Predicting temperamentally inhibited young children's clinical internalizing problems from

parenting and parent wellbeing: A population study

Abstract

The aim of this study was to explore how some temperamentally inhibited young children and not others in the general population develop internalizing problems, with a focus on the family. A brief screening tool for inhibition was universally distributed to parents of children in their year before starting school across eight socioeconomically diverse government areas in Melbourne, Australia (307 preschool services). Screening identified 11% of all children as inhibited. We invited all parents of inhibited children to participate in a longitudinal prevention study. Participants were 545 parents of inhibited pre-schoolers (78% uptake) of whom 489 (90%) completed assessment one year later and 463 (85%) two years later. Parents completed questionnaires to assess parenting practices, parent wellbeing, and clinical level child internalizing problems. Parents also engaged in structured diagnostic interviews to assess child anxiety disorders. During the follow up period close to half of the inhibited young children had anxiety disorders and one in seven had broader (anxious/depressive) clinical internalizing problems. The family variables significantly predicted inhibited children's anxiety disorders and broader internalizing problems. For child anxiety disorders, overinvolved/protective parenting as well as parental anxiety and depression were important. For child anxious/depressive problems, parental anxiety, depression and stress as well as harsh discipline parenting were important. These etiological findings support early intervention for temperamentally inhibited young children that focuses on the family environment to prevent the development of mental health problems.

Keywords: child, preschool; internalizing problems; anxiety disorders; etiology; parenting; mental health

This study explored early child and family risks for emotional mental health. Few people in society are untouched by internalizing problems, a broad term that refers to inner distress and encompasses emotional symptoms of anxiety and depression. While practitioners view anxiety and depression disorders as multiple distinct diagnoses, empirical evidence shows high overlap between them and supports use of the broader term internalizing problems (Achenbach & McConaughy, 1992; Chorpita & Barlow, 1998). Public health advocates describe internalizing problems as an international priority area. Mathers and Loncar (2006) projected that by 2030 depression would be one of three leading causes of global burden of disease with HIV/AIDS and heart disease. Murray and colleagues (2012) noted that disability adjusted life years (DALYs) for depression increased by 37% from 1990 to 2010, moving from 15th to 11th cause of DALYs worldwide. The World Health Organization recently reported that depression is the leading cause of disability worldwide (www.who.int/mediacentre/factsheets/fs369/en/). The roots of emotional problems begin in childhood for many affected adults (Kessler et al., 2007). Internalizing problems affect 15-20% of school age children (Beesdo, Knappe & Pine, 2009; Carter et al., 2010; Dittman et al., 2011; Furniss, Beyer & Guggenmos, 2007; Sawyer et al., 2000). Even earlier, Paulus, Backes, Sander, Weber and von Gontard (2015) reported that the prevalence of anxiety disorders for 4-7 year old children was 22% in a population-based sample. Others note that socio-emotional problems affect around 15% of children in the preschool years (Barlow & Parsons 2003; Bayer, Hiscock, Ukoumunne, Price & Wake, 2008; Carter, Briggs-Gowan & Ornstein Davis, 2004).

Internalizing difficulties can show stability from early childhood onwards. In illustration, Bayer and colleagues followed a community sample of 112 children from age two through to seven years. A degree of continuity was identified between toddler and

preschool internalizing symptoms ($r = .56$, $p<.001$) and preschool and school age

internalizing symptoms ($r = .63$, $p<.001$) (Bayer, Hastings, Sanson, Ukoumunne & Rubin,

2010; Bayer, Sanson, & Hemphill, 2006a, 2009). Beyer and colleagues followed a larger

community sample of 814 children from preschool to primary school and reported that 38%

of those with clinical internalizing problems continued to have these disorders four years later

(Beyer, Postert, Muller & Furniss, 2012). In a review of prospective studies with children

and adolescents Beesdo and colleagues (2009) reported that only 10-13% of youth with

anxiety disorders at baseline were without disorder ten years later, with 35-41% having the

same anxiety disorder and 64-73% having any anxiety or depression disorder.

There is converging evidence from prospective community, clinical, and adult

retrospective studies that internalizing problems can have stability from childhood into

adolescence and then into adulthood (Asendorpf, Denissen & van Aken 2008; Bosquet &

Egeland 2006; Cytryn & McKnew, 1996; Duchesne, Vitaro, Larose & Tremblay, 2008;

McGee, Feehan & Williams, 1995; Pine, Cohen, Gurley, Brook & Ma, 1998). This can

impact on children's peer relationships, school engagement (Duchesne et al., 2008), later

adult employment (Asendorpf et al., 2008) and mortality (Joleka, Ferrie, & Kivimaki, 2009).

