

Full title: The role of violent video game exposure, personality and deviant peers in aggressive behaviors among adolescents: a two-wave longitudinal study

Running title: VVGE, personality and peers in aggression

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Acknowledgements

The authors wish to thank the students, parents and teachers of the high schools *El Caminàs* and *Bovalar* for making this study possible.

Author Disclosure Statement

No competing financial interests exist.

Funding

This study was supported by the Banco de Instrumentos de Cibersam (SAM15PI01/2015), the Generalitat Valenciana (AICO/2019/197, GV/2016/158 and Grisolia/2017/129), the Spanish Ministry of Economy and Competitiveness (MINECO/FEDER) (PSI2015–67766-R), the Spanish Ministry of Science, Innovation and Universities (RTI2018-099800-B-I00) and the Universitat Jaume I (UJI-A2017-18, UJI-B2017-74 and E-2018-16).

Abstract

The impact of violent video game exposure (VVGE) on aggressive behaviors has been extensively explored, but still remains controversial. While some studies have shown slight, detrimental short-term effects of VVGE, other studies have failed to find any consequence. In addition, the existence of long-lasting effects on aggressiveness, or their impact on adolescents, are still not well established. One limitation of most of these studies is that they do not control for other important risk variables for aggressive behaviors, such as personality and deviant peers, nor have they investigated the possible moderation role of these risk factors in the link between VVGE and aggression. Therefore, the main aim was to examine the additive and interactive role of VVGE, personality and deviant peers in adolescent aggressive behaviors cross-sectionally and longitudinally. Many regression analyses and a cross-lagged autoregressive model were carried out. At both waves, aggressive behavior was predicted by having deviant peers and specific personality traits, especially low agreeableness. VVGE also presented a slight but significant effect at both waves, but it became nonsignificant when controlling for other variables. No long-term effects on the relation between VVGE and aggressive behaviors were found. Some moderation effects were consistently found at both waves: when participants reported having more deviant peers, the effects of VVGE and low agreeableness on aggressive behaviors significantly increased. These findings suggest that multiple biopsychosocial variables and their complex interplay need to be examined to gain a better understanding of the origin and expression of aggressive behavior.

Introduction

Whenever a serious act of violence occurs, the media, lawmakers and other important society sectors tend to focus on the detrimental effects of playing violent video games.¹ For instance, after the Parkland school shooting episode on 14 February 2018, US President Donald Trump organized a meeting with Congress members, video game executives and other stakeholders to “*discuss violent video game exposure and the correlation to aggression and desensitization in children*” (according to the White House press release).² During this period, a judge forbade a high school student to play violent video games after he made a school-shooting threat on social media.³ In an attempt to tackle this issue, some US politicians have proposed an extra sales tax to be imposed on violent video games.⁴

Theoretical background

The debate about the role of violent video game exposure (VVGE) in the etiology of aggressive behaviors has also been particularly heated in the scientific literature. One of the most followed psychological models in the field of violent media is the General Aggression Model (GAM).^{5,6} This model focuses on social-cognitive learning processes for explaining aggression, and points out the importance of violent media (e.g. VVGE) for provoking short-term increases in aggression. It also posits that repeated exposure to media violence may lead to changes in a person’s basic personality structure (e.g. aggressive beliefs and attitudes, perception and expectation schemata, aggressive behavior scripts and aggression desensitization) and may, thus, induce long-term increases in aggressiveness.

Other theoretical proposals have relativized the role of VVGE in aggression. For example, the *catalyst model* has focused the main causes of violent behaviors on more “innate” variables according to the importance of the genetics found in the etiology of

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aggression.⁷ This model posits that genetic predispositions lead to aggressive personality characteristics that would most likely be catalyzed into aggressive behaviors when facilitating environments occurred, such as family violence. In this model environmental factors, such as media or peer violence exposure, do not directly cause aggressiveness, but act as *stylistic catalysts*: when a highly aggressive individual acts violently, this person would model violence according to the aggressive behaviors that (s)he has seen in the media.¹

Whereas the *GAM model* focuses mainly on social learning processes and the *catalyst model* centers on biodispositional personality characteristics, other proposals have highlighted the interplay between both personality and social factors. A specific model for VVGE is the *Differential Susceptibility to Media Effects Model* (DSMEM).⁸ Its main proposal is that the variables which predispose media use may also moderate the effect of that media use. Thus VVGE would have a differential impact by producing or increasing aggressive behavior depending on other risk variables, such as dispositional factors, e.g., personality or attitudes; or social contexts, e.g. family environment or peer group, among others.

