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## **Adolescent Callous-Unemotional Traits Mediates the Longitudinal Association between Conduct Problems and Media Violence Exposure**

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**Abstract:** The current study investigates the bidirectional longitudinal association between conduct problems (CPs) and media violence exposure (MVE), with callous-unemotional (CU) traits as a potential mediator of this association. The sample consisted of 1,451 (49.9% boys) Greek Cypriot adolescents. CPs and MVE were measured at Year 1 and Year 3 and CU traits were measured at Year 2, enabling the examination of longitudinal associations and indirect effects between these variables. A bidirectional association between CPs and MVE was identified. Further, both CPs and MVE at Year 1 were positively associated with Year 2 CU traits, and youth high on CU traits at Year 2 were more likely to exhibit CP behaviors and to be exposed to media violence at Year 3. Finally, two indirect pathways were identified, suggesting that the longitudinal bidirectional association between CPs and MVE was partially mediated by CU traits. These findings suggest that CU traits constitute an underlying mechanism explaining the longitudinal association between CPs and MVE.

**Keywords:** media violence exposure; callous-unemotional traits; conduct problems; indirect pathway; bidirectional

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## 1. Introduction

Although mass media represents a principle source of entertainment, a number of studies provided evidence for potential negative influences on people's behaviors and emotions after long term and short-term exposure to different types of media (e.g., [1–3]). Particularly in modern media, there is an extensive presence of violence, which is easily accessible via television, movies, video games and the Internet. An alarming fact is that young children and adolescents spend a disproportionate amount of their time watching or interacting with violent media, possibly leading to increases in aggressive and antisocial behavior [4]. Therefore, exposure to violent media is a great cause of concern for the potential harmful effects on child and adolescent behavior. On the other hand, individuals who already exhibit aggressive and antisocial behaviors are more likely to watch and to be exposed to media violence (e.g., [5,6]). Thus, it is important to examine the bidirectional association between media violence and antisocial behavior. In addition to investigating the bidirectional link between violent media and antisocial behavior, it is also of great importance to determine whether this link is mediated by personality characteristics. In the current study, we propose that callous-unemotional traits might be such a mediator, since youth characterized by callous-unemotional traits engage in aggressive and antisocial behaviors with low empathy and regret towards the victims of their interpersonal transgressions (e.g., [7]).

### 1.1. Media Violence Effects

Accumulating evidence in the last 50 years provide support for the harmful effects of media violence exposure (MVE). The majority of prior work suggests a strong causal link between MVE and aggressive, delinquent, and antisocial behavior (e.g., [1,4,8–12]). Among other consequences of violent media are imitative behavior [13], increased acceptance of real-world violence [14], distortion of viewer's aggressive perceptions, beliefs, and expectations [15], and desensitization to the suffering of victims of violence [16], even after brief exposure to violent scenes [3].

However, there are some contradicting findings that question the well-established causal link between violent media and aggressive behavior, and suggest the presence of publication bias in the literature [17–19]. One such criticism is that the use of less standardized measures of aggression might have led to increases in the effect sizes reported between violent video game exposure and aggression. Additionally, Ferguson and Dyck [20] argued for the need of a more systematic and objective process of evaluating theories pertaining to media violence effects. Notwithstanding these criticisms, a recent meta-analysis of 136 studies on the effects of violent video games has clearly demonstrated that video game exposure is a causal risk factor for increased aggressive behavior, aggressive affect and aggressive cognition, and for decreased pro-social behavior and lower empathy, whereas susceptibility effects of culture and sex differences, as well as publication bias, have been ruled out [1]. Other studies have also confirmed the association between violent media and aggression by demonstrating that most rated violent games [21] and other types of violent media [22] are related to physical aggression and to lower empathy scores. Interestingly, as Huesmann and colleagues [10] suggested *'just as every cigarette one smokes increases a little bit the likelihood of a lung tumor someday...every violent TV*

*show increases a little bit the likelihood of a child growing up to behave more aggressively in some situation' (p. 218).*

