated the aggression resulting from exposure to pornography. This research mainly aimed to discover whether exposing males to pornography generally affected their aggression and, more specifically, whether violent pornography affects males' aggressive behaviors against women.

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A typical experiment of this type exposed male participants to different types of sexually explicit material or to neutral stimuli: a scene of a man raping a woman, a scene depicting nonviolent sex, or a scene containing neither sex nor violence. Prior to viewing the sexual stimuli, each male participant interacted with a female confederate. The confederate antagonized or annoyed the participants in the experimental group (e.g., the confederate rated the participants as quite unfavorable and derogatory), whereas the confederate treated control group participants in a friendly (e.g., the confederate rated the participants quite favorable) or neutral (e.g., the participants were exposed to neutral stimuli right away without rating them) manner.

In the latter part of such an experiment, the paradigm gave each participant an opportunity to act against the confederate by delivering an electric shock every time the confederate made a mistake on a learning task. The researchers thus used the strengths of the shocks participants "administered" to measure their aggressive tendencies [1, 4, 13, 16]. In a meta-analysis of 33 studies ($N$ = 2,040), Allen *et al*. [13] concluded that a connection between exposure to pornography and subsequent behavioral aggression exists, but many factors (e.g., prior anger, content of the pornography) influence the connection. For example, aggravated participants (i.e., the experimental group) who were exposed to sexually explicit material subsequently revealed highly aggressive behaviors. Furthermore, exposure to violent pornography generated more aggression than exposure to nonviolent pornography did. On the other hand, non-aggravated participants (i.e., the control group) showed no increase in aggression when exposed to pornography.

There are two possible explanations for the relationship between exposure to pornography and aggressive behavior: *excitation transfer theory* and *social learning theory*. Excitation transfer theory is based on the theory of Schachter and Singer [18] that the experiencing of emotions depends on autonomic arousal and cognitive interpretation of the

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arousal state. In excitation transfer, a provoked person feels anger toward the provoker, and the amount of physiological arousal at that particular time determines the anger intensity. When the person is again angry with the provoker (or perhaps with some other agent), the previous arousal level determines the intensity of the later anger [19]. Since viewing pornography usually elicits physiological arousal, the theory predicts that a person could attribute this arousal to anger if the person had experienced previous provocation. The theory likewise suggests that a previously-angered group will manifest higher aggression levels when viewing pornography than a control group, while a group with exposure to pornography but not to provocation will not differ in aggression level as compared to the control group. On the other hand, social learning theorists argue that individuals may learn both appropriate and inappropriate behaviors through the mass media, which provide information about the rewards and punishments for such behaviors. According to this theory, viewing violent pornography can increase males' subsequent aggressive behaviors because it portrays these behaviors as rewarding [13, 16].

Early laboratory research on the relationship between pornography and aggression had a few limitations. Primarily, there was strong evidence that the facilitative effect of the erotic stimuli on aggression depended on prior anger instigation [20]. Male participants in such experimental groups (i.e., those who had been provoked) were exposed to pornography. They then received an opportunity to express their frustration by administering electric shocks to the source of their annoyance. The manner in which they indicated something had facilitated their aggressive behavior. However, such increased retaliatory aggression would be neither an excitatory reaction to provocation nor an excitatory reaction to sexually explicit material. Facilitation of such aggression results from a combination of anger, due to provocation, and arousal, due to exposure to pornography.

The unprovoked participants (control group) who were treated as friendly or neutral showed increase or no increase in aggression when exposure to pornography. But Allen *et al*. concluded that the unprovoked participants exhibit no increase in aggressive [13]. Thus, it was difficult to discern whether exposure to pornography affected subsequent aggressive behavior. When the control group exposed to pornography had an opportunity to act against the confederate, they were not aggressive because the confederate had treated the participants in a friendly manner or had no interaction with them. In earlier studies with unprovoked participants, the participant's positive or neutral feeling toward the confederate was a factor, and aggression failed to follow participant exposure to pornography.

To summarize, previous research regarding exposure to pornography and aggressive behavior involved participants in provocative conditions prior to their viewing of the pornographic materials. In addition, the confederate who provoked the participants became the potential target for the aggressive behavior. Therefore, for provoked participants, previous feelings of anger and arousal resulting from exposure to pornography compounded their facilitated aggression. For unprovoked participants, the arousal from such exposure did not translate into aggression against the confederate. However, the direct link between exposure to pornography and aggressive behavior contains a structural limitation. An examination of any direct connection between exposure to pornography and aggressive behavior requires experimental methods that exclude emotional experiences such as provocation.

Aggression refers to the intention to harm another person [21]. Earlier laboratory studies that designed to examine the effects of pornography exposure on aggression typically used a version of the Buss shock paradigm [16]. However, this approach has at least a couple of weak points [5, 16, 22]. First, the participants in shock paradigm studies (especially college students) often know of the obedience studies of Milgram [23] and thus likely disbelieve that such studies will deliver real shocks. Second, the participants in many shock paradigms are told that the experiment investigates the effects of punishment on learning; thus, the shock intensities could be associated with intentions besides hurting the other (e.g., to be a good teacher).

