Original Investigation

Mediators and Moderators of Long-term Effects of Violent Video Games on Aggressive Behavior
Practice, Thinking, and Action

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IMPORTANCE Although several longitudinal studies have demonstrated an effect of violent video game play on later aggressive behavior, little is known about the psychological mediators and moderators of the effect.

OBJECTIVE To determine whether cognitive and/or emotional variables mediate the effect of violent video game play on aggression and whether the effect is moderated by age, sex, prior aggressiveness, or parental monitoring.

DESIGN, SETTING, AND PARTICIPANTS Three-year longitudinal panel study. A total of 3034 children and adolescents from 6 primary and 6 secondary schools in Singapore (73% male) were surveyed annually. Children were eligible for inclusion if they attended one of the 12 selected schools, 3 of which were boys' schools. At the beginning of the study, participants were in third, fourth, seventh, and eighth grades, with a mean (SD) age of 11.2 (2.1) years (range, 8-17 years). Study participation was 99% in year 1.

MAIN OUTCOMES AND MEASURES The final outcome measure was aggressive behavior, with aggressive cognitions (normative beliefs about aggression, hostile attribution bias, aggressive fantasizing) and empathy as potential mediators.

RESULTS Longitudinal latent growth curve modeling demonstrated that the effects of violent video game play are mediated primarily by aggressive cognitions. This effect is not moderated by sex, prior aggressiveness, or parental monitoring and is only slightly moderated by age, as younger children had a larger increase in initial aggressive cognition related to initial violent game play at the beginning of the study than older children. Model fit was excellent for all models.

CONCLUSIONS AND RELEVANCE Given that more than 90% of youths play video games, understanding the psychological mechanisms by which they can influence behaviors is important for parents and pediatricians and for designing interventions to enhance or mitigate the effects.

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More than 90% of American youths play video games.[1-3] More than 90% of games that are E10+ rated, teen rated, or mature rated contain depictions of violence,[4-6] and that violence is often portrayed as justified, fun, and without negative consequences.[7] The most recent meta-analysis found that the effects of violent game play (VGP) were consistent across design (experimental, cross-sectional, longitudinal), age, culture (Eastern or Western), and outcome (aggressive cognitions [ACs], aggressive feelings, and aggressive behaviors [ABs]), but there were relatively few longitudinal studies.[8]

Social-cognitive models of aggression suggest that long-term effects of any repeated activity on later AB could be mediated by changes in AC or affect.[9] Examples of AC include measures of hostile attribution bias and of attitudes and beliefs about the appropriateness of AB. Examples of affective measures include trait anger and empathy. A recent meta-analysis found significant longitudinal effects of VGP predicting both ACs and aggressive affect.[8] Even critics of research finding associations between VGP and aggression also find VGP effects on ACs.[10]

Several recent longitudinal studies[11-15] provide additional support for the hypothesis that VGP is a risk factor for later aggression, but none have measured potential mediators at more than 2 points in time, thus precluding the use of latent growth curve models. A study is needed that (1) assesses potential mediating variables in at least 3 waves, (2) assesses AB in the last 2 waves (or all 3 waves), and (3) has a sample size large enough to test for effects that are expected to be small. Furthermore, because prior studies were based on Western samples, it would be useful to test the model in a different culture.

Evidence for moderators of the effects of VGP (eg, age, sex, trait aggression) has been mixed.[14] Studies have not found reliable age differences[14] despite strong theoretical reasons for them.[16] Although some studies have found males to be more susceptible to media violence effects than females,[17] most have shown robust effects for both sexes,[8,14] and studies reporting sex differences have typically not conducted the analyses appropriate to answer this question.[18] Similarly, studies testing trait aggressiveness as a moderator have found evidence of an interaction in both directions, with some studies showing greater effects on aggressive youths and others showing the opposite.[19-22] These inconsistencies suggest that violent media have robust effects that are not strongly moderated by individual difference variables. Past studies testing moderator effects, however, tended to have relatively small sample sizes or a narrow range of ages, limiting their ability to detect small moderator effects.

