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Developmental association of prosocial behaviour with aggression, anxiety and depression from infancy to preadolescence

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Background: Research on associations between children's prosocial behaviour and mental health has provided mixed evidence. The present study sought to describe and predict the joint development of prosocial behaviour with externalizing and internalizing problems (physical aggression, anxiety and depression) from 2 to 11 years of age. **Method:** Data were drawn from the National Longitudinal Survey of Children and Youth (NLSCY). Biennial prosocial behaviour, physical aggression, anxiety and depression maternal ratings were sought for 10,700 children aged 0 to 9 years at the first assessment point. **Results:** While a negative association was observed between prosociality and physical aggression, more complex associations emerged with internalizing problems. Being a boy decreased the likelihood of membership in the high prosocial trajectory. Maternal depression increased the likelihood of moderate aggression, but also of joint high prosociality/low aggression. Low family income predicted the joint development of high prosociality with high physical aggression and high depression. **Conclusions:** Individual differences exist in the association of prosocial behaviour with mental health. While high prosociality tends to co-occur with low levels of mental health problems, high prosociality and internalizing/externalizing problems can co-occur in subgroups of children. Child, mother and family characteristics are predictive of individual differences in prosocial behaviour and mental health development. Mechanisms underlying these associations warrant future investigations. **Keywords:** Prosociality, aggression, anxiety, depression, development.

Introduction

Prosocial behaviours, including helping, sharing, comforting and cooperating, have been defined as behaviours benefiting others and/or promoting positive social relationships (e.g. Eisenberg, Fabes, & Spinrad, 2006; Hay, 1994; Jackson & Tisak, 2001). Past research has shown that childhood prosociality positively correlates with various markers of well-being and adjustment (see Eisenberg & Fabes, 1998; Eisenberg et al., 2006 for a review). Investigations specifically examining links between prosociality and mental health have, however, yielded mixed evidence (Caplan, 1993; Hay, 1994).

Many studies investigating links between prosociality and externalizing (e.g. aggression) or internalizing (e.g. depression) difficulties have described negative associations (Bandura, Pastorelli, Barbaranelli, & Caprara, 1999; Crick, 1996; Romano, Tremblay, Boulerice, & Swisher, 2005; Zimmer-Gembeck, Hunter, & Pronk, 2007). Positive associations have, however, also been reported (Gill & Calkins, 2003; Gjerde & Block, 1991). Mixed findings may be partly attributed to heterogeneity in associations. For example, prosociality may be differentially associated with specific forms of externalizing or internalizing difficulties (Card, Stucky, Sawalani, & Little, 2008; Culotta & Goldstein, 2008; Hay, Hudson, & Liang, 2010). Furthermore, negative correlations do not preclude that subgroups of children simultaneously exhibit high prosociality and internalizing/externalizing problems (Hastings, Zahn-Waxler, Robinson, Usher, & Bridges, 2000; Hay & Pawlby, 2003; Perren, Stadelmann, von Wyl, & von Klitzing, 2007). High prosociality may be associated with high internalizing symptoms, particularly in girls (Gjerde & Block, 1991; Keenan & Hipwell, 2005). Disruptive children exhibiting relatively high prosociality levels may show lesser stability in problem behaviours over time (Hastings et al., 2000; Lacourse et al., 2006; Tremblay, Pihl, Vitaro, & Dobkin, 1994).

Prosociality has been previously suggested to contribute positively to adjustment when optimally regulated, but to perhaps increase the risk of psychopathology if overly low or high (Caplan, 1993; Hay, 1994). Proposed mechanisms underlying such dual contribution have included the empathy and care thought to often motivate prosocial actions. Overly low prosociality may indicate lack of empathy, thereby increasing the likelihood of disruptive, harmful behaviours towards others (Hastings et al., 2000). Children who show the highest levels of callousness towards others may be at greatest risk of presenting the most severe forms of antisocial behaviours (Frick & White, 2008) Conversely, overly high prosociality may be indicative of overly intense

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empathy, care or guilt (Keenan & Hipwell, 2005; Oakley, Knafo, & McGrath, 2012; Zahn-Waxler & Van Hulle, 2012), putting children at risk for distress (Hay & Pawlby, 2003; Perren et al., 2007).

Understanding the interplay of prosocial behaviour and mental health requires developmental investigations. A number of studies have now looked at prosociality in childhood and adolescence using a developmental trajectory approach (e.g. Cote, Tremblay, Nagin, Zoccolillo, & Vitaro, 2002; Kokko, Tremblay, Lacourse, Nagin, & Vitaro, 2006; Nantel-Vivier et al., 2009). The developmental trajectory approach, a semiparametric, group-based method, is advantageous in that it simultaneously takes into account all available data points and identifies subgroups of children who tend to follow similar behavioural patterns over time (Nagin, 2005; Nagin & Tremblay, 1999). It thereby paints a longitudinal portrait of individual differences in development. It also allows for the examination of associations between different behavioural dimensions throughout developmental periods rather than at single, discrete points in time.

