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Exposure to music with prosocial lyrics reduces aggression: First evidence and test of the
underlying mechanism

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ACCEPTED MANUSCRIPT

Abstract

Previous research has predominantly focused on negative effects of music exposure by demonstrating that listening to antisocial music increases aggression and aggression-related variables. The present research tests the idea that listening to prosocial (relative to neutral) music decreases aggressive outcomes. In fact, five studies revealed that prosocial music exposure decreased aggressive cognition, affect, and behavior. Mediation analyses showed that the effect of music condition on aggressive behavior was accounted for by differences in aggressive affect. Implications of these results for the predictive validity of the General Learning Model (Buckley & Anderson, 2006) for the effects of media exposure on social tendencies are discussed.

Key Words: aggression; music; media effects

Exposure to music with prosocial lyrics reduces aggression: First evidence and test of the underlying mechanism

Previous research has predominantly focused on negative effects of media exposure on social tendencies. For instance, playing antisocial (relative to neutral) video games has been shown to have serious consequences, such as criminal actions (Anderson & Dill, 2000) or physical violence (Gentile, Lynch, Linder, & Walsh, 2004). Likewise, listening to aggressive (relative to neutral) music increases aggressive cognition, affect (Anderson, Carnagey, & Eubanks, 2003), and behavior (Fischer & Greitemeyer, 2006). Recently, however, it has been argued that the effects of media exposure depend to a large extent on the content of the media (Buckley & Anderson, 2006): whereas media with antisocial content should increase antisocial outcomes and decrease prosocial outcomes, media with prosocial content is assumed to increase prosocial outcomes and to decrease antisocial outcomes. In fact, there has been some initial research showing that helping behavior is promoted by exposure to prosocial video games (Gentile et al., 2009; Greitemeyer & Osswald, 2010) and prosocial music (Greitemeyer, 2009a, 2009b). In contrast, it is less known whether aggressive behavior is indeed decreased by exposure to prosocial media.

Thus, the present research examines the idea that exposure to prosocial (relative to neutral) media is associated with aggression and aggression-related variables. Concretely, the hypothesis was tested that listening to prosocial music decreases aggressive cognition, affect, and behavior. Moreover, it was addressed whether the effects of music exposure on aggressive behavior (if there are any) would be mediated by aggressive cognition and/or aggressive affect. It is important to note that aggressive behavior is not simply the mirror image of helping behavior. For example, people can be both high in aggressive (e.g., toward their foes) and helpful (e.g., toward their friends) behaviors. Likewise, some variables do not

have opposite but parallel effects on pro- and antisocial behavior. For instance, negative (relative to neutral) mood states have been shown to increase both helping (Cialdini, Baumann, & Kenrick, 1981) and aggression (Berkowitz, 1989). Thus, it is not clear from the beginning whether media effects on pro- and antisocial outcomes are reciprocally related. If listening to prosocial music indeed decreases aggressive outcomes, this would further strengthen the notion that media exposure does not inevitably harm but may also benefit social relations.

Theoretical Perspective: The General Learning Model

To explain the effects of media exposure on action, one can refer to the General Learning Model (GLM) proposed by Buckley and Anderson (2006). According to the GLM, person (such as sex and trait aggression) and situation variables (such as media exposure) (sometimes interactively) may affect a person's internal state, consisting of cognition, affect, and arousal. This internal state in turn influences how events are perceived and interpreted. Finally, this decision process shapes a person's behavior in a social encounter.

Most relevant to the present research, the GLM suggests that depending on the content of the media exposed, either negative or positive effects of media exposure on social behavior are to be expected: whereas exposure to antisocial media should increase antisocial and decrease prosocial outcomes, exposure to prosocial media is assumed to decrease antisocial and to increase prosocial outcomes. There have been accumulative investigations into the effects of exposure to antisocial media. In contrast, evidence regarding prosocial media effects is very limited. In particular, little is known about whether and why exposure to prosocial media decreases aggression. These issues were addressed in the present series of studies.

Effects of Exposure to Antisocial Media

Correlational evidence suggests that exposure to antisocial music is related to a wide

range of undesirable phenomena. For instance, a preference for rap and heavy metal music has been shown to be associated with psychoticism (North, Desborough, & Skarstein, 2005), tolerance of racial and sexual discrimination (Gan, Zillman, & Mitrook, 1997), vandalism and drug use (Arnett, 1991, 1992), and violence and aggression (Rubin, West, & Mitchell, 2001) in young adults. Providing causal evidence, Anderson and colleagues (2003) found that listening to violent (relative to neutral) music increased aggression-related cognition and affect. Subsequently, Fischer and Greitemeyer (2006) showed that participants who had listened to violent music were more likely to behave aggressively than participants who had listened to neutral music. Moreover, by matching artists and genre in the experimental and the control condition and by controlling for measured arousal, Anderson et al. (2003) and Fischer and Greitemeyer (2006) made sure that the effects of violent songs on aggression and aggression-related variables were not due to the specific arousal properties of the songs used.

Likewise, the effects of violent video games on aggressive thoughts, feelings, and behavior are well-documented. Meta-analytic evidence (Anderson et al., 2010) suggests that exposure to violent video games causes an increase in aggression and aggression-related variables. Moreover, long-term changes as a result of repeated encounters with violent video games have been demonstrated in a recent longitudinal study (Anderson, Gentile, & Buckley, 2007). These authors found that children who had played more violent video games early in a school year became more aggressive later in the school year (even after controlling for Time 1 aggressive tendencies).

Effects of Exposure to Prosocial Media

Whereas there has been abundant evidence documenting the effects of exposure to antisocial media, research into the effects of exposure to prosocial media has been relatively sparse. There is evidence that television with prosocial content promotes prosocial behavior (Hearold, 1986; Mares & Woodard, 2005). Greitemeyer (2009a, 2009b) tested the hypothesis

that exposure to prosocial (relative to neutral) music increases prosocial tendencies.

Participants were exposed to songs, which were either prosocial or neutral in content.

Afterwards, prosocial cognition, affect, and behavior were measured. As expected, listening to prosocial music increased the accessibility of prosocial thoughts, led to more empathy, and fostered helping behavior. Likewise, playing prosocial video games increases prosocial cognitions and behavior (Gentile et al., 2009; Greitemeyer & Osswald, 2010). Finally, Greitemeyer and Osswald (2009) examined the effects of exposure to prosocial video games on aggressive cognitions. Two studies revealed that playing a prosocial (relative to a neutral) video game decreased the hostile expectation bias and the accessibility of antisocial thoughts.