Our 3-year study tracked a large sample of youths. We hypothesized that habitually playing video games with violent content would lead to increases in AB over time and that this effect would be mediated by cognitive and affective changes (increases in different kinds of ACs and decreases in empathy). We also examined age, sex, parental monitoring, and trait aggression as moderators.

Methods

Participants

The sample comprised 3034 children and adolescents (73% male) from 6 primary and 6 secondary schools in Singapore, 5 of which were boys' schools. Data were collected annually in 3 waves (n = 3034, 2360, and 2232 in waves 1-3, respectively). The research was approved by the Ministry of Education and participating schools. Each school gathered parental consent based on their established procedures. At wave 1, all children in grades 3, 4, 7, and 8 were eligible for inclusion; participation in wave 1 was 99% (mean [SD] age, 11.2 [2.1] years overall, 9.2 [0.7] years in primary schools, and 13.0 [0.8] years in secondary schools; overall range, 8-17 years). Additional details are available.[23]

Measures

Gaming Habits

Participants reported how many hours they spend playing video games on weekdays and weekends. At each wave, they were asked to list 3 favorite video games and rate the following: (1) how often they play each game (4 items), and (2) how frequently each game contains violent or prosocial themes (4 items). These measures were adapted from the General Media Habits Questionnaire,[15,24] and the self-ratings of game violence have been validated against expert ratings.[25,26]

Aggressive Behavior

Six items assessed physical aggression (eg, "When someone has angered or provoked me in some way, I have reacted by hitting that person"; coefficient α = 0.87).[27] Items were rated on a 4-point scale (strongly disagree to strongly agree). Due to an administrative error, this scale was not administered in wave 1.

Aggressive Cognitions

Three types of AC were measured. A modified 20-item version of the Normative Beliefs About Aggression Scale[28] was used (coefficient α = 0.77). Children rated the acceptability of a number of ABs (eg, "Suppose a boy says something bad to another boy, John. Do you think it's wrong for John to hit him?"). Items were rated on a 4-point scale (really wrong to perfectly okay).

The Aggressive Fantasy Scale[29] (coefficient α = 0.82) contains 6 items measuring students' imagining about aggressive actions (eg, "Do you sometimes imagine or have daydreams about hitting or hurting somebody that you don't like?"). Items were rated on a 4-point scale (never to almost always).

Hostile attribution bias was measured with 6 scenarios, each describing an instance of provocation in which the intent of the provocateur is ambiguous.[30] For each, participants were asked to judge the best of 4 reasons for the provocation (2 were accidental and 2 intentional) and to judge whether the provocateur intended to be mean (coefficient α = 0.72).

Table 1. Reliabilities for the Main Scales of Interest

Scale	Items, No.	Wave 1		Wave 2		Wave 3	
		α	Score, Mean (SD)	α	Score, Mean (SD)	α	Score, Mean (SD)
Violent video game play	9	0.77	3.93 (4.41)	0.75	4.24 (4.52)	0.76	3.69 (4.28)
Normative beliefs about aggression	20	0.94	1.82 (0.67)	0.95	1.85 (0.68)	0.95	1.83 (0.64)
Hostile attribution bias	12	0.72	0.40 (0.25)	0.72	0.35 (0.26)	0.72	0.29 (0.25)
Aggressive fantasies	6	0.78	2.04 (0.72)	0.82	1.90 (0.70)	0.84	1.84 (0.68)
Empathy	15	0.86	2.32 (0.40)	0.87	2.32 (0.39)	0.89	2.33 (0.40)
Physical aggression	6	NA	NA	0.86	1.62 (0.64)	0.87	1.52 (0.59)
Parental involvement	11	0.86	1.90 (0.69)	0.85	2.10 (0.74)	0.88	2.04 (0.75)

Abbreviation: NA, not applicable.