As such, previous studies focusing on joint trajectory analyses have indicated that while prosocial behaviour trajectory membership tends to be inversely related to mental health problems (Côté, Tremblay, Nagin, Zoccolillo, & Vitaro, 2002), subgroups of children may display different joint prosocial and mental health trajectories. For example, Kokko and colleagues (Kokko et al., 2006) found that while levels of prosocial behaviours and physical aggression tended to be negatively associated, a small proportion of boys jointly followed high physical aggression and high prosocial behaviour trajectories. Similarly, Phelps et al. (2007) showed that negative associations tended to operate between levels of positive youth development trajectories and levels of internalizing and externalizing risk trajectories. Heterogeneity in trajectory membership associations was, however, present. It is of note that joint trajectories presented to date have spanned middle childhood to adolescence. Past research has, however, indicated that prosocial behaviour emerges within the first years of life, with individual differences beginning to consolidate before school entry (Eisenberg et al., 2002). To the best of our knowledge, joint trajectories including younger age cohorts have not been the focus of previous investigations.

As well, overlap exists in the child, parent and family characteristics previously studied in relation to childhood prosociality and mental health. Boys generally exhibit lower prosociality (Eisenberg & Fabes, 1998; Romano et al., 2005) and more externalizing problems (Côté, Vaillancourt, LeBlanc, Nagin, & Tremblay, 2006; Romano et al., 2005). Boys also tend to show fewer internalizing problems (Phelps et al., 2007), albeit gender differences may only emerge around puberty (Côté et al., 2009). Socioeconomic status is negatively associated with externalizing problems (Côté et al., 2006; Dunn, Deater-Deckard, Pickering, O'Connor, & Golding, 1998), while results have been less consistent for prosociality (Dunn et al., 1998; Eisenberg et al., 2006; Phelps et al., 2007) and internalizing problems (Côté et al., 2009; Morgan, Farkas, & Qiong, 2009; Phelps et al., 2007). Positive parenting practices positively correlate with prosociality (Eisenberg et al., 2006; Romano et al., 2005), while hostile parenting and family dysfunction are negatively associated with prosociality and positively associated externalizing/internalizing problems (Côté et al., 2006; Dunn et al., 1998; Gilliom & Shaw, 2004; Romano et al., 2005). While research on maternal depression and prosocial development has been mixed (Eisenberg et al., 2006), there has been some evidence that maternal depression may be associated with both increased prosociality and increased emotional/behavioural problems (e.g. Romano et al., 2005). No investigation, to the best of our knowledge, has studied the above factors in association with joint prosocial and mental health development.

Our first objective was to model the joint development of prosocial behaviour with three types of mental health problems (physical aggression, anxiety and depression) from ages 2 to 11 years. Based on past investigations (e.g. Kokko et al., 2006; Phelps et al., 2007), we hypothesized an inverse relationship between prosociality levels and levels of mental health difficulties. Subgroups of children exhibiting a high prosociality with high physical aggression, anxiety and depression trajectory were nevertheless expected to emerge. The second objective was to examine child, mother and family predictors of associations between prosocial behaviour and mental health. Being a boy was expected to increase the likelihood of low prosocial behaviour trajectory membership (Eisenberg & Fabes, 1998) particularly with high physical aggression (Côté et al., 2006). We hypothesized that socioeconomic status indicators would be more strongly associated with physical aggression trajectory membership (Côté et al., 2006) than with prosociality or internalizing problems (Côté et al., 2009; Dunn et al., 1998). We expected positive/consistent parenting to be associated with high prosociality (Eisenberg et al., 2006; Romano et al., 2005), while hostile parenting and family dysfunction would be associated with joint low prosociality and high problem trajectory membership (Côté et al., 2006, 2009; Gilliom & Shaw, 2004; Romano et al., 2005). Finally, maternal depression was expected to predict joint high prosocial/high problem trajectory membership (Hay, 1994; Romano et al., 2005; Zahn-Waxler & Van Hulle, 2012).

Method

Participants

Participants were from the National Longitudinal Survey of Children and Youth (NLSCY; Statistics Canada, 2007), which