Although these results are encouraging, research into the effects of prosocial media is still rather in its infancy. In particular, more research into the effects of exposure to prosocial media on aggression and aggression-related variables is needed. Perhaps most pressing is whether and why prosocial media exposure decreases aggressive behavior. According to the GLM, the effects of media exposure on behavior may operate through the activation of cognition related to behavior. In fact, there is some evidence that cognitive variables mediate the effects of media exposure on behavior. Anderson and Dill (2000) found that playing a violent (relative to a neutral) video game led to a greater accessibility of aggression-related thoughts, which then increased aggressive responses. Likewise, Greitemeyer and Osswald (2010) showed that participants who had played a prosocial (relative to a neutral) video game listed more prosocial thoughts, which then led to prosocial behavior. Thus, because exposure to prosocial video games appears to reduce aggressive cognitions (Greitemeyer & Osswald, 2009), there are good reasons to assume that prosocial media exposure decreases aggressive behavior.

However, the GLM proposes two other main routes (affect and arousal) by which media exposure may instigate behavior. In fact, it appears that the effect of prosocial (relative

to neutral) music on prosocial behavior is mediated by prosocial affect (Greitemeyer, 2009b): Listening to prosocial music increased empathy, which in turn promoted helping. Thus, it may well be that any effects of prosocial music on aggression work through the affective route of the GLM. Because both prosocial and neutral media can affect arousal, the arousal route is arguably scientifically less interesting than the other two routes. Nevertheless, it is important to measure and to control for the effects of arousal on aggression. In sum, it was anticipated that exposure to prosocial (relative to neutral) music would decrease aggressive cognition, affect, and behavior (while controlling for arousal). In addition, the effect of prosocial music on aggressive behavior should be mediated by one or both of aggressive cognition and affect.

The Present Research

The present research had two main aims. First, it addressed whether exposure to prosocial (relative to neutral) music would decrease aggression and aggression-related variables. Second, it aimed to clarify the causal mechanisms by which exposure to prosocial music decreases aggressive behavior. To these ends, five studies were carried out. In all studies, participants were exposed to either prosocial or neutral music. Because measurement of the possible mediators may influence subsequent measures of aggressive behavior (e.g., Lindsay & Anderson, 2000), in Studies 1-4, the possible mediators and aggressive behavior were assessed in different studies. Studies 1-3 tested the effects of exposure to prosocial (relative to neutral) music on aggressive cognition and affect. Study 4 addressed the effects of prosocial music exposure on aggressive behavior. Finally, Study 5 aimed to provide an initial test of why exposure to prosocial music decreases aggressive behavior by examining whether aggressive cognition and/or aggressive affect mediates the effect of music exposure on aggressive behavior. Taken together, this series of studies aims to clarify whether and why exposure to music with prosocial lyrics reduces aggression. By so doing, it provides the first comprehensive test of the predictive validity of the GLM for the effects of prosocial media

exposure on antisocial outcomes.

Study 1

Anderson and colleagues (2003) examined the effects of exposure to antisocial (relative to neutral) music on the accessibility of antisocial thoughts. They found that participants who were exposed to antisocial songs were more likely to generate aggressive word completions than participants who were exposed to neutral songs. Likewise, it was expected that listening to prosocial (relative to neutral) music would decrease the accessibility of antisocial thoughts in that participants who were exposed to prosocial songs are assumed to be less likely to generate aggressive word completions than participants who were exposed to neutral songs.

Method

Participants and design. Participants were 59 students (25 women, 34 men) of the Ludwig-Maximilians University in Munich, Germany, who were randomly assigned to one of the two music conditions (prosocial vs. neutral). There were 26 participants (14 women, 12 men) in the prosocial condition and 33 participants (11 women, 22 men) in the neutral condition. Participants were tested in small groups of three to four people.

Procedure and materials. At the outset, participants were welcomed by the experimenter and learned that they would participate in a marketing survey on music preferences. To this end, they would listen to four songs. To make sure that participants listened to the lyrics, they were told that they would evaluate the songs toward the end of the study. Participants in the prosocial condition were exposed to: “Heal the World” (Michael Jackson), “Ein bißchen Frieden” (Nicole), “We are the World” (Liveaid), and “Help” (Beatles). Participants in the neutral condition were exposed to: “On the Line” (Michael Jackson), “Spiel um deine Seele” (Peter Maffay), “An Englishman in New York” (Sting), and “Octopus’s Garden” (Beatles). Greitemeyer (2009b) employed these songs

and found that the lyrics of the prosocial songs were perceived as being more prosocial than the lyrics of the neutral songs. In addition, liking and perceived aggressive content of the prosocial and the neutral songs were relatively similar. Finally, by matching genre in the prosocial and the neutral condition and by controlling for measured arousal and mood, he made sure that any effects of listening to the songs are unlikely to be due to specific arousal and mood properties of the songs used.

Then, participants learned that a short delay was necessary before they could evaluate these songs. To bridge this time gap, they would respond to a filler task (which, in fact, constituted the main dependent measure, namely, a word completion task to assess aggressive thought accessibility). Participants received a list of 11 word fragments (e.g., Anderson et al., 2003). Their task was to fill in the missing letters to form a word. For instance, “schla ___” can become the aggressive word “schlagen” (“to hit”) or the neutral word “schlafen” (“to sleep”). Accessibility of aggressive thoughts was the proportion of word completions that were aggressive. In determining whether a word completion was antisocial or not, we used the coding scheme developed by Anderson and his colleagues.

Finally, participants answered demographic questions and were thanked and probed for suspicion. None of the participants indicated any suspicion of a relationship between listening to the songs and the word completion task.