Table 2. Sex Differences in Means for the Main Scales of Interest

Scale	Wave 1				Wave 2				Wave 3			
	Score, Mean (SD)				Score, Mean (SD)				Score, Mean (SD)			
	Boys	Girls	*t* (*df*)	*P* Value	Boys	Girls	*t* (*df*)	*P* Value	Boys	Girls	*t* (*df*)	*P* Value
Violent video game play	4.53 (4.63)	2.24 (3.13)	11.70 (2499)	<.001	4.99 (4.63)	1.98 (3.25)	14.10 (2184)	<.001	4.36 (4.43)	1.47 (2.73)	13.28 (1990)	<.001
Normative beliefs about aggression	1.86 (0.69)	1.71 (0.59)	5.31 (2784)	<.001	1.90 (0.71)	1.72 (0.60)	6.17 (2473)	<.001	1.87 (0.66)	1.70 (0.58)	5.78 (2337)	<.001
Hostile attribution bias	0.40 (0.25)	0.40 (0.25)	−0.63 (2766)	.53	0.35 (0.26)	0.34 (0.26)	1.38 (2493)	.17	0.29 (0.25)	0.29 (0.25)	0.11 (2418)	.99
Aggressive fantasies	2.12 (0.72)	1.85 (0.67)	9.07 (2612)	<.001	1.96 (0.70)	1.75 (0.66)	6.87 (2469)	<.001	1.90 (0.69)	1.69 (0.63)	6.72 (2353)	<.001
Empathy	2.27 (0.41)	2.44 (0.33)	−10.07 (2735)	<.001	2.29 (0.40)	2.41 (0.34)	−6.72 (2453)	<.001	2.29 (0.4)	2.43 (0.37)	−7.13 (2349)	<.001
Physical aggression	NA	NA	NA	<.001	1.71 (0.66)	1.39 (0.54)	11.23 (2475)	<.001	1.60 (0.61)	1.33 (0.48)	10.01 (2361)	<.001
Parental involvement	1.96 (0.69)	1.74 (0.66)	7.75 (2732)	<.001	2.17 (0.74)	1.90 (0.73)	8.14 (2430)	<.001	2.11 (0.75)	1.84 (0.71)	8.00 (2353)	<.001

Abbreviation: NA, not applicable.

Empathy

The 16-item Children's Empathic Attitudes Questionnaire[7] (coefficient α = 0.86) was used, modified for language appropriate to the culture (eg, "When I see a student who is upset, it really bothers me"). Students responded yes, maybe, or no for each statement.

Parental Involvement

An 11-item scale measuring parental involvement in children's video game playing was adapted from the Adult Involvement in Media Scale[24] and the parent supervision scale.[31] Each item was rated on a scale from 1 to 4 (never to every day or almost every day; coefficient α = 0.85). Versions of this scale have been validated.[32]

Results

Preliminary Analyses

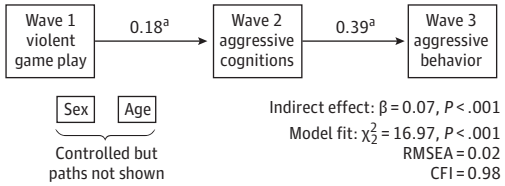
Descriptive statistics for the main measures are shown in **Table 1**, with tests for sex differences at each time in **Table 2**. At all 3 times, boys reported significantly more VGP and AB.