### *1.2. Individual Characteristics — Trait Aggression and Conduct Problems*

Some skeptics argue that certain personality characteristics might account for the display of aggressive behavior after exposure to media violence. For example, trait aggression is considered to account for both high aggressive behavior and preference for violent media, and hence the relationship between aggression and media violence is characterized by some researchers as spurious [23]. Furthermore, an interaction between trait aggressiveness and videotape content revealed that high trait aggressive individuals tend to show higher aggression compared to low aggressive individuals after watching violent movies [5,6]. These findings are consistent with earlier findings demonstrating that individuals with longer history of antisocial behavior are more aggressive after watching films with violent content [24]. Furthermore, Berkowitz [25] argued that the relationship between MVE and human behavior is bidirectional, and that this relationship is heavily depended on individual's perspectives and interpretations. Therefore, by considering the role of individual differences will enable researchers to identify groups of youth that are at higher risk and are more susceptible to the effects of media violence [6,26].

With regard to child and adolescent psychopathological symptoms, those with Conduct Disorder (CD) and Oppositional Defiant Disorder (ODD) are more vulnerable to the putative effects of media violence [27,28], since their pre-existing levels of aggressive, hostile and antisocial behavior might be reinforced when they are exposed to such stimuli [29]. In a study that investigated reactions of children to violent movie scenes, children with CD or ODD showed differential processing of antisocial messages in violent movies compared to children without a psychiatric disorder [27], providing evidence for the harmful effects of antisocial media on children with Conduct Problems (CPs; *i.e.*, a combination of CD and ODD). Compared to non-disordered boys, those with CPs show significantly less arousal during observation of violent film clips [28], suggesting that MVE is not seen as distressing or fearful to these children. Earlier studies with primary school children suffering from emotional and behavioral difficulties found that after watching aggressive cartoons, children's physical aggression and inappropriate social interactions were increased [30], as well as their non-compliance, whereas cartoons low on aggression resulted in decreases in physical and non-physical aggression [30].

In terms of the amount of media violence that children with CD or ODD are exposed to, studies have indicated that children with CPs watch more violent material compared to children scoring lower on CP symptoms [31]. A more recent study with adolescents showed that those high on CD or ODD accompanied by aggressive features were more exposed to media violence (*i.e.*, video game violence and TV violence; [32]). Further, adolescents with CD or ODD diagnosis were more likely to prefer aggressive characters compared to those without the diagnosis [31]. In addition, incarcerated juvenile offenders were more likely to choose and play a violent video game compared to a non-offender control group [33,34]. These findings suggest that, similar to aggressive youth, children with CPs are at higher risk to be exposed and be affected by media violence.

### 1.3. Callous-Unemotional Traits

In addition to MVE, another empirically-supported and robust predictor of youth violence and antisocial behavior is Callous-unemotional (CU) traits (see [35] for review). Among youth high on CPs, those scoring high on CU traits are more likely to engage in severe [36], aggressive [37], and chronic (e.g., [38]) CPs compared to youth low on CU traits. In recent years, CU traits have been proved so important that on the fifth edition of the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-V), CU traits are considered as a specifier of CD [39]. Youth with CU traits are characterized with a certain interpersonal and affective style, showing lack of empathy and remorse, and behaving callously and uncaring for their own personal gain (e.g., [40]). Furthermore, these youth tend to show a reward-dominant response style, punishment insensitivity, and lack of fear [41]. They are also less likely to display or understand emotions, especially sadness and fear (e.g., [42,43]). Engagement in CPs behaviors has also been shown to result in decreased concern and empathy towards others [44], and therefore higher callous and unemotional characteristics, suggesting that the relationship between CPs and CU traits is bidirectional.

Given that CU-traits are associated with lack of empathy and CPs, and that both CPs and MVE are also associated with antisocial behavior, aggression and decreased levels of empathy, one could expect that CU traits might play a mediational role in the relationship between MVE and CPs, and vice versa. Furthermore, it is of great importance to identify individual differences in the relationship between MVE and antisocial behavior, in order to provide evidence of the existence or not of publication bias or spurious associations. Importantly, no prior work, to our knowledge, investigated the association between MVE and CPs after taking into account the mediational role of CU-traits, and hence there is a scarcity of relevant research.