For example, Woodward and Fergusson (2001) followed a birth cohort of 1,265 children for

21 years and found that adolescent anxiety disorders predicted major depression, substance

abuse, suicidal behavior, educational underachievement, and early parenthood. Jokela and

colleagues (2009) with the British National Child Development Study (N=11,142) found that

internalizing problems at age 7-11 years forecast higher mortality by age 45 (OR 1.20, 95%

CI 1.06-1.35).

A constitutional factor that is known to increase children's risk for developing

internalizing problems is an inhibited temperament (Biederman et al., 2001; Claus &

Blackford, 2012; Degnan, Almas & Fox, 2010; Hirshfeld-Becker et al., 2007; Hudson &

Dodd, 2012; Hudson, Dodd & Bovopoulos, 2011; Muris, van Brakel, Arntz, & Schouten, 2011; Prior, Smart, Sanson & Oberklaid, 2000; Rapee, Schniering, & Hudson, 2009; Schwartz et al., 2016). Around 15% of typically developing children have an inhibited temperament, defined as the tendency to withdraw from unfamiliar people, objects, or situations (Degnan et al., 2010). In a meta-analysis Clauss and Blackford (2012) quantified a greater than sevenfold risk for child inhibition and social anxiety disorder. Recently Paulus and colleagues (2015) found that toddler inhibition predicted not only social anxiety but all anxiety disorders by six years of age (separation, social phobia, specific phobia, generalized anxiety/depression) in their large representative sample ($N = 1,342$). Toddler inhibition predicted 7.6% of the variance in children's later internalizing problems.

Child temperament is a risk, however, it is clear that not all inhibited young children go on to develop clinical internalizing problems. It is vital to understand what contributes to some children at temperamental risk but not others developing mental health problems, and this presents a gap in knowledge in the field (Murray, Creswell & Cooper, 2009; Spence & Rapee, 2016). Diathesis-stress models of risk for psychopathology emphasise the importance of examining individual and interpersonal risk factors (Gazelle & Ladd, 2003). In early childhood the immediate family may play an important role. The daily interactions that take place between parents and their young children are a potentially modifiable aspect of the environment. Review articles point to a potential role posed by parenting practices and parental wellbeing in children's emotional development (Beesdo et al., 2009; Degnan et al., 2010; Moller, Nikolic, Majdandzic & Bogels, 2016; Murray et al., 2009; Percy, Creswell, Garner, O'Brien & Murray, 2016; Spence & Rapee, 2016). Young children's inhibited behavior can evoke overprotective or controlling reactions from parents (Hudson, Doyle, & Gar, 2009; Kiel & Buss, 2011, 2016; Murray et al., 2009; Rubin, Nelson, Hastings, & Asendorpf, 1999). This type of habitual interaction may contribute to inhibited young

children developing internalizing difficulties (Bayer, Sanson & Hemphill, 2006b; Coplan, Arbeau, & Armer, 2008; Keil, Premo & Buss, 2016; Rapee et al., 2009; Rubin, Burgess & Hastings, 2002). The most likely relationship between parent factors and child internalizing symptoms is a cyclical one (Edwards, Rapee & Kennedy, 2010). Nevertheless, there are few epidemiological studies to examine if the early family environment is an important risk for inhibited children's internalizing problems and work is required to understand core risk variables in critical time-periods (Beesdo et al., 2009). Large-scale longitudinal research in temperamentally at risk populations is recommended to examine associations between the environment and children's internalizing problems (Degnan et al., 2010). This study aimed to follow a large population-based sample of temperamentally inhibited preschool children over two years to explore the etiology of clinical internalizing problems with a focus on the family.