Results and Discussion

It was expected that listening to prosocial (relative to neutral) music would decrease the accessibility of aggressive thoughts. In fact, a 2 (music condition: prosocial vs. neutral) x 2 (participant sex) ANOVA revealed the predicted significant main effect for music condition, $F(1, 55) = 5.68, p < .05, \eta_p^2 = .09$. Participants who had listened to the prosocial songs ($M = 0.07, SD = 0.09$) had lower aggression word completion scores than those who had listened to the neutral songs ($M = 0.12, SD = 0.09$). The effect for participant sex, $F(1,$

55) = 0.56, $p = .46$, $\eta_p^2 = .01$, and the interaction were not significant, $F(1, 55) = 2.35$, $p = .13$, $\eta_p^2 = .04$. Thus, the hypothesis that exposure to prosocial (relative to neutral) music reduces aggressive cognition received initial support from the data.

Study 2

Study 2 was similar to Study 1, with the following modifications. First, aggressive cognition was assessed in a different way, namely, participant's attitudes towards war and violence. Second, to test generality, different songs by different artists were utilized. Third, participants were from the UK (rather than from Germany). Fourth, and finally, to control for the arousal route of the GLM, participant's arousal and positive and negative mood were measured. It was expected that listening to prosocial (relative to neutral) music would lead to less positive attitudes towards war and violence.

Method

Participants and design. Participants were 38 students (33 women, 5 men) at the University of Sussex. There were 22 participants (20 women, 2 men) in the prosocial condition and 16 participants (13 women, 3 men) in the neutral condition.

Procedure and materials. At the outset, participants learned that they would participate in two unrelated studies. Participants were told that in the interest of experimental economy, both studies would be carried out within a single experimental session. The first study was described as dealing with their musical preferences, whereas the second study involved answering questions about their feelings and attitudes. As in Greitemeyer (2009b), participants in the prosocial condition listened to: "Love Generation" (Bob Sinclair) and "Feed the World" (U2 with Band Aid), whereas participants in the neutral condition listened to: "Rock this Party" (Bob Sinclair) and "Vertigo" (U2). Pilot testing, reported in Greitemeyer (2009b), revealed that the lyrics of the prosocial songs were perceived as being more prosocial than the lyrics of the neutral songs. In addition, the songs were matched on mood

and arousal dimensions, and liking and perceived aggressive content of the songs were relatively similar.

As in Study 1, participants learned that a short delay was necessary before they could evaluate the songs and thus in the meantime they would participate in the second study. First, participant's perceived arousal and mood were assessed. Arousal was assessed by employing the Perceived Arousal Scale (Anderson, Deuser, & DeNeve, 1995), which contains 31 adjectives describing feelings of arousal (e.g., *aroused*) or lack of arousal (e.g., *drowsy*). Lack of arousal items were reverse scored. Positive and negative emotions were assessed by employing the PANAS (Watson, Clark, & Tellegen, 1988). Participants then completed the Revised Attitudes Toward Violence Scale (RATVS; Anderson, Benjamin, Wood, & Bonacci, 2006). The RATVS contains 39 statements, which measure the favorability of attitudes toward four forms of war and violence. The four subscales are attitudes toward war (12 items; $\alpha = .91$; e.g., "Killing of civilians should be accepted as an unavoidable part of war"), penal code violence (seven items; $\alpha = .85$; e.g., "Violent crimes should be punished violently"), corporal punishment of children (eight items; $\alpha = .87$; e.g., "A parent hitting a child when he/she does something bad on purpose teaches the child a good lesson"), and intimate violence (12 items; $\alpha = .60$; e.g., "It is all right for a partner to shoot the other if they are unfaithful"). Participants were asked to indicate the extent to which they agree or disagree with these statements, assessed on a 5-point Likert-type scale (1 = *strongly disagree*, 5 = *strongly agree*). This scale successfully predicted self-reported violent behavior (Anderson et al., 2006) and self-reported trait aggression, anger, and hostility (Carnagey & Anderson, 2007).

Results and Discussion

Because there were only five men in the sample, participant sex was not included in the main analyses. Mean and standard deviations of the main dependent measures as a

function of type of music as well as test statistics are reported in Table 1.

Attitudes toward violence. Music condition had significant effects on two of the RATVS subscales: participants who had listened to the prosocial (relative to the neutral) music had more negative war attitudes and were less accepting of penal code violence. In contrast, attitudes toward corporal punishment of children and attitudes toward intimate violence were not significantly affected by music exposure (see Table 1).¹

Mood and arousal. There were no significant effects of music condition on participants' mood, neither on the positive affect scale nor on the negative affect scale. In addition, there were no significant effects on perceived arousal (see Table 1). Finally, when controlling for positive and negative mood and perceived arousal, the effects of type of music on attitudes toward war, $\beta = 0.40$, $t(33) = 2.56$, $p < .05$, and penal code violence, $\beta = 0.40$, $t(33) = 2.72$, $p = .01$, were still evident. Thus, different mood and arousal states are unlikely to account for the effect of listening to prosocial music on attitudes toward violence.

In sum, as in Study 1, exposure to prosocial music reduced aggressive cognition. Study 2 further showed that this effect remained reliable when controlling for the mood and arousal properties of the songs used. Study 3 will address the effects of prosocial music exposure on aggressive affect as well as aggressive cognition.

Study 3

Study 3 once again tested the effect of prosocial music exposure on aggressive cognition, but a different measure of aggressive cognition was employed. In addition, Study 3 addressed the effects of exposure to prosocial (relative to neutral) music on aggressive affect. Anderson et al. (2003) has shown that participants who were exposed to antisocial songs reported higher levels of state hostility than did participants who were exposed to neutral songs. Likewise, it was expected that listening to prosocial (relative to neutral) music would reduce reported state hostility. Finally, the potential moderating effects of trait aggression

were examined. According to the GLM, person (such as trait aggression) and situation (such as media exposure) variables may interact in influencing aggressive behavior. For instance, Bushman (1995) found that media violence was more likely to evoke aggressive affect and behavior in high trait aggressive individuals than in low trait aggressive individuals. However, other research (Anderson et al., 2003) failed to find significant interactive effects between music exposure and trait aggression. Thus, there were no clear predictions whether people high or low in trait aggression would be more susceptible to prosocial music exposure.

Method

Participants and design. Participants were 80 students (42 women, 38 men) at the University of Sussex. There were 40 participants (20 women, 20 men) in the prosocial condition and 40 participants (22 women, 18 men) in the neutral condition. All participants were tested individually.