Despite the shortage of relevant studies associating CU-traits, CPs and MVE, prior work provides evidence for the association between media violence and psychopathic traits, including CU traits. Williams *et al.* [45] have examined the relationship between entertainment preferences, antisocial behavior and psychopathic traits. Their results showed a link between psychopathy and anti-social media of various types, such as violent sports, aggressive films, violent video games, internet pornography and hacking. Importantly, psychopathy was found to moderate the impact of violent sports activity on antisocial behavior. On the other hand, a study investigating the association between psychopathic tendencies, MVE and relational aggression found that MVE was not a mediator of the relationship between psychopathy and relational aggression, and hence they concluded that it is not necessary for individuals with psychopathic tendencies to be exposed to media violence in order to engage in relational aggression [46]. However, the specific study examined only one type of aggression, relational aggression, and these findings cannot be generalized to all types of aggressive behavior or CPs. To our knowledge, only one study that examined the contribution of violent media preferences to the prediction of violent behavior, has also measured CU traits [47]. Although this study showed a positive association between CU-traits and violent media preferences, the authors did not examine CU traits as a possible mediating mechanism in the association between MVE and CPs.

#### *1.4. The Present Study*

The present study aims to investigate the bidirectional association between MVE and CPs during adolescence, and whether this association is mediated by CU traits. Although, there is an extensive literature that links MVE and CPs, it is not clear whether this association is bidirectional. It might be that exposure to media violence increases the likelihood of CP behaviors, and in turn individuals high on CPs are more prone to watch and interact with this type of media. Moreover, CU traits are theorized to function as a mechanism through which youth exposed to media violence are more likely to engage in CPs. Finding this association will suggest that MVE increases the likelihood of CPs through the effects it has on CU traits, such as decreases in empathy. CU traits might also be the mechanism underlying the effect from CPs to MVE, with remorseless CU individuals being more likely to be exposed and enjoy media violence. Therefore, we hypothesize that during adolescence (1) the relationship between MVE and CPs will be bidirectional and (2) this association will be mediated by the presence of individual characteristics, in this case CU-traits.

## **2. Method**

### *2.1. Participants*

The sample consisted of 1512 (50.1% boys) Greek Cypriot adolescents (aged 12–13 years at the first assessment;  $M$  age = 12.69), recruited from 13 middle schools in three different cities in Cyprus (Larnaca, Limassol, and Nicosia). At the second assessment one year later, 96.86% ( $n = 1,464$ ; 50% boys) of the original sample of students participated. Finally, at the third assessment, 99.15% of the Year 2 sample participated ( $n = 1,451$ ; 49.9% boys), and these students comprised the final sample of the study. Attrition was due to an inability to contact students who had moved away or transferred to a different school. The sample was diverse in terms of maternal (18.6% did not complete high school, 42.2% had a high school education, and 39.2% had a university degree) and paternal educational levels (21.2% did not complete high school, 46.5% had a high school education, and 32.3% had a university degree). Additionally, 6.4% of the participants came from single parent families. These categorizations approximate national demographics in Cyprus. Analyses of Variance (ANOVA) were conducted to examine whether the main study variables differed across schools; post hoc analyses did not reveal any differences between the schools on any of the measures under investigation.

### *2.2. Procedure*

Following approval of the study by the Cyprus Ministry of Education, the first author randomly selected 13 schools in three Cypriot towns (Larnaca, Limassol, and Nicosia). The school administrators and personnel were provided with a description of the study, and the study was approved by the school principals and the school boards of all 13 schools. Students were then given an informed consent form for their parents to sign, and only students with parental consent were permitted to participate in the study; the refusal rate was 5%. Adolescents and their parents were informed of the longitudinal nature of the project. In the classroom, students were informed by the researchers that the study aimed to understand adolescent emotions and behaviors. Students were also informed that no teachers or parents

would have access to their answers, and that they have the right to refuse to be in this study. Questionnaires were group administered by trained research assistants in classrooms of 20–25 students. On average, students completed the questionnaires in 45 minutes. CPs and MVE were measured at Year 1 and Year 3 and CU traits at Year 2. The Cronbach's alpha for all measures are reported in Table 1.

