



Bushman and Huesmann, 2006; Gentile and Gentile, 2008; Huesmann and Kirwil, 2007; Maier and Gentile, 2012; Swing et al., 2008]. Specific to the present study, these theories suggest that playing a prosocial video game should prime knowledge structures related to prosocial actions, including associated cognitions, feelings, and physiological arousal. Of course, the efficacy of priming prosocial behavioral scripts depends on the existence of such scripts and chronic accessibility. For example, Bushman and Huesmann (2006) showed that brief experimental manipulations of media violence tend to produce somewhat larger short-term effects on older participants (mostly college students) than on younger ones. This difference in short-term effects occurs because short-term effects of media exposure are primarily attributed to activation of existing knowledge structures and children have less developed knowledge structures and fewer existing encoded cognitions based on their limited experience. Although previous work has tested the short-term effect of violent content on children, the short-term effect of prosocial content on children remains unexplored.

In addition to short-term effects the social-cognitive learning theory predicts that repeated practice with prosocial (or antisocial) behavioral scripts can yield several long-term effects, including the development of and changes in precognitive and cognitive constructs (perception and expectation schemata, beliefs, scripts), cognitive-emotional constructs (attitudes and stereotypes) and affective traits (conditioned emotional responses, empathy, trait hostility). Indeed, recent longitudinal studies (some as short as 3 months, others as long as 30 months) have found that children and adolescents who play a lot of violent video games become more aggressive over time, even after controlling for earlier aggressiveness and other theoretically relevant variables [Anderson et al., 2007, 2008; Hopf et al., 2008; Moller and Krahe, 2009; Wallenius and Punamaki, 2008]. Aggressive behaviors in these studies included getting into fights and delinquency. In terms of prosocial video game effects, the only published longitudinal study found that prosocial video game exposure significantly predicted prosocial behavior 4–5 months later, even after statistically controlling for other relevant variables [Gentile et al., 2009].

In addition to situation variables, the social-cognitive learning theories suggest that person variables (e.g., trait aggression) may also directly or indirectly influence prosocial and antisocial outcomes. For example, individual differences in aggressiveness might interact with the presence of violent stimuli in the elicitation of aggression-related thoughts,

emotional states, action tendencies, and behavioral responses. More specifically, high trait aggressive individuals might manifest all of these responses to aggressive cues more than individuals low on trait aggression, because they have more extensive aggressive cognitive-associative networks. Indeed, Bushman (1995) found that media violence was more likely to evoke aggressive affect and behavior in high rather than low trait aggressive individuals. Similarly, Gentile et al. (2009) found trait aggression to be positively related to hurting and negatively related to helping behavior. These findings are important in understanding the complicated interactions between habitual personality variables (e.g., trait aggression) and situational variables (e.g., media violence exposure). Thus, in the present study a measure of trait aggression was included to better understand the combined influence of person and situation variables on helpful and hurtful behaviors.

In sum, previous research finds support for the short- and long-term effects of violent video games on helpful and hurtful behaviors using samples of children as well as adults [see Anderson et al., 2010 for a metaanalytic review]. Similarly, prior research on prosocial video games has tested short-term (experimental) effects on adults, and long-term (cross-sectional, longitudinal) effects on children and adolescents [Gentile et al., 2009; Greitemeyer and Osswald, 2009, 2011]. However, one gap concerns whether brief exposure to prosocial games (relative to violent and neutral games) increases helpful and decreases harmful behavior among children. This question is important considering short-term effects of media exposure are usually attributed to the priming of existing well-encoded scripts, schemas, and beliefs, cognitive structures that are not as well developed in children as in adults. Thus, the main focus of the current research was to examine the effects of prosocial, neutral, and violent video games on helpful and hurtful behaviors using a sample of 9–14 years olds. A secondary focus was to further validate the help/hurt tangram measure [Gentile et al., 2009, Study 3], which simultaneously assesses helpful and hurtful behaviors, with a different age group.

## METHODS

### Participants

Participants were recruited for this study by an advertisement in the local paper and by contacting interested parents compiled from previous studies. Each child participant (104 males, 87 females) with ages ranging from 9 to 14 ( $M = 11.4$ ) completed the study individually and received 20 dollars. The study was

approved by the Iowa State University's Institutional Review Board and all participants were treated in accordance with APA ethical guidelines.