Procedure and materials. After participants were welcomed by the experimenter, they filled in the Buss and Perry (1992) aggression questionnaire, which consists of four subtraits. The physical aggression subtrait consists of 9 items (e.g., "If someone punches me, I punch back."); verbal aggression consists of 5 items (e.g., "I can't help getting into arguments when people disagree with me."); anger consists of 7 items (e.g., "I have trouble controlling my temper."); and hostility consists of 8 items (e.g., "I sometimes feel that people are laughing at me behind my back."). All items were rated on a Likert scale ranging from 1 (*extremely uncharacteristic of me*) to 5 (*extremely characteristic of me*). Internal consistencies were very good: physical aggression: $\alpha = .93$; verbal aggression: $\alpha = .93$; anger: $\alpha = .89$; hostility: $\alpha = .87$. Participants then listened to either the prosocial or the neutral songs (the same songs were used as in Study 2), which was followed by measures of aggressive affect and cognition.

Aggressive affect. To assess aggressive affect, participants completed the State Hostility Scale (Anderson et al., 1995). This scale consists of 35 mood statements (e.g., "I feel

angry” and “I feel irritated”), and participants are asked to indicate the extent to which they agree or disagree, assessed on a 5-point Likert-type scale (1 = *strongly disagree*, 5 = *strongly agree*). Scale reliability was very good ($\alpha = .94$).

Aggressive cognition. To assess aggressive cognition, participants completed a word-pair task (adapted from Anderson et al., 2003; Bushman, 1996). Participants were presented with pairs of words. There were 20 words in total: 10 words that are clearly aggressive in meaning (e.g., *fight, gun, kill*) and ten words that are ambiguous in meaning, having both aggressive and nonaggressive meanings (e.g., *alley, police, rock*). Using these words, Bushman (1996) found that participants who scored highly on trait hostility perceived greater similarity of meaning between pairs of aggressive and ambiguous words than did participants who scored lowly on trait hostility. As in Anderson and colleagues (2003), participants received all possible pairs of these 20 words and rated how similar, associated, or related they find each word pair, ranging from 1 (*not at all similar, associated, or related*) to 7 (*extremely similar, associated, or related*). Based on these responses, three average similarity scores were calculated for each participant: aggressive–aggressive word pairs, aggressive–ambiguous word pairs, and ambiguous–ambiguous word pairs. Anderson et al. found that participants who had listened to violent (relative to neutral) songs gave larger similarity ratings of aggressive-ambiguous word pairs relative to their ratings of ambiguous-ambiguous and aggressive-aggressive word pairs. Likewise, it was expected that listening to prosocial (relative to neutral) songs would lead to smaller ratings of similarity of aggressive-ambiguous word pairs relative to ratings of ambiguous-ambiguous and aggressive-aggressive word pairs.

Results and Discussion

Aggressive affect (state hostility). As predicted, when state hostility was regressed on music condition, trait aggression, and participant sex, music condition received a significant regression weight, $\beta = .27$, $t(76) = 2.90$, $p < .01$. Participants in the prosocial condition ($M =$

1.82, $SD = 0.47$) reported lower levels of state hostility than did participants in the neutral condition ($M = 2.14$, $SD = 0.62$).² There was also a significant effect of trait aggression, $\beta = .45$, $t(76) = 4.58$, $p < .001$. Those participants who scored high on trait aggression tended to score high on state hostility. Sex of participants did not significantly predict state hostility, $\beta = .13$, $t(76) = 1.32$, $p = .19$. Trait aggression and participant sex did not significantly interact with music condition.

Aggressive cognition (word-pair ratings). Table 2 presents the mean similarity ratings (and standard deviations) as a function of music condition and word type. Following Anderson et al. (2003), a contrast score was computed. First, each participant's aggressive-aggressive and ambiguous-ambiguous scores were averaged. From this control rating, each participant's aggressive-ambiguous score was then subtracted. A small contrast score indicates that the aggressive-ambiguous pairs were perceived as relatively more similar than the control-word pairs, whereas a large contrast score indicates that the aggressive-ambiguous pairs were perceived as relatively more dissimilar than the control-word pairs.

As expected, participants in the prosocial condition ($M = 0.75$, $SD = 0.34$) had larger contrast scores than did participants in the neutral condition ($M = 0.46$, $SD = 0.29$), $\beta = .39$, $t(76) = 4.09$, $p < .001$.³ There was also a significant effect of trait aggression, $\beta = -.28$, $t(76) = 2.87$, $p < .01$. Those participants who scored high on trait aggression tended to have small contrast scores. Sex of participant also significantly predicted word-pair ratings, $\beta = .33$, $t(76) = 3.34$, $p < .01$: female participants ($M = 0.52$, $SD = 0.31$) had smaller contrast scores than did male participants ($M = 0.70$, $SD = 0.36$). Trait aggression and participant sex did not significantly interact with music condition.

As in Studies 1-2, exposure to prosocial music reduced aggressive cognition: participants who had listened to prosocial music rated aggressive and ambiguous words as less similar than participants who had listened to neutral music. Study 3 also provided a first

test of the idea that prosocial music exposure is associated with aggressive affect. In fact, listening to prosocial music decreased state hostility. Finally, Study 3 extended Studies 1-2 by including a measure of trait aggression into the analysis. It is noteworthy that both the personal (trait aggression) and the situational (music condition) variable independently predicted aggressive cognition and affect. Moreover, there was no significant interaction between music condition and trait aggression for both aggressive cognition and affect. Thus, the effects of prosocial music exposure on aggressive cognition and affect materialize even when accounting for trait aggression and are reliable for both people high and low in trait aggression.

Study 4

After Studies 1-3 have shown that listening to prosocial (relative to neutral) music decreases aggressive cognition and affect that, as outlined by GLM, may reduce aggressive behavior, Study 4 examines whether listening to prosocial music indeed affects antisocial action. Concretely, it was examined whether listening to prosocial (relative to neutral) music would decrease relational aggressive behavior.

As an additional refinement, a manipulation check was included. This was done to (a) make sure that the songs differ in the extent to which they are perceived as being prosocial and (b) to test whether perceived content mediates the effect of type of music on aggression. If prosocial content indeed is what distinguishes the songs used, this is exactly what should occur (Bushman & Anderson, 2002).

Method

Participants and design. Participants were 90 students (78 women, 12 men) at the University of Sussex. There were 45 participants (40 women, 5 men) in the prosocial condition and 45 participants (38 women, 7 men) in the neutral condition. All participants were tested in small groups of three to four people.