Recent research on measuring aggression has employed alternative methods [5, 22, 24-26]. Lieberman et a1. [22] introduced an aggression-measurement method that used the amount of hot sauce allocated to a target who earlier provoked the participant. Meanwhile, other studies have used photographs depicting nonliving, nonhuman, and human images as potential targets of aggressive behavior. For example, Capezza [24] measured violence with a shooting game. Different images (bull's-eye, duck from a video game, live ducks, bronze duck, four bottles, member of the KKK, Hitler, and an old man) were individually projected onto a screen in front of the participants. They could then decide if they would shoot at the image, using a toy gun. The participants often chose to shoot at the bull's-eye, the video-game duck, the four bottles, the KKK member, and Hitler, but they generally did not shoot at the live ducks or the old man, because they perceived shooting these targets as aggressive behavior.

In their study of the sex-aggression association, Mussweiler and Förster [26] measured aggressive behavioral tendencies *via* a dart-throwing task, comparing participants' aggressive behaviors after priming them with sets of either sexual or neutral words. The targets for these darts [two pictures depicting faces (one male, one female), and two pictures depicting objects (a vase and an orange)] were arranged randomly on a square dartboard. Males more often chose faces as targets after being primed with sexual words. Yang and Youn [5] also measured the association between sexual stimuli and aggressive tendencies using a dart-throwing task. They exposed participants to either sexual stimuli (pornography) or neutral stimuli and then asked them to choose 10 out of 20 pictures, which were arranged randomly on a square board, to be targets. The 20 pictures depicted 10 human faces (5 males, 5 females) and 10 objects (5 fruits, 5 vases). Male participants exposed to pornography chose pictures of human faces more frequently than participants exposed to the neutral stimuli did. Furthermore, male participants in the sexual stimulus condition also chose a greater number of female than male face pictures as the targets of their aggression.

The current study aimed to confirm that exposure to pornography can influence laboratory aggressive behavior through three main objectives. First, we sought to confirm, *via* a dart-throwing decision task, that exposure to pornography facilitates male aggressive behavior; second, we examined whether this facilitative effect on aggression differed according to the content of the pornographic materials; and third, we tried to determine whether male participants more frequently choose female than male face pictures as targets of aggression after exposure to violent pornography. In the study, the pornographic materials were divided into three categories according to whether the sexual content appeared consensual and whether it included violence. Nonviolent pornography depicted consensual, nonviolent heterosexual interaction, sadomasochistic pornography depicted consensual heterosexual sexual interaction with mutual violence, and violent pornography depicted nonconsensual sexual interaction with a male aggressor and female victim.

The above objectives generated the following hypotheses:

(1) Exposing participants to pornography, as opposed to neutral stimuli, will result in higher levels of their aggression; and

(2) After exposure to violent pornography, participants will choose a greater number of female than male faces as targets of their aggressive behavior.

The above hypotheses, in turn, produced the following research questions:

(1) Will exposure to pornography depicting violent sexual interaction result in higher levels of participants' aggression than exposure to nonviolent sexual interaction will?

(2) Will exposure to pornography depicting violent, nonconsensual sexual interaction result in higher levels of participant's aggression than exposure to consensual sexual interaction will?

## METHOD

### Pretest

The pretest validated the use of a dart-throwing decision task to measure aggressive behavioral tendencies. In this procedure, 123 male students enrolled in an *Introduction to Psychology* course were asked to complete a self-report questionnaire on aggression. It comprised nine items about the domain of physical aggression and used a five-point scale [27]. These nine items had a high internal consistency ($\alpha = .83$). We divided the students into two groups based on their self-reported physical aggression scores (total score range, 9-45). The Group 1 comprised those in the lowest quartile of the score distribution (range, 10-19; $n = 16$) and the Group 2, the highest quartile (range, 29-40; $n = 19$). Every student performed a dart-throwing decision task. The targets comprised eight black-and-white photographs: four depicted human faces (two males, two females) and four depicted objects (a cup, a vase, a bag, and a roll of adhesive tape). The eight photographs appeared before each participant one at a time, in a random sequence, at the center of the dartboard. Participants were instructed to decide whether or not to throw a dart at each photograph.

The two groups showed a significant difference in the frequencies with which they threw darts at human face targets, $F(1, 34) = 4.27$, $P < .05$. The second group tended to choose human face pictures as targets more often than the first group did (0.84 vs. 0.25). However, there was no difference between the two groups with regard to their tendencies to choose object pictures as targets (2.88 vs. 2.95). Self-reported physical aggression correlated significantly with the number of human faces chosen as targets, $r(35) = .42$, $P < .01$. These findings suggest that throwing a dart at a picture of a human face is an aggressive act.

### Participants

The participants were 120 male undergraduate student volunteers enrolled in an *Introduction to Psychology* course at a large university located in the southwestern region of Korea. No participants had ever been married, and they reported their sexual orientation as heterosexual. They were assigned randomly to one of the four stimulus conditions described in the following section. Mean age was 21.54 years ($SD = 2.22$; range, 19-26), with no significant age differences among any of the groups, $F(3, 116) = 1.55$, $P > .05$ (see Table **1**). Participants were asked to respond to the question, "How often were you exposed to pornography during the last six months?" to measure their frequency of exposure to pornography. Responses ranged from 1 to 7: 1 (*never*), 2 (*once during the last two or three months*), 3 (*once a month*), 4 (*twice a month*), 5 (*once a week*), 6 (*three or four times a week*), and 7 (*almost every day*). Mean frequency of exposure to pornography was 4.13 ($SD = 1.31$; range, 2-6), which meant an exposure of twice a month, on the average. There was no significant difference among the groups in their frequency of exposure to pornography during the six months before the experiment. In addition, participants' results on a self-report questionnaire about aggression, which consisted of 29 items on a five-point scale [27], showed no significant difference in aggression levels among the four groups.