## Materials and Measures

**Trait aggression.** The 9-item physical aggression subscale of the aggression questionnaire was administered prior to the experimental manipulation to assess trait aggression [Buss and Perry, 1992]. The Buss-Perry aggression questionnaire has been successfully used to assess trait aggression with a range of age groups including elementary school children [e.g., Reynes and Lorant, 2001, 2003, 2004; Walters et al., 2010; Zhen et al., 2011]. Participants rated their agreement with statements on a 5-point scale (1 = "Extremely uncharacteristic of me," 5 = "Extremely characteristic of me"),  $\alpha = .81$ .

**Video games.** Four E-rated video games were used: two violent (*Ty2*,  $n = 31$ , *Crash Twin sanity*,  $n = 32$ ); and two neutral (*Pure Pinball*,  $n = 30$ , *Super Monkey Ball Deluxe*,  $n = 30$ ). One E-10 game was used for the prosocial category (*Chibi Robo*,  $n = 67^1$ ). *Ty2* and *Crash Twin sanity* are action adventure games in which the goal is to complete various stages by defeating the enemies and bosses, while overcoming any obstacles on the way. The goal of *Pinball* is to keep the ball on the table using the left and right triggers. *Super Monkey ball* requires the player to guide a monkey through various puzzles toward the goal within the time limit. *Chibi Robo* lets the player control a robot whose job is to make its family happy by cleaning up, helping them out in their chores, and everyday tasks. As the player cleans up throughout the house, they earn Happy Points that improve their robot's ranking. The player can do several things to get happy points (e.g., picking up trash and throwing it in a trashcan, scrubbing stain marks with a toothbrush). All video games were played for 30 min.

**Helping or hurting behavior.** Helping or hurting behavior was assessed using the tangram puzzle procedure [Gentile et al., 2009]. Tangrams are based on seven differently shaped plastic pieces (e.g., small square, large triangle) used to form a specified outlined shape. Participants chose 11 puzzles that their "partner" would attempt to complete from a set of ten easy, ten medium, and ten hard puzzles. Participants were told that their partner would win a \$10 gift certificate if he/she completed at least ten of the assigned puzzles within 10 min. Thus, participants could help

their partner by assigning easy puzzles, or hurt their partner by assigning hard puzzles.

**Postexperimental questionnaire.** Participants rated their game on several dimensions using 10-point scales: action-packed, enjoyable, exciting, entertaining, fun, involving, hard to play, frustrating. They also rated their "ability on the video game task." Replicating prior work [Anderson and Dill, 2000], these individual ratings formed a "fun" scale ( $\alpha = .92$ ) and a "difficulty" scale ( $\alpha = .70$ ). They were not significantly correlated with each other ( $r = .06$ ). Participants also indicated their agreement with a statement that "The game involved helping other people" and a statement that "The game was violent."

## PROCEDURE

After arrival, both parent and child completed consent forms explaining the overall purpose<sup>2</sup> and procedures. Participants were told that the research involved how playing different video games affected performance on puzzles. Participants were told that they would play a video game by themselves, work together with a partner on a puzzle task, and that they would choose 11 tangrams for their partner to complete (there was no actual partner). If their partner completed ten of the 11 tangrams within 10 min, their partner would win a \$10 gift certificate. They were told that after selecting tangrams for their partner they would receive 11 tangrams from their partner, and that although their performance would be scored they were not eligible to win a gift certificate. To justify this unequal treatment, participants were told that one of the study's goals was to determine whether a potential prize influences performance within this tangram task.

Participants received standardized tangram instructions and a practice packet. After demonstrating understanding of the tangram task, participants received video game instructions and practiced until they demonstrated mastery of the controls. Participants played the assigned game for 30 min by themselves. Then they chose 11 tangrams to assign their partner, and were encouraged to pick from multiple difficulty categories. Finally, participants completed the postexperimental questionnaire (including demographics) and a funnel debriefing with open-ended probes for suspicion. Fourteen suspicious participants were identified and excluded from analyses, 11 males and

<sup>1</sup>A second prosocial game (as in Gentile et al., 2009) was initially tested, but its difficulty prevented many children from getting to the prosocial parts of the game.

