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Post-traumatic stress disorder and having antisocial peers in adolescence are risk factors for the development of antisocial personality disorder

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ABSTRACT

Antisocial personality disorder is a mental illness that is a major public health concern. Both post-traumatic stress disorder and association with antisocial peers have been found to be associated with increased risk for diagnosis of antisocial personality disorder. Despite this, past research has yet to examine the interrelatedness of these three constructs from a developmental perspective. This study sought to examine the effect of post-traumatic stress disorder in adolescence on the risk for antisocial personality disorder diagnosis in adulthood and the relevance of differences in developmental patterns of degree of association with antisocial peers in adolescence as an additional risk factor. The Pathways to Desistance data were used in analyses, comprising the longitudinal responses of 1,354 juvenile offenders who had recently been adjudicated for a serious offense prior to baseline measurement. Logistic regression was used to examine these relationships. Ever meeting criteria for post-traumatic stress disorder in adolescence significantly increased the odds of developing antisocial personality disorder in adulthood. This effect was no longer significant upon inclusion of variables pertaining to association with antisocial peers. Implications are discussed.

1. Introduction

Antisocial personality disorder (APD) is a DSM-5 mental disorder characterized by disregard for the rights of others, lack of remorse for actions, impulsivity, and patterns of manipulative and antisocial behavior (American Psychiatric Association, 2013). APD has been linked to increased risk for engagement in a variety of deleterious outcomes, including drug abuse and violent behavior (Dykstra et al., 2015; Gillespie et al., 2018; Goldstein et al., 2007; Kolla et al., 2017; Shepherd et al., 2018). Because of the socially pervasive and costly nature of APD, understanding etiology is a major concern for psychologists, criminal justice officials, and public health professionals. While past research has provided some insight into etiology (Chang et al., 2017; Di Giacomo and Clerici, 2017; Gobin et al., 2015), there remain significant gaps in the literature. Post-traumatic stress disorder (PTSD) and association with antisocial peers are two factors that have been found to be related to APD onset. However, there has yet to be any study which has sought to clarify the interrelated nature of all three phenomena and provide more complete understanding of how PTSD and developmental patterns of antisocial peer association during adolescence may lead to the onset of APD in adulthood.

1.1. Specific aims

The present study sought to understand the causal pathway linking PTSD in adolescence to APD diagnosis in adulthood through the development of antisocial peer ties during adolescence. In this way, the direct effect of PTSD on APD diagnosis was expected to be reduced when differences in the social development of antisocial peer relationships during adolescence was accounted for in the model. Antisocial peer relationships/association refer to established friendships with peers who engage in antisocial behavior. It was believed that components of the PTSD symptom constellation and experience may lead to selection into peer groups characterized by members who attempt to influence an adolescent to engage in antisocial behavior, which would subsequently lead to increased risk for developing a diagnosis of APD in adulthood.

1.2. PTSD and antisocial peer association

PTSD is a pervasive mental disorder that is precipitated by exposure to trauma and is characterized by intrusion symptoms (distressing flashbacks, memories, and dreams associated with the trauma), negative mood symptoms, and sensitivity to reminders of the trauma (triggers) which can cause further mood symptom severity and is associated