Empirical evidence

The bulk of experimental and correlational research has been conducted to elucidate the role of VVGE in aggression. Experimental studies show the potential short-term effects of brief exposures to violent video games on experimental aggressive behaviors (e.g. noise blasts or small electric shocks), whereas correlational studies identify associations between VVGE and different forms of aggression in the “real world” (e.g. aggressive behavior, delinquency, bullying or physical fights). For both experimental and correlational studies, most systematic meta-analyses show a significant but small association between VVGE and aggressive behavior, cognition and affect ($r \approx .10$ -

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.20).^{5,9-13} Effect size is even smaller when examining its long-term impact in longitudinal studies ($r = .11$).¹⁴ However, this evidence is controversial according to criticisms of some authors. These have pointed out the possible existence of confounding variables not included in the studies, and also the possible overstatement of the effects because of possible publication bias, citation bias and false positives¹⁵⁻¹⁸.

In addition, meta-analyses have reached conflicting conclusions about the impact of VVGE on aggression in children and adolescents. Some have suggested that older subjects would be affected by video games more than younger subjects,¹³ but others have concluded that the effect of VVGE would be similar for both lifespan stages.^{5,9,10} A meta-analysis specifically focused on children and adolescents found a significant, but very slight, effect of VVGE on aggressive behavior ($r = 0.06$).¹⁵

To summarize, data point to small detrimental effects of VVGE on aggressive behavior at best. Some scholars have interpreted these minor effects as negligible or even statistical artifacts. However, and according to other authors^{8,16} overall minor effects may hide null effects for some people, together with stronger effects for others, if individual differences in susceptibility to VVGE exists, for example personality.

Nowadays, the most accepted personality framework is the Five-Factor Model (FFM),¹⁹ which proposes five basic dimensions: extraversion, neuroticism, agreeableness, conscientiousness, and openness to experience.²⁰ These personality domains are in part genetically rooted²¹ and influence a wide range of everyday outcomes,²² including aggressiveness and antisocial behavior.²³ Personality is also relevant for video game-related behaviors; e.g., low agreeable players tend to prefer competitive and violent video games.^{24,25} The few studies that have assessed FFM domains when exploring the link between VVGE and aggression have found that this association tends to decrease,²⁶ or even vanish,²⁷ when controlling for personality.

In addition, some scholars have proposed that VVGE may present increased adverse effects on some individuals with pre-existing personality dispositions, which would make them susceptible to violent media.^{8,28} Accordingly, experimental studies have described moderating effects between the effect of VVGE on aggression and traits of aggressiveness,²⁹⁻³² anger^{33,34} psychoticism,³² and a combination of high neuroticism, low agreeableness and low conscientiousness,²⁸ although these effects have not always been replicated.^{26,35,36} As far as we know, the moderation role of FFM personality domains in the link between VVGE and aggressive behavior has not yet been examined in teenagers.

Another variable that is closely associated with aggressiveness and other antisocial behaviors is deviant peers. Having peers that present deviant behaviors, like fighting, substance abuse or vandalism, leads to more aggressiveness, antinormative and externalizing behaviors.^{37,38} According to the *Social Interaction Model*,³⁹ having deviant peers may lead to aggressive behavior by facilitating the expression of preexisting aggressive dispositions⁷. Despite this model and the DSMEM specifically predicting interaction effects between risk factors for aggressive behaviors, we are unaware of any study that has examined the possible moderation effect of personality and peers on the link between VVGE and aggressive behaviors.

The present study

Whereas data point out a minor detrimental effect of VVGE on aggressive behaviors in adults, the existence of long-lasting effects on aggressiveness, and the impact it has on adolescents, are still not well established. Research into VVGE and aggression often ignores other well-established factors for aggressive behavior, such as personality and deviant peer influences. Therefore, the research objectives (RO) of the present study were:

RO1. To examine the additive role of VVGE, personality and deviant peers in adolescent aggressive behaviors cross-sectionally

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RO2. To explore the moderating effects of personality and peers in the link between VVGE and aggression.