recruited 13,439 children in 1994 (Cycle 1) within 12 age cohorts (0–11 years). Sampling for the NLSCY ensured that a sufficient number of children were drawn from each age group to allow for reliable estimates at the national level. Sampling also ensured that sufficient numbers of children were drawn from each of the 10 Canadian provinces [See Statistics Canada (2007) for further information]. Biennial data collections were conducted through home interviews with the person most knowledgeable about the child, the mother in the vast majority of cases (91% of respondents for the present analyses). The survey focused on a number of areas of children's and families' lives, including sociodemographic characteristics, family functioning, maternal history, children's health and development, children's behaviours and children's education. The present study focused on 10 age cohorts: children aged 0–9 years at Cycle 1 (Cohorts 1–10, $N = 10{,}758$) using data collected at Cycles 1 to 4 (1994, 1996, 1998, 2000). Children with complete behavioural ratings for at least one data point were included in the trajectory analyses, excluding only 58 children and yielding a final sample of 10,700. Children excluded from the analyses did not significantly differ from included children on prosociality, aggression, anxiety and depression ratings at the first assessment point. Excluded children were, however, more likely to have young mothers, parents who were not employed, mothers who reported less consistent parenting, and to have a greater number of siblings. Informed consent was obtained from all informants. Fifty-one per cent of included children were boys. At Cycle 1, 79% of mothers and 76% of fathers had graduated from high school, 71% of mothers and 95% of fathers were employed in the previous year, and 81% of families were intact (i.e. two parents living in the same home). The median annual family income was within the 40,000$ to 59,000$ range. Between 2% and 5% of children within the sample had seen a psychologist/psychiatrist within the past year at each cycle. Between 1% and 3% of children within the sample were taking stimulant medications (Ritalin) at each cycle. Fewer than 1% of children were taking anxiety medication at each cycle [See Statistics Canada (Statistics Canada, 2007) for further information].

Measures

Child behaviours. The informant rated the frequency of child behaviours, for children aged 2 years and older, using a three-point scale (0 = *never* to 2 = *often*). Prosocial behaviour items were: 'will help someone who has been hurt'; 'offers to help other children with a task'; 'comforts a child who is crying or upset'; 'helps other children who are feeling sick'; and 'praises the work of less able children'. Physical aggression items were: 'gets into many fights'; 'reacts with anger and fighting'; and 'kicks, bites, hits other children'. Anxiety items were: 'too fearful, anxious'; 'worried'; and 'nervous, high--strung, tense'. Depression items were: 'seems to be unhappy, sad or depressed'; 'is not as happy as other children'; 'cries a lot'; and 'has trouble enjoying him/herself'. Cronbach alphas ranged from .80 to .83 for prosocial behaviour, .61 to .66 for physical aggression, .50 to .71 for anxiety, and .41 to .67 for depression across ages.

Predictors of joint development. Mother and family characteristics at Cycle 1 were included as predictors. Dichotomous coding was used to represent mother having completed high school (1 = yes, 0 = no), low family income (1 = below the 25th percentile of the income distribution, 0 = above the 25th percentile of the income distribution) and intact family status (1 = both parents living with the child, 0 = both parents not living with the child).

A 12-item scale from the Center for Epidemiological Studies of Depression (Radloff, 1977) was used to measure past-week maternal depressive symptoms (e.g. mood, appetite and sleep issues). Mean Cronbach alpha for this scale was of .83. Three parenting scales were also included. The positive parenting scale (mean Cronbach alpha: .82) assessed sharing of pleasant activities and positive emotions (e.g. How often do you praise your child?), while the consistent parenting scale (mean Cronbach alpha: 1.0) assessed the extent of following through when making a request (e.g. When you give your child a command or order to do something, what proportion of the time do you make sure he/she does it?). The hostile parenting scale (mean Cronbach alpha: .97) assessed disapproval and negative emotions (e.g. How often do you get angry when you punish your child?). Parenting behaviours were rated on a scale ranging from *never* to *many times each day* (scale of 1–5). Finally, a family dysfunction scale, comprised of 12 items (mean Cronbach alpha: .89), assessed problems in communication, problem-solving, behaviour management and sharing of affection within the family (Boyle et al., 1987).

Statistical analyses

Joint developmental trajectories. Developmental trajectories were modelled using an accelerated group-based design, based on ratings by the informant. The accelerated design combines trajectories from each of the 10 age cohorts (ages 0–9 years at Cycle 1) into a summary model describing trajectories from ages 2 to 11. Children contributed to a minimum of two and a maximum of four time points.

Prosocial behaviour, physical aggression, anxiety and depression trajectories were first modelled separately, and derived from a general nonlinear Mixture of Curves (MOC) procedure in R programming (Boulerice, 2001). Models with different numbers of groups are tested to find the optimal number and shape of trajectories, using the Bayesian Information Criterion (BIC; Schwarz, 1978). For physical aggression, a previous model by Côté et al. (2006) using a slightly different sample ($N = 10\ 658$), was estimated with the present sample ($N = 10{,}700$). The posterior probabilities of group membership, consisting of the probability for each individual of belonging to each trajectory, are used to assign individuals to the trajectory to which they have the highest probability of belonging (Nagin, 2005).

Joint trajectory models were subsequently estimated to describe longitudinal overlap (Côté, Vaillancourt, Barker, Nagin, & Tremblay, 2007; Nagin, 2005; Nagin & Tremblay, 2001). Joint probabilities (i.e. the proportion of children within each dual trajectory combination) and conditional probabilities (i.e. the probability of belonging to a certain mental health trajectory conditional on the probability of belonging to a certain prosocial trajectory and vice versa) are the main outputs of the joint trajectory analyses.