Procedure and materials. The procedure was similar to the previous studies, with the following modifications. After listening to each song (the same songs were used as in Studies 2-3), participants rated to what extent the song lyrics were about helping and cooperation, respectively. These ratings were highly correlated (Bob Sinclair: $\alpha = .78$; U2: $\alpha = .94$) and all four ratings were thus combined to a prosocial index ($\alpha = .83$). Then, participants responded to some unrelated filler items (e.g., the New Ecological Paradigm, Dunlap, Van Liere, Mertig, & Emmet-Jones, 2000). Finally, to measure aggression, participants were asked to make an evaluation of a doctoral student who had allegedly created the questionnaire and who had applied to be a research assistant in the Department of Psychology at the University of Sussex. Participants learned that this position was very competitive so the Psychology Department was trying to get several evaluations of each candidate and that their judgment would influence the decision whether the candidate would get the position or not. Participants judged the candidate by answering the following three questions: “Would you recommend hiring the doctoral student?”, “How competent do you think is the doctoral student?”, and “How likeable do you think is the doctoral student?”. All items were assessed on a 7-point Likert-type scale (1 = *not at all*, 7 = *definitely*). Scale reliability was very good ($\alpha = .88$). Many previous investigations have relied on similar job-relevant evaluations to measure aggression (e.g., Coyne et al., 2008; Stucke & Baumeister, 2006; for a review, Bushman & Anderson, 1998). Finally, participants were thoroughly debriefed about the real aim of the study. Special attention was given to inform participants that the doctoral student was nonexistent and thus that they did not harm anybody.

Results and Discussion

Because there were only 12 men in the sample, participant sex was not included in the main analyses. The manipulation check was successful: The perceived content of the prosocial songs received a higher score on the prosocial index ($M = 4.05$, $SD = 0.50$) than the

perceived content of the neutral songs ($M = 2.28$, $SD = 0.69$), $t(88) = 13.97$, $p < .001$, $d = 2.94$.

Aggressive behavior. As predicted, participants in the prosocial condition ($M = 3.73$, $SD = 0.73$) judged the doctoral student more positively than participants in the neutral condition ($M = 3.40$, $SD = 0.69$), $t(88) = 2.18$, $p < .05$, $d = 0.46$.

To test whether indeed the extent to which the songs are prosocial in content (and not any other song features) accounts for the effect of type of music on aggression, judgment of the doctoral student was regressed onto music condition and the prosocial index. In fact, the effect of music condition was no longer significant, $\beta = 0.14$, $t(87) = 0.75$, $p = .46$, whereas the prosocial index received a significant regression weight, $\beta = 0.44$, $t(87) = 2.40$, $p < .05$. Thus, one can have confidence that indeed the extent to which the songs are prosocial in content (and not any other song features) accounts for the effect of music exposure on aggression. On the other hand, it should be noted that the manipulation check itself may have affected the dependent measure. It may be that the manipulation check has primed the concept of helping, and such a prime could reduce aggressive responses. To avoid this possible confound, in Study 5 no manipulation check was assessed between manipulation and main dependent measures.

Study 5

So far, the results show that prosocial music exposure decreased aggressive cognition and affect (Studies 1-3) and aggressive behavior (Study 4). However, inasmuch as aggressive behavior and the possible mediators were assessed in different studies, it remains unclear what variable constitutes the mediating path from music exposure to action. Thus, in Study 5, aggressive cognition, affect, and behavior were all assessed. In addition, the third route (arousal) proposed by the GLM on how media exposure influences social behavior was also incorporated. Finally, the measurement of aggressive behavior differs from Study 4 in two

important ways. Study 4 assessed the effects of prosocial music exposure on indirect, relational aggression (Crick & Grotpeter, 1995) toward a target person who did not provoke the participant. Study 5 examines the effects of prosocial music exposure on direct, physical aggression toward a target person (administering hot chili sauce) who had insulted the participant.

Method

Participants and design. Participants were 50 adults (24 women, 26 men) of a community sample in Brighton, UK. Two participants (2 male) were excluded from the following analyses. One participant suspected correctly that there was no other individual participating in the study; one participant gave an extreme response on the chili sauce task (more than 5 SD above the mean). Mean age was 29.9 years ($SD = 11.0$). There were 24 participants (12 women, 12 men) in the prosocial condition and 24 participants (11 women, 13 men) in the neutral condition. All participants were tested individually.

Procedure and materials. At the outset, participants learned that the aims of the experiment were to examine (a) their musical preferences and (b) human communication patterns and thus they would be later interacting with another participant of the same sex. As a starting point for this coming interaction, both participants had to write a personal essay. After completion, the participant's essay was taken away to be shown to the other participant (who was, actually, nonexistent) for evaluation. Meanwhile, the participant received the partner's essay (which was, actually, written by the experimenter). A short time later, the experimenter returned the participant's own essay with comments allegedly made by the other participant. All participants received bad evaluations and a concluding comment stating "This is a rather boring essay." This method has been used in several studies to evoke aggression (e.g., Bushman & Baumeister, 1998; Twenge, Baumeister, Tice, & Stucke, 2001).

Participants then listened to either the prosocial or the neutral music (the same songs

were used as in Studies 2-4), which they should allegedly later evaluate. Afterwards, measures of aggressive affect, aggressive cognition, and arousal were taken. Concretely, participants responded to the State Hostility Scale, the RATVS, and the Perceived Arousal Scale.

Participants were then informed that hot and sweet sauces would be tested in context of another marketing study. Because the experimenter had to be blind for the experimental condition (i.e., whether hot or sweet chili sauce was administered), the participant was asked to administer the chili sauce. The participant learned that the other participant does not like hot spices at all, but that because of good payment would be willing to participate in the marketing study. It was stressed that it was completely up to the participants to decide how much chili sauce they would administer, that the other participant would have to consume all of it, and that the other participant would not learn who administered the sauce. The participant was then shown a bottle of hot chili sauce, a spoon, and a plastic cup. Participants were asked to use the plastic spoon to test the taste of the chili sauce and then to pour the chili sauce into the plastic cup. Actually, participants always got the hot chili sauce to taste and to administer. The administered amount of chili sauce was measured in grams and utilized as a behavioral measure of aggression (Fischer, Kastenmüller, & Greitemeyer, 2010; Lieberman, Solomon, Greenberg, & McGregor, 1999).

