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Within-individual versus between-individual predictors of antisocial behaviour: A longitudinal study of young people in Victoria, Australia

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Abstract

In an influential 2002 paper, Farrington and colleagues argued that to understand ‘causes’ of delinquency, within-individual analyses of longitudinal data are required (compared to the vast majority of analyses that have focused on between-individual differences). The current paper aimed to complete similar analyses to those conducted by Farrington and colleagues by focusing on the developmental correlates and risk factors for antisocial behaviour and by comparing within-individual and between-individual predictors of antisocial behaviour using data from the youngest Victorian cohort of the International Youth Development Study, a state-wide representative sample of 927 students from Victoria, Australia. Data analysed in the current paper are from participants in Year 6 (age 11–12 years) in 2003 to Year 11 (age 16–17 years) in 2008 (N = 791; 85% retention) with data collected almost annually. Participants completed a self-report survey of risk and protective factors and antisocial behaviour. Complete data were available for 563 participants. The results of this study showed all but one of the forward- (family conflict) and backward-lagged (low attachment to parents) correlations were statistically significant for the within-individual analyses compared with all analyses being statistically significant for the between-individual analyses. In general, between-individual correlations were greater in magnitude than within-individual correlations. Given that forward-lagged within-individual correlations provide more salient measures of causes of delinquency, it is important that longitudinal studies with multi-wave data analyse and report their data using both between-individual and within-individual correlations

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to inform current prevention and early intervention programs seeking to reduce rates of antisocial behaviour.

Keywords

Antisocial behaviour; correlates; delinquency; longitudinal study; risk factors

Youth antisocial behaviour (e.g., violence, stealing, truancy) and delinquency (antisocial behaviour that is a crime) are recognised around the world in Western countries as prevalent and costly phenomena. The prevalence of antisocial behaviour peaks in adolescence (Baker, 1998; Bond, Thomas, Toumbourou, Patton, & Catalano, 2000; Rutter & Giller, 1983) and is estimated to be 5% to 17% (depending on how it is defined) in Australia, with similar rates in the United States of America and the United Kingdom (Costello, Mustillo, Erklanli, Keeler, & Angold, 2003; Sawyer et al., 2001). The costs associated with youth antisocial behaviour are extensive and include those associated with physical and mental health services for youth offenders, law enforcement and youth justice services (Hemphill, 1996; Rollings, 2008). Indeed, the cost of crime has been estimated to be $36 billion per year in Australia, with young people engaging in much of this crime and therefore contributing strongly to the costs associated with crime. In the USA, the cost of crime is $60 billion a year for young people (Kuklinski, Briney, Hawkins, & Catalano, 2012), while in the UK it is estimated the average cost of prosecuted youth crime is £8000 per young person (National Audit Office, 2011).

Integrated Cognitive Antisocial Potential (ICAP) theory

The ICAP theory is a developmental life-course theory that attempts to explain both why individuals engage in antisocial behaviour (between-individual differences) and why people commit crimes (how potential is converted into offending; within-individual differences) (Farrington, 2014). This theory integrates components of strain, control, learning, labelling and rational choice theories. The main construct is antisocial potential, and the ICAP theory assumes that whether antisocial potential is translated to antisocial behaviour depends on cognitive (thinking and decision-making) processes that take account of encountering opportunities and victims. Hence, it both describes the longitudinal factors that predict antisocial behaviour, as well as the situational influences on antisocial behaviour.

Within-individual versus between-individual analyses

Increasing understanding of the predictors of youth antisocial behaviour is crucial to inform appropriate prevention and early intervention programmes that aim to reduce rates of such behaviours (Mulvey et al., 2004; O'Connell, Boat, & Warner, 2009). In the extant literature, most research focuses on between-individual (i.e. causes are inferred from variations between individuals) rather than within-individual (i.e. causes inferred from changes within individuals) predictors of antisocial behaviour. In this context, within-individual does not refer only to predictors internal to the individual (e.g. hyperactivity); rather, it refers to changes across time in the variables applying to the individual. Within-individual analyses require multiple repeated measures of both risk factors and antisocial behaviour; that is