Methods

Setting and Participants

Participants were enrolled in a population study on prevention in metropolitan Melbourne (population 4 million) in the state of Victoria, Australia (Bayer et al., 2011). Eight of Melbourne's 31 local government areas ranked by census derived socioeconomic indexes of relative disadvantage were selected (Australian Bureau of Statistics, 2006) to provide a broad spread of social circumstance. All preschool services offering a government funded four-year-old program in these districts were invited to participate. Participating preschools (n=307, 78% uptake) distributed an inhibition screening questionnaire for children enrolled in the year before starting school and this was completed by over 6,000 parents (Beatson et al., 2014). Parents with inhibited children received a telephone call about the prevention study and a baseline questionnaire and consent form by mail (Ethics in Human

Research Committee of the Royal Children's Hospital Melbourne 30105A, La Trobe

University Human Ethics Committee HEDC13-022). Exclusion criteria were parents with

insufficient English to complete questionnaires and children with a major

medical/developmental problem. Of 703 inhibited children the parents of 545 (78%)

consented to enrol in the prevention study (figure). Table 1 describes the sample

characteristics. At the one year follow up assessment, 90% of families returned

questionnaires and 90% completed diagnostic telephone interviews. At the two year follow

up assessment, 85% of families completed questionnaires and 83% completed diagnostic

telephone interviews.

Measures

The parent questionnaires at enrolment included measures of child inhibited

temperament, family demographics, parenting practices, and parent wellbeing. The parent

questionnaires at one and two year follow up included measures of child internalizing

(anxious/depressive) problems, parenting practices, and parent wellbeing. A structured

telephone interview also assessed child anxiety disorders at follow up. As inhibition is

considered a constitutional (biologically based) aspect of temperament (Calkins, Fox and

Marshall, 1996) its measure was not repeated at follow up.

Child inhibited temperament was measured by the Australian Temperament Project's

approach/withdrawal scale (7-items), which has sound psychometric properties (Sanson,

Pedlow, Cann, Prior, & Oberklaid, 1996; Sanson, Smart, Prior, Oberklaid & Pedlow, 1994).

Children scoring >30 were classified as inhibited in line with prior work in the field (Rapee,

Kennedy, Ingram, Edwards & Sweeney, 2005, 2010). Family disadvantage was indicated by

the Australian Bureau of Statistics (2011) SEIFA score based on home postcode (national

mean 1000, *SD* 100). Parenting practices were assessed by the Parenting Behavior Checklist

(PBC: Brenner & Fox, 1998) nurturing and harsh discipline subscales, supplemented with

Bayer and colleagues' (2006b, 2010) subscale for overinvolved/protective practices. The PBC yields *T* scores (mean 50, *SD* 10) derived from norms for age 1-5 years in six-month age bands. The overinvolved/protective score is the mean across items. Parent wellbeing was assessed by the Depression Anxiety Stress Scales (DASS-21: Lovibond & Lovibond, 1995). The DASS has three subscales for depression, anxiety and stress (summed symptom scores). Children's internalizing problems were measured by the Children's Moods, Fears and Worries Questionnaire (CMFWQ: Bayer et al., 2006a), which has a mean score across 34 symptoms and a clinical cut-point (>2.87). The CMFWQ demonstrates convergent validity with internalizing scales of the Child Behavior Checklist's (CBCL: Achenbach & Rescorla, 2000, 2001) and Behavior Assessment System for Children's (BASC-2: Reynolds & Kamphaus, 2004) (Andrijic, Bayer & Bretherton, 2013). Child anxiety disorders were assessed by the Anxiety Disorders Interview Schedule for DSM-IV, Child Version, Parent Interview Schedule (ADIS-CP-IV: Silverman & Albano, 1996) via telephone interviews (Lyneham & Rapee, 2005). This covered separation anxiety, specific phobia, social phobia, and generalized anxiety disorder as relevant for young children.

Analyses

We summarized sample demographic characteristics using proportions for categorical variables and means and SDs for continuous variables. To estimate the rate of clinical level internalizing problems amongst inhibited children in the control arm of the prevention study, we used the ADIS-CP-IV for anxiety disorders and the CMFWQ clinical cut-point for broader anxious/depressive problems. Logistic regression analysis was used to test associations between family variables and children's anxiety disorder and clinical internalizing problems. Regression models controlled for baseline inhibition severity and trial arm of the original study. The included predictors were family variables measured before or at the time-point of the child mental health outcome. First, one family variable at a

time was a predictor variable. Then we fitted multi-predictor models including as predictors all family variables at each age year of the child. To account for multicollinearity in the family variables and to obtain simpler models, variable selection with a Bayesian Information Criterion (BIC) was used. Prediction rates for the logistic regression analyses were estimated using ten-fold cross-validation. The logistic regression analyses were complemented with random forest analyses (Breiman, 2001) based on 2000 classification trees to obtain further estimates of prediction rates and an assessment of variable importance based on reduction in the prediction rates. R version 3.3.3 (R Core Team, 2017) was used for the analysis.