Finally, participants were thanked and fully debriefed. They were told that their essay had not actually been evaluated and learned that the other participant did not actually exist and thus that no one had to taste the chili sauce.

Results and Discussion

Responses in the chili sauce task considerably violated the normal distribution so these data were log-transformed. Mean and standard deviations of the main dependent measures as a function of type of music as well as test statistics are reported in Table 3.

Aggressive affect (state hostility). A 2 (music condition: prosocial vs. neutral) x 2 (participant sex) ANOVA revealed the predicted significant main effect for music condition, $F(1, 44) = 9.68, p < .01, \eta_p^2 = .18$. Participants in the prosocial music condition reported lower levels of state hostility than did participants in the neutral music condition (see Table 3). The effects for participant sex, $F(1, 44) = 1.15, p = .29, \eta_p^2 = .03$, and the interaction, $F(1, 44) = 0.05, p = .83, \eta_p^2 = .00$, were not significant.

Aggressive cognition (attitudes toward violence). With regard to attitudes toward war, an ANOVA revealed a significant main effect for music condition, $F(1, 44) = 7.50, p < .01, \eta_p^2 = .15$. Participants in the prosocial music condition had more negative war attitudes than did participants in the neutral music condition (see Table 3). The effect for participant sex was marginally significant, $F(1, 44) = 3.58, p = .07, \eta_p^2 = .08$. In addition, the interaction was significant, $F(1, 44) = 5.78, p < .05, \eta_p^2 = .12$. Male participants in the prosocial music condition ($M = 2.26, SD = 0.64$) had more negative war attitudes than did male participants in the neutral music condition ($M = 3.24, SD = 0.69$). In contrast, female participants' attitudes toward war in the prosocial music condition ($M = 2.36, SD = 0.61$) and the neutral music condition ($M = 2.42, SD = 0.68$) did not differ. With regard to attitudes toward penal code violence, participants in the prosocial music condition were less accepting of penal code violence than participants in the neutral music condition, $F(1, 44) = 10.31, p < .01, \eta_p^2 = .19$. The effect for participant sex was not significant, $F(1, 44) = 0.01, p = .93, \eta_p^2 = .00$. The interaction was marginally significant, $F(1, 44) = 3.07, p = .09, \eta_p^2 = .07$. (The effect of music condition on attitudes toward penal code violence was stronger for male participants than for female participants.) With regard to attitudes toward corporal punishment of children, participants in the prosocial music condition were less accepting of corporal punishment of children than participants in the neutral music condition, $F(1, 44) = 7.35, p = .01, \eta_p^2 = .14$. The effect for participant sex was not significant, $F(1, 44) = 0.00, p = 1.00, \eta_p^2 = .00$.

However, the interaction was significant, $F(1, 44) = 4.50, p < .05, \eta_p^2 = .09$. Male participants in the prosocial music condition ($M = 1.25, SD = 0.25$) were less accepting of corporal punishment of children than were male participants in the neutral music condition ($M = 2.22, SD = 0.82$). In contrast, female participants' attitudes toward corporal punishment of children in the prosocial music condition ($M = 1.68, SD = 0.83$) and the neutral music condition ($M = 1.80, SD = 0.65$) did not differ. With regard to attitudes toward intimate violence, the effect for music condition was not significant, $F(1, 44) = 0.65, p < .43, \eta_p^2 = .01$. Likewise, the effect for participant sex, $F(1, 44) = 0.08, p = .78, \eta_p^2 = .00$, and the interaction, $F(1, 44) = 2.81, p = .10, \eta_p^2 = .06$, were not significant.

Arousal. Participants' reported arousal in the prosocial and the neutral music condition did not differ, $F(1, 44) = 1.47, p = .23, \eta_p^2 = .03$ (see Table 3). In addition, the effect for participant sex, $F(1, 44) = 0.27, p = .60, \eta_p^2 = .01$, and the interaction, $F(1, 44) = 0.03, p = .87, \eta_p^2 = .00$, were not significant.

Aggressive behavior (chili sauce). Participants in the prosocial music condition administered less hot chili sauce than did participants in the neutral music condition, $F(1, 44) = 6.57, p < .05, \eta_p^2 = .13$ (see Table 3). The effect for participant sex was not significant, $F(1, 44) = 2.78, p = .10, \eta_p^2 = .06$. The interaction was marginally significant, $F(1, 44) = 3.90, p = .06, \eta_p^2 = .08$. (The effect of music condition on attitudes toward penal code violence was stronger for female participants than for male participants.)

Mediational analysis. Bivariate correlations between the main dependent measures are reported in Table 4. As can be seen, administered chili sauce only significantly correlated with state hostility.⁴ Thus, I tested whether state hostility would mediate the effect of music condition on administered chili sauce. To test this potential mediation effect, a bootstrapping analysis based on 1,000 bootstraps was run (Preacher & Hayes, 2004). Results showed a significant direct effect of music condition on administered chili sauce, $t = 2.43, p < .05$,

which was reduced to non-significance, $t = 1.50$, $p = .14$, when controlling for state hostility. Moreover, the indirect effect was significantly different from zero ($p < .05$, 95% confidence interval = -0.47, -0.02). In sum, it appears that the effect of listening to prosocial music on aggressive behavior is mediated by differences in reported aggressive affect.⁵

General Discussion

Previous research has provided abundant evidence that exposure to antisocial media increases aggression and aggression-related variables (e.g., Anderson et al., 2010; Bushman & Huesmann, 2006). In contrast, research concerning whether media exposure may also decrease aggressive outcomes has been very limited. Based on the GLM as a theoretical framework, the present research aimed to fill this gap. In fact, the present five studies showed that listening to prosocial (relative to neutral) music decreased aggression and aggression-related variables. Study 1 revealed that exposure to prosocial music reduced the accessibility of aggressive thoughts. Study 2 replicated and extended this finding by using a different measure for aggressive cognition and by controlling for mood and arousal. Study 3 showed that prosocial music exposure did not only decrease aggressive cognition but also aggressive affect. Study 4 then provided a first test of the idea that prosocial music exposure decreases aggressive behavior. In fact, participants who had listened to prosocial music were less aggressive than participants who had listened to neutral music. Because measurement of the possible mediators (aggressive cognition and affect) may change subsequent measures of aggressive behavior (e.g., Lindsay & Anderson, 2000), behavior and the possible mediators were assessed in different studies. Thus, it remained unclear what variable constituted the mediating path from music exposure to action. Study 5 provided some initial evidence about the causal mechanism: it appears that prosocial music exposure decreases state hostility, which in turn reduces aggressive behavior. Taken together, these studies provide supportive evidence of the predictive validity of the GLM for the effects of listening to prosocial music

on antisocial outcomes. On a more general level, by documenting (a) media effects on aggressive behavior and (b) the mediating path from media exposure to action, the present research offers the first comprehensive test of the effects of prosocial media exposure on aggression and aggression-related variables.