<sup>2</sup>The child was given a slightly different version of the consent form in which they were led to believe that there is an actual partner they will be participating with. The parent's consent form revealed that there is no actual partner in this study.

three females. Suspicion was unrelated to experimental condition,  $P > .20$ .

## RESULTS

### Scoring Tangram Choices

Participants chose medium difficulty tangrams most frequently ( $M_{medium} = 4.65$ ), followed by the hard ( $M_{hard} = 3.67$ ), and easy tangrams ( $M_{easy} = 2.70$ ). Because the task had ten puzzles per difficulty level, participants had to pick from at least two categories. It is possible for someone to pick ten medium tangrams and one easy (or hard) tangram to complete the 11 required. However, this individual is not necessarily intending to help (or harm) their partner, because the partner needed to complete only ten tangrams to win the gift certificate. Thus, “helping” was operationally defined as the number of “easy” puzzles greater than one. Similarly, “hurting” was defined as the number of “hard” puzzles greater than one<sup>3</sup>.

### Preliminary Analyses

**Manipulation check.** Participants’ perceptions of helpful and violent content in their assigned game were analyzed with a 3 (*game type*: prosocial, neutral, or violent)  $\times$  2 (*rating type*: helping or violent) analysis of variance, with rating type as a repeated measures factor. The predicted game type by rating type interaction was significant,  $F(2, 157) = 117.43$ ,  $P < .001$ . The prosocial game ( $M = 7.18$ ) was rated significantly higher on helpfulness than either the neutral ( $M = 2.13$ ) or violent games ( $M = 1.84$ ),  $F_s(1, 157) = 129.58$  and  $162.12$ ,  $P_s < .001$ , respectively. The latter two conditions were not significantly different,  $F < 1.00$ . Also, the violent games ( $M = 4.54$ ) were rated significantly higher on violence than the neutral ( $M = 1.07$ ) or prosocial games ( $M = 1.28$ ),  $F_s(1, 157) = 106.42$  and  $104.84$ ,  $P_s < .001$ , respectively. The latter two were not significantly different,  $F < 1.00$ .

**Covariates.** Separate one-way ANOVAs (*game type*: prosocial, neutral, or violent) were conducted on the fun and difficulty game ratings. Difficulty ratings differed by game type,  $F(2, 169) = 20.07$ ,  $P < .001$ . Contrasts revealed that the violent games ( $M = 4.68$ ) were perceived as more difficult than the prosocial ( $M = 2.78$ ) and neutral ( $M = 3.74$ ) games,  $F_s(1, 169)$

$= 40.14$  and  $9.29$ ,  $P_s < .001$  and  $.01$ , respectively. The neutral games were rated as more difficult than the prosocial game,  $F(1, 169) = 9.51$ ,  $P < .01$ . Thus, difficulty rating was used as a covariate in all analyses of the help/hurt tangram choices.

Fun ratings did not differ by game type, nor were any specific game contrasts significant,  $F_s < 2.00$ ,  $P_s > .15$ . Furthermore, preliminary analyses found no significant effects of fun ratings or participant sex on helping and hurting behavior. Therefore, these predictors were dropped.

### Main Analyses: Tangram Choices

A 3 (*game type*: prosocial, neutral, or violent)  $\times$  2 (*behavior type*: helping or hurting) analysis of covariance was conducted on helping and hurting tangram behavior, with behavior type as a repeated factor, and trait aggression and game difficulty as covariates. The game type by trait aggression interaction was not significant and thus was not included in the final model. Game difficulty yielded no significant effects,  $P_s > .50$ , and is not discussed further.

**Video game effects.** The main prediction was that playing a prosocial game would lead to increased helpful and decreased hurtful behavior, relative to violent games, with neutral games yielding intermediate behaviors. The means (shown in Fig. 1) fit this model quite well, and the specific contrast testing this model (decreasing linear contrast from prosocial to neutral to violent games for helpful behavior, increasing linear contrast for hurtful behavior) accounted for 97% of the predicted interaction variance,  $F(1, 152) = 9.02$ ,  $P < .001$ . Furthermore, deviations from the predicted pattern were nonsignificant,  $F < 1$ .