### Measures

The independent variables in this study were stimulus conditions (neutral, nonviolent-sexual, sadomasochistic, and violent-sexual) and target type (male faces and female faces). The dependent variable was aggressive behavioral tendencies, as measured by the dart-throwing decision task.

#### *Stimulus Materials*

This study utilized four types of stimuli, in the form of 10-minute video excerpts. Three of these were sexually explicit pornographic materials commercially available to the public,[1] and the fourth was a neutral stimulus. The

[1] As a pilot study of the current study, 20 male participants, randomly distributed into three groups, watched these videos to assess the stimulus materials as nonviolent, sadomasochistic, or violent pornography. After watching a video excerpt, the participants answered four questions about it, each on a nine-point scale. Responses to the first, "What is the degree of sexual explicitness in the film?" ranged from 1, *not at all,* to 9, *very much so*. For the second, "How sexually aroused did you feel while viewing the film?" responses ranged from 1, *no sexual arousal,* to 9, *extreme sexual arousal*. Responses to the third, "Are there any aggressive or violent behaviors in the film?" ranged from 1, *none at all* to 9, *very many*, and to the fourth, "Did they have

**Table 1. Means of Sample Characteristics for Each Stimulus Condition**

| Variables | Stimulus Condition | | | | | | | | *F* |
|---|---|---|---|---|---|---|---|---|---|
| | Neutral (*n*=30) | | Nonviolent (*n*=30) | | Sadomasochistic (*n*=30) | | Violent (*n*=30) | | |
| | *M* | *SD* | *M* | *SD* | *M* | *SD* | *M* | *SD* | |
| Age | **21.70** | 2.34 | **21.77** | 2.06 | **21.90** | 2.35 | **20.80** | 2.06 | 1.55 |
| Frequency of pornography exposure | **4.03** | 1.25 | **4.13** | 1.31 | **4.20** | 1.35 | **4.13** | 1.25 | < 1 |
| Self-reported aggression | **79.03** | 10.93 | **83.00** | 10.37 | **79.23** | 14.29 | **81.13** | 14.33 | < 1 |

sexually explicit materials were categorized based on their consensual and/or violent heterosexual interaction content into nonviolent pornography, sadomasochistic pornography, and violent pornography. The nonviolent pornography focused on scenes of an adult male and female couple consensually engaging in a variety of sexual activities (e.g., manual or oral stimulation of the genitals, coitus). All interactions in this category were mutual, non-derogatory, and non-abusive [28]. Participants viewing this type of stimulus constituted the NV group ($n$ = 30).

The second sexually explicit stimulus comprised sadomasochistic pornography, in which an adult male and female engaged in mutual, violent but consensual sexual interaction. Both were seen to enjoy inflicting pain upon the other and receiving pain (e.g., manual stimulation of genitals in flogging, oral stimulation of genitals or sexual intercourse in bondage) while satisfying their sexual desires. Participants viewing this type of stimulus constituted the SM group ($n$ = 30).

The violent pornography stimulus depicted a non-mutual interaction between an adult male and female, in which the male grabbed the female, forcibly removed her clothes, threw her onto the bed, and forced her to engage in cunnilingus and sexual intercourse. The satisfaction of the male and the pain and distress of the female in this nonconsensual interaction were evident. The victim consistently resisted the coercive sexual activity, from beginning to end. Participants viewing this stimulus constituted the V group ($n$ = 30).

The neutral stimulus was used as a control condition to compare the other three stimulus conditions against. This group viewed clips from a wildlife documentary that contained no aggressive or sexual content, focusing on scenes of underwater creatures of the Federated States of Micronesia. Participants viewing this stimulus constituted the N group ($n$ = 30).

After watching the video excerpt, the participants responded to four questions. The first asked, "How well could you concentrate on the film?" with responses ranging from 1 (*not at all*) to 9 (*very well*). The second was, "How interesting was the film?" Responses ranged from 1 (*not at all*) to 9 (*very interesting)*. The third was, "How sexually aroused did you feel while watching the film?" Responses ranged from 1 (*no sexual arousal*) to 9 (*extremely sexually aroused*). The fourth was, "What kind of emotion did you feel while viewing the film?" Responses ranged from 1 (*a very negative feeling*) to 9 (*a very positive feeling*).

### *Dart-throwing Decision Task*

To evaluate the dependent variable (i.e., aggressive behavioral tendencies) we employed a dart-throwing decision task.[2] This is a modification of a type of dart-throwing task from earlier studies [5, 22]. In this task, the participants had to decide whether to throw a dart at each of the various dartboard targets, which comprised photographs of human faces as well as of various objects. The targets consisted of eight black-and-white photographs [5], with four depicting human faces with slightly smiling expressions (two males and two females)[3] and four depicting objects (a cup, a vase, a bag, and a roll of adhesive tape). Each photograph in circular form was 16 cm in diameter. Each participant received a random sequence of untouched targets.