**Table 1.** Descriptive Statistics and Correlations among the Main Study Variables (N = 1,451).

Main Study Variables	ODD Year 1	CD Year 1	MVE Year 1	CU Year 2	ODD Year 3	CD Year 3	MVE Year 3
CD (Yr 1)	0.64 **						
MVE (Yr 1)	0.29 **	0.53 **					
CU (Yr 2)	0.27 **	0.43 **	0.37 **				
ODD (Yr 3)	0.50 **	0.37 **	0.19 **	0.29 **			
CD (Yr 3)	0.38 **	0.58 **	0.40 **	0.49 **	0.61 **		
MVE (Yr 3)	0.22 **	0.35 **	0.53 **	0.36 **	0.28 **	0.47 **	
<i>Descriptives</i>							
Alpha	0.70	0.82	0.86	0.82	0.71	0.89	0.89
Mean	3.38	4.70	1.16	22.33	3.58	5.13	1.18
(SD)	(2.05)	(4.61)	(1.29)	(8.94)	(2.21)	(5.05)	(1.34)

\*\*  $p < 0.01$ . ODD = oppositional defiant disorder; CD = conduct Disorder; CU = callous-unemotional traits; MVE = media violence exposure.

## 2.3. Measures

### 2.3.1. Callous-Unemotional Traits

The Inventory of Callous-Unemotional Traits (ICU) [48] is a 24-item self-report scale designed to assess callous and unemotional traits in youth. The ICU was derived from the 6-item callous-unemotional (CU) subscale of the Antisocial Process Screening Device (APSD) [49]. The CU component of the APSD has emerged as a distinct factor in clinic and community samples of preadolescent boys and girls [50] and detained samples of adolescent boys and girls [51]. It has been associated with more severe aggression and more proactive patterns of aggression and violence in detained male adolescents [52]. However, the self-reported CU scale has demonstrated only moderate internal consistency in many past studies (e.g., [53]), which is likely due to its small number of items ( $n = 6$ ) and three-point rating system. In addition, 5 out of the 6 items are worded in the same direction, increasing the possibility of response bias.

The ICU was developed to overcome these limitations and to provide a more extended assessment of CU traits. It was constructed using the four items (out of the original six) that loaded significantly on the CU scale of the APSD in both clinic-referred and community samples [50]. For each item (“I am concerned about the feelings of others”, “I feel bad or guilty when I do something wrong”, “I care about how well I do at school or work”, and “I do not show my emotions to others”), three positively and three negatively worded variations were developed (including the original item in its exact wording), and these 24 items were placed on a four-point scale (0 = “not at all true,” 1 = “somewhat true,” 2 = “very true,” and 3 = “definitely true”). Scores are calculated by reverse-scoring the

positively worded items and then summing the items to obtain a total score. Previous research has provided evidence for the validity of the self-reported ICU in a community sample of German adolescents [54], in community samples of Greek Cypriot adolescents [55,56], and in a high risk sample of American adolescents [43].

### 2.3.2. Conduct Problems

The CPs variable consisted of scores from the Youth Self-Report (YSR) [57,58]. Adolescents rated how well each of the items described them over the past six months on a three-point scale (0 = not true, 1 = somewhat or sometimes true, 2 = very true or often true). For the present study only the 17-item oppositional defiant disorder subscale (e.g., “My mood and my feelings change suddenly”, “I am cruel and mean to others”, “I tease others a lot”) and the 15-item conduct disorder subscale (e.g., “I break the rules in my school”, “I run away from home”) was used. The YSR has been used widely with normal and clinically referred youths and has shown adequate reliability and validity in assessing a broad range of behavioral and emotional problems experienced by youths aged 11 to 18.

### 2.3.3. Media Violence Exposure

Participants were asked five questions regarding the average time per week they are exposed to media violence on an ordinal scale of: 0 = never, 1 = 1 to 2 hours, 2 = 3 to 6 hours, 3 = 7 to 10 hours, 4 = 11 to 14 hours; 5 = 15 to 20 hours, and 6 = more than 20 hours. Adolescents were instructed that: “The following questions relate to violence portrayed in the media. Violence is a behavior involving physical force intended to hurt, damage, or kill someone. Please report the average time per week you spent watching or interacting with violent content in different media, including television, movies, video games, and the internet.” Specifically, adolescents were asked to report how many hours they spend on a weekly basis (1) “watching violent television programs, shows or series,” (2) “watching violent movies at home (TV or DVD),” (3) “watching violent movies at movie theaters,” (4) “playing violent video games,” and (5) “watching violent scenes or videos in the internet,” and these items were summed to create an overall scale of media violence exposure, with possible scores ranging from 0 to 6. Therefore, the questionnaire used in the current study measures exposure to different types of media. The media violence exposure questionnaire was based on prior work by Funk *et al.* [58]. The measure demonstrated adequate reliability and validity in a Greek Cypriot sample of adolescents and has been associated with both CPs and CU traits [55].