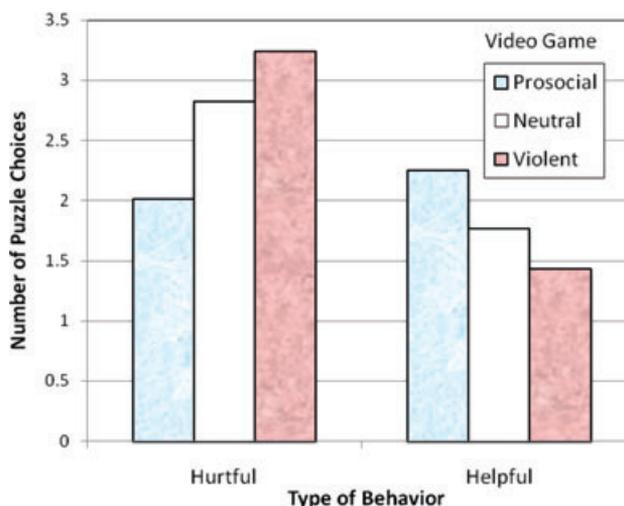


Fig. 1. Helpful and hurtful puzzle choices as a function of video game played.

<sup>3</sup>For example, participants who chose 3 easy tangrams were assigned a “helping” score of 2. As in Gentile et al., 2009, the correlation between the raw # of easy and hard tangrams was large,  $r = -0.61$ ,  $p < .001$ . Also as in that study, the “greater than one” scoring procedure reduced this correlation,  $r = -0.51$ ,  $p < .001$ . Note that using the raw scores in the main analyses yielded results that were essentially the same as those reported here, also as in Gentile et al., 2009.

For both helpful and hurtful behavior, the prosocial and violent game conditions were significantly different. Those who played a prosocial game were significantly more helpful ( $M = 2.25$ ;  $SD = 2.23$ ) than those who had played a violent game ( $M = 1.43$ ;  $SD = 1.48$ ),  $F(1, 152) = 4.65$ ,  $P < .05$ ,  $d = 0.35$ . Those who played a violent game were significantly more hurtful ( $M = 3.23$ ;  $SD = 1.86$ ) than those who played a prosocial game ( $M = 2.01$ ;  $SD = 2.03$ ),  $F(1, 152) = 9.20$ ,  $P < .01$ ,  $d = 0.49$ . The neutral condition means for helpful ( $M = 1.77$ ;  $SD = 1.47$ ) and hurtful ( $M = 2.82$ ;  $SD = 1.89$ ) behaviors fell between the other two game conditions.

**Trait aggression effects.** The behavior type by trait aggression interaction also was significant,  $F(1, 152) = 5.82$ ,  $P < .05$ ,  $d = .39$ . As expected, trait aggression was positively related to hurtful behavior and negatively related to helpful behavior,  $b_{hurtful} = 0.15$ ,  $P < .05$ ,  $b_{helpful} = -0.16$ ,  $P < .05$ , respectively. This further validates the tangram task as a measure of both prosocial and aggressive behavior.

## DISCUSSION

The main goal of the current study was to test if short-term exposure to prosocial video games can increase helpful and decrease hurtful behaviors in children compared to neutral and violent games. Results revealed that video games with prosocial content increased helpful and decreased hurtful behaviors in a short-term experimental context with children. In contrast, children's games with violent content increased hurtful and decreased helpful behavior. This study adds to the existing literature in several ways: (1) it is the first to test experimental prosocial video game effects on children; (2) it provides additional validity tests of the Tangram procedure for assessing aspects of helpful and hurtful behavior; (3) it is one of a handful of experimental studies that have used violent children's video games rather than more graphic and realistic violent games.

Sestir and Bartholow (2010) recently demonstrated that some nonviolent games can decrease aggression, despite having no prosocial content. Whether a given game or game-type appears to increase or decrease aggression or prosocial behavior depends, of course, on the conditions with which it is being compared. No-game comparison conditions have been problematic in this domain, because they differ in so many ways from the key violent or prosocial game conditions. Among other things, they tend to be boring or even frustrating to participants, especially to those who expected to be playing a video game or who

believe that other participants are playing. Therefore, most video game experiments have all participants play some type of game, and the best ones assess potential confounding variables (such as fun and frustration) and control for them statistically when necessary. In the present experiment, even after several theoretically relevant factors were accounted for, results revealed that prosocial game content increased helpful and decreased hurtful behavior relative to both violent and neutral games.