RO3. To examine the reciprocal predictive role of VVGE and aggressive behavior one year later.

We hypothesized that the main predictors of aggressive behavior would be deviant peers, the personality dimensions of low agreeableness and low conscientiousness and, to a lesser extent, VVGE. We also expected to find that these personality and social variables would present moderation effects on aggression. Finally, by using a longitudinal design, we expected to show the long-term effects of playing violent video games on aggressive behaviors 1 year later.

Methods

Participants

Participants were high school students of an urban area of the east coast of Spain who took part in a broader project that examined the psychosocial risk and protective factors involved in mental health in adolescence (for more details, see Moya-Higueras et al.⁴⁰). This research was approved by the ethical committee from the Universitat Jaume I, and authorized by the school board of the participating high schools as well as by the regional Valencian authorities. The participants' parents or legal guardians gave written informed consent in accordance with the Declaration of Helsinki.

Data were collected through two waves 1 year apart. At wave 1, 542 gamers of the 1161 high school students invited to participate reported their most played games and were considered for the study. The participants' mean age was 14.23 years ($SD = 1.59$) and 67.7% of them were males. At wave 2, 427 of the 1233 students invited to participate reported the games they played the most. Their mean age was 14.83 ($SD = 1.21$) and 67.8%

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were males. Finally, 264 students participated in both waves and were entered for longitudinal analyses, of whom 72.3% were males.

Measures

Aggressive behavior

The aggressive behaviors scale from the high school self-report version of the SENA⁴¹ was herein employed. It comprises 7 items (e.g., “*I threaten others to get what I want*”, “*I beat others when I get angry*”) that are rated from 0 (“Never or almost never”) to 4 (“Always or almost always”).

Violent Video Game Exposure

Video game use frequencies were assessed with the following points: never or almost never (0); once per month (1); once per week (2); less than 1 hour per day (3); between 1 and 3 hours per day (4); more than 3 hours per day (5). The participants also reported up to five of their most played video games at the time data were collected. Based on the reported games, and as in other studies²⁹, an index of violence experienced in gaming (I_{VEG}) was calculated as follows:

$$I_{VEG} = \frac{PEGI\ 18}{N} \times GF$$

I_{VEG} = Index of violence experienced in gaming

PEGI 18 = Number of games with PEGI 18¹

N = Total reported number of games

GF = Total gaming frequency

Personality

¹ The Pan-European Game Information (PEGI) is the standard age rating system for video games in 38 European countries and Israel, and is supported by major console manufacturers. The adult classification, PEGI 18, is applied when the level of violence reaches a stage at which it depicts gross violence, apparently motiveless killing or violence toward defenseless characters.

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Personality was assessed using the JS NEO-A60,⁴² a 60-item version of the Junior Spanish version of the NEO-PI-R.⁴¹ It measures the FFM personality domains of neuroticism, extraversion, openness to experience, agreeableness and conscientiousness to be assessed in youths aged between 12 and 17 years. Items are responded on 5-point Likert scales ranging from 0 (“Strongly disagree”) to 4 (“Strongly agree”).

Deviant Peers

The Deviant Peer Scale-UJI (DPS-UJI) comprises nine items that ask adolescents about the number of friends they have who have performed deviant and antisocial behaviors in the last 6 months (e.g. vandalism, fights, stealing or substance use).⁴⁴ The Likert response scale ranges from 0 (none) to 4 (all).

Statistical analyses

The descriptive statistics, scale reliabilities, correlations and regression analyses were conducted using IBM SPSS Statistics version 21. All predictors were centered.⁴⁵ Simple slope analyses for depicting interactions were applied.⁴⁶ The Structural Equation Modeling Software, EQS version 6,⁴⁷ was used to conduct the cross-lagged autoregressive model. Any missing values that represented less than 5% in a questionnaire were replaced with the mean score for the items remaining in that scale.