## 3. Results

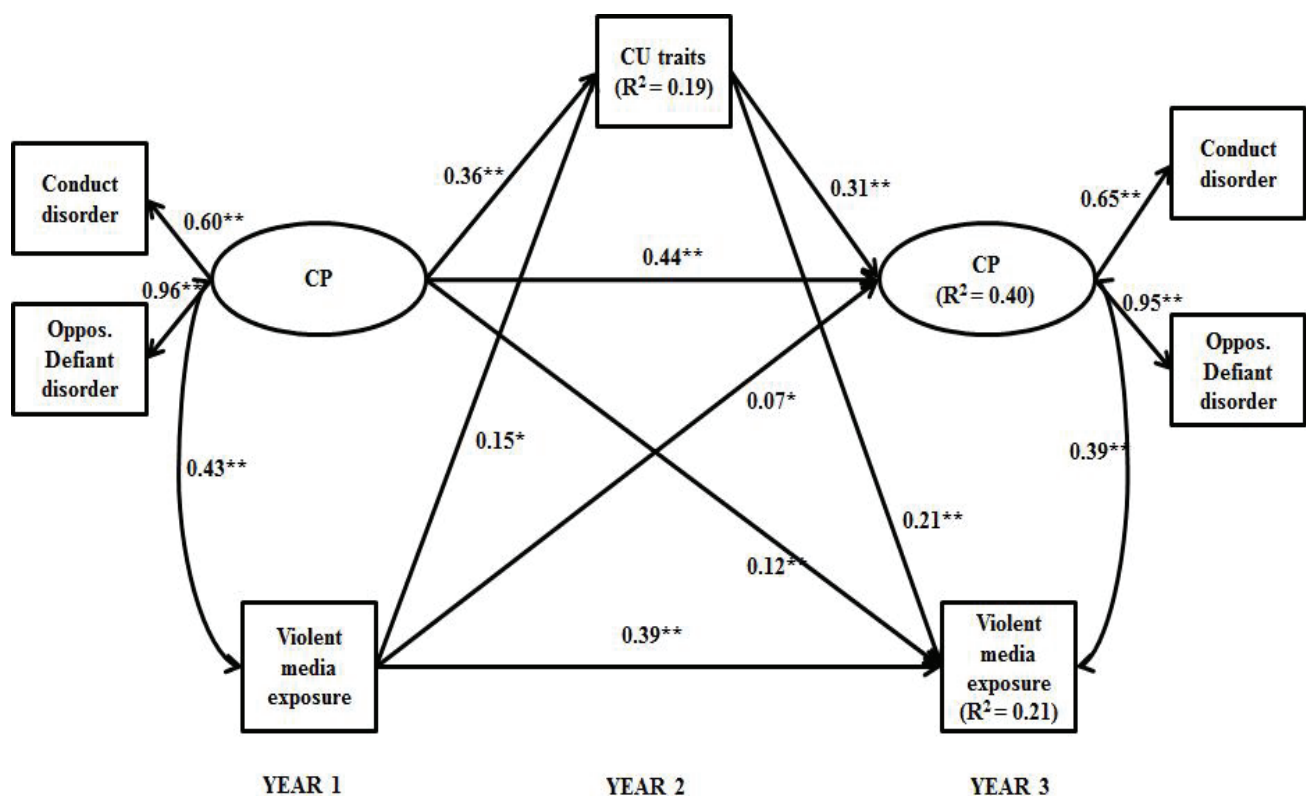
### 3.1. Descriptive Statistics

Table 1 shows the means and standard deviations of each of the variables under investigation. Both ODD,  $t(1,451) = 3.95$ ,  $p < 0.001$ , and CD subscale scores,  $t(1,451) = 4.57$ ,  $p < 0.001$ , increased from Year 1 to Year 3. ODD and CD subscale scores were highly correlated across time, providing evidence for their interrelation, and were significantly associated with both MVE and CU traits across time, providing initial evidence for the longitudinal associations between the variables under study. Year 1 and Year 3 MVE and Year 2 CU traits were also significantly correlated.