longitudinal studies with multiple waves of data collection. Examination of within-individual changes in risk factors over time may be a better way of studying predictors of antisocial behaviour (Farrington, Loeber, Yin, & Anderson, 2002) because individuals are effectively their own controls which reduces variation due to individual-level factors such as gender, race, and many biological and personality factors (in contrast in between-individual analyses, the effect of the risk factor of interest [e.g. peer delinquency] cannot easily be separated from the effects of the many other risk factors that are related to peer delinquency and that may also influence antisocial behaviour). Specifically, the concept of 'cause' requires that changes in X within individuals are followed by changes in Y within individuals (Farrington, 1988). Therefore, to study causes of antisocial behaviour, it is necessary to study changes within individuals. This paper seeks to contribute to the literature that uses longitudinal data to compare the between-individual and within-individual predictors of youth antisocial behaviour.

Predictors of delinquency and antisocial behaviour

An extensive literature exists on the predictors of delinquency and antisocial behaviour in young people. Studies in this literature typically report the results of between-individual analyses by comparing risk factors of offenders and non-offenders or correlating risk factors with levels of delinquency (Farrington et al., 2002). These analyses have identified a range of predictors internal to the individual and in the family, peer, school and community domains (see Farrington, 2014 for a recent review of many of these).

Several characteristics of individuals (not to be confused with within-individual change) have been shown previously to predict antisocial behaviour in longitudinal studies. Hyperactivity and impulsivity predict delinquency and offending (Brennan, Mednick, & Mednick, 1993; Defoe, Farrington, & Loeber, 2013; Farrington, 1990, 1992; Herrenkohl et al., 2000; Higgins, Kirchner, Ricketts, & Marcum, 2013; Klinteberg, Andersson, Magnusson, & Stattin, 1993; Lipsey & Derzon, 1998; Pratt, Cullen, Blevins, Daigle, & Unnever, 2002; White et al., 1994). Studies have also shown that depressive symptoms are linked with delinquency and offending (Ritakallio, Kaltiala-Heino, Kivivuori, & Rimpela, 2008; Vermeiren, Deboutte, Ruchkin, & Schwab-Stone, 2002), although one study suggested gender differences, with depressed girls more likely than depressed boys to engage in antisocial behaviour (Ritakallio et al., 2008). Other studies (Measelle, Stice, & Hogansen, 2006; Obeidallah & Earls, 1999) reported reciprocal relationships between depressive symptoms and delinquency for females. Low academic performance also predicts higher engagement in delinquency and offending (Farrington, 1990; Jakobsen, Fergusson, & Horwood, 2012; West & Farrington, 1973). In addition, several longitudinal studies have shown that school failure predicts delinquency (Lynam, Moffitt, & Stouthamer-Loeber, 1993; Maguin & Loeber, 1996; McEvoy & Welker, 2000; Phillips & Kelly, 1979), although one study (Lynam et al., 1993) only found this association for African–American boys.

In the peer domain, a well-established finding is that having friends and peers who are antisocial is associated with an increased risk of antisocial behaviour and offending (Battin, Hill, Abbott, Catalano, & Hawkins, 1998; Hawkins et al., 2000; Hemphill et al., 2009; Hemphill, Toumbourou, Herrenkohl, McMorris, & Catalano, 2006). This effect could reflect

co-offending; Reiss and Farrington (1991) found that the probability of committing offences with others decreased with age. Young people aged less than 17 years committed their crimes with others of similar age and living nearby, whereas young people aged over 17 years were less likely to offend with others. The direction of the associations between having antisocial friends and delinquent behaviour is likely to be reciprocal, with having antisocial friends causing delinquency and delinquency causing young people to have antisocial friends (Farrington et al., 2002; Thornberry, Lizotte, Krohn, Farnworth, & Jang, 1994). Associating with antisocial friends also seems to influence whether young people continue to offend. Farrington (1986) found that recidivists at 19 years of age who desisted from offending were more likely than those who continued to offend to have ceased associating with antisocial friends. Comments received from participants in the Cambridge Study indicated that an important influence on ceasing to offend was withdrawal from their delinquent peer group (West & Farrington, 1973).