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with impulsivity (American Psychiatric Association, 2013; Contractor et al., 2017; Evren et al., 2018). PTSD has also been shown to have a relatively high comorbidity with APD (Goldstein et al., 2016; Goodwin and Hamilton, 2003). While little research has examined the temporal ordering of onset, Johnson et al. (2004) do indicate that childhood trauma resulting in PTSD increases risk for subsequent development of APD. Antisocial peer association is one mechanism by which this progression from PTSD to APD in adulthood may occur. While past research has yet to investigate the possibility that PTSD sufferers demonstrate elevated levels of antisocial peer association, there is reason to believe that this may be the case. The potential link between PTSD and antisocial peer association relates to characteristics of PTSD which may lead to selection into peer groups with members who engage in antisocial behavior. Mainly, this relates to impulsivity that is characteristic of PTSD. Akers' (1973) social learning theory posits that the relevance of antisocial peers for offending is due to a socialization process focused on providing definitions favorable to offending and reinforcement for engagement in antisocial behavior. While the present study does not focus explicitly on offending, an alternative postulation regarding why antisocial peers are often found to be associated with offending is: the "birds of a feather" hypothesis. This opposing perspective posits that individuals of similar social and psychological characteristics select into peer groups with others like themselves (Glueck and Glueck, 1950; Gottfredson and Hirschi, 1990). Low self-control is explicitly cited as one of these characteristics which may be associated with peer group selection. Social network analysis lends credence to this theory, as research indicates that social networks are generally characterized by homophily (McPherson et al., 2001). While past research on this topic has yielded mixed results (Meisel and Lynch, 2017; Young, 2011), there remains reason to believe that there may be a relationship here. This is based upon the relationship between self-control and behavioral outcomes. Related to low self-control and selection is the fact that drug use rates are generally higher among those diagnosed with PTSD (Jones et al., 2018; Sullivan et al., 2016; Wojciechowski, 2018a). Low self-control is a major risk factor for drug use also (Jones et al., 2015; Schaefer et al., 2015; Tarantino et al., 2015). Past research has indicated that social network ties are important for obtaining illicit drugs (Coomber et al., 2016; Hughes et al., 2017), further indicating that behaviors like this may lead to increases in antisocial peer association. A history of antisocial behavior, like drug use, is also a necessary condition for progression to APD diagnosis in adulthood. It is here that antisocial peer association may be identified as a risk factor impacting the of the PTSD-APD relationship.

1.3. Antisocial peer association as a risk factor associated with the PTSD-APD relationship

As noted above, impulsivity that is characteristic of PTSD and related antisocial behaviors may lead to selection into peer groups whose members engage in antisocial behavior. Association with these antisocial peers has been found to be associated with an increased risk of developing APD later in life (Shook et al., 2009). There exist numerous mechanisms that may contribute to this elevated risk. Association with antisocial peers can lead to greater engagement in antisocial behavior (Lee et al., 2017; Oxford et al., 2001; Price et al., 2018), which is a necessary condition for APD diagnosis (American Psychiatric Association, 2013). Further, this association and continued involvement in a antisocial lifestyle can lead to deeper entrenchment of antisocial values, attitudes, and beliefs; in a manner consistent with Akers' (1973) social learning theory. Considering that these sorts of attitudes, like a disregard for the rights of others, are also necessary conditions for establishing APD diagnosis (American Psychiatric Association, 2013), this again is a possible contributor to diagnosis. Finally, the increased engagement in antisocial behavior that is precipitated by antisocial peers can lead to issues transitioning away from a antisocial lifestyle at later points. Moffitt (1993) describes such events causing issues transitioning to a normative lifestyle as snares. These snares include events like dropping out of school, establishing a formal criminal record, and addiction; among others. All of these identified events are associated with antisocial peer association and antisocial behavior, either by definition or via relationship (Capaldi et al., 2008; Marschall-Lévesque et al., 2014; Morrow and Vilodas, 2018; Thornberry et al., 2016). These mechanisms also are developmental in nature, that is, they are all processes of change across the adolescent period of the life-course that may eventually lead to an APD diagnosis. It is here that the developmental importance of understanding the role that antisocial peer association plays for this relationship.

The developmental relevance of these concepts of interest is paramount to understanding the nature of their relationships. By definition, APD cannot be diagnosed until after age 18 (American Psychiatric Association, 2013). This makes early adulthood the period of the life-course that is particularly salient for this concept. However, research indicates that peer relationships are most salient in adolescence (Warr, 2002). In childhood, family relationships hold the greatest degree of salience, but this salience wanes as peer relationships take on greater importance in adolescence. In adulthood, these peer ties lose a degree of relevance, as family formation and stable romantic relationships begin to necessitate increased time commitment and engagement. This has been posited to facilitate a shift away from engagement in criminal behavior (Moffitt, 1993; Sampson and Laub, 1995). Despite this general shift away from time and energy devoted to peer relationships, antisocial peer association still exists as a risk factor for antisocial behavior in adulthood. Wojciechowski (2018b) found that antisocial peer association could be delineated into three main developmental subgroups in adolescence and that subgroup membership predicted continued involvement in antisocial behavior in adulthood. All three groups maintained rank stability in their development through adolescence and into adulthood, indicating that relative levels of antisocial peer association were generally established in early adolescence. It may be that PTSD that has onset in early adolescence and earlier may precipitate selection into antisocial peer groups that then is maintained through adolescence, resulting in increased risk for developing APD in adulthood. This would be demonstrative of the proposed role that antisocial peer association is expected to play in impacting the PTSD-APD relationship.