The idea of prosocial games increasing helpful behaviors in children in the short term is encouraging. Of course, more significant is the potential for these short-term effects to produce long-term changes. Indeed, social-cognitive learning theories suggests that the processes that produce such short-term effects can, with repeated exposure, lead to long-term increases in the accessibility and use of prosocial knowledge structures (including behavioral scripts), as demonstrated in cross-sectional and longitudinal studies [Gentile et al., 2009]. Although results from the present study are encouraging in finding behavioral effects of prosocial games, it is important to study the underlying mechanisms responsible for these behavioral effects. Previous studies on prosocial video game effects suggest that these behavioral effects might be due to changes in cognition [e.g., Gentile et al., 2009; Greitemeyer and Osswald, 2010, 2011] as well as affect [Greitemeyer and Osswald, 2010; Saleem et al., 2012]. Note that the studies testing the effects of prosocial games on affect have used an adult sample. Future research should explore this link using a sample of children. It would be ideal to test the effects of prosocial video game content on prosocial and antisocial cognitions, affect, and behaviors within the same study in order to do mediational analyses exploring the underlying mechanisms responsible for prosocial effects on prosocial behaviors.

Similar to the behavioral study by Gentile et al. (2009), the present study assessed helpful and hurtful behaviors using a single help/hurt tangram measure. This method has an important advantage in that helpful and hurtful behaviors can be assessed simultaneously. Although helpful and hurtful behaviors are conceptually distinct, they often are inversely related especially in the short-term real world contexts. For example, when people engage in a hurtful behavior toward a target person, they seldom simultaneously engage in helpful behavior toward that same target. By allowing participants the option to help, be neutral, or hurt another individual, this tangram measure has the potential to assess a range of interpersonal behaviors related to conflict.

However, an important limitation of this design is that individuals who score high on helpfulness by selecting a greater number of easy puzzles will tend to score low on hurtfulness, and vice versa. Indeed, even after using our “greater than one” scoring procedure, the correlation between the helpful and hurtful scores remained at  $r = -.51$ . Thus, there is an issue of nonindependence in the way hurtfulness and helpfulness is assessed using the tangram measure. In previous studies [Gentile et al., 2009] and in the current study, this concern has been addressed in at least three ways: (1) ignoring the medium category for the analyses, thus reducing interdependence; (2) using the number of easy and difficult puzzles greater than one instead of raw scores so participants can obtain a score of 0 on both helpfulness and hurtfulness; and (3) entering both helpful and hurtful scores as a within-subject factor. An alternative scoring procedure is to derive one overall score by assigning equidistant weights to hard, medium, and easy choices, such  $-1, 0, +1$ .<sup>4</sup> In the present study, this overall score yielded significant main effects of game type,  $F(2, 152) = 4.43, P < .05$ , and trait aggression,  $F(1, 152) = 5.31, P < .05$ . The pattern of means was as expected, with the most positive scores by participants who had played the prosocial game and the most negative scores by those who had played a violent game. This contrast pattern was significant,  $F(1, 152) = 8.40, P < .01$ , and accounted for 95% of the between groups variance. Of course, none of these solutions completely solve the nonindependence question, either with the tangram task or with the broader conceptual questions of whether people can (or do) try to help and hurt others at the same time. Nonetheless, the present study found that prosocial and violent video games with unrealistic cartoonish characters significantly affected children’s behavior in a task where they could help or hurt another child. We believe that there is a need for continued research using novel measures, such as the tangram task, in order to fully understand video game effects on children. Furthermore, additional work with the tangram task is needed to explore its conceptual and methodological advantages and limitations within the prosocial and aggressive behavior literatures.

<sup>4</sup>Note that statistically this is identical to assigning 1, 2, & 3 to the number of hard, medium, and easy tangram choices. We prefer  $-1, 0,$  &  $+1$  because negative and positive scores indicate a preponderance of hard vs. easy choices.

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