There are several risk factors for antisocial behaviour that have been described within the family domain. Family conflict and family violence are established predictors of antisocial behaviour (Buehler et al., 1997; Hawkins et al., 2000; Hemphill et al., 2009; Herrenkohl et al., 2000; Ireland & Smith, 2009). Poor family management (reflected by lack of clear rules and monitoring of students) is also an established predictor of violent offending and delinquency (Hawkins et al., 2000; Herrenkohl et al., 2000). Low attachment to one's family and the lack of positive prosocial activities in the family is linked to antisocial behaviour (Catalano & Hawkins, 1996). Low involvement of fathers in family activities is another risk factor for delinquency (Besemer, 2014; Farrington, 2003).

The neighbourhood in which a young person lives is also a potentially important context for youth prosocial and antisocial development (Hawkins et al., 2000; Herrenkohl et al., 2000). Community disorganisation (i.e. poor housing, high crime rates) and neighbourhood disadvantage are known predictors of violent crime (Herrenkohl et al., 2003). In a study of first or second grade children, neighbourhood social cohesion moderated the link between hostile parenting and externalising behaviour (Herrenkohl et al., 2003; Silk, Sessa, Sheffield Morris, Steinberg, & Avenevoli, 2004). Sampson, Raudenbush, and Earls (1997) conducted a study of neighbourhoods in Chicago and reported that the most important community predictors were concentrated economic disadvantage (including poverty), immigrant concentration, residential instability (i.e. high mobility of residents), and low levels of social control and social cohesion.

Studies of within- versus between-individual analyses

Most of the predictors of youth antisocial behaviour identified in the literature to date have been detected using between-individual analyses. However,Farrington et al. (2002) argue for investigating within-individual changes in antisocial behaviour over time. Farrington et al. posit that this is potentially a better approach to investigate the possible predictors of youth antisocial behaviour. In Farrington et al.'s (2002) paper contrasting between-individual and within-individual factors, it was demonstrated that the predictors of youth antisocial behaviour can differ depending on the analytic approach adopted. For example, peer delinquency was found to be the strongest correlate of delinquency in the between-

individual analyses; however, it was not a predictor in the forward-lagged within-individual correlations. Other variables that were statistically significant in forward-lagged within-individual correlations were poor parental supervision, low parental reinforcement and low involvement of the participant in family activities (Farrington et al., 2002).

Other studies have since examined within-individual predictors. Kazemian, Farrington and Le Blanc (2009) focused on the predictors of desistence in offending using data from the Cambridge Study in Delinquent Development and the Montreal Two Samples Longitudinal Study. Within-individual change was contrasted with between-individual differences in offending behaviour. Interestingly, Kazemian et al. found that measures of social bonds and cognitive predispositions at age 17–18 years only weakly predicted de-escalation of offending at age 32 years. In contrast, these same measures were strong predictors of between-individual differences in offending behaviour. In a third study, Horney, Osgood and Marshall (1995) analysed month-to-month variation in offending in newly convicted male offenders in Nebraska, as well as the influence of local life circumstances (e.g. going to school, living with girlfriend, illegal drugs) on change in offending and found that short-term change in offending was highly related to local life circumstances. The California Youth Authority Parolee Recidivism Study (Piquero, Brame, Mazerolle, & Haapanen, 2002), a study of 524 male parolees followed across a period of seven years post-parole, was able to demonstrate that local life circumstances (alcohol dependence, heroin dependence, marriage, full-time employment) had different effects for their four different offending trajectories and offence types (nonviolent, violent). Further, findings from the Pathways on Desistance Study (Mulvey et al., 2004), have been used to suggest that knowledge of risk and protective factors that may influence young offenders to desist their behaviour may assist court personnel in advising on appropriate service provision and treatment options for young offenders. It remains an important research question to compare within-individual and between-individual predictors in longitudinal studies of youth with sufficient data points on both risk factors and antisocial behaviour.