Hypothesis. : Accounting for heterogeneity in developmental patterns of antisocial peer association in adolescence will reduce the magnitude of the relationship between PTSD in adolescence and the development of APD in adulthood.

2. Methods

2.1. Data

Data from Waves 1 and 10 from the Pathways to Desistance study were utilized in analyses. These data comprise the responses of 1354 juvenile offenders over the course of 84 months following a recent adjudication for a serious offense. Serious offenses consisted of all felonies, as well as misdemeanor sexual assault and weapons charges. Qualifying offenses had to have been committed when participants were between 14 and 17 years of age and participants were all between ages 14 and 19 at baseline measurements. Participants were recruited from study sites in Philadelphia, PA and Maricopa County, AZ. Of all qualified juvenile offenders approached regarding their interest to take part in the study, 20% declined participation. Attrition had reached 12.9% at Wave 10 of data collection. The proportion of male drug offenders who were included in the sample was capped at 15% of the total purposive sample. This was done in order maintain heterogeneity in offender type and gender in the sample. These data have been used to publish manuscripts on a number of topics of particular interest to this study. PTSD, antisocial peer association, and APD have all been topics

of previous publications (Vaughn et al., 2014; Wojciechowski, 2018a,b). Beyond these most salient topics, the Pathways to Desistance data have also been utilized in publications focused on other topics including, but not limited to: substance abuse (Mulvey et al., 2010; Walters, 2014), general offending (Cauffman et al., 2015; Cid and Martí, 2012), and healthcare access (Baggio et al., 2019; Wojciechowski, 2018c).

Data utilized in the present study were obtained via participant self-report. Laptops were provided to participants by the research team to collect data. Participants were administered oral prompts by a member of the research team and then used the laptops to provide responses. This was done to maximize confidentiality in reporting, which was expected to increase honesty in reporting. Interviews were administered in places convenient for the participant, like: participants' homes, libraries, and criminal justice facilities.

2.2. Measures

2.2.1. Antisocial personality disorder

APD was the dependent variable in this study. The Personality Assessment Inventory was utilized to assess the presence of APD among participants. This tool was comprised of 32 individual items which would indicate the presence or absence of personality traits associated with APD. Raw scores were then converted to T-scores, of which, scoring above 82 would indicate likely presence of APD diagnosis. This resulted in a binary measure, delineating participants who likely demonstrated APD and those who did not (0 = No; 1 = Yes). The Wave 10 measure of this construct was used in this study, as this was the only wave at which this construct was assessed.

2.2.2. Post-Traumatic stress disorder

PTSD was one of the main independent variables in this study. The Composite International Diagnostic Interview was used to assess the presence of the disorder. Diagnostic measures with built-in skip patterns are used in this tool to identify whether or not a participant is likely to demonstrate a PTSD diagnosis. This resulted in a binary measure, delineating participants demonstrating a likely lifetime PTSD diagnosis from those who did not (0 = No; 1 = Yes). This measure indicated if participants had ever demonstrated symptoms consistent with a PTSD diagnosis at any point in their lives. The baseline measure of this variable was used in order to model the relevance of adolescent PTSD and antisocial peer group selection leading to the development of APD in adulthood.

2.2.3. Antisocial peer association

Antisocial peer association was examined as a potential risk factor impacting the odds that PTSD in adolescence leads to the development of APD in adulthood. Past research on developmental patterns of antisocial peer association by Wojciechowski (2018b) resulted in the identification of a three-group model of development. All three groups demonstrated general declines in antisocial peer association across adolescence and into early adulthood, but maintained rank stability throughout. This resulted in Low, Moderate, and High groups being defined. The general path and rank stability of all three groups makes these groups useful for examination of developmental effects that may cascade from a baseline variable to more distal outcomes. This is the case for examining the nature of the effect of antisocial peer association trajectory group membership within the PTSD-APD relationship. Dummy variables corresponding to group membership for each trajectory group (ex: 1 = High group assignment; 0 = All other participants). The dummy variable corresponding to the Low group was omitted from analyses in order to provide a reference category. The original antisocial peer association variables utilized to construct this trajectory model were measured at each time point. A series of ordinal items were used to assess the general number of peers who participants reported attempted to influence them to engage in seven different antisocial acts. All of these measures were used to elucidate the three-group trajectory model comprised of the three antisocial peer association trajectory groups used in analyses for the present study.