The dartboard was 45 cm × 45 cm × 3.5 cm (manufactured by Puma Dart Products Ltd, NZ) and was 1.73 m from the ground to the bull's-eye. Each steel-tipped dart weighed 34 g. The participants threw the darts from a distance of 2.37 m. The dependent measure, the indicator of the participant's tendency to behave aggressively, was the number of human faces (out of a possible four) each participant chose to target. Whether the participants threw their darts at images of human faces reflected their aggressive behavioral tendencies. If a participant threw at a

consensual sexual activity?" ranged from 1, *not at all* to 9, *very definitely*. There were no significant differences in "degree of sexual explicitness" ($F$ < 1) and "degree of sexual arousal" ($F$ < 1) among the three types of pornography. Participants rated the sadomasochistic and violent pornography higher on "aggressive or violent behavior" [$F(2,12) = 162.33$, $P < .001$] than they did the nonviolent pornography. Likewise, they rated the nonviolent and sadomasochistic pornography higher on "consensual sexual activity" [$F(2,12) = 131.40$, $P < .001$] than they rated the violent pornography.

[2] Aggressive behavioral tendencies were measured through a dart-throwing decision task instead of an shock paradigm. In the dart-throwing decision task, we measured participant's aggression by allowing them to decide whether they should behave aggressively, while offering photographs of human faces as targets of such aggression. One may argue that this paradigm does not assess aggressive behavior in its strictest sense, typically defined as the intention to harm another person [21], because, in the dart-throwing task, participants do not inflict aggression on an actual person, but merely on male and female images. However, researchers have suggested many people often believe the image equals the object and, consequently, behave toward an image in a manner similar to the way they would behave toward the actual object [5, 24, 25].

[3] In a pilot study, 15 male participants viewed a random sequence of 12 black-and-white pictures of human faces having slightly smiling expressions (six males and six females). They were then asked to rate the attractiveness of each face on a nine-point scale (from 1, *not at all*, to 9, *very attractive*). We chose two male and two female face pictures, which participants rated *somewhat attractive*, but which did not differ statistically from one another in level of attractiveness ($F$ < 1), as the targets for the current study.

photograph of a human face, he received one point; if the participant chose not to throw, he received no points. Thus, each participant's score ranged from zero to four points.

### Procedure

First, the participants were informed that the experiment was designed to examine the connection between exposure to video excerpts, involving either pornography or a wildlife documentary, and concentration ability. Prior to viewing the videos, the participants were told the study involved two steps. The first step would consist of watching pornography or a wildlife documentary for about 10 minutes, followed by the second step, which would investigate their ability to concentrate *via* the dart-throwing decision task. The participants were asked to listen to the instructions carefully and sign a consent form. They were also informed of their option to withdraw from the experiment if the video excerpt made them feel uncomfortable.

Each participant viewed his video inside a soundproof experimental chamber that contained a desk, a chair, and a computer. One computer video file, which contained either one of three types of pornography or the neutral material, was randomly assigned to each participant. Before seeing the actual clip, the participants received a brief summary on the type of stimulus in the video. The participant voluntarily opened the file to begin viewing the video. After watching their video excerpts, the participants rated their concentration, interest, affective state, and subjective sexual arousal using nine-point Likert-type scales. The participants were asked to go to a different experimental chamber for the second step. They were not told this was a test for aggressive behavior tendencies but were told it was a test of their ability to concentrate.

The dart-throwing decision task comprised three stages. In the first stage, each participant practiced by throwing five darts at the dartboard. In the second stage, the participant again threw five darts, aiming at the bull's eye. An experimenter recorded the points to make the participant believe the experimenter was investigating his ability to concentrate. The final stage was the actual testing of aggressive behavioral tendencies. The following instructions were given to the participants, who stood approximately 2.4 m from the dartboard: "*We will assess your accuracy when you throw the darts at the target. The targets consist of eight black-and-white photographs. Each picture will be placed at the center of the dartboard, and they will be shown one at a time in random sequence. You must decide whether to throw a dart as soon as you view a target picture. When you decide to throw a dart at a target, throw it after saying 'Yes!' When you decide not to throw a dart at a target, just say 'No!'*"

When a participant threw a dart, the experimenter recorded whether the participant hit the target. Immediately after the participant either threw or said "No!" the experimenter presented the next target. The participants had to decide whether to throw up to eight times. No participants ever completely missed a target they threw at, because we presented them with large targets at quite a close distance.

After the dart-throwing decision task, the participants completed a final questionnaire about self-reported aggression.[4] Subsequent to the completion of the questionnaire, the participants were thanked for their participation and asked the reason they did or did not throw each dart. Their answers were tape-recorded and transcribed. At the end of the experiment, the experimenter completely explained the nature of the experiment to the participants and answered any questions. For each participant, the full experimental session lasted about 30 minutes.