The present study

The current paper seeks to complete similar analyses to those conducted in Farrington et al.'s (2002) original paper by focusing on the developmental correlates and risk and protective factors for antisocial behaviour and by comparing within-individual and between-individual predictors of antisocial behaviour. As much as possible, we sought to include similar variables to those analysed by Farrington et al. (2002). Based on earlier findings, it was expected that there would be differences in the within-individual and between-individual predictors identified. In particular, as Farrington et al. (2002) found, peer delinquency may be a between-individual correlate but not a within-individual predictor. Arguably the latter is a more rigorous test of causal relationships since pre-existing extraneous influences on antisocial behaviour are controlled for in within-individual analyses, whereas they are confounded in between-individual analyses. A variable could not be considered a cause of antisocial behaviour when a between-individual correlation is strong and a within-individual correlation is negligible; rather it is likely that the variable is an indicator of antisocial behaviour. The importance of detecting these differences in between-individual and within-individual associations is that it will strengthen

understanding of the influences on the development of antisocial behaviour which can then inform the development of effective prevention and intervention programs for these behaviours. Prevention and intervention programs also require changes within individuals.

The paper described here also seeks to conduct similar additional analyses to Farrington et al. (2002): (1) it compares the results of simultaneous correlations (i.e. the variable of interest and antisocial behaviour measured at the same time) with forward-lagged correlations (i.e. the variable of interest is measured before antisocial behaviour); and (2) it investigates the predictive accuracy of a composite risk score based on between-individual correlations with a risk score based on within-individual correlations.

Method

Participants

The sample for this study comprised Victorian students from the International Youth Development Study (IYDS), a longitudinal study of antisocial and pro-social behaviours among adolescents in Victoria, Australia and Washington State, USA. The Victorian sample consisted of 927 (481 female, 446 male) students who were first surveyed in 2002 when they were 10 to 11 years old (M = 11.0, SD = .41). These students have been reassessed in 2003–2004 and 2006–2008. Of the original sample, 791 (85%) completed the survey at age 16–17 years (367 male, 424 female; M_{age} = 17.0, SD_{age} = 0.4). The original sampling and recruitment for the IYDS has been described elsewhere (McMorris, Hemphill, Toumbourou, Catalano, & Patton, 2007). Briefly, the IYDS used a two-stage cluster sampling approach: (1) random selection of public and private schools stratified according to geographic location, using a probability proportionate to grade-level size sampling procedure; and (2) one class at each grade level (Years 5, 7, and 9), within each school, was selected at random.

Measures

The self-reported measures of risk factors and antisocial behaviour were contained within a modified version of the *Communities That Care* survey, used in the IYDS. The survey has acceptable psychometric properties in the U.S. (Arthur, Hawkins, Pollard, Catalano, & Baglioni, 2002; Glaser, Van Horn, Arthur, Hawkins, & Catalano, 2005; Pollard, Hawkins, & Arthur, 1999) and has been successfully adapted for use in Victoria (Hemphill et al., 2011). All risk factors were scored so that high scores reflected unfavourable outcomes (e.g. high depressive symptoms, low opportunities for prosocial involvement in the family).

Risk factors—The risk factors selected for inclusion in the current paper are similar to those analysed by Farrington et al. (2002). Unless otherwise described, mean scores were calculated on measures of risk factors with more than one item. Concentration/attention and impulsivity were measured using five items (e.g. ‘I get distracted easily when I’m doing work at school or other tasks’, ‘I rush into things, starting before I know what to do’) rated on a four-point scale from definitely no to definitely yes (Cronbach’s alpha = .75). Depressive symptoms were measured using the self-report Short Mood and Feelings Questionnaire (SMFQ; Angold, Costello, Messer, & Pickles, 1995) designed for the quick assessment and screening of core depressive symptomatology or for use in epidemiological