2.2.4. Control variables

Several control variables were included in analyses to mitigate the risk of bias in estimation of effects on the risk of reporting APD-diagnosis. Gender was the first of these control variables, as APD generally is observed at higher rates among males than females (American Psychiatric Association, 2013). Participants' gender was measured as a binary variable at baseline. This delineated males and females into two groups (0 = Males; 1 = Females).

Race was also included in analyses as a control variable. This is because of differing prevalence rates for the disorders of interest stratified along racial lines (American Psychiatric Association, 2013). Race was originally measured as a nominal variable, delineating participants into the following categories: White, Black, Hispanic, and Other Race. Dummy variables corresponding to each of these racial categories were constructed for use in analyses. These dummy variables delineated participants in one racial category from all other participants (ex: 1 = Hispanic; 0 = All other participants). The dummy variable corresponding to White participants was excluded from analyses, as this would provide a reference racial category to interpret the race dummy variable coefficients effects against.

Socioeconomic status (SES) was also included as a control variable, as antisocial behavior has been found by past research to be stratified by social class (Piotrowska et al., 2015). SES was measured at baseline as a weighted score based upon participants' parents' occupational prestige and educational attainment. If both parents were available to provide SES data, then a mean of both scores was computed so that each participant was provided a single SES score.

The final control variable included in analyses was participants' age at Wave 10. This is because APD, by definition, cannot be assessed until after age 18. While all participants were older than age 18 at Wave 10, some were indeed older than others, so some participants had more time for the disorder to fully develop and demonstrate the full constellation of symptoms necessary for diagnosis. Age is simply measured as an interval variable in years.

2.3. Analytic strategy

A series of logistic regression models were estimated in order to test the impact of PTSD diagnosis in adolescence on the risk for developing APD diagnosis in adulthood and the relevance of developmental patterns of antisocial peer association for understanding this relationship. The first model examined the direct effect of PTSD diagnosis on APD diagnosis. The second model included the antisocial peer association variables to test for the impact that antisocial peer association has on impacting the magnitude of this proposed direct effect. If there is a significant direct effect of PTSD on APD in the first model, then inclusion of the antisocial peer association variables should result in reducing this significant effect to nonsignificance. Reduction of the magnitude of the effect, while still maintain significance, may also be evidence of some importance of this variable for this relationship. Logistic regression is used to examine covariate effects on binary outcomes. In this specific case, results are reported in odds ratios (OR). Odds ratios indicate the impact of a covariate score on the odds of being assigned to the "1" category of the outcome variable, relative to being assigned to the "0" category. A coefficient <1 indicates that increases in the scale on a given independent variable are associated with lower odds of being categorized as likely presenting APD-diagnosis. A coefficient >1 indicates that increases in the scale on a given independent variable are associated with increased odds of being categorized as likely presenting APD-diagnosis. Comparative model fit is assessed using likelihood ratio tests.

Table. 1
Descriptive statistics.

	Mean/Proportion	Standard deviation	Minimum	Maximum
Antisocial personality disorder diagnosis (0 = No; 1 = Yes)	0.064	0.244	0	1
Antisocial Peer Association				
High group	0.201	0.401	0	1
Moderate group	0.476	0.499	0	1
Post-traumatic stress disorder at baseline (Ever) (0 = No; 1 = Yes)	0.065	0.247	0	1
Age at wave 10	22.026	1.146	20	25
Gender (0 = Males, 1 = Females)	0.136	0.343	0	1
Race (Reference = Whites)				
Black	0.414	0.493	0	1
Hispanic	0.335	0.472	0	1
Other Race	0.048	0.214	0	1
SES at Baseline	51.409	12.299	11	77

Table. 2
Covariate effects on the odds of antisocial personality disorder diagnosis in adulthood (Odds ratios): Model 1.

	OR	*p*-value	95% confidence interval	
Ever met criteria for PTSD at baseline (0 = No; 1 = Yes)	2.255	.035	1.057	4.810
Gender (0 = Male; 1 = Female)	0.460	.080	0.193	1.097
Race (Reference = White)				
Black	0.595	.137	0.301	1.178
Hispanic	1.066	.847	0.555	2.049
Other race	1.035	.953	0.331	3.324
SES at baseline	0.990	.330	0.969	1.011
Age at wave 10	0.874	.216	0.706	1.082
Constant	5.583	.494	0.040	774.731

3. Results

Table 1 provides descriptive statistics pertaining to relevant variables. Table 2 provides results examining the direct effect of baseline PTSD diagnosis and control covariates on risk for meeting criteria for APD diagnosis in adulthood (Model 1). Table 3 provides statistics pertaining to Model 2 results, which included antisocial peer association variables as risk factors potentially impacting the magnitude of the PTSD-APD relationship.