Prediction of joint trajectories. Nominal regression was used to predict joint trajectory membership from child (sex), mother (education, depression) and family (income, intact status, parenting practices, family dysfunction) characteristics. Odds of membership to a specific joint trajectory group were calculated relative to the odds of belonging to the moderate prosocial/low problem trajectory group. An alpha value of .001 or lower was selected as the threshold for statistical significance in the light of our large sample.

The NLSCY being a probability sample, each participant represents several other individuals within the population not included within the sample. All analyses were weighted to account for the sampling and stratification strategies used for the NLSCY [See Statistics Canada (2007) for further information].

Results

Developmental trajectories

Three trajectories (BIC: 139291.7; mean posterior probabilities ranging from .75 to .81) emerged for prosocial behaviour [Figure 1A: 1- Low (28%); 2- Moderate (51%); 3- High (22%)]. Three trajectory groups (Côté et al., 2006) were modelled for physical aggression as well. Four trajectory groups (BIC: 93137.11; mean posterior probabilities ranging from .56 to .81) emerged for anxiety [Figure 1C: 1- Extremely Low (6%); 2- Low (46%); 3- High Decreasing (12%); 4- High Increasing (36%)]. Four trajectories (BIC: 99010.53; mean posterior probabilities ranging from .53 to .93) were modelled for depression as well [Figure 1D: 1- Extremely Low (8%); 2- Low (55%); 3- Moderate (34%); 4- High (3%)]. A moderate prosocial behaviour trajectory, as well as low-to-moderate problem trajectories, was thus normative.

Joint developmental trajectories

As shown in Table 1, the largest joint trajectory groups consisted of children exhibiting moderate prosocial behaviour and moderate aggression (28%), as well as moderate prosocial behaviour and low anxiety (22%) or depression (26%).

Twenty-two per cent of children following a low prosocial trajectory membership jointly followed a high physical aggression trajectory, compared to one in 10 children from the moderate and high prosocial behaviour trajectories. Similarly, 46% of children following a high physical aggression trajectory jointly followed a low prosocial behaviour trajectory, compared to 21% and 25% of children assigned to the low and moderate physical aggression trajectories respectively.

While the majority of children tended to follow a low or high/increasing anxiety trajectory at all prosocial trajectory levels, 17% of children assigned to the moderate prosocial trajectory followed a high/decreasing anxiety trajectory. Similarly, a fifth to a third of children within the extremely low, low, and high increasing anxiety trajectories followed a high prosocial trajectory, compared to 9% of children assigned to the high/decreasing anxiety trajectory. Finally, both joint and conditional probabilities revealed that children within the extremely low depression trajectory followed a low or high prosocial trajectory, and not a moderate prosocial trajectory.

Predicting joint development

Prosocial behaviour and physical aggression. Table 2 presents nominal regression results predicting joint prosocial and aggressive development. Odds ratios represent likelihood of membership relative to the joint moderate prosocial/low physical aggression trajectory. Associations were found mainly for child sex, family income, maternal depression and parenting. Boys were more than three times more likely to exhibit low prosociality with moderate or high physical aggression, and were less likely to exhibit high prosociality with low or moderate physical aggression. Low family income increased the likelihood of membership to the high physical aggression trajectory with low or high prosocial behaviour. Maternal depression increased the likelihood of following the moderate prosocial behaviour trajectory with moderate or high physical aggression, and the high prosocial behaviour trajectory with low or moderate physical aggression. Positive parenting increased the likelihood of membership to the high