research of adolescents. Attachment to parents comprised four items (e.g. 'Do you feel very close to your mother?') rated on a four-point scale from definitely no to definitely yes (Cronbach's alpha = .77). Opportunities for prosocial involvement in the family had three items (e.g. 'My parents ask me what I think before most family decisions affecting me are made') rated on the same scale as attachment to parents (Cronbach's alpha = .79). Poor family management included nine items (e.g. 'The rules in my family are clear'; Cronbach's alpha = .83) and family conflict had three items (e.g. 'People in my family have serious arguments'; Cronbach's alpha = .84). Both scales were rated on a four-point scale from definitely no to definitely yes. Low academic performance comprised two items (e.g. 'Putting them all together, what were your grades/marks like last year?') rated on four-point scales ranging from very poor/definitely no to very good/definitely yes (Cronbach's alpha = .74). Interaction with antisocial peers was measured by five items asking participants how many of their best friends in the past year have: been suspended from school; carried a weapon; stolen something worth more than $10; been arrested; and attacked someone with the idea of seriously hurting them. The response options ranged from none of my friends to *four* or more of my friends on a five-point scale (Cronbach's alpha = .54). The community level factor of disorganised neighbourhood was used in the current study to replace Farrington et al.'s (2002) measure of poor housing which was not available in the current study. It comprised three items (e.g. 'How much do each of the following statements describe your neighbourhood: I feel safe in my neighbourhood?'; Cronbach's alpha = .84) rated on a four-point scale from definitely no to definitely yes.

Antisocial behaviour—Students were asked how often they had engaged in six types of antisocial behaviour over the past year. These items included how often they had: been suspended from school; carried a weapon; stolen something worth more than $10; been arrested; attacked someone with the idea of seriously hurting them; and beaten up someone so badly that they probably needed to see a doctor or nurse (Cronbach's alpha = .49). Response options ranged from Never to 40 or more times on an eight-point scale.

Procedure

Ethics approval was obtained from the Royal Children's Hospital Ethics in Human Research Committee (2002–2004), The University of Melbourne Human Ethics in Research Committee (2006–2008), and then relevant educational authorities. Permission to administer the survey in schools was obtained from each school principal. The survey was group administered within the students' classrooms and required approximately 50–60 min to complete. Students no longer attending school during the follow-up surveys, or who were absent on the day of the survey, were surveyed individually by trained personnel. Both parental written informed consent and student assent was obtained for each participant. After each survey, participants received a small gift.

Student honesty—Drawn from early studies of the development and validity of the Communities That Care youth survey (Arthur et al., 2002) items were included to assess whether or not students answered the survey questions honestly. Students were categorised as dishonest if they reported any of the following: (1) that they were not honest at all when filling out the survey; (2) that they had used a fake drug in their lifetime or in the past 30

days; or (3) that they had used illicit drugs on more than 120 occasions in the past 30 days. A single dichotomous measure of honesty was calculated using these items.

Statistical analyses

Data analyses were performed using Stata/IC 13.1 for Windows (StataCorp, 2013) and Mplus 6.1 (Muthén & Muthén, 1998–2010) for participants with complete data on all analysed variables and those who did not meet the criteria for dishonesty. First, descriptive statistics and mean scores for independent and dependent variables were examined for each survey. Mean stability correlations were calculated by averaging the longitudinal between-individual correlation for each variable across four waves. Multi-level modelling in MPlus was used to calculate within- and between-correlations reported here. Cross-sectional between- and within-individual mean correlations between each independent variable and antisocial behaviour were examined. Spearman correlations were used to determine the correlation for each variable prospectively across each wave. Mean correlations were based on averages over four waves. Significance levels were obtained using Fisher's combined probability test (Fisher, 1932).

Third, to examine if causal relationships exist between the independent variables and antisocial behaviour and between antisocial behaviour and the independent variables, forward- and backward-lagged (respectively) between- and within-individual correlations were examined. Spearman correlations were used to determine the mean correlation for each association over four waves. Significance levels were determined using Fisher's combined probability test (Fisher, 1932). Last, risk scores were calculated using the five highest between- and within-individual cross-sectional and forward-lagged correlations with antisocial behaviour.