Results

Inhibited preschool children in this population-based sample had substantial rates of mental health problems across two years of follow up. After one year (as five-year-olds), 47.3% of inhibited children had anxiety disorders and 14.3% had clinical internalizing problems. After two years (as six-year-olds), 40.2% of inhibited children had anxiety disorders and 14.9% had clinical internalizing problems. The mental health problems of inhibited young children showed substantial continuity. Of five-year-olds with anxiety disorders, 64.6% had anxiety disorders and 25.8% had clinical internalizing problems at age six years. Of five-year-olds with clinical internalizing problems, 78.3% had anxiety disorders and 66.7% had clinical internalizing problems at age six years.

Overinvolved/protective and harsh discipline parenting practices were each associated with the likelihood of inhibited children having an anxiety disorder by age five years, with parent mental health also significant (Table 2a). A logistic regression model including all family variables had reasonable predictive strength (predication rate 60.8% and 64.2% for variables measured at age four and five years respectively). Much of the predictive strength was explained by overinvolved/protective parenting and parent anxiety alone at age four

years (OR = 2.58, [1.39, 4.89]; OR = 1.14 [1.08, 1.21]; 60.9% Table 2a) and

overinvolved/protective parenting and parent depression at age five years (OR = 2.57 [1.37,

4.93], OR = 1.10, [1.05, 1.15]; 60.8%). The random forests analysis found similar prediction

rates (58.8% for age four and 59.7% for age five variables; Table 2b), with greater predictive

strength of a non-diagnosis. A random forest variable importance analysis (variables with

higher mean decrease in accuracy are deemed the most important) suggested that parent

anxiety and overinvolved/protective parenting at age four years were the most important

variables leading to 5-year-old child anxiety disorder, which was in agreement with the

logistic regression approach. Random forests analysis at age five years chose parent anxiety

and depression as the important variables. This differed from the logistic regression analysis

suggesting that overinvolved/protective parenting was adequately explained by the other

variables.

For child anxiety disorder by six years of age, the logistic regression models had good

predictive strength with prediction rates of approximately 60% or higher (up to 65.6%) for

variables measured at ages four, five and six years (Table 3a). Again,

overinvolved/protective parenting and parent depression were able to account for much of the

prediction rate, although when considered individually all measures except for nurturing

parenting were associated with child anxiety disorder. The random forests analyses returned

similarly good prediction rates (Table 3b) although to achieve a reasonable prediction rate for

correctly identifying child anxiety diagnosis all variables measured at each year were

required. Overinvolved/protective parenting and parent depression were again typically

deemed the important variables.

For child clinical internalizing (anxious/depressive) problems at age five years

associations were detected for all family variables (Table 4a). With an imbalance between

normal (419) and clinical groups (70), logistic regression prediction rates are misleading

since greater than 85% can be achieved by simply predicting normal. We have not therefore included these rates and favor the random forest prediction rates as better indicators (Table 4b), which had some success in predicting clinical cases. This was around 50%, and it should be noted that the prediction rates for the normal group were high. Variable selection for the logistic regression model chose harsh discipline parenting and parent depression as important factors, while the random forest analyses also highlighted parent anxiety and stress.

For children's clinical internalizing problems by six years of age, the associations were similar to age five (Table 5a). Random forest prediction rates again had some success in predicting clinical cases (around 50%, Table 5b). Variable selection for the logistic regression model highlighted harsh discipline and parent depression as important, while the random forest analyses also highlighted parent anxiety and stress.

Discussion

Close to half of temperamentally inhibited preschool children in the general population had anxiety disorders, while one in seven had broader clinical level anxious/depressive problems, at the time when most children commence school (five to six years of age). Inhibited young children's rate of anxiety disorders was double that of children in the general population (Paulus et al., 2015). Inhibited young children's rate of clinical anxious/depressive problems was similar to the population rate across youth of all ages combined (four to 17 years; Sawyer et al., 2000). The emotional mental health problems of inhibited preschool children were also persistent. Over two thirds retained problems over a year. The patterns of comorbidity over time reflected severity (Chorpita & Barlow, 1998; Kovacs & Devlin, 1998), in that a quarter of those with anxiety disorders had broader clinical anxious/depressive problems, whereas most with clinical anxious/depressive problems had anxiety disorders. Inhibited young children's early family environment predicted their

mental health status when at the age for starting school. Inhibited preschool children were most likely to have anxiety disorders at follow up when living in a context of overinvolved/protective parenting practices and parental anxiety/depression. Inhibited young children were most likely to have broader internalizing problems (which reflect greater severity) when in a family context of parental anxiety/depression along with stress and harsh discipline parenting practices. These findings highlight features of the early family environment in which inhibited young children are more likely to develop mental health problems as they grow.