Although modern social-cognitive theories predict that repeated VGP should influence ACs, which in turn should influence ABs, they do not specifically predict whether different types of ACs (eg, normative beliefs, hostile attribution bias, aggressive fantasies) should be differentially influenced or whether they would be influenced sequentially or in parallel. We therefore adopted a parsimonious approach testing whether all 3 types of ACs measured here could be modeled as measuring an underlying general AC construct. In this measurement model, AC was hypothesized to be a second-order latent variable comprising normative beliefs, hostile attribution bias, and aggressive fantasies. The model fit was good (χ^2_{41} = 508.33; P < .001; root mean square error of approximation = 0.06; confirmatory fit index = 0.95), indicating that these 3 constructs may be considered to be implicit and explicit facets of a general aggressive way of thinking. This model of AC was used in all subsequent analyses; all modeling analyses were conducted with Mplus version 6.1 software (Muthén and Muthén). Missing data were treated using full-information maximum-likelihood estimation, which estimates parameters by using all available information in the analysis but does not impute missing values. It produces less biased and more reliable estimates than conventional methods of dealing with missing data.[33-35]

Mediation Analyses

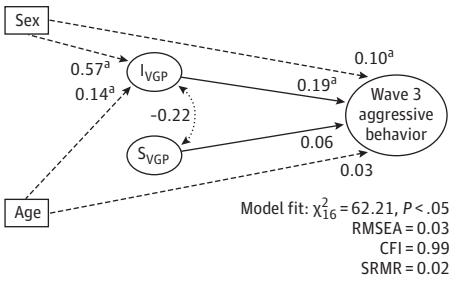
Figure 1 presents tests of the basic mediation model, wherein wave 1 VGP predicts wave 2 AC, which predicts wave 3 physi-

Figure 1. Test of Basic Mediation Model



Wave 1 violent game play predicts wave 2 aggressive cognitions, which in turn predict wave 2 aggressive behavior. Values adjacent to arrows indicate standardized regression coefficients. CFI indicates confirmatory fit index; RMSEA, root mean square error of approximation.
[a]*P* < .001.

Figure 2. Simple Latent Longitudinal Growth Curve Model, With Violent Video Game Play Across 3 Years Predicting Wave 3 Aggressive Behavior



Model controls for sex and age. Values adjacent to arrows indicate standardized regression coefficients. CFI indicates confirmatory fit index; I_{VGP}, intercept of violent game play; RMSEA, root mean square error of approximation; SRMR, standardized root mean square residual; and S_{VGP}, slope of violent game play.
[a]*P* < .001.

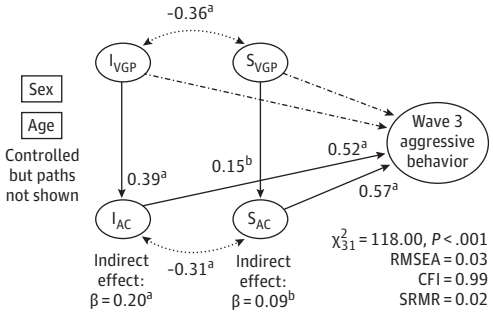
cal AB. This conservative model fit well, with all paths significant and a significant indirect effect of VGP on AB mediated through AC.

We computed longitudinal latent growth curves for VGP, yielding intercept and slope terms. These were used to predict wave 3 aggression (**Figure 2**), demonstrating consistency with other studies showing that earlier VGP predicts later AB. This model also fit well. It does not, however, test the key hypothesized mediation processes.

Figure 3 presents the mediation results. The VGP effect on AB was fully mediated through ACs. The intercept for AC was significantly predicted by the intercept of VGP, and the slope for AC was significantly predicted by the slope of VGP. The intercept and slope of AC strongly predicted wave 3 AB, and the intercept and slope of VGP were reduced to nonsignificance. Furthermore, the indirect paths of VGP influencing aggression through AC were both significant. The total variance in AB accounted for was $R^2 = 0.45$ ($P < .001$).