## RESULTS

### Stimulus Materials Ratings

Table **2** shows the results of the participants' responses to the four questions regarding the stimulus materials. The main effects of the stimulus materials were gauged from answers to questions about how well the participants could concentrate on each film ($F < 1$), how interesting each film was [$F(3, 116) = 5.62$, $P < .01$], how sexually arousing it was [$F(3, 116) = 92.26$, $P < .001$], and what kind of positive or negative affective state the film caused [$F(3, 116) = 57.90$, $P < .001$]. Table **2** shows there was no difference in concentration among the groups but all three pornographic stimuli were more interesting and more sexually arousing than the neutral stimulus was. Based on the participants' ratings, the neutral stimulus induced a positive affective state more than the three types of pornography did, and the nonviolent pornography elicited a more positive feeling than the sadomasochistic or the violent pornography did.

### Aggressive Behavioral Tendencies

In this study, the independent variables were the stimulus condition and the target type. The stimulus condition had four levels: neutral, nonviolent, sadomasochistic, and violent. The target type had two levels: male and female face pictures. The dependent variable (aggressive behavior tendencies) was measured by the number of human faces participants chose to throw at during the dart-throwing decision task. Although four targets were pictures of objects, the current study did not use the choice of object pictures as targets as an indicator of aggressive behavioral tendencies. Additionally, the groups showed no significant differences when the targets offered were nonhuman (object) pictures ($F < 1$), nor did the groups show significant differences in choosing each object picture (a cup, a vase, a bag, and a roll of adhesive tape) as targets ($F < 1$).

Table **3** presents the mean number of times human faces were chosen as targets according to stimulus condition and target type. The mean number of human faces as targets was evaluated in a 2 × 4 ANOVA using the stimulus condition (neutral, nonviolent, sadomasochistic, and violent) as a between-subjects factor and the target (male and female faces) as a within-subjects factor. Table **4** illustrates how the two-way ANOVA revealed significant main effects for each stimulus condition [$F(3, 116) = 12.32$, $P < .001$], target type

[4] Male undergraduate students ($n = 158$) who enrolled in an *Introduction to Psychology* course were asked to complete a self-report questionnaire [27] on aggression in the first week of the semester. The dart-throwing decision experiment began around the fifth week of the semester. When the students participated in the experiment, they were again asked to complete a self-report questionnaire, at the end of the experimental session. The two aggression scores were highly correlated, $r = .87$, $P < .001$, and the data analysis used the second set of aggression scores.

**Table 2. Mean Ratings of Each Stimulus Conditions**

| Variables | Stimulus Condition | | | | | | | | *F* |
|---|---|---|---|---|---|---|---|---|---|
| | Neutral | | Nonviolent | | Sadomasochistic | | Violent | | |
| | M | *SD* | *M* | *SD* | *M* | *SD* | *M* | *SD* | |
| Concentration | **5.17**$_a$ | 1.32 | **5.63**$_a$ | 1.96 | **5.90**$_a$ | 2.02 | **5.37**$_a$ | 1.65 | < 1 |
| Interesting | **3.97**$_a$ | 2.06 | **5.83**$_b$ | 2.19 | **5.37**$_b$ | 1.40 | **5.47**$_b$ | 1.81 | 5.62*** |
| Sexually arousing | **1.10**$_a$ | 0.31 | **5.93**$_b$ | 1.76 | **5.53**$_b$ | 1.41 | **5.87**$_b$ | 1.41 | 92.26*** |
| Affective state | **6.87**$_a$ | 1.31 | **5.50**$_b$ | 1.61 | **2.93**$_c$ | 1.36 | **2.83**$_c$ | 1.42 | 57.90*** |

***P < .001

*Note.* All responses used a nine-point scale, as follows: 'concentration' (1, *not at all* to 9, *very well*), 'interesting' (1, *not at all* to 9, *very much so*), 'sexually arousing' (1, *no sexual arousal* to 9, *extreme sexual arousal*), and 'affective state' (1, *very negative feelings* to 9, *very positive feelings)*. Means that do not share a common subscript within each row differ significantly from each other according to Scheffé's procedure ($P < .05$).

**Table 3. Mean Number of Chosen Faces as a Function of Stimulus Condition and Target Type**

| Stimulus Condition | Target | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Male Face (a) | | Female Face (b) | | Total (a+b) | | Non-human (Object) | |
| | *M* | *SD* | *M* | *SD* | *M* | *SD* | *M* | *SD* |
| N group | **0.17**$_a$ | 0.46 | **0.13**$_a$ | 0.35 | **0.30**$_a$ | 0.75 | **3.17** | 0.91 |
| NV group | **0.60**$_{ab}$ | 0.86 | **0.80**$_b$ | 0.85 | **1.40**$_b$ | 1.48 | **3.07** | 0.87 |
| SM group | **0.93**$_b$ | 0.91 | **0.90**$_{bc}$ | 0.92 | **1.83**$_{bc}$ | 1.76 | **3.23** | 0.94 |
| V group | **1.03**$_b$ | 0.81 | **1.40**$_c$ | 0.81 | **2.43**$_c$ | 1.43 | **3.37** | 0.89 |

*Note.* N = neutral stimuli; NV = nonviolent pornography; SM = sadomasochistic pornography; V = violent pornography. Means that do not share a common subscript within each column differ significantly from each other by Scheffé's procedure ($P < .05$).