This population-based study had the following strengths. A 78% enrolment rate of parents from those who were eligible with an inhibited preschool child (Beatson et al., 2014) is substantial considering other early childhood community studies (Hiscock et al., 2008; Rapee et al., 2010). The socioeconomic disadvantage of non-participants was only marginally lower than of participants (on parent education and welfare recipient; Bayer et al., in press) and therefore the findings can be generalized to a wide socioeconomic spectrum. The longitudinal retention of the population sample was high over two years. Validated measures appropriate to the young age group were employed and included diagnostic interviews. Statistical analyses controlled for children's initial severity of inhibition and therefore a universal parent reaction to child shyness (i.e., all parents respond to inhibited behaviors with over-involvement/protection) cannot explain the prediction of child mental health from parenting. The study also had design limitations. High risk families may have chosen not to participate in the study, although the sample demographics and rate of child mental health problems suggest that families with risks were included. Primary caregivers were the sole data source, and while primary caregivers are the most informed source on early childhood socioemotional functioning (Glascoe, 2005), teacher report and direct observation could tap additional aspects. Nevertheless, direct observation tends to be

impractical in population studies of this scope. Literature also indicates that teachers are not best placed to identify inner child emotions (Berg-Nielsen, Solheim, Belsky & Wichstrom, 2012; Bryer & Signorini, 2011; Stanger & Lewis, 1993) and they are unlikely to be aware of most children's home environments in detail.

In terms of practical implications, the study findings suggest reasons for how some but not other inhibited young children develop clinical mental health problems as they grow. Some temperamentally at risk young children experience a pattern of overinvolved/protective or harsh parenting responses to their behavior, which can be understood in a context of parents' own stress and emotional distress. There can be well-meaning efforts by parents to prevent their shy/sensitive child from facing any challenge and the potential for failure. When parents feel anxious they may try to avoid an inhibited child facing any frustration, distress or potential mistakes. They may 'take over' when trying to ensure their shy/sensitive child is included in play. It may be very upsetting to leave their reticent child, even with other people who are well known to them. If their child could be hurt in any way they may feel very upset or angry. When parents are stressed and depressed they can also respond with harshness to inhibited young children's reticent behaviors. Temperamentally inhibited young children living in these types of distressed family context lack opportunities to gradually face and overcome their fears, anxiety and emotional distress.

Early intervention programs have been developed to support parents of children with temperamental inhibition and have demonstrated success in improving children's mental health outcomes (Bayer et al., 2009; Chronis-Tuscano et al., 2015; Rapee, 2013; Rapee et al., 2005). The Cool Little Kids program (Rapee et al., 2005) is illustrative of this work. Parents with inhibited preschool age children are taught about the principle of 'exposure' where children learn to fight fears by gradually facing and overcoming their fears. Parents create systematic exposure 'stepladders' tailored to their child's unique fear and distress behaviors.

The program guides parents on how to reward inhibited young children for each small step in facing a fear, and how to avoid jumping in too quickly to take over for their child. Parents are also taught 'realistic thinking' skills to help manage their own distressed emotions, enabling them to contain urges to respond with overprotective or harsh reactions to their child's distress. Modifying the family environment via this early intervention has reduced the likelihood of temperamentally inhibited young children developing anxiety disorders and internalizing problems in longitudinal research (Rapee, 2013; Rapee et al., 2005, 2010).

In conclusion, this study of temperamentally inhibited preschool children in the general population found that they are at substantial risk of developing clinical mental health problems as they grow. The daily parent-child interactions that take place in the context of parents' own emotional wellbeing were found to be important for inhibited children's developing mental health. Consistent with the diathesis stress model, inhibited children in a home environment of overinvolved/protective and harsh parenting and parental distress are more likely to have clinical anxiety disorders and internalizing problems. Early intervention programs have been developed to offer parents guidance on how best to respond to inhibited children's fears, anxieties and distress. The present findings suggest that early intervention may be best targeted to temperamentally at risk children whose parents are stressed and distressed.

Ethical Approval

All procedures performed were in accordance with the ethical standards of the institutional research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

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Fig. 1 Flowchart of participants.