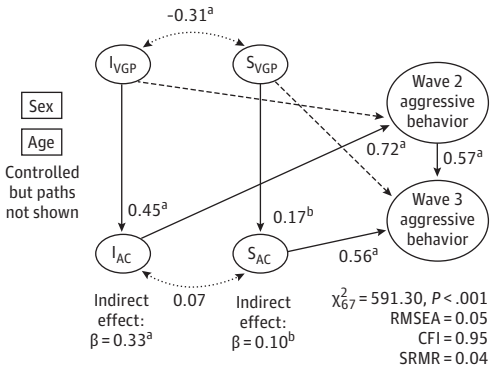
To provide a more conservative test, we added wave 2 AB to the model (**Figure 4**), with the starting values of VGP and AC predicting wave 2 AB 1 year later and the changes in VGP and AC predicting wave 3 AB. Again, VGP had its effects on AB fully mediated by ACs. Furthermore, after controlling for wave

Figure 3. Mediated Longitudinal Latent Growth Curve Model, With Violent Video Game Play Predicting Wave 3 Aggressive Behavior, Mediated by Aggressive Cognitions



Model controls for sex and age. Values adjacent to arrows indicate standardized regression coefficients. CFI indicates confirmatory fit index; I_{AC}, intercept of aggressive cognition; I_{VGP}, intercept of violent game play; RMSEA, root mean square error of approximation; S_{AC}, slope of aggressive cognition; SRMR, standardized root mean square residual; and S_{VGP}, slope of violent game play.
[a]*P* < .001.
[b]*P* < .01.

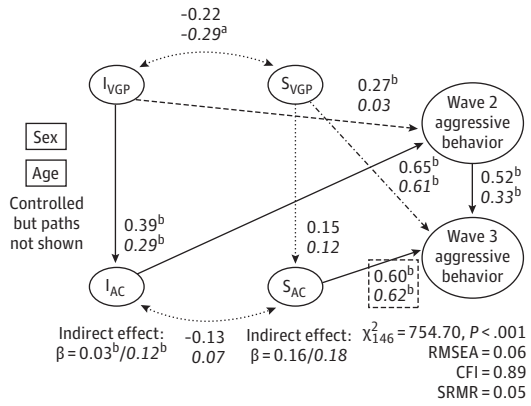
Figure 4. Mediated Longitudinal Latent Growth Curve Model, With Violent Video Game Play Predicting Wave 2 and Wave 3 Aggressive Behavior, Mediated by Aggressive Cognitions



Model controls for sex and age, and wave 2 aggressive behavior is controlled for when predicting wave 3 aggressive behavior. Values adjacent to arrows indicate standardized regression coefficients. CFI indicates confirmatory fit index; I_{AC}, intercept of aggressive cognition; I_{VGP}, intercept of violent game play; RMSEA, root mean square error of approximation; S_{AC}, slope of aggressive cognition; SRMR, standardized root mean square residual; and S_{VGP}, slope of violent game play.
[a]*P* < .001.
[b]*P* < .05.

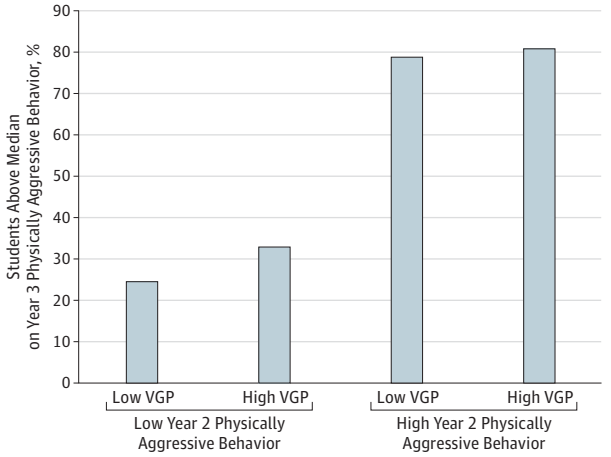
2 AB, VGP and AC still predicted wave 3 AB, demonstrating that increases in VGP predicted increases in aggressive thoughts (normative beliefs, hostile attributions, and aggressive fantasies), which predicted increases in ABs. This model fit well and accounted for substantial variance in AB ($R^2 = 0.55$, $P < .001$ for wave 2 AB and $R^2 = 0.65$, $P < .001$ for wave 3 AB). In sum, the mediation results strongly support the hypothesis that long-term exposure to violent video games increases later AB mainly through its effect on ACs.