[$F(1, 116) = 4.56$, $P < .05$], and stimulus condition × target type interaction effect [$F(3, 116) = 2.78$, $P < .05$]. Analyses indicated that the type of stimulus condition influenced participants' decisions to throw, or not, at a human face image. Contrast analyses (Helmert code) revealed significant effects for the neutral group versus the three pornography (NV, SM, V) groups [$F(1, 116) = 28.69$, $P < .001$] and the nonviolent versus the two violent pornography (SM, V) groups [$F(1, 116) = 5.43$, $P < .05$]. Participants chose a greater number of human faces when exposed to pornography, regardless of the pornography's content, than when exposed to the neutral stimulus. In addition, participants chose the human face pictures as targets more frequently when exposed to sadomasochistic and violent pornography than when exposed to nonviolent pornography. Participants also demonstrated a higher tendency to target female faces than male ones.

For the stimulus condition × target type interaction, an analysis of simple effects for stimulus condition revealed no difference between male and female faces chosen as targets by the N (0.17 vs. 0.13), NV (0.60 vs. 0.80), and SM (0.93 vs. 0.90) groups. However, the V group targeted female faces more frequently than male faces (1.03 vs. 1.40). There was a marginal effect for the SM vs. V × target type interaction [$F(1, 116) = 3.81$, $P < .10$], as well. In contrast, the SM group showed no significant difference in choosing male or female faces as targets.

For male face targets, an analysis of simple effects revealed a significant difference in the effects of stimulus conditions on aggressive behavior tendencies, $F(1, 116) = 7.58$, $P < .01$. A *post hoc* test indicated that both SM and V groups chose more male faces than the N group did. However, there was no significant difference between the N and NV groups (0.17 vs. 0.60).

For female face targets, the effect of stimulus condition on aggressive behavior tendency also showed a significant difference, $F(1, 116) = 13.86$, $P < .001$. A *post hoc* test revealed that, regardless of the pornographic materials' content, the NV, SM, and V groups chose more female faces than the N group chose. In addition, the V group chose also more female faces than did the NV group (1.40 vs. 0.80). Analysis of the total number of male and female faces chosen revealed the same pattern of results. Finally, regarding the relationship between pornography type (stimulus condition) and aggressive behavioral tendency, an analysis using a polynomial contrast coding approach revealed a significant linear relationship between violent, non-consensual pornography and the choice to throw darts at human faces, $F(1, 116) = 35.37$, $P < .001$.

## Reasons for Throwing Darts at Human Face Pictures

Why did the participants throw darts at human face pictures after exposure to pornography? It was necessary to

**Table 4. Two-way ANOVA as a Function of Stimulus Condition and Target Type**

| Source | *SS* | *df* | *MS* | *F* |
|---|---|---|---|---|
| Stimulus condition (A) | 36.48 | 3 | 12.16 | 12.32*** |
| error | 114.52 | 116 | 0.99 | |
| Target type (B) | 0.94 | 1 | 0.94 | 4.56* |
| A×B | 1.71 | 3 | 0.57 | 2.78* |
| error | 23.85 | 116 | 0.21 | |

*$P < .05$ ***$P < .001$

confirm the dart-throwing decision task's validity as a measure of aggressive behavioral tendencies. As Appendix **1** illustrates, the major reasons why the participants threw darts at human face pictures were categorized into six general themes: 1) 'just threw' (e.g., "I just wanted to throw", "I want to hit the person"), 2) 'feeling a thrill' (e.g., "It was fun to throw at a human face it is a living thing"), 3) 'hostility' (e.g., I didn't like the looks of that person", "I felt that man was my competition"), 4) 'insensibility' (e.g., "It doesn't matter because it is just a picture"), 5) 'interest in opposite sex' (e.g., "Because it is a women, and I had an interest in that women", "She looked like my type of woman"), and 6) 'sexual interest' (e.g., "I wanted to have that woman", "I felt attracted to that woman"). On the contrary, the main reason why they did not throw darts was because the target was a human face (e.g., "Although it is just a picture, it is still human face, so I couldn't throw").

In order to examine any differences in reasons for throwing darts at human face pictures by stimulus condition, tests of independence were performed. The tests revealed that there were significant differences in the conditions. The frequency of 'just threw' and 'hostility' were higher in the SM and V groups than in the N group, and that of 'feeling a thrill' was higher in the NV and V groups than in the N group. For the reason of 'insensibility' the V group showed higher frequency that the N, NV, and SM groups. And the frequency of 'sexual interest' was significantly lower in the N group than the NV, SM, and V groups.

## DISCUSSION

This study basically tested the hypothesis that exposure to pornography can influence laboratory aggressive behavior, *via* a dart-throwing decision task in which participants could decide whether to behave aggressively toward the targets.