Results

Mean scores for independent and dependent variables in each wave

Table 1 presents the descriptive statistics and mean scores for independent and dependent variables in each wave two through six. The magnitude of associations was examined for multi-collinearity. All variables were positively correlated. Across all waves, no inter-correlations between variables were greater than .60, with the highest inter-correlations between low attachment to parents and low opportunities for prosocial involvement in the family, high concentration/attention and impulsivity and high depressive symptoms, high poor family management and low opportunities for prosocial involvement in the family, and high interaction with antisocial peers and high antisocial behaviour. Hence, all correlations were well below the level that suggests multi-collinearity (Tabachnick & Fidell, 2013).

The rates of engagement in antisocial behaviour increased steadily across the waves from approximately 11% in wave two to almost 20% five years later. Mean levels of hyperactivity/impulsivity, low academic performance, poor family management, low parent attachment, family conflict, and low involvement in family activities generally increased over time, while antisocial behaviour, depressive symptoms, and level of neighbourhood disorganisation remained relatively stable. The mean stability correlations (the average of

longitudinal between-individual correlations for each variable across four waves) were also generally stable for all variables. Low academic performance and low attachment to parents were the most stable across the five waves, with peer delinquency displaying the lowest stability. All other variables were moderately stable (r = .48 or greater) (see Table 1).

Cross-sectional between- and within-individual mean correlations with antisocial behaviour

Cross-sectional between- and within-individual correlations between each independent variable and antisocial behaviour are presented in Table 2. All examined variables showed statistically significant correlations with engagement in antisocial behaviour in the between-individual analysis, with the highest correlations evident for hyperactivity/impulsivity, depressive symptoms, high neighbourhood disorganisation, and peer delinquency. The mean between-individual correlation was .48. For the within-individual correlations, all but one of the nine examined variables, low attachment to parents, reached statistical significance. Almost all within-individual correlations were lower in magnitude than the between-individual correlations. The mean within-individual correlation was .18.

Prospective forward- and backward-lagged between- and within-individual mean correlations with antisocial behaviour

Table 3 presents the prospective between- and within-individual forward-lagged correlations between each independent variable and antisocial behaviour, and backward-lagged correlations between antisocial behaviour and each independent variable. The difference between the mean correlation for the forward-lagged between-individual correlations with antisocial behaviour and mean cross-sectional correlation was .31. With the exception of neighbourhood disorganisation and peer delinquency, all between-individual forward-lagged correlations were lower than the corresponding cross-sectional between-individual correlation. As observed with the cross-sectional correlations, all between-individual forward lagged correlations were statistically significant.

Forward-lagged within-individual correlations are also displayed in Table 3. The mean correlation was low (r = .13), and was less than the corresponding cross-sectional mean within-individual correlation. All but one of the analysed variables, family conflict, displayed statistically significant correlations with antisocial behaviour. The largest correlations were evident for hyperactivity/impulsivity, poor family management and peer delinquency. With the exception of low parent attachment and family conflict, all forward-lagged within-individual correlations were less than the corresponding cross-sectional within-individual correlation.

Backward-lagged between- and within-individual correlations are also presented in Table 3. Findings show that all examined variables were again statistically significant for the between-individual (backward-lagged) correlations. Approximately half of the backward-lagged between-individual correlations were less than the corresponding forward- lagged between individual correlations. Specifically, depressive symptoms, low attachment to parents, low family involvement, family conflict and peer delinquency were greater in magnitude for the backward- compared to forward-lagged corresponding between-individual

correlation. With the exception of the correlations between antisocial behaviour and low academic performance, poor family management, low involvement in family activities and family conflict, all backward-lagged within-individual correlations were less than the corresponding forward-lagged within-individual correlation. All but one backward-lagged within-individual correlation reached statistical significance. The mean between- and within-individual backward-lagged correlations were statistically significant ($r = .41$ and $r = .13$, respectively).