Figure 5. Comparing the Mediated Longitudinal Latent Growth Curve Model for Children With Low and High Aggression, With Violent Video Game Play Predicting Wave 2 and Wave 3 Aggressive Behavior, Mediated by Aggressive Cognitions



Italicized values indicate those for children with high aggression. Model controls for sex and age, and wave 2 aggressive behavior is controlled for when predicting wave 3 aggressive behavior. Values adjacent to arrows indicate standardized regression coefficients. Only the pair of coefficients in the dashed box are significantly different from each other. CFI indicates confirmatory fit index; I_{AC}, intercept of aggressive cognition; I_{VGP}, intercept of violent game play; RMSEA, root mean square error of approximation; S_{AC}, slope of aggressive cognition; SRMR, standardized root mean square residual; and S_{VGP}, slope of violent game play.
[a] $P < .05$.
[b] $P < .001$.

Figure 6. Comparing Low and High Violent Game Play (VGP) on Year 3 Physically Aggressive Behavior, Split by Low and High Year 2 Aggressive Behavior



Moderation Analyses

Using Figure 4 as the base model, we tested whether the paths predicting aggression differed between boys and girls. Constraining the paths to be equal for girls and boys did not reduce the goodness of fit, and the result of the Wald test of parameter constraints was not significant (Wald = 9.05, *df* = 6; *P* = .17). Thus, although boys and girls have different base rates of VGP and AB, the effects of violent games are much the same for boys and girls.

We also tested whether the paths predicting aggression differed for primary school students (beginning in third and fourth grades) and secondary school students (beginning in seventh and eighth grades). Constraining the paths to be equal for younger and older children did not reduce the goodness of fit of the overall model, but the Wald test result was significant (Wald = 16.98, *df* = 6; *P* = .009). A comparison of the path coefficients for younger vs older students showed that only 1 of the 6 was driving this result—the path between the intercept of VGP and the intercept of AC. The coefficients were β = 0.64 for primary school students and β = 0.28 for secondary school students. This suggests that VGP has a greater effect on younger children's AC. All other paths were similar in magnitude for younger and older children, yielding a good fit for the overall model despite this one path not being equal for both groups (χ^2_{142} = 730.40; *P* < .001; root mean square error of approximation = 0.05; confirmatory fit index = 0.95; standardized root mean square residual = 0.04).

Parental monitoring of children's media has occasionally been shown to ameliorate the effects of media.[14,36] We tested whether the paths predicting aggression were equal for students whose parents were either highly involved in their media habits or not (based on a wave 1 median split). Constraining the paths to be equal did not reduce the goodness of fit and the Wald test result was not significant (Wald = 2.99, *df* = 6; *P* = .81).

Some have suggested that media violence only affects children who are already aggressive—that is, already at higher risk.[22] We tested this hypothesis 3 ways. First, we split the students into high- and low-aggression groups based on wave 2 aggressive behavior, using a median split. Testing the model in Figure 4 while constraining the paths to be equal for these 2 groups did not reduce the overall goodness of fit, but the Wald test result was significant (Wald = 62.93, *df* = 6; *P* < .001). This result was driven entirely by 1 pathway, from the slope of AC to wave 3 AB. The relation between changes in aggressive thoughts and ABs was significant for both groups but was slightly stronger for children who were more aggressive (**Figure 5**).

Including wave 2 AB in a model split by high or low wave 2 AB may not be the best test of this hypothesis, however. We therefore tested low and high wave 2 aggression groups against the model in Figure 3, which does not include wave 2 AB. The model fit was good and the Wald test result was nonsignificant, further demonstrating that the difference between children with low aggression and those with high aggression is not in the effects of violent games.