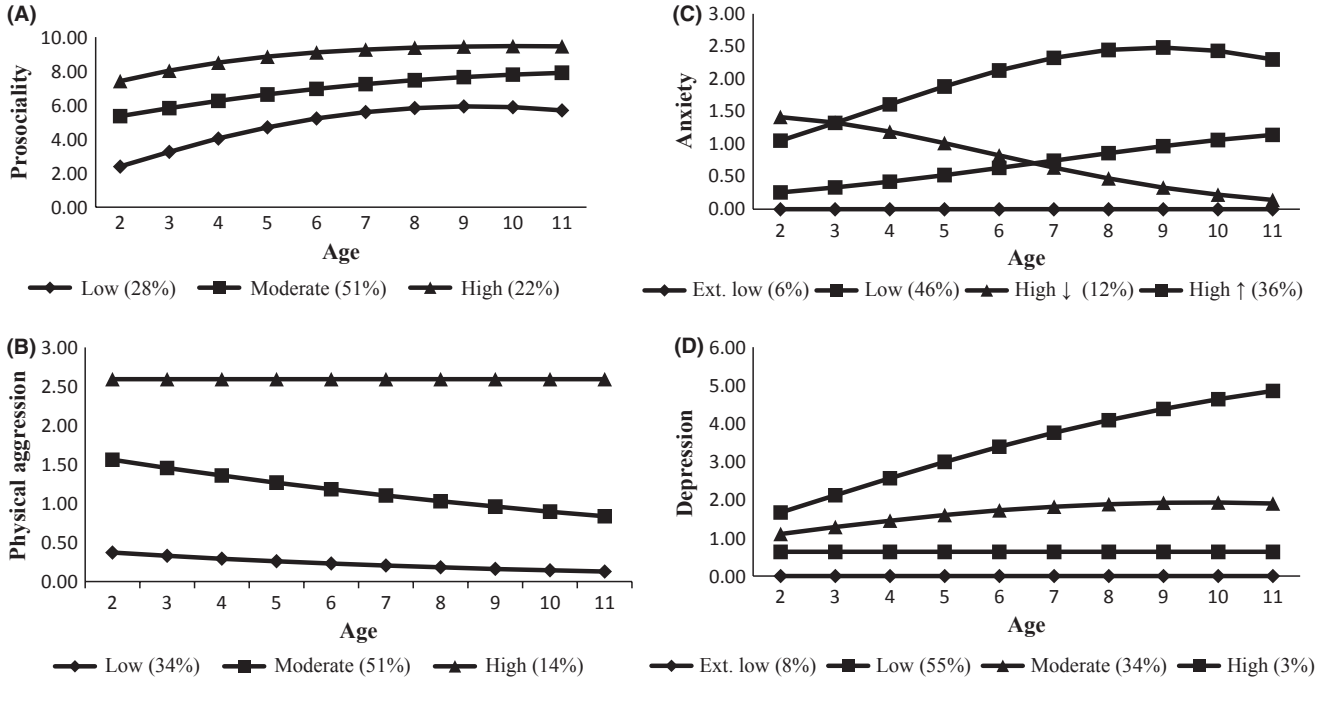

Figure 1 Developmental trajectories

Table 1 Joint and conditional trajectory membership probabilities

	Joint probabilities			Mental health trajectory conditional on prosocial trajectory			Prosocial trajectory conditional on mental health trajectory		
	Prosocial trajectory			Prosocial trajectory			Prosocial trajectory		
Mental health trajectory	Low	Moderate	High	Low	Moderate	High	Low	Moderate	High
Physical aggression									
Low	.07	.18	.10	.28	.36	.46	.21	.51	.29
Moderate	.13	.28	.10	.50	.55	.44	.25	.55	.20
High	.06	.05	.02	.22	.09	.10	.46	.36	.18
Anxiety									
Extremely Low	.02	.03	.02	.07	.05	.09	.29	.42	.29
Low	.14	.22	.10	.52	.44	.46	.31	.48	.21
High/Decreasing	.02	.09	.01	.07	.17	.05	.17	.75	.09
High/Increasing	.10	.17	.09	.35	.34	.41	.27	.48	.25
Depression									
Extremely Low	.03	.00	.02	.09	.00	.11	.54	.01	.46
Low	.13	.26	.10	.43	.55	.44	.27	.53	.20
Moderate	.13	.19	.09	.41	.41	.42	.31	.46	.23
High	.02	.02	.01	.06	.04	.04	.42	.40	.19

prosocial behaviour trajectory irrespective of physical aggression levels, and decreased the likelihood of low prosocial behaviour trajectory membership with moderate or high physical aggression. Hostile parenting increased the likelihood of following the moderate or high physical aggression trajectories irrespective of prosocial behaviour trajectory.

Prosocial behaviour and anxiety. Table 3 presents nominal regression results predicting joint prosocial and anxiety development. The extremely low and low anxiety trajectories were combined to provide sufficient power to test the role of predictors. Odds ratios represent likelihood of membership relative to the joint moderate prosocial/combined low anxiety trajectory. Associations emerged for child sex, maternal depression and parenting. Boys were particularly likely to follow a low prosocial behaviour trajectory. Maternal depression and hostile parenting were generally associated with membership to the higher level anxiety trajectories, while positive parenting increased the likelihood of membership to the high prosocial behaviour trajectory and decreased the likelihood of membership to the low prosocial behaviour trajectory with low or high/increasing anxiety.

Prosocial behaviour and depression. Table 4 presents nominal regression results predicting joint prosocial and depression development. The extremely low and low depression trajectories were combined to provide sufficient power to test the role of predictors. Odds ratios represent likelihood of membership relative to the joint moderate prosocial/combined low depression trajectory. Strongest associations were found for child sex, family income, maternal depression and parenting. Boys were again particularly likely to follow a low prosociality trajectory. Low family income increased by threefolds the likelihood of following a joint high prosocial behaviour/high depression trajectory. Maternal depression and hostile parenting generally increased the likelihood of membership to the moderate and high depression trajectories. Positive parenting increased the likelihood of following the high prosocial behaviour trajectory at all depression levels.

Discussion

The present study first aimed to investigate the associations between the development of prosocial behaviour and the development of aggression, anxiety and depression. As hypothesized, results revealed a general negative association between prosociality and physical aggression, with a large proportion of high prosocial children following a low (46%) or moderate (44%) physical aggression trajectory, and a large proportion (46%) of highly physically aggressive children following a low prosocial trajectory. However, more complex associations emerged between prosociality and internalizing problems. Similar proportions of children within the extremely low, low, and high increasing anxiety trajectories followed a high prosocial trajectory. As well, membership in the low prosocial trajectory was associated with membership in the extremely low and high depression trajectories.