Analysis of risk scores

Risk scores were calculated using the five highest between- and within-individual forward-lagged correlations with antisocial behaviour. The variables low academic performance, depressive symptoms, low parent attachment, neighbourhood disorganisation and peer delinquency displayed the five highest between-individual forward-lagged correlations with antisocial behaviour. Variables displaying the highest within-individual forward-lagged correlations with antisocial behaviour included hyperactivity/impulsivity, poor family management, and low involvement in family activities, high neighbourhood disorganisation and peer delinquency. The cross-sectional between-individual correlation for risk scores ($r = .34$) was similar to that observed for longitudinal correlation ($r = .35$), while the forward-lagged within-individual correlation was substantially lower than the corresponding cross-sectional correlation ($r = .25$ and $r = -.02$, respectively).

Discussion

This longitudinal study of young people in Victoria, Australia followed from 2002 to 2008 has provided an opportunity to compare within-individual and between-individual predictors of antisocial behaviour. The results of this study showed all but one each of the forward- (family conflict) and backward-lagged (low attachment to parents) correlations were statistically significant for the within-individual analyses compared with all analyses being statistically significant for the between-individual analyses.

The results of the current study were similar to those of Farrington et al. (2002) who also found within-individual variables were related to antisocial behaviour. Results were similar even though the current study analysed four waves of data compared with Farrington et al.'s seven waves and the variables measured in the two studies were similar but not exactly the same.

The correlations found in the present study were similar to those reported in previous studies of the risk factors for antisocial behaviour and included low academic performance, depressive symptoms, low involvement in family activities, and peer delinquency. Within the individual young person, depressive symptoms (Ritakallio et al., 2008; Vermeiren et al., 2002) and low academic performance (Farrington, 1990; Jakobsen et al., 2012; West & Farrington, 1973) have been associated with antisocial behaviour. In the peer group context, interacting with antisocial friends and peers has consistently been found to be a risk factor for antisocial behaviour in between-individual analyses (Battin et al., 1998; Hawkins et al., 2000; Hemphill et al., 2006, 2009), although not in within-individual analyses (Farrington et al., 2002). Low involvement in family activities was a predictor of antisocial behaviour in

the current study as it was in Farrington et al. (2002) and consistent with the Social Development Model's (Catalano & Hawkins, 1996) emphasis on providing young people with opportunities to engage in prosocial activities in the family (as well as other key contexts such as school and within the local community). The findings of the current study in relation to neighbourhood disorganisation were also consistent with the findings of previous studies in showing an association between high neighbourhood disorganisation and antisocial behaviour.

Theoretical implications

The ICAP theory (Farrington, 2014) emphasises the importance of both between-individual and within-individual predictors of antisocial behaviour. The results of the present study are consistent with this emphasis on the importance of both between- and within-individual predictors of antisocial behaviour. Based on the results of risk and protective factor studies, the ICAP theory describes a range of factors that influence antisocial behaviour. The present study also found that most of the variables measured here were associated with increased levels of antisocial behaviour.

Strengths and limitations of this study

This study has a number of strengths. It draws on a rich data set collected as part of an ongoing longitudinal study of young people's development. It therefore provides an opportunity to examine within-individual versus between-individual predictors of antisocial behaviour. The sample was state-representative when originally recruited and included equal numbers of boys and girls.

The current study also has several limitations. First, the number of waves of data analysed in the current study is at the lower end of what is required to conduct analyses of the kind reported here. However, given that relatively few similar studies have been conducted, it is important to maximise the use of the current data to address the research questions of the present paper. Another limitation of this study is that all of the data were obtained from a self-report survey which may introduce bias into the study. However, the survey included items designed to detect the level of honesty of participant responses, and analyses were only conducted on students classified as honest. In addition, the use of self-report measures in studies of pre-adolescents and adolescents is considered a reliable source of data for behaviour problems such as antisocial behaviour (Huizinga & Elliott, 1986; Jolliffe et al., 2003; Rutter & Giller, 1983) which may not be visible to adults. Some risk factors were measured using relatively few items to ensure that the overall length of the survey was not too long. Further longitudinal research is needed to further explore similarities and differences in within-individual and between-individual correlations between various risk factors and antisocial behaviour. Future longitudinal studies on populations at risk for engaging in antisocial behaviour that examine within-individual and between-individual predictors are warranted. In the current study, it was not possible to include a measure of family socioeconomic status because it was only measured in the first wave of the study in 2002. It is important that future longitudinal studies ensure a reliable measure of family socioeconomic status is included when examining possible causes and correlates of antisocial behaviour.