### 3.2. Structural Equation Model (SEM)

The hypothesized model, which is illustrated in Figure 1, was based on a three-wave structural equation model that investigated the cross-lag association between MVE and CPs, and two indirect pathways: (a) from Year 1 MVE to Year 2 CU traits to Year 3 CPs and (b) from Year 1 CPs to Year 2 CU traits to Year 3 MVE. As seen in the figure, CPs represent a latent variable based on CD and ODD observed scores, and MVE and CU traits represent observed variables. The model included both direct and indirect paths linking the constructs of interest. Three standard fit indices were used in addition to the Chi-square statistic to evaluate model fit of the SEM models: The Root Mean-square Error of Approximation (RMSEA), Standardized Root Mean Residual (SRMR), and the Comparative Fit Index (CFI). Cut-off values close to 0.06 for RMSEA, 0.08 for SRMR, and 0.95 for CFI were considered a good fit [59]. The Full Information Maximum Likelihood Estimator in Mplus 6.1 [60], which accommodates missing data by estimating the full model using all available information from all participants, was utilized for all analyses. The model also takes into account the nested structure of the data by indicating in the Mplus syntax that children are nested within different schools.

**Figure 1.** Structural Equation Model examining the longitudinal associations between Conduct Problems (CP), Callous-Unemotional (CU) traits, and Media Violence Exposure (MVE).



Indirect effects: CP → CU → VME:  $\beta = 0.07$ ,  $SE = 0.01$ ,  $p < 0.001$

VME → CU → CP:  $\beta = 0.09$ ,  $SE = 0.02$ ,  $p < 0.001$



### 3.2.1. Direct Effects

The SEM under investigation fit the data well,  $\chi^2_{(6, N=1,451)} = 8.65, p = 0.20$ ;  $RMSEA = 0.02$  ( $RMSEA\ CI: 0.01|0.03$ ),  $SRMR = 0.01$ ,  $CFI = 0.99$ . MVE was positively correlated with CPs at Year 1 and at Year 3. The factor loading of the observed indicators on the CPs latent factors were all higher than 0.60. The autoregressive paths between Year 1 and Year 3 CPs,  $\beta = 0.44, SE = 0.04, p < 0.001$ , and MVE,  $\beta = 0.39, SE = 0.04, p < 0.001$ , were significant, indicating stability over time. As shown in Figure 1, greater CPs at Year 1 was associated with higher MVE at Year 3,  $\beta = 0.12, SE = 0.03, p < 0.001$ , and CU traits at Year 2,  $\beta = 0.36, SE = 0.03, p < 0.001$ . In turn, MVE was associated with higher CPs at Year 3,  $\beta = 0.07, SE = 0.03, p < 0.05$ , and greater CU traits at Year 2,  $\beta = 0.15, SE = 0.03, p < 0.001$ . Therefore, the results suggest bidirectional associations among CPs and MVE and that both variables are directly associated with CU traits. Year 2 CU traits were positively associated with both CPs,  $\beta = 0.31, SE = 0.03, p < 0.001$ , and MVE,  $\beta = 0.21, SE = 0.03, p < 0.001$ , measured at Year 3.

### 3.2.2. Indirect Effects

Findings so far provide support that the independent variables (CPs and MVE measured at Year 1) are directly associated with the mediator (CU traits measured at Year 2), and that the mediator is directly associated with the dependent variables (CPs and MVE measured at Year 3). The indirect effect of Year 1 CPs to Year 3 MVE through CU traits was also significant,  $\beta = 0.07, SE = 0.01, p < 0.001$ . Similarly, the indirect effect of Year 1 MVE to Year 3 CPs through CU traits was significant,  $\beta = 0.09, SE = 0.02, p < 0.001$ . Therefore, both indirect pathways under examination were significant, and the model under examination suggests that both direct and indirect pathways, through CU traits, explain the association between MVE and CPs. Finally, 19% of the variance in CU traits, 40% of the variance in CPs, and 21% of the variance in MVE was explained by the model under investigation.

## 4. Discussion

The current study contributes two important findings to improve our understanding of CPs in youth and its relation with MVE. First, the model under investigation suggested a longitudinal, bidirectional association between CPs and MVE. Second, this bidirectional association was mediated by CU traits, therefore highlighting the significance of individual differences as an underlying mechanism in the association between MVE and CPs.