Results

The descriptive statistics, correlations and scale reliabilities of all the study variables are presented in Table 1. In order to examine the associations of VVGE, personality traits and their moderations in aggression, hierarchical regression analyses were conducted for each wave (see Table 2). Collinearity diagnoses revealed no multicollinearity problems. At both waves, aggressive behaviors were consistently associated with gender (males), a

higher I_{VEG} , low agreeableness, low conscientiousness and higher extraversion and deviant peers. However, gender and I_{VEG} associations disappeared when personality and deviant peer variables were introduced in the regression, and only the variables low agreeableness, low conscientiousness and deviant peers remained robust in wave 1 and 2 regressions when all predictors were entered. Regarding the interactions between the I_{VEG} and personality, the combination of the I_{VEG} and low conscientiousness was significantly related to aggressive behaviors at wave 1, whereas the I_{VEG} and low agreeableness interacted at wave 2. In addition, and consistently at both waves, aggressive behavior was predicted by an interaction between the I_{VEG} and deviant peers, and between low agreeableness and deviant peers. Figure 1 depicts the consistent moderation effects found at both waves.

Insert Table 1 here

Insert Table 2 here

Insert Figure 1 here

Finally, a cross-lagged autoregressive model was employed to examine the direction between the associations of the I_{VEG} and aggressive behaviors 1 year apart, controlled for each variable at time 1 (see Fig. 2). The model provided a good data fit by robust methods: $S-B\chi^2(df = 1) = 1.09, p = .30, CFI = .99, IFI = .99, NNFI = .99, RMSEA = .02$. We found

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that neither violent video game play predicted aggressive behaviors, nor aggressive behaviors increased the use of violent games over time. Stability coefficients and longitudinal links between the rest of variables are reported in Table 3.

Insert Figure 2 here

Insert Table 3 here

Discussion

Aggression is a complex behavior caused and influenced by multiple biopsychosocial variables⁷. Accordingly, the present research cross-sectionally and longitudinally explored the interrelations between playing violent video games, a widely studied and debated variable in the field of aggressive behavior, with two of the most well-established factors involved in aggressive behavior: a biodispositional variable such as personality, and a social variable such as deviant peers.

The most important variables for explaining individual differences in the aggressive behaviors in the present study were deviant peers and personality, specifically, low agreeableness and, to a lesser extent, low conscientiousness and high extraversion. The magnitudes of such deviant peer and personality associations herein found were virtually the same as those effect sizes indicated in other studies and meta-analyses.^{23,37-39}

In relation to the effect of VVGE, it was consistently associated at both waves with aggressive behaviors when gender and age were controlled for, but effect sizes were small in accordance with the meta-analyses performed in children and adolescents.¹⁵ When controlling for FFM personality domains and deviant peers variables, the minor effect of VVGE became nonsignificant, which also falls in line with the scarce research on the topic.^{26,27} Regarding the long-lasting effects of VVGE, no longitudinal predictions on aggressive behavior were found 1 year later. Longitudinal studies tend to show very minor long-term effects of VVGE on aggressive behaviors¹⁴ and some longitudinal interventions have found no significant effects on aggression.⁴⁸⁻⁵⁰

The fact that VVGE does not play a major role in aggression does not necessarily mean that its effect is negligible, as some authors have maintained.¹⁵ Other scholars have argued that overall minor effects may hide null effects for some people with greater effects for others if individual differences in susceptibility to VVGE exist, for instance, according to personality or other social risk factors.^{8,28} Accordingly, we tested whether VVGE affected adolescents with certain personality characteristics more negatively, or, whether those that presented environments that facilitate the expression of aggression, such as having deviant peers, were more susceptible.

Moderation effects on aggression were revealed between using violent games and low conscientiousness and low agreeableness, these being the personality variables that are more closely associated with aggression.²³ However, these moderation effects were not consistent across waves, with the moderation effect of low conscientiousness found only at wave 1, and the moderation effect of low agreeableness seen only at wave 2. Thus, and according to our data, there is no clear evidence that personality enhanced (or diminished) the effects of VVGE on aggressive outcomes in adolescents, in contrast with the only

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study in adults that has examined the moderating effects of FFM traits with violent game play on experimental aggression.²⁸

In contrast, a consistent moderation effect across two waves appeared: those adolescents who presented greater VVGE showed more aggressive behavior if they reported having deviant friends, in accordance to the *Differential Susceptibility to Media Effects Model* (DSMEM).⁸ A second robust moderation effect was also found: those low agreeable individuals showed increased aggressive behavior when having deviant peers at both waves, as expected from the *Social Interaction Model*.³⁹ Thus, deviant peers seem to not only facilitate the expression of aggressive models learned in video games, but can also facilitate pre-existing aggressive tendencies. As far as we are aware, these moderation effects on aggressive behavior have not been previously examined, but other studies have described similar moderation effects of deviant peers on the association between personality and other externalizing behaviors like delinquency.^{51,52}