Model 1 results indicate that having ever met criteria for PTSD diagnosis at baseline significantly increased the odds of meeting criteria for APD diagnosis in adulthood (OR = 2.255). No other variables were significantly associated with APD diagnosis in adulthood in this model. Model 2 results indicate that developmental patterns of antisocial peer association reduced the PTSD-APD relationship to nonsignificance. Additionally, assignment to both the Moderate antisocial peer association trajectory group and High antisocial peer association trajectory, relative to assignment to assignment to the Low antisocial peer association trajectory group, predicted increased risk of meeting criteria for APD diagnosis in adulthood (Moderate OR = 2.505; High OR = 9.126). Younger age at Wave 10 was also a significant predictor of meeting APD diagnostic criteria at Wave 10. The likelihood ratio test indicated that Model 2 provided significantly better fit to the data than did Model 1.

Table. 3
Covariate effects on the odds of antisocial personality disorder diagnosis in adulthood (odds ratios): Model 2.

	OR	*p*-value	95% Confidence Interval	
Ever Met Criteria for PTSD at Baseline (0 = No; 1 = Yes)	2.064	.070	0.942	4.521
Antisocial Peer Association (Reference = Low group)				
High group	9.126	$p < .001$	4.037	20.634
Moderate group	2.505	.026	1.116	5.625
Gender (0 = Male; 1 = Female)	0.710	.455	0.289	1.744
Race (Reference = White)				
Black	0.529	.074	0.263	1.064
Hispanic	1.021	.952	0.527	1.977
Other race	1.007	.991	0.312	3.246
SES at baseline	0.987	.229	0.966	1.008
Age at wave 10	0.790	.038	0.632	.987
Constant	12.488	.335	0.074	2119.578

4. Discussion

The results of this study indicate that experiencing the onset of PTSD in adolescence or childhood significantly predicts increased risk for developing APD in adulthood. Further, this risk is linked to selection into peer groups whose members engage in antisocial behavior, as heterogeneity in developmental patterns of antisocial peer association during adolescence were linked to both PTSD and APD as a risk factor reducing the magnitude of this relationship to nonsignficance upon inclusion in the model. This would seem to indicate that components of the PTSD symptom constellation result in selection into friendships with antisocial peers, which then leads to the development of APD. While clarification of the distinct mechanisms is beyond the scope of this study, this research provides a first step towards understanding how the social and psychological intersect to produce APD. There are numerous implications of this research for future studies on these phenomena.

Heterogeneity in the developmental patterns of antisocial peer association was found to strongly predict APD diagnostic status, with individuals with moderate and high levels of antisocial peer association demonstrating greater risk for diagnosis. While past research has posited the importance of antisocial peers for the development of APD (Shook et al., 2009), this study is the first to examine how these developmental patterns predict onset of the disorder. While this provides a useful first step, establishing the precise mechanism by which antisocial peer association leads to increased risk for APD onset was beyond the scope of this study. For now, this remains speculative. However, it seems probable that antisocial peer association functions to increase risk for APD onset in adulthood through one or more of the identified mechanisms. This would seem to indicate that programs focused on disrupting antisocial peer ties would be useful for impacting APD. However, there are often issues with trying to provide programming efforts focused on this specific risk factor. First, aggregating antsocial youth together in groups to provide programming is decidedly a poor choice (Dodge et al., 2006), as this is specifically the type of peer group formation that programs would seek to inoculate against. Further, traditional programming can do little to actually eliminate the contact between youth and antisocial peers in community contexts, as youth will leave a program and be subject to the same exposure to antisocial peers. Impacting antisocial peer association as a risk factor often requires intensive treatment that takes great effort on the parts of youth, family, and program staff or culture change via geographic relocation and/or contextual changes in rules/expectations (Farrell et al., 2001;

Henggeler et al., 1998). However, there are also simpler ways to address antisocial peer association. Mentoring programs have also been offered as one way of reducing antisocial peer association (Dodge et al., 2006). By providing structured time with a prosocial role model, unstructured time with antisocial peers can be substituted and impacted. While this provides some promise for reducing the negative impact of antisocial peer association, a great deal of work is left to be done. Future research should investigate the mechanisms underlying the relationship between APD and antisocial peer association and determine their relevance for programming meant to reduce antisocial peer association.