### 4.1. Bidirectional Association between CPs and MVE over Time

Prior work has established a causal link between MVE and aggressive behavior in youth [8–11,61,62]. The present findings support the idea that MVE predicts CPs, a more specific type of aggressive and antisocial behavior, which is in accordance with the General Aggression Model proposed by Anderson and Dill [63]. On the other hand, there is also work supporting the tendency of youth scoring high on CPs to watch violent media (e.g., [31]). As an explanation for this finding, it has been suggested that people seeking thrill and adventure, a characteristic of youth with symptoms of CD or ODD [64], are more inclined to choose media violent content that in part fulfills their psychological need of sensation

seeking [65]. However, the current study extends these findings by providing evidence for a bidirectional longitudinal association between MVE and CPs in adolescence. This positive bidirectional association indicates that youth who are more likely to be attracted to media with violent content are those who have a tendency to act aggressively or violently, and at the same time youth high on CPs are the ones who are more likely to be influenced from the detrimental effects of such exposure [66]. Importantly, current findings suggest that we should focus on bidirectional rather than unidirectional effects in order to understand the association between MVE and CPs.

#### *4.2. CPs Add Unique Variance to the Prediction of MVE and CU Traits Mediates This Association*

Youth with CPs are more vulnerable to the negative effects of media violence [27,28], and aggressive adolescents are more likely to watch aggressive characters in TV [31] and play violent video games [34]. Therefore, current findings provide additional evidence that antisocial youth are at increased risk to be exposed to media violence. However, our findings differ from previous research because we examined the association between CPs and MVE using a cross-lag model that controls for initial reports of MVE, and the findings indicate that the effect of CPs is independent of the variance contributed by MVE. At the same time, the current findings suggest that CU traits can partially explain the longitudinal association from CPs to MVE, indicating that it is important to understand the significant mediational role of CU traits in this association. Individual characteristics, such as the reward dominant style and sensation seeking characterizing youth with CU traits [41], have potential for explaining the robust effect from CPs to MVE. CPs youth with CU traits might be more likely to be reinforced by violent media stimuli and be more aggressive or antisocial as a result of watching media with violent content, as Hartmann [24] found. Another explanation of this association has to do with the fearlessness and insensitivity to negative emotions characterizing youth with CU traits [41], making them more prone to be exposed to media violence. Importantly, according to the new diagnostic criteria for conduct disorder reported in the DSM-V [39], CU traits constitute an important specifier for CD, and children with CP and CU traits represent a more severe and aggressive subgroup of youth [36,38]. Prior work suggests that youth with severe conduct problems and CU traits are the ones more likely to be exposed to media violence [55], and our findings suggest that CU traits is an underlying mechanism explaining the longitudinal association between CPs and MVE.

#### *4.3. MVE Is Associated with Higher CU Traits and CU Traits Mediate the Longitudinal Association from MVE to CPs*

The theoretical model under investigation suggested that both CPs and MVE are robust predictors of CU traits. There are a number of studies suggesting an association between CP and CU traits (e.g., [55], see [67] for review); however, this is among the first studies providing evidence that MVE, which represents an environmental stimulus, results in higher CU traits. Much research attempted to understand the developmental origins of CU traits by focusing on both biological-temperamental [68,69] and environmental factors [70–72], providing evidence for a biological and genetic predisposition to CU traits (see [73] for review). However, Karpman [74] theorized that exposure to trauma can be an etiological pathway to psychopathic traits. Consistent with this theoretical perspective, developmental research indicates that trauma exposure during toddlerhood is associated with early affective

deficits consistent with CU traits, namely a lack of empathy and concern for others [75]. Moreover, chronic exposure or witnessing violence influences the normative development of empathy and morality [76,77], suggesting that violence exposure might possibly lead to the development of CU traits. Previous studies have also suggested that violent content either in television or video games can affect empathy through desensitization of the viewers to the consequences of violent actions [78,79]. Thus, the literature on trauma and violence exposure supports the findings of the present study. MVE might not necessarily be considered as a traumatic experience for youth; however, similar to traumatic experiences or witnessing violence in other environmental contexts, MVE might be an etiological pathway leading to the development of CU traits, at least among adolescents.