Overall, our data better fitted those approaches to aggression that place more emphasis on the complex interaction effects between biodispositional variables such as personality, together with social variables, such as peers, like the catalyst model,¹ or the biopsychosocial approach proposed by Tremblay et al.⁷ . In relation to the role of violent videogames on aggressive behavior, in the present study VVGE did not present any additive effect, cross-sectionally or longitudinally. However, we found a possible interaction between VVGE and deviant peers, suggesting that VVGE could be relevant for some adolescents who also present other high risk factors, such as deviant peers, in accordance to the DSMEM.⁸ This moderation effect, however, has to be taken with caution until independent replication studies are performed. In any case, we believe that the DSMEM may constitute an important integrative framework because it promotes richer research that would integrate social-cognitive processes with dispositional, social

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and developmental factors, and would conciliate contrary views by assuming, according to the GAM, that social-learning processes could be important for some individuals, but also predicting that the overall effect of VVGE would be small, according to the catalyst model.

The present study is not without its limitations. First, although the estimation of VVGE is similar to other studies,²⁹ a specific frequency measure and a violence rating scale for each game might be a more accurate approach than an estimation based on general gaming frequencies. Second, although the present data do not support a very relevant role for VVGE, this does not necessarily mean that social learning processes for explaining aggression are unimportant, since exposure to other kinds of violence, such as other media or family violence, has not been assessed. Third, in some occasions we have interpreted data in a causal way according to theoretical assumptions, but the present study is correlational in nature, therefore no causal inference can be established. Last, moderation effects should be interpreted with caution because effect sizes are small, and corrections for multiple testing may lead to nonsignificant effects. However, the fact that most of the moderations found were replicated in the two waves give us confidence about the robustness of our results.

To conclude, we show that biodispositional variables, such as personality, and social variables, such as deviant peers, present strong additive and robust interactive effects on the expression of aggressive behavior in adolescence. In contrast, VVGE does not present any additive effect on aggressive behavior, cross-sectionally or prospectively, although it could play a small but significant moderation role in the harmful impact of other risk factors, such as having a deviant group of friends. These results suggest that a comprehensive understanding of aggressive behavior requires taking into account multiple biopsychosocial variables that present complex interrelationships between them.

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Figure 1: Simple slopes showing moderating effects between Deviant Peers (DP) levels with the IVEG and Agreeableness at Wave 1 (n= 542) and Wave 2 (n=427) on aggressive behaviors.

Figure 2: The longitudinal relations between the IVEG and aggressive behaviors (n = 264).

Table 1: Descriptive data, Cronbach's alphas and correlation coefficients among the study variables.

Table 2: Multiple regression analyses of aggressive behaviors.

Table 3: Path coefficients in the longitudinal structural model by estimating stability and cross-lagged paths from Time 1 to 2 (n = 264).