Implications, Limitations, and Future Directions

The present set of studies lends further credence to GLMs assumption that media content significantly influences the consequences of media exposure. Whereas listening to antisocial music increases aggressive cognition, affect (Anderson et al., 2003), and behavior (Fischer & Greitemeyer, 2006), listening to prosocial music decreases it. Moreover, the present research addressed why listening to prosocial (relative to neutral) music decreases aggressive behavior. Based on the GLM, it was examined whether prosocial music would activate two of the main routes (cognition and affect) proposed to mediate the effects of media exposure on behavior (while measuring and controlling for the arousal route of the model). In fact, listening to prosocial music decreased aggressive cognitions and affect. However, only the latter significantly instigated aggressive behavior. Thus, it appears that the effect of prosocial music on aggressive behavior operates through the affective (rather than the cognitive) route of the model.

However, it is important to note that in Study 5 of the present research there was a positive (although not significant) association between (the combination of the four measures of) aggressive cognition and aggressive behavior ($r = .18$). If sample size were bigger (and thus statistical power improved), aggressive cognition might have (partially) accounted for the effect of music condition on aggressive behavior. In addition, other measures of aggressive cognition may show stronger associations with aggressive behavior. Finally, only one behavioral measure was employed (i.e., participant's direct, physical aggressive behavior as a response to a provocation, which might be a behavioral response that is especially prone to be

influenced by affective measures). Thus, future research may well find that under certain circumstances prosocial music does not only decrease (e.g., non-provoked) aggressive behavior because of reduced aggressive affect, but also because of reduced aggressive cognition.

Interestingly, however, the effect of prosocial music on prosocial behavior also appears to be mediated by affective rather than cognitive variables (Greitemeyer, 2009b). Although listening to prosocial music increases both the accessibility of prosocial thoughts and empathy, only empathy instigated helping behavior. In contrast, the effects of playing video games on social behavior are mediated by cognitive rather than affective variables. Playing antisocial video games increases both aggressive cognition and affect, but only cognition instigates aggressive behavior (e.g., Anderson & Dill, 2000). Likewise, playing prosocial video games increases the accessibility of prosocial thoughts (Greitemeyer & Osswald, 2010) and empathy (Greitemeyer, Osswald, & Brauer, in press), but only accessibility of prosocial thoughts elicits helping behavior (Greitemeyer & Osswald, 2010). Finally, cognitive variables also account for the effects of racing game exposure on risk taking: playing a racing game alters self-perceptions of being a reckless driver, which in turn increases risk taking behavior (Fischer et al., 2009).

Combined, these findings appear to suggest that the effects of music exposure on social behavior work through the affective route, whereas the effects of playing video games work through the cognitive route of the GLM. It seems fair to conclude that the GLM provides a useful framework for explaining the effects of media exposure on interpersonal behavior, but more research is needed to further refine the model. For instance, Anderson and colleagues (2003) found that listening to antisocial music increased aggressive cognition and affect, but no aggressive behavior was measured. Fischer and Greitemeyer (2006) found that antisocial music increased aggressive behavior, but they did not test for mediation. Thus,

future research investigating the underlying mechanisms by which exposure to antisocial music instigates aggressive behavior would be fruitful. Likewise, future research should examine whether and why exposure to prosocial video games decreases aggressive behavior. Greitemeyer and Osswald (2009) showed that playing prosocial video games reduced aggressive cognition, but no aggressive behavior was measured. Perhaps listening to antisocial music increases aggressive behavior via increased aggressive affect, whereas playing prosocial video games decreases aggressive behavior via decreased aggressive cognition. Such findings would further suggest that the effects of music and video game exposure on social behavior are similar (both antisocial music and antisocial video games increase aggressive outcomes and decrease prosocial outcomes, whereas both prosocial music and prosocial video games decrease aggressive outcomes and increase prosocial outcomes), but the underlying mechanisms are different (music effects operate through affective variables, whereas video game effects operate through cognitive variables).

It is noteworthy that prosocial music decreased aggression and aggression-related variables although participants were exposed to only a few songs. If people repeatedly listen to prosocial music, aggressive tendencies might be even more reduced. To test this claim, longitudinal studies on the effects of exposure to prosocial music on aggression and aggression-related variables are clearly needed. Such a study should be also interesting in terms of how prosocial music exposure decreases aggressive behavior. As pointed out by the GLM, repeated encounters with prosocial media may affect long-term behavior through the development and construction of knowledge structures (see also Huesmann & Miller, 1994). Thus, it may be that long-term effects of prosocial music on aggressive behavior are mediated by aggressive cognition (and/or by aggressive affect).

Finally, one may wonder to what extent both the music and the song lyrics contribute to the observed effects of music exposure on aggression and aggression-related variables.

Would the music alone in absence of the lyrics produce similar effects? Would the prosocial song lyrics exclusively reduce antisocial responses? Or, is the interplay between music and song lyrics obligatory to produce a unique set of effects of music exposure? Note that the music characteristics of the prosocial and neutral songs were controlled by matching genre and mood and arousal properties. Note also that Study 4 provides some evidence that the song lyrics account for the observed effects in that the effect of music condition on aggressive behavior was mediated by differences in the perceived content of the song lyrics. Thus, it appears that the effects of prosocial music on aggression are (in part) a result of the prosocial content of the lyrics. Nevertheless, future research that separately examines the effects of prosocial music (without the lyrics), prosocial song lyrics (without the music), and the combination of prosocial music and song lyrics would be informative in this regard.