It is particularly important that current research findings replicates prior work and provides additional support that MVE is a precursor of CPs, within a cross-lag longitudinal model. Theoretical perspectives, such as social learning theory (e.g., [80]), provide a potential explanation of this direct effect. Youth, exposed to media violence or violence in other contexts (*i.e.*, community and family) [81], are more prone to exhibit aggressive behavior. However, the present study provides a new perspective in the literature. It was theorized that CU traits, representing a personality variable, will act as an underlying mechanism, explaining the longitudinal effect from MVE to CPs. The role of CU traits as a mediator of this association was supported by the study's findings, providing evidence for an indirect pathway from MVE to CU traits to CPs, which is in addition to the direct association from MVE to CPs. Indeed, CU traits were found to play an important mediational role in explaining the association between exposure to violence and violent behavior. Kimonis *et al.* [82] investigated the link between family violence exposure and lifetime violent offending in incarcerated youth. They found that CU traits contributed to the prediction not only of the chronicity, but also of the severity of delinquency exhibited by incarcerated youth. Thus, the present study builds on prior evidence linking different types of violence exposure (*i.e.*, family or community) and CPs by investigating a different kind of exposure to violence, specifically MVE. These findings in combination, suggest that there are multiple risk-factor pathways to understand aggressive and CP behavior in youth; however CU traits seems to be an underlying mechanism explaining the association of environmental risk factors, and more specifically MVE, to behavioral problems [36].

#### 4.4. Strengths, Limitations, Future Directions, and Implications

One of the strengths of the current research was the large sample of adolescents, which enabled the use of SEM. In addition, collection of data at three different time points allowed the exploration of longitudinal effects between CPs and MVE, and the investigation of longitudinal indirect effects. Lastly, the large sample included in the current study was representative of the population in Cyprus. Nevertheless, the present findings should be interpreted in light of some limitations, such as the reliance on self-reports for children's CPs, CU traits and MVE, and future studies should investigate this association from the perspective of additional reporters, such as parents and teachers. Despite their limitations, self-report instruments administered to adolescents have the advantage of measuring individual attitudes or characteristics, such as CU traits and CPs that may not be apparent to other reporters such as parents or teachers [54]. Additionally, whereas the validity of self-report measures of psychopathology and personality increases with the child's age, the validity of parent and teacher

report measures decreases during adolescence [83]. Future work should also consider different types of measurements, including observational and interview measures, which will allow for an in depth assessment of youths' reactions to MVE. Further, research should also focus on understanding the emotional reactions of adolescents with CPs and CU traits after watching violent scenes, possibly using psychophysiological measurements, providing evidence on whether the effects identified in the current study are due to desensitization to media violence. Longitudinal research may also examine alternative possibilities, such as the possibility that MVE may actually mediate the longitudinal association between CU traits and CPs, or account for other important factors that may explain the inter-relationship between CPs, MVE, and CU traits, such as parental monitoring or peer pressure. In addition, the model should be replicated with aggressive behavior instead of CPs, which will be directly related to studies investigating the association between aggressive behavior and MVE.

The current study has clear value for understanding how CPs develop during adolescence, since findings suggest that direct effects of MVE and direct and indirect effects of CU traits contribute to the development of antisocial behavior during adolescence. There are only a handful of studies investigating these links, and our findings support the need for further research in this area. Importantly, our results suggest that personality traits along with environmental factors, such as MVE, influence the development of CPs, informing theory regarding etiological pathways to CPs and providing evidence for the design of interventions. Practically, our findings may be used to inform efforts at preventing the persistence of CPs into adulthood by minimizing exposure to media violence, especially for youth high on CU traits. Although youth high on CU traits are less responsive to traditional interventions than those scoring low [84–86], our findings indicate that environmental effects should also be taken into account for interventions to be effective. One way to minimizing exposure to media violence is through parental monitoring [8]. Parents need to monitor the amount of time their children spend watching violent movies and/or playing violent video games. Finally, it is important for future research investigating the effects of media violence exposure to antisocial behavior, as well as interventions designed to ameliorate the effects of exposure to violence, to take into account individual differences. The inability to process emotional and threatening information, characterizing individuals with callous-unemotional traits might explain the link from violence exposure to CPs.

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## Conflicts of Interest

The authors declare no conflict of interest.

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