A second goal of the present study was to examine potential predictors of joint prosocial behaviour and mental health development. Hypotheses were partially supported, with a number of child, mother and family characteristics emerging as significant predictors. In line with previous studies (Cote et al., 2002; Perren et al., 2007), results indicated that being a boy was a very strong predictor of membership to the low prosocial behaviour trajectory. This tended to be true independently of mental health trajectory membership. In addition, positive parenting tended to be associated with greater likelihood of membership to the high prosocial behaviour trajec-

Table 2 Prediction of joint prosocial behaviour (P) and physical aggression (PA) trajectories

	Joint trajectory groups [OR (95% CI)]							
Predictors	Low P/Low PA	Low P/ Moderate PA	Low P/High PA	Moderate P/Moderate PA	Moderate P/ High PA	High P/Low PA	High P/ Moderate PA	High P/High PA
Boy	1.33 (1.08–1.64)	3.38* (2.80–4.09)	3.66* (2.74–4.88)	1.21 (1.06–1.38)	1.16 (0.84–1.59)	0.45* (0.37–0.55)	0.70* (0.58–0.85)	1.01 (0.69–1.48)
Low income	1.20 (0.95–1.51)	1.10 (0.90–1.34)	1.89* (1.43–2.51)	1.11 (0.95–1.30)	1.29 (0.91–1.83)	0.78 (0.62–0.97)	1.09 (0.88–1.35)	2.52* (1.70–3.75)
Intact family	1.61 (0.96–2.69)	1.07 (0.74–1.55)	0.86 (0.52–1.40)	1.10 (0.82–1.47)	0.83 (0.45–1.54)	0.73 (0.50–1.05)	0.74 (0.50–1.09)	2.98 (0.85–10.47)
High maternal education	0.68 (0.52–0.89)	1.00 (0.78–1.27)	0.78 (0.56–1.07)	0.98 (0.81–1.18)	0.80 (0.53–1.20)	1.07 (0.82–1.40)	0.94 (0.73–1.22)	0.82 (0.48–1.39)
Maternal depression	0.97 (0.95–1.00)	1.03 (1.01–1.05)	1.03 (1.00–1.06)	1.04* (1.03–1.06)	1.06* (1.03–1.09)	1.05* (1.03–1.08)	1.05* (1.03–1.07)	1.05 (1.01–1.10)
Positive parenting	0.97 (0.94–1.01)	0.93* (0.90–0.95)	0.90* (0.87–0.94)	1.00 (0.98–1.02)	1.11* (1.05–1.17)	1.12* (1.09–1.16)	1.17* (1.13–1.21)	1.26* (1.17–1.34)
Hostile parenting	0.99 (0.96–1.02)	1.16* (1.13–1.20)	1.36* (1.31–1.41)	1.17* (1.15–1.20)	1.41* (1.35–1.48)	0.93* (0.90–0.96)	1.15* (1.12–1.19)	1.41* (1.34–1.48)
Consistent parenting	0.96 (0.93–0.99)	0.95 * (0.93–0.98)	0.99 (0.95–1.02)	1.00 (0.98–1.03)	1.07 (1.01–1.12)	1.07* (1.03–1.10)	0.98 (0.95–1.01)	1.20* (1.12–1.28)
Family dysfunction	0.97 (0.92–1.02)	1.01 (0.97–1.06)	1.01 (0.95–1.08)	0.98 (0.94–1.01)	0.90 (0.83–0.97)	0.99 (0.94–1.03)	0.92* (0.88–0.96)	1.09 (0.98–1.20)

Comparison group: Moderate prosocial/Low physical aggression joint trajectory.
*$p \leq .001$. $N = 6988$.