Conclusion

Music exposure is omnipresent in our daily life. For instance, the average American college-age student listens to music for over 4 hours a day (Rubin et al., 2001). Given this amount, there is considerable interest in the effects of listening to music. Previous research has almost exclusively focused on negative effects of exposure to music with antisocial lyrics. However, it is important to note that individuals do not only listen to antisocial music, but to other music as well. In fact, some of the prosocial songs used in the present research have been very popular. “We are the World” has been named the biggest-selling single of all time; “Love Generation” was the most popular song in Germany in 2006; “Ein bißchen Frieden” won the Eurovision Song Contest and sold more than three million copies (the English version “A Little Peace” topped the charts in the UK). Thus, the present findings are not only of theoretical significance, but have important practical implications as well in suggesting that depending on the content of the song lyrics music exposure may reduce aggressive encounters.

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Footnotes

- 1 The absence of significant effects of music condition on attitudes towards corporal punishment and particularly intimate violence may have been due to a floor effect; that is, the low means indicate that there was little room for exposure to prosocial music to further reduce endorsements of these attitudes.
- 2 Anderson and Carnagey (2009) broke the state hostility into several subscales, namely, feeling unsociable, feeling mean, lack of positive feelings, and aggravation. They found that antisocial video game effects were stronger for the subscales feeling mean and aggravation than for the subscales feeling unsociable and lack of positive feelings. Interestingly, in the present study, feeling mean, $t(78) = 2.42, p < .05, d = 0.56$, and aggravation, $t(78) = 3.96, p < .001, d = 0.89$, were significantly affected by music condition, whereas lack of positive feelings was not, $t(78) = 0.99, p = .32, d = 0.22$. Note, however, that in Study 5 of the present paper, there was a significant effect of music condition on all three subscales and effect sizes were comparable in its size. Nevertheless, this is an important avenue for future research. The items of the subscale feeling unsociable were not significantly correlated and thus due to low reliability they were not combined.
- 3 As can be seen in Table 2, participants in the prosocial (relative to the neutral) condition rated not only the aggressive-ambiguous words as less similar, $t(78) = 5.81, p < .001, d = 1.30$, but also the control words, $t(78) = 4.77, p < .001, d = 1.08$. However, inasmuch as the latter effect was less pronounced than the first effect, there were larger ratings of similarity of aggressive-ambiguous word pairs relative to ratings of ambiguous-ambiguous and aggressive-aggressive word pairs in the prosocial, relative to the neutral, condition.

- 4 To further test whether aggressive cognition might (partially) mediate the effect of song condition on aggressive behavior, those attitude subscales that were highly correlated were combined. However, neither a combination of attitudes towards war and penal code violence nor a combination of attitudes towards war, penal code violence, and corporal punishment was significantly correlated with aggressive behavior (albeit in the predicted direction).
- 5 Inasmuch as the effect of music condition on aggressive cognition was stronger for male than for female participants, it may be that aggressive cognition mediates the effect of music condition on aggressive behavior for male participants only. However, including male participants only, the bivariate correlations between measures of aggressive cognition and behavior were not significant, all $r_s(25) < .18$, all $p_s > .41$.

Table 1. Means and Standard Deviations for Responses to the Dependent Measures as a Function of Type of Music (Study 2).

Dependent measures	Music Condition		<i>t</i> (36)	<i>d</i>
	Prosocial	Neutral		
Attitudes towards violence				
War	2.03 (0.68)	2.60 (0.61)	2.66*	0.88
Penal code violence	2.13 (0.76)	2.96 (0.80)	3.24**	1.06
Corporal punishment of children	1.63 (0.62)	1.66 (0.56)	0.13	0.05
Intimate violence	1.16 (0.19)	1.11 (0.19)	0.76	0.26
Positive mood	2.36 (0.75)	2.02 (0.84)	1.31	0.43
Negative mood	1.40 (0.38)	1.44 (0.42)	0.32	0.10
Perceived arousal	2.88 (0.74)	2.68 (0.85)	0.78	0.25

* $p < .05$, ** $p < .01$

Note: Standard deviations are in parentheses.

Table 2. Effects of Type of Music on Perceived Similarity of Aggressive–Aggressive (AgAg), Aggressive– Ambiguous (AgAm), and Ambiguous–Ambiguous (AmAm) Word Pairs (Study 3).

Music condition	Word-pair type				
	AgAg	AmAm	Control average: AgAg and AmAm	AgAm	Contrast: Control-AgAm
Prosocial	4.13 (0.79)	1.84 (0.61)	2.98 (0.64)	2.24 (0.78)	0.75 (0.34)
Neutral	4.81 (0.66)	2.45 (0.62)	3.63 (0.56)	3.17 (0.65)	0.46 (0.29)

Note: Standard deviations are in parentheses.

Table 3. Means and Standard Deviations for Responses to the Dependent Measures as a Function of Type of Music (Study 5).

Dependent measures	Music Condition		<i>t</i> (46)	<i>d</i>
	Prosocial	Neutral		
State hostility	1.66 (0.27)	2.07 (0.60)	3.09**	0.88
Attitudes toward violence				
War	2.31 (0.61)	2.86 (0.78)	2.71**	0.79
Penal code violence	2.21 (0.92)	3.07 (0.90)	3.25**	0.95
Corporal punishment of children	2.03 (0.76)	1.46 (0.66)	2.73**	0.80
Intimate violence	1.16 (0.23)	1.23 (0.33)	0.88	0.25
Perceived arousal	3.60 (0.59)	3.81 (0.60)	1.25	0.35
Administered chili sauce	0.38 (0.73)	0.82 (0.53)	2.43*	0.69

* $p < .05$, ** $p < .01$

Note: Standard deviations are in parentheses.

Table 4. Intercorrelations among variables (Study 5).

Variable	Variable						
	1	2	3	4	5	6	7
1. State hostility	-						
2. Attitudes toward war	.24	-					
3. Attitudes toward penal code violence	.29*	.73**	-				
4. Attitudes toward corporal punishment	.31*	.68**	.68**	-			
5. Attitudes toward intimate violence	.05	.35*	.39**	.63**	-		
6. Arousal	.26	.27	.26	.26	-.12	-	
7. Administered chili sauce	.37**	.25	.19	.12	-.08	.17	-

* $p < .05$, ** $p < .01$