A third approach compared a median split of both AB and VGP. **Figure 6** suggests that the VGP effect on AB may be slightly larger for less aggressive children. Consider first the children who were below the median in wave 2 AB. If they were above the median in VGP, there was a 32% increase in the number of children above the median in wave 3 AB ([33 − 25]/25). There was a much smaller increase for children above the median in wave 2 aggression ([81 − 79]/79). Of course, children with low aggression had more room to increase. If we consider it as a ratio against the possible room for increasing, children with

low aggression increased 16% ([33 − 25]/[100 − 25]), whereas children with high aggression increased 10% ([81 − 79]/[100 − 79]).

Empathy Analyses

The prior analyses demonstrated a VGP effect on later AB mediated through ACs. To determine whether emotional traits also mediate this effect, we tested a model with empathy as a mediator but without AC in the model. This model, with VGP predicting empathy and in turn predicting aggression, fit the data well (**Figure 7**). Empathy was negatively related to aggression, as expected, but the VGP effect on wave 3 AB was not mediated by a change in empathy.

To test whether the long-term effects of VGP on aggression are mediated mostly through cognitive constructs or more emotional constructs, we included both in **Figure 8**. This model also fit well, and it provided additional support for the view that the long-term effects of VGP were fully mediated through ACs rather than emotion constructs.

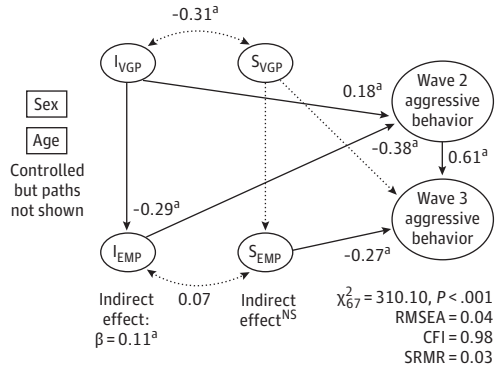
Discussion

This research yielded a number of important results. First, we replicated previous studies of long-term effects of VGP on aggression using a large sample of youths. Both the initial level and change in VGP during a 2-year period predicted AB in the final wave of measurement, even after controlling for sex, age, and prior level of aggression. Second, a latent growth curve analysis found that this effect was mediated by AC. Third, trait empathy did not yield significant mediation effects. These results suggest that violent video game use influences AB in the long term primarily by producing lasting changes in ACs. Of course, given the overlap between cognition and emotion and their measures, this conclusion should be interpreted with caution. Increasing hostile attribution bias, for example, also likely increases feelings of anger when provoked. Such situation-bound affective reactions could not be tested in the current longitudinal design. Nonetheless, these results support the predictions made by learning theories.[9,37]

Despite the large sample, we found no evidence of moderation by sex. There was a minor age moderation effect. The relation of initial VGP on initial AC was stronger for primary school students than for secondary school students. However, both younger and older children were significantly affected by VGP; the results merely suggest that starting VGP when younger may provide a greater initial boost to ACs. This is consistent with theories suggesting that a key developmental task of middle childhood is to learn social and cultural norms such as the acceptability of aggression.[38] By adolescence, many of these norms will have been learned, which may explain why we find a difference between primary and secondary school students only at the initial point of measurement.

Surprisingly, parental involvement was not a significant moderator. This may be a result of lower variance in parental involvement in the current Singapore sample relative to US samples, but additional research is needed.[14]

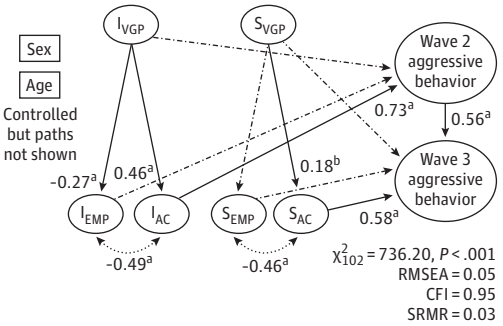
Figure 7. Mediated Longitudinal Latent Growth Curve Model, With Violent Video Game Play Predicting Wave 2 and Wave 3 Aggressive Behavior, Mediated by Empathy