PTSD was found to exert a direct effect on APD diagnosis, increasing risk for onset. This risk was reduced to nonsignificance upon inclusion of variables pertaining heterogeneity in the development of antisocial peer association in the model. Again, the mechanisms underlying this relationship remain unclear, but establishing the interconnected relationship is the first step towards a clearer understanding of how trauma and peers are interrelated with APD. While speculative, there are several potential components of the PTSD symptom constellation which could lead to increased involvement with antisocial peers. Increased impulsivity is related to PTSD (Contractor et al., 2015; Contractor et al., 2016). Impulsivity is also a hallmark characteristic of APD and antisocial behavior (Swann et al., 2009). If highly impulsive individuals are selecting into peer groups characterized by antisocial behavior, this could offer a mechanism by which PTSD leads to antisocial peer association and subsequent APD. This would be consistent with the "birds of a feather" hypothesis associated with Akers' (1973) social learning theory (Glueck and Glueck, 1950; Gottfredson and Hirschi, 1990). If this is the case, then providing juvenile offenders who are diagnosed with PTSD with programming focused on strengthening self-control may reduce future recidivism by decreasing the likelihood of progression to APD in adulthood. Future evaluation research should focus on PTSD-diagnosed populations to examine the degree to which improving self-control may reduce risk of development of APD later in the life-course.

A final finding from this study was that being younger at Wave 10 measurements was the only control covariate to significantly influence risk of APD diagnosis in the full model. Antisocial peer association trajectory group assignment may have acted as a suppressor variable in this regard, as inclusion of this variable in the full model led the age coefficient to become significant when it previously was non-significant. This may be due to younger participants continuing to demonstrate higher levels of antisocial peer association than older participants, a possibility supported by past research on the salience of peer ties (Warr, 2002). All other demographic characteristics were found to be non-significantly related to APD risk even in Model 1. This would seem to indicate differential risk for PTSD in adolescence may be impacting those potential effects on APD risk. This would be consistent with research on differential prevalence rates of PTSD by gender, race, and social class (American Psychiatric Association, 2013). Future research should be conducted to provide a deeper examination of these potential mechanisms underlying significance and non-significance among these control covariates.

The present study provides insight into the nature of the risk for the development of APD among PTSD sufferers. However, there remain some limitations. The first of these limitations relates to the generalizability of results. The Pathways to Desistance sample is comprised solely of juvenile offenders, so generalizability beyond this population is likely to be somewhat limited. The sample was also gathered purposively, further limiting generalizability. Another limitation of this research relates to the lack of examination of processual mechanisms linking the concepts that is highlighted above. Providing more complete understanding of what components of the PTSD symptom constellation and aspects of antisocial peer association that led them to be related to one another and to APD is beyond the scope of this study. Future research should investigate these mechanisms further, as this will be the best way to design programming that can actually address these risk factors for the development of APD.

This study indicated that APD in adulthood was predicted by onset of PTSD earlier in the life-course. This finding is consistent with past research indicating a comorbidity overlap between PTSD and APD (Goldstein et al., 2016; Goodwin and Hamilton, 2003). This effect was reduced to nonsignificance after accounting for developmental patterns of antisocial peer association during adolescence. This indicates the importance of preexisting mental illness, as well as social context, for predicting the onset of APD. APD represents a highly pervasive mental disorder that should be a prominent public health concern because of its relationship to violent offending and substance abuse (Dykstra et al., 2015; Gillespie et al., 2018; Goldstein et al., 2007; Kolla et al., 2017; Shepherd et al., 2018). For this reason, the results of this study are highly relevant, as early screening for PTSD among trauma victims and assessment of those individuals' social environment may help to reduce the risk that psychopathology will progress to APD in adulthood. This study also highlights how trauma may be related to APD onset, as experience of trauma is a necessary condition for the onset of PTSD. Future research should continue to explore the nuances of these relationships in order to best understand the most efficient ways to reduce the prevalence of APD.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.psychres.2019.02.053.

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