We found that exposure to pornography increased dart throwing at human faces, which is correlated with aggressive tendencies. The aggressive tendencies differed according to the pornographic materials' content. That is, the aggressive tendencies depended on whether the pornographic acts were consensual and whether they were violent. Specifically, pornography depicting violent sexual interaction (i.e., the SM and V conditions) revealed a higher frequency of dart-throwing at human faces than nonviolent pornography. Although earlier studies have included rape and sadomasochism in the category of violent pornography [13], none have compared aggression after exposure to sadomasochistic pornography to violent pornography. In the present study, the aggressive behavior following participants' exposure to sadomasochistic pornography (depicting consensual, as well as mutual, violence) resembled that following participants' exposure to violent pornography (depicting nonconsensual violence). The aggressive behavior of dart throwing at human faces results showed partially gender-specific tendencies. That is, the three groups exposed to neutral stimuli, nonviolent pornography, and sadomasochistic pornography showed no targeting differences between male and female faces, but the participants exposed to violent pornography selected more female faces than male ones as targets. This means that exposure to violent pornography increased dart throwing at female faces, which is correlated with aggressive tendencies.

The findings of the current study emphatically support previous studies that used the shock paradigm. In these, male participants exposed to pornography tended to administer higher electric shock levels than males exposed to neutral stimuli did. In particular, exposure to violent pornography generated more aggression than exposure to nonviolent pornography did, and the aggression intensity was greater against a female than against a male target [4, 13, 29, 30]. The participants chose human faces more frequently as targets when primed with sexual words than with neutral words [26], and male participants exposed to pornography targeted human faces more frequently than male participants exposed to neutral stimuli did [5]. The current study's findings also supported those studies that used the dart throwing paradigm.

What are the possible reasons aggressive tendencies increased after participants' exposure to pornography in the present study? According to social learning theory, individuals begin to differentiate appropriate from inappropriate behaviors using the mass media because these provide information about rewards or punishments for various behaviors [31, 32]. In particular, viewing violent pornography can increase males' subsequent aggressive behavior because it portrays a male's coercive and aggressive behavior against a female victim as being a reward. In contrast, nonviolent pornography should not increase aggression, because there is no aggression to be learned [13, 16]. However, in the present study, participant exposure to nonviolent pornography also increased dart throwing at human faces, which is correlated with aggressive

tendencies, though at a lower level than violent pornography did.

Taking into account that perceived sexual arousal levels were about the same for the three pornography types, aggressive tendencies in the nonviolent pornography stimulus group might be due to viewing scenes of sexual activity. Nevertheless, the violent pornography stimuli conditions (i.e., the SM and V conditions) resulted in much higher participant aggressive behavioral tendencies than the nonviolent pornography stimulus condition produced. This difference might be due to the violent scenes producing learning effects. Male participant's aggressive tendencies toward human face pictures would be reinforced by violent scenes.

Feminist theories consider pornography as a means of eliciting violence against women [33]. Exposure to violent pornography (e.g., rape imagery) can result in changes in men's cognitive appraisals of sexual violence, according to social learning theory [16]. For instance, men who watch rape scenes could think women desire coerced sexual activity, and, thus, they could perceive a female's resistance as just a spurious action. Thus, exposure to violent pornography could result in participants throwing more darts at female than male face pictures.

According to a two-component (arousal-affect) model, exposure to sexual stimuli produces two effects; it increases arousal and influences current affective states [34, 35]. Researchers have shown that exposure to nonviolent pornography generated strong arousal and positive emotions [36, 37], while exposure to sexually violent stimuli (i.e., images of rape or bondage) generated strong arousal but substantial negative emotions, because the stimuli were demonstrated to be unpleasant or repulsive [35, 38, 39]. In the current study, the sadomasochistic and the violent pornography elicited greater negative feelings than the nonviolent pornography did. The consequent negative emotional state partially affected participants' subsequent aggressive tendencies.

The aggressive tendencies of the participants might be explained by the priming theory [26]. The participants exposed to pornographic materials for ten minutes should concentrate on the human characters in the pornography while those exposed to the neutral material did not. If priming would be effective, exposure to pornography would increase participants' frequency of throwing a dart at human face. Especially, if the participants exposed to violent pornography would pay more attention to the female character as a victim than the male character as an aggressor, they would choose female faces more as targets than male faces.

The generalizability of the present study's results has several limitations. First, this study measured short-term effects of exposure to pornography. When individuals view pornography in a real-world setting, they do not always incur these negative consequences (e.g., violence). For example, Ferguson *et al*. [40] stated that exposure frequency to television violence was not predictive of youth aggression. Also when Hald and Malamuth [41] assessed participant's reports of how hardcore pornography affected them personally in various areas (i.e., sexual knowledge, attitudes toward sex, attitudes toward and perception of the opposite sex, sex life, and general quality of life), participants reported only small negative effects with men reporting slightly more negative effects than women. Moreover, Diamond [42] stated that sex crimes have either decreased or not increased even though pornography has increased in availability. However, when individuals lacking clearly established sexual values (i.e., children, adolescents, and some adults), experience frequent exposure to pornography, they could possibly express sexual aggression toward females [43, 44].

Second, this study measured aggression by using four pictures of human faces (two males and two females) as stimuli (targets) during a dart-throwing task. Commonly, studies treat stimulus sampling as an issue of external validity, in which the issue is generalizability of the results across other participants, stimuli, time, settings, and so on. If the human face pictures were verified as general stimuli, the results could be greatly generalized [45].

Third, the participants were told they would be watching either pornography or a wildlife documentary for about 10 minutes. These instructions might frustrate some participants, who wanted to watch pornography, or disappoint other participants, who would like to view a nature documentary rather than pornography. Such reactions may have confounded participants' aggressive tendencies. Further research is required to control for participants' expectation or sexual arousal prior to their exposure to the pornography.