Practical implications of study findings and conclusion

The findings of the present study support the use of multifaceted prevention and early intervention programmes that target a range of risk factors. Such approaches are needed to effectively reduce antisocial behaviour engaged in by young people.

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Table 1

Descriptive statistics and mean scores for independent and dependent variables in each wave (N = 563).

Wave	2	3	4	5	6	Mean stability correlation
Average age	11.94	12.95	15.15	15.98	16.96	-
Sample size	563	563	563	563	563	-
Antisocial behaviour (%)	11.72	14.83	21.77	21.53	18.66	-
Mean scores						
Antisocial behaviour	1.04	1.04	1.10	1.10	1.10	.48
Hyperactivity/impulsivity	1.87	2.02	2.26	2.28	-	.56
Low academic performance	1.73	1.79	1.94	2.02	2.08	.62
Depressive symptoms	1.41	1.46	1.53	1.58	1.60	.57
Poor family management	1.38	1.48	1.82	1.87	1.97	.58
Low attachment to parents	1.58	1.73	1.99	1.98	2.04	.60
Low involvement in family activities	1.57	1.62	1.91	1.89	1.92	.58
Family conflict	1.86	1.91	2.17	2.21	2.21	.55
High neighbourhood disorganisation	1.31	1.35	1.48	1.49	1.49	.57
Peer delinquency	.10	.14	.31	.34	.30	.42

Note: Mean stability based on spearman correlations.

Table 2

Cross-sectional mean correlations of independent variables with antisocial behaviour ($N = 563$).

	Between-individual		Within-individual	
Independent variables	***r***	***p***	***r***	***p***
Hyperactivity/impulsivity	.666	<.001	.155	<.001
Low academic performance	.231	<.001	.086	<.05
Depressive symptoms	.635	<.001	.103	<.001
Poor family management	.393	<.001	.224	<.001
Low attachment to parents	.378	<.001	.032	ns
Low involvement in family activities	.334	<.001	.160	<.001
Family conflict	.353	<.001	.126	<.001
High neighbourhood disorganisation	.717	<.001	.132	<.001
Peer delinquency	.611	<.001	.588	<.001
Mean	.480	<.001	.178	<.001

Note: r=Spearman correlation; averaged over four comparisons of wave (n) and wave ($n + 1$).

Table 3

Forward and backward lagged mean correlations of independent variables with antisocial behaviour (N = 563).

	Variables predicting antisocial behaviour (forward-lagged)				Antisocial behaviour predicting variables (backward-lagged)			
	Between-individual		Within-individual		Between-individual		Within-individual	
Independent variables	***r***	***p***	***r***	***p***	***r***	***p***	***r***	***p***
Hyperactivity/impulsivity	−.147	<.001	.157	<.001	-	-	-	-
Low academic performance	.202	<.001	.064	<.05	.047	<.001	.095	<.01
Depressive symptoms	.257	<.001	.067	<.05	.699	<.001	.035	<.05
Poor family management	−.454	<.001	.164	<.001	−.123	<.001	.202	<.001
Low attachment to parents	.073	<.001	.034	<.05	.627	<.001	.003	ns
Low involvement in family activities	.037	<.001	.104	<.01	.307	<.001	.129	<.001
Family conflict	.058	<.001	.041	ns	.345	<.001	.068	<.05
High neighbourhood disorganisation	.889	<.001	.139	<.001	.752	<.001	.137	<.001
Peer delinquency	.630	<.001	.380	<.001	.657	<.001	.390	<.001
Mean	.172	<.001	.128	<.001	.414	<.001	.132	<.001

Note: Hyperactivity/impulsivity was removed from analyses since it was perfectly correlated with antisocial behaviour.

r = Spearman correlation; averaged over four comparisons of wave (n) and wave (n + 1).