Table 3 Prediction of joint prosocial behaviour (P) and anxiety (A) trajectories

	Joint trajectory groups [OR (95% CI)]							
Predictors	Low P/Low A	Low P/High ↓ A	Low P/High ↑ A	Moderate P/ High ↓ A	Moderate P/ High ↑ A	High P/Low A	High P/ High ↓ A	High P/High ↑ A
Boy	2.11* (1.82–2.45)	6.83* (2.78–16.78)	2.39* (1.97–2.90)	1.22 (1.02–1.47)	1.07 (0.92–1.24)	0.61* (0.51–0.72)		0.57* (0.46–0.69)
Low income	1.30 (1.10–1.53)	1.45 (0.63–3.31)	1.31 (1.07–1.61)	0.97 (0.78–1.21)	1.26 (1.07–1.49)	1.03 (0.85–1.25)		1.22 (0.99–1.51)
Intact family	0.98 (0.71–1.36)	1.31 (.24–7.29)	0.78 (0.53–1.14)	0.64 (0.44–0.94)	0.73 (0.54–1.00)	0.65 (0.46–0.93)		0.66 (0.44–0.99)
High maternal education	0.80 (0.66–0.97)	5.28 (1.49–18.69)	1.06 (0.83–1.35)	1.42 (1.06–1.89)	0.84 (0.69–1.02)	0.90 (0.71–1.13)		1.31 (0.99–1.73)
Maternal depression	0.97* (0.95–0.99)	1.15* (1.10–1.21)	1.05* (1.03–1.06)	0.98 (0.96–1.00)	1.05* (1.04–1.07)	1.01 (0.99–1.03)		1.06* (1.04–1.08)
Positive parenting	0.93* (0.91–0.95)	0.84 (0.75–0.93)	0.94* (0.91–0.96)	0.98 (0.95–1.00)	1.01 (0.98–1.03)	1.17* (1.14–1.21)		1.14* (1.10–1.18)
Hostile parenting	0.98 (0.96–1.00)	1.30* (1.19–1.43)	1.07* (1.04–1.10)	1.00 (0.97–1.03)	1.06* (1.04–1.08)	0.93* (0.91–0.96)		1.07* (1.04–1.10)
Consistent parenting	0.96* (0.94–0.98)	0.89 (0.81–0.97)	0.94* (0.92–0.97)	1.00 (0.97–1.03)	0.99 (0.97–1.02)	1.04 (1.01–1.07)		1.00 (0.97–1.03)
Family dysfunction	1.00 (0.97–1.04)	0.98 (0.82–1.17)	1.04 (0.99–1.09)	0.97 (0.92–1.01)	0.96 (0.93–1.00)	0.97 (0.93–1.01)		1.00 (0.95–1.05)

Comparison group: Moderate prosocial/Low anxiety joint trajectory.
The number of children ($n = 7$) for the joint High P/High↓A trajectory did not allow inclusion in formal analyses.
*$p \leq .001$. $N = 6983$.

Table 4 Prediction of joint prosocial behaviour (P) and depression (D) trajectories

Predictors	Joint trajectory groups [OR (95% CI)]						
	Low P/Low D	Low P/ Moderate D	Low P/High D	Moderate P/Moderate D	Moderate P/ High D	High P/Low D	High P/ Moderate D	High P/High D
Boy	1.81* (1.56–2.12)	1.81* (1.53–2.14)	2.43* (1.51–3.91)	0.71* (0.62–0.81)	0.56 (0.34–0.93)	0.53* (0.44–0.63)	0.45* (0.37–0.55)	0.26* (0.12–0.57)
Low income	1.21 (1.02–1.43)	1.22 (1.02–1.46)	1.30 (0.82–2.06)	1.02 (0.87–1.19)	0.52 (0.28–0.97)	0.83 (0.68–1.02)	1.06 (0.86–1.30)	3.19* (1.59–6.37)
Intact family	1.23 (0.86–1.76)	0.70 (0.50–0.98)	0.75 (0.33–1.72)	0.64 (0.48–0.86)	0.78 (0.31–2.00)	0.56* (0.39–0.80)	0.71 (0.48–1.05)	1.72 (0.29–10.15)
High maternal education	0.87 (0.71–1.06)	0.96 (0.78–1.20)	0.94 (0.55–1.59)	0.83 (0.69–1.00)	0.40* (0.23–0.70)	1.06 (0.82–1.36)	1.13 (0.87–1.47)	0.71 (0.28–1.83)
Maternal depression	1.01 (0.99–1.02)	1.03* (1.01–1.05)	1.09* (1.05–1.13)	1.06* (1.04–1.07)	1.12* (1.08–1.16)	1.02 (0.99–1.04)	1.07* (1.05–1.09)	1.09 (1.03–1.16)
Positive parenting	0.92* (0.90–0.94)	0.93* (0.91–0.95)	0.96 (0.90–1.02)	0.98 (0.96–1.00)	1.05 (0.97–1.14)	1.18* (1.15–1.22)	1.11* (1.07–1.14)	1.36* (1.20–1.55)
Hostile parenting	0.97 (0.95–0.99)	1.11* (1.08–1.13)	1.23* (1.17–1.30)	1.11* (1.09–1.13)	1.23* (1.16–1.31)	0.97 (0.94–0.99)	1.04 (1.02–1.07)	1.43* (1.32–1.56)
Consistent parenting	0.95* (0.92–0.97)	0.97 (0.95–1.00)	1.01 (0.95–1.08)	1.02 (1.00–1.04)	1.10 (1.02–1.19)	1.05* (1.02–1.08)	1.00 (0.97–1.03)	1.25* (1.12–1.40)
Family dysfunction	1.02 (0.98–1.06)	1.01 (0.97–1.05)	1.02 (0.92–1.13)	0.95 (0.92–0.99)	0.92 (0.82–1.04)	0.98 (0.94–1.02)	0.97 (0.93–1.01)	1.10 (0.92–1.31)

Comparison group: Moderate prosocial/Low depression joint trajectory.
*$p \leq .001$. 001. $N = 6988$.

tory and decreased likelihood of membership to the low prosocial behaviour trajectory, irrespective of aggression, anxiety and depression levels. In contrast, hostile parenting was generally associated with membership to the high physical aggression, anxiety and depression trajectories, and this tended to be true at all prosociality levels.