Fourth, this study examined the association between exposure to pornography and aggression *via* randomization of the participants, but participant self-report questionnaire scores about aggression, especially in the domain of physical aggression, correlated significantly with the number of human faces chosen as targets, $r(120) = .39$, $P < .01$. Thus, future research needs to examine the connection between exposure to pornography and aggression by apportioning participants into groups according to individual risk factors, such as degree of aggression, degree of belief in rape myths, degree of attraction to sexual aggression, frequency of pornography use, etc.

In spite of these limitations, the present study's findings have substantial implications for the measurement of aggression after exposure to pornography. Aggressive behavioral tendencies increased after participants' exposure to pornography, and the reasons participants gave for throwing darts at human face pictures confirmed this effect. Most laboratory research on the connection between pornography and aggressive behavior focuses on male participants because they are the main pornography consumers [13]. Women can also be consumers of pornography; thus, it would seem useful to examine female laboratory aggression as well, particularly because studies involving female participants are very rare. According to the meta-analysis of Allen *et al*. [13], exposing female participants to pornography facilitated their retaliatory aggression (e.g., delivering electric shocks to a confederate). In particular, female participants showed more aggressive behavior against a male target than against a female target

who had initially annoyed the participants. Yang and Youn [5] found that, after exposure to pornography, female participants, given target choices out of photos depicting human faces and objects, chose male face pictures more often than female face pictures. Although this is a very limited result, it supports the idea that both males and females tend to show aggressive behavior against the opposite sex after viewing pornography. However, as male participants showed greater aggression toward women when exposed to violent pornography, it is necessary to examine, through further research, whether female participants under similar conditions will demonstrate aggression toward men.

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Declared none.

## CONFLICT OF INTEREST

Declared none.

**Appendix 1. Reasons for Throwing Darts at Human Face Pictures as a Function of Stimulus Condition**

| Target Reason for Throwing | Stimulus Condition | | | | | | | | | | | | | | | | | | | | | | | | $\chi^2$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | N Group | | | | | | NV Group | | | | | | SM Group | | | | | | V Group | | | | | | |
| | Male | | Female | | Total | | Male | | Female | | Total | | Male | | Female | | Total | | Male | | Female | | Total | | |
| | *f* | % | *f* | % | *f* | % | *f* | % | *f* | % | *f* | % | *f* | % | *f* | % | *f* | % | *f* | % | *f* | % | *f* | % | |
| Just threw | **2** | 3.3 | **1** | 1.7 | **3** | 2.5 | **9** | 15.0 | **2** | 3.3 | **11** | 9.1 | **10** | 16.7 | **8** | 13.3 | **18** | 15.0 | **15** | 25.0 | **10** | 16.7 | **25** | 20.8 | 21.24*** |
| Feeling a thrill | **0** | 0.0 | **0** | 0.0 | **0** | 0.0 | **4** | 6.7 | **4** | 6.7 | **8** | 6.7 | **2** | 3.3 | **0** | 0.0 | **2** | 1.7 | **6** | 10.0 | **3** | 5.0 | **9** | 7.5 | 12.89** |
| Hostility | **1** | 1.7 | **0** | 0.0 | **1** | 0.8 | **3** | 5.0 | **2** | 3.3 | **5** | 4.2 | **12** | 20.0 | **7** | 11.7 | **19** | 15.8 | **3** | 5.0 | **8** | 13.3 | **11** | 9.2 | 22.10** |
| Insensibility | **2** | 3.3 | **0** | 0.0 | **2** | 1.7 | **2** | 3.3 | **0** | 0.0 | **2** | 1.7 | **4** | 6.7 | **0** | 0.0 | **4** | 3.3 | **7** | 1.7 | **6** | 10.0 | **13** | 10.8 | 16.48*** |
| Interest in opposite sex | **0** | 0.0 | **3** | 5.0 | **3** | 2.5 | **0** | 0.0 | **8** | 13.3 | **8** | 6.7 | **0** | 0.0 | **6** | 10.0 | **6** | 5.0 | **0** | 0.0 | **7** | 11.7 | **7** | 5.8 | 2.47 |
| Sexual interest | **0** | 0.0 | **0** | 0.0 | **0** | 0.0 | **0** | 0.0 | **8** | 13.3 | **8** | 6.7 | **0** | 0.0 | **6** | 10.0 | **6** | 5.0 | **0** | 0.0 | **8** | 13.3 | **8** | 6.7 | 8.19* |
| Throw / Total trials | **5/ 60** | 8.3 | **4/ 60** | 6.7 | **9/ 120** | 7.5 | **18/ 60** | 30.0 | **24/ 60** | 39.9 | **42/ 120** | 35.1 | **28/ 60** | 46.7 | **27/ 60** | 45.0 | **55/ 120** | 45.8 | **31/ 60** | 51.7 | **42/ 60** | 70.0 | **73/ 120** | 60.8 | |

* $P < .05$ ** $P < .01$ *** $P < .001$

*Note.* N = neutral stimuli; NV = nonviolent pornography; SM = sadomasochistic pornography; V = violent pornography.

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