Model controls for sex and age, and wave 2 aggressive behavior is controlled for when predicting wave 3 aggressive behavior. Values adjacent to arrows indicate standardized regression coefficients. CFI indicates confirmatory fit index; I_{EMP}, intercept of empathy; I_{VGP}, intercept of violent game play; NS, nonsignificant; RMSEA, root mean square error of approximation; S_{EMP}, slope of empathy; SRMR, standardized root mean square residual; and S_{VGP}, slope of violent game play.

[a] $P < .001$.

Figure 8. Mediated Longitudinal Latent Growth Curve Model, With Violent Video Game Play Predicting Wave 2 and Wave 3 Aggressive Behavior, Mediated by Empathy and Aggressive Cognitions



Model controls for sex and age, and wave 2 aggressive behavior is controlled for when predicting wave 3 aggressive behavior. Values adjacent to arrows indicate standardized regression coefficients. CFI indicates confirmatory fit index; I_{AC}, intercept of aggressive cognition; I_{EMP}, intercept of empathy; I_{VGP}, intercept of violent game play; RMSEA, root mean square error of approximation; S_{AC}, slope of aggressive cognition; S_{EMP}, slope of empathy; SRMR, standardized root mean square residual; and S_{VGP}, slope of violent game play.

[a] $P < .001$.

[b] $P < .05$.

Finally, prior aggressiveness did not moderate the VGP effects on later aggression. This confirms past findings concerning robust video game violence effects on both individuals high in aggressiveness and those low in aggressiveness and contradicts the popular belief that video game violence only affects people who are already highly aggressive.[8,39]

This study is methodologically stronger than many longitudinal studies of violent media because of the large

sample size, high participation rate, low dropout rate, use of a wide range of theoretically relevant measures, and inclusion of 3 waves of measurement instead of 2. These findings also provide evidence of generalization to non-Western cultures.

Several limitations should be noted. We used self-report measures, which may be affected by self-report biases, although children's self-reports have been found to correlate highly with parent and teacher reports in past studies.[14,23] Nevertheless, it would be useful to add parent reports, teacher reports, or observational measures in future research. Another limitation is that AB was not measured at wave 1. Obtaining 3 or more measurement waves in future studies would make it possible to explore growth rates of aggression. Finally, a plausible alternative explanation should be considered for the lack of significant mediating effects of empathy. Trait empathy is a combined emotion and cognitive trait. It is possible that empathy stopped being significantly related to later AB after AC was included in the mediation model because of this overlap. The fact that empathy and ACs were correlated at $r > -0.45$ supports this view. Other affective traits (eg, trait anger) should be tested before concluding that long-term VGP effects on aggression are entirely mediated by changes in AC.

Conclusions

This study found that habitual violent VGP increases long-term AB by producing general changes in ACs, and this occurs regardless of sex, age, initial aggressiveness, and parental involvement. These robust effects support the long-term predictions of social-cognitive theories of aggression and confirm that these effects generalize across culture.[8,9,39,40] Because of the large number of youths and adults who play violent video games, improving our understanding of the effects is a significant research goal that has important implications for theory, public health, and intervention strategies designed to reduce negative effects or to enhance potential positive effects.[24,41]

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Author Contributions: Drs Gentile and Khoo had full access to all of the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis.
Study concept and design: Gentile, Khoo, Anderson.
Acquisition of data: Li, Khoo.
Analysis and interpretation of data: Gentile, Li, Prot.
Drafting of the manuscript: Gentile, Li, Prot.
Critical revision of the manuscript for important intellectual content: Gentile, Khoo, Anderson.
Statistical analysis: Gentile, Li, Prot, Anderson.
Obtained funding: Khoo.
Administrative, technical, and material support: Gentile, Li, Khoo.
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