As well, low family income increased the likelihood of joint low prosocial behaviour/high physical aggression development. Low income, however, also increased the likelihood of joint high prosociality/high physical aggression development, as well as high prosociality/high depression development. While maternal depression tended to be associated with higher physical aggression, anxiety and depression levels, it increased odds of membership to the joint high prosociality/low physical aggression trajectory.

While our study did not assess causal links, it does point to important clinical and research avenues. Prosociality has been previously proposed to promote healthy development when appropriately regulated, but creating difficulties if too low or too high (Hay, 1994). The development of overly high prosociality may be accompanied by an over concern for others or empathic over arousal (Hoffman, 2000), leading to anxiety (Hay & Pawlby, 2003). Alternatively, highly anxious individuals may be more likely to use prosocial behaviour as a way of navigating their social environments (Culotta & Goldstein, 2008), in contrast to depressed individuals who may lack the energy to engage prosocially with others. Conversely, overly low concern for others may be associated with externalizing problems (Hastings et al., 2000).

Studies specifically investigating the mechanisms underlying different joint prosocial and mental health development are needed to clarify patterns of association and the significance of such associations. The present study shows that population heterogeneity may not only exist in terms of levels of prosocial behaviour and externalizing and internalizing difficulties but also in terms of joint development. Furthermore, prosociality's contribution to adjustment is complex and prosocial children may not be exempt from mental health difficulties. As previously suggested, subgroups of children may, in fact, exhibit high prosocial behaviour development in the context of potentially significant behavioural and emotional problems (Hay & Pawlby, 2003). Prosocial development should thus be conceptualized within the broader context of individuals' functioning (Perren et al., 2007). In particular, recent research has highlighted the importance of investigating both children's self- and other-oriented social skills (Perren, Forrester-Knauss, & Alsaker, 2012). More generally, parents and professionals working with children may choose to promote a balance between self-interest and concern for others.

Furthermore, the present results lead us to speculate that adverse environments, characterized by various stressors (e.g. economic hardship, parental

mental health difficulties), may lead some children to develop a certain callousness or overconcern towards others. Children evolving in adverse psychosocial circumstances and showing overly low or high prosocial tendencies may thus be of particular research and clinical interest. Research focusing on the interaction of various psychosocial circumstances with different behavioural or more biologically based child characteristics (e.g. temperament) would also be valuable.

The present study was the first, to the best of our knowledge, to map associations between the development of prosocial behaviour and the development of aggression, anxiety and depression from the preschool years to preadolescence. Using a large, representative sample of children, we painted a broad picture of longitudinal associations. However, because children were from a general rather than clinical sample, the extent to which children following a high problem trajectory experienced significant distress is unknown. Specifically, a relatively large proportion of children followed the high/increasing anxiety trajectory, making it unlikely that all were suffering from clinically significant levels of anxiety. Nevertheless, a number of risk factors did predict membership to the high aggression, anxiety and depression trajectories, speaking to the validity of our measures. Future research investigating associations within clinical samples will be informative. As well, data for the present study were largely derived from maternal reports. Potential paternal influences on children's behavioural development were not the focus because paternal variables in this data set suffer from a greater rate of missing data than maternal variables. Past research has suggested that while mothers may be able to report on their children's behaviour across context and over time, parent and family characteristics can influence perceptions of children's functioning and affect interinformant agreement (De Los Reyes & Kazdin, 2005). Investigations focusing on multiple informants, including fathers, teachers, and children themselves, as well as the impact of various sociocultural influences on informant perceptions, would be important. Furthermore, as noted above, while we may speculate regarding the potential risk and protection afforded by prosociality, this study cannot identify the direction or underlying mechanisms of observed relationships. As well, the present study used a composite prosocial behaviour measure. Evidence of stronger associations between specific forms of prosocial responding and mental health has, however, been provided with a sample of adolescents (Champion et al., 2009). Future investigations will therefore benefit from disentangling the specific associations at play between subcomponents of prosociality and mental health. Finally, because the prevalence of prosociality, externalizing problems and internalizing problems has been shown to vary between the sexes, future studies may benefit from examining interactions between sex of the child and joint prosocial/problem development.

The present study provides evidence for the complex relationship between prosocial behaviour and mental health during childhood. Future research will be important in differentiating contexts where prosociality can be helpful to children's development from contexts where prosociality may be associated with distress.

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Key points

- Previous studies have provided mixed evidence for associations of prosociality with mental health.
- The present study indicates that while high prosociality tends to co-occur with low levels of mental health problems, high prosociality and internalizing/externalizing problems can co-occur in subgroups of children.
- Findings contribute to a greater understanding of the predictors and development of prosociality with mental health, setting the stage for investigations differentiating contexts where prosociality can be helpful to children's development from contexts where prosociality may be associated with distress.

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