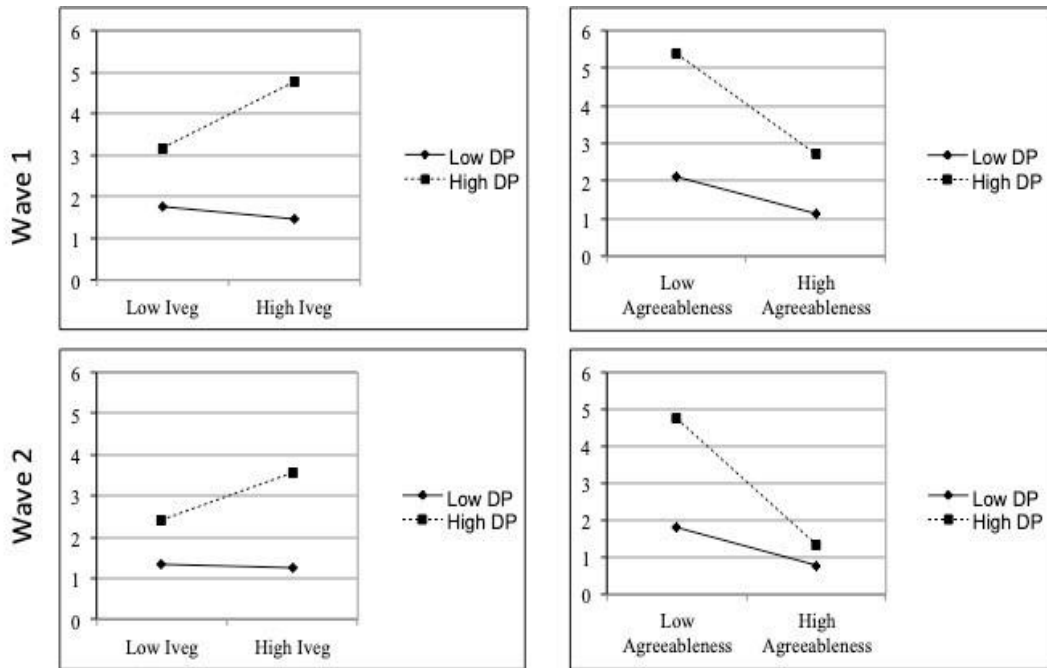


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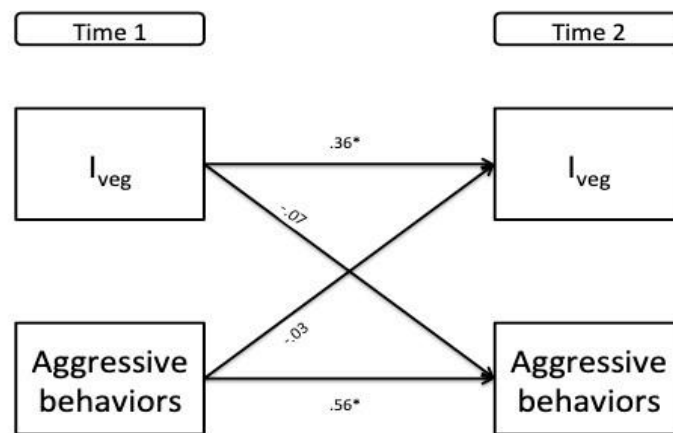


Figure 2: The longitudinal relations between the IVEG and aggressive behaviors (n = 264)

* $p < .001$

Table 1. Descriptive data, Cronbach's alphas and correlation coefficients among the study variables

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1. I _{veg} W1	-															
2. Aggressive behaviors W1	.13*	-														
3. Neuroticism W1	-.10*	.16*	-													
4. Extraversion W1	.01	.03	-.10	-												
5. Openness W1	-.09	-.19**	-.18**	.11	-											
6. Agreeableness W1	-.19**	-.48**	-.19**	-.03	.16*	-										
7. Conscientiousness W1	-.04	-.31**	-.18**	.18**	.22**	.28**	-									
8. Deviant peers W1	.10	.63**	.09	.21**	-.12	-.28**	-.23**	-								
9. I _{veg} W2	.37**	.05	.00	-.09	-.23**	-.02	-.11	-.04	-							
10. Aggressive behaviors W2	.04	.57**	.13*	.01	-.20**	-.45**	-.25**	.44**	.10	-						
11. Neuroticism W2	-.01	.11	.60**	-.16*	.17**	-.03	-.21**	.13*	-.03	.14*	-					
12. Extraversion W2	-.06	-.05	-.10	.62**	.07	.02	.14*	.13	.00	.00	-.22**	-				
13. Openness W2	-.06	-.10	.17**	.00	.68**	.02	.04	-.12	-.17**	-.14*	.22**	-.02	-			
14. Agreeableness W2	-.17**	-.39**	-.12	.05	.18**	.63**	.21**	-.30**	-.09	-.53**	-.19**	.06	.08	-		
15. Conscientiousness W2	-.05	-.26**	-.21**	.08	.16*	.18**	.65**	-.22**	-.11	-.27**	-.30**	.21**	.11	.20**	-	
16. Deviant peers W2	.04	.26**	.14*	.17*	-.01	-.25**	-.15*	.45**	.01	.51**	.12	.06	.05	-.23**	-.16*	-
M	1.26	3.01	22.80	31.88	24.40	34.56	29.80	6.93	1.01	2.45	20.65	31.26	24.89	35.49	28.56	4.65
SD	1.61	3.83	8.80	7.76	7.72	7.76	8.25	6.23	1.36	3.38	8.73	7.45	7.94	7.52	8.16	4.78
α	-	.76	.83	.73	.70	.81	.83	.86	-	.75	.85	.84	.75	.81	.86	.84

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Note. W_1 and W_2 are wave 1 ($n = 542$) and wave 2 ($n = 427$) respectively. Participants at both W_1 and W_2 $n = 264$
** $p < .05$. ** $p < .01$*

Table 2. Multiple regression analyses of aggressive behaviors

Independent Variables	Aggressive behaviors									
	Step 1		Step 2		Step 3		Step 4		Step 5	
	W ₁	W ₂	W ₁	W ₂	W ₁	W ₂	W ₁	W ₂	W ₁	W ₂
Gender	-0.10*	-0.14*	-0.03	-0.01	-0.06	-0.01	-0.07	-0.01	-0.05	-0.02
Age	0.04	0.06	-0.04	0.00	-0.09*	-0.04	-0.04	-0.09*	-0.04	-0.02
I _{VEG}	0.11*	0.11*	0.08	0.09	0.06	0.07	0.06	0.06	0.10	0.08
Neuroticism (N)			0.07	0.06	0.05	0.04	0.06	0.04	0.07	0.02
Extraversion (E)			0.10*	0.10*	0.01	0.04	0.02	0.04	0.02	0.03
Openness (O)			-0.07	-0.08	-0.03	-0.10*	-0.02	-0.08	-0.01	-0.09*
Agreeableness (A)			-0.38***	-0.45***	-0.30***	-0.36***	-0.30***	-0.35***	-0.25***	-0.33***
Conscientiousness (C)			-0.17***	-0.11*	-0.10*	-0.07	-0.10*	-0.08	-0.10*	-0.09*
Deviant Peers (DP)					0.40***	0.39***	0.40***	0.39***	0.31***	0.26***
I _{VEG} X N					-0.02	-0.01	-0.04	-0.04	0.00	0.00
I _{VEG} X E					0.02	0.06	-0.03	-0.03	0.00	0.00
I _{VEG} X O					-0.01	0.01	0.01	0.01	-0.04	-0.04
I _{VEG} X A					0.03	-0.10*	0.12**	-0.05	-0.05	-0.05
I _{VEG} X C					-0.09*	-0.07	-0.05	-0.05	-0.06	-0.06
DP X N					-0.01	-0.01	-0.01	-0.01	-0.02	-0.02
DP X E					-0.04	-0.04	-0.04	-0.04	0.03	0.03
DP X O					-0.01	-0.01	-0.01	-0.01	-0.02	-0.02

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DP X A										-.13**	-.21***
DP X C										-.05	.01
DP X I _{VGE}										.14**	.12*
AR	.03	.04	.24	.24	.13	.13	.01	.01	.05	.05	

Note. The rest of the moderations at Step 5 were omitted to simplify the model. Coefficients are standardized coefficients; ΔR^2 = change in variance;

* $p < .05$. ** $p < .01$. *** $p < .001$. W_1 and W_2 are wave 1 (n = 542) and wave 2 (n = 427) respectively. 1 = males, 2 = female

Table 3. Path coefficients in the longitudinal structural model by estimating stability and cross-lagged paths from Time 1 to 2 (n = 264)

Stability coefficients between T₁ and T₂	
I _{veg}	.37***
Aggressive behaviors	.55***
Neuroticism	.58***
Extraversion	.62***
Openness	.67***
Agreeableness	.59***
Conscientiousness	.64***
Deviant peers	.42***
Cross-lagged path from T₁ to T₂	
I _{veg} → Aggressive behaviors	-.03
I _{veg} → Neuroticism	-.04
I _{veg} → Extraversion	-.06
I _{veg} → Openness	.00
I _{veg} → Agreeableness	-.06
I _{veg} → Conscientiousness	-.02
I _{veg} → Deviant peers	-.01
Aggressive behaviors → I _{veg}	.10
Neuroticism → I _{veg}	.02
Extraversion → I _{veg}	-.03
Openness → I _{veg}	-.18***
Agreeableness → I _{veg}	.12
Conscientiousness → I _{veg}	-.08
Deviant peers → I _{veg}	-.16

Note. Coefficients are standardized coefficients.

* $p < .05$. ** $p < .01$. *** $p < .001$