Table 1

Characteristics of Sample at Enrolment

Variable	*N*=545
Children	
Age in years, mean (*SD*)	4.5 (0.4)
Female, *n* (%)	263 (48.3)
First born, *n* (%)	280 (51.4)
Inhibition, mean (*SD*)	34.2 (2.8)
Primary caregiver	
Age in years, mean (*SD*)	37.8 (4.7)
Relationship status	
Married/ cohabiting, *n* (%)	502 (92.1)
Separated/divorced, *n* (%)	34 (6.2)
Single/widowed, *n* (%)	9 (1.7)
Born in Australia/New Zealand, *n* (%)	402 (73.8)
English main language at home, *n* (%)	483 (88.6)
Highest level of education	
Did not complete high school, *n* (%)	62 (11.5)
Completed high school (only), *n* (%)	124 (22.9)
Completed tertiary degree, *n* (%)	355 (65.6)
Family	
Household income (optional item) ($AUS per annum)	
< $25,000, *n* (%)	21 (4.6)
$25,000 to $51,900, *n* (%)	59 (12.9)
$52,000 to $88,400, *n* (%)	104 (22.8)

> $88,400, *n* (%)	273 (59.7)
Financial hardship (welfare card), *n* (%)	100 (18.7)
Neighbourhood disadvantage, mean (*SD*)	1046.6 (42.6)

Note. Statistics reported are based on 534 to 545 participants (income optional item *n* = 457).

Table 2a

Logistic Regression Predicting Child Anxiety Disorders at Age Five Years

Family Variables	Individual Predictors			Multivariate Model		
	OR	95% CI	*p*	*OR*	95% CI	*p*
Parenting Practices (child age)						
Nurturing (4 years)	1.01	0.99 to 1.03	0.381			
(5 years)	0.99	0.98 to 1.01	0.446			
Harsh discipline (4 years)	1.04	1.01 to 1.08	0.008			
(5 years)	1.04	1.00 to 1.07	0.036			
Over-involved/protective (4 years)	3.00	1.74 to 5.27	<0.001	2.58	1.39 to 4.89	0.003
(5 years)	2.53	1.44 to 4.53	0.001	2.57	1.37 to 4.93	0.004
Parent Wellbeing (child age)						
Stress (4 years)	1.07	1.05 to 1.10	<0.001			
(5 years)	1.07	1.04 to 1.10	<0.001			

Anxiety (4 years)	1.14	1.08 to 1.20	<0.001	1.14	1.08 to 1.21	<0.001
(5 years)	1.15	1.08 to 1.22	<0.001			
Depression (4 years)	1.11	1.06 to 1.14	<0.001			
(5 years)	1.11	1.06 to 1.16	<0.001	1.10	1.05 to 1.15	<0.001
Prediction rate						
4 years		60.8*			60.9*	
5 years		64.2*			60.8*	

Table 2b

Random Forests Analyses Predicting Child Anxiety Disorders at Age Five Years

Prediction rate	*Overall*	*No anxiety disorder*	*Anxiety disorder*
4 years	58.77	63.44	53.77
5 years	59.68	64.76	54.25
Full model	61.28	64.32	58.02

Table 3a

Logistic Regression Predicting Child Anxiety Disorders at Age Six Years

Family Variables	Individual Predictors			Multivariate Model		
	OR	95% CI	*p*	*OR*	95% CI	*p*
Parenting Practices (child age)						
Nurturing (4 years)	1.01	0.99 to 1.03	0.371			
(5 years)	1.00	0.98 to 1.02	0.721			
(6 years)	1.00	0.98 to 1.02	0.992			
Harsh discipline (4 years)	1.04	1.01 to 1.08	0.011			
(5 years)	1.06	1.02 to 1.10	0.002			
(6 years)	1.07	1.03 to 1.11	0.001			
Over-involved/protective (4 years)	2.79	1.56 to 5.09	0.001	2.74	1.43 to 5.35	0.003
(5 years)	3.57	1.94 to 6.73	<0.001	3.14	1.60 to 6.31	0.001
(6 years)	3.50	1.91 to 6.55	<0.001	3.71	1.85 to 7.63	<0.001

Parent Wellbeing (child age)

Stress (4 years)	1.06	1.03 to 1.09	<0.001			
(5 years)	1.06	1.03 to 1.10	<0.001			
(6 years)	1.06	1.04 to 1.10	<0.001			
Anxiety (4 years)	1.11	1.06 to 1.18	<0.001			
(5 years)	1.11	1.05 to 1.19	<0.001			
(6 years)	1.12	1.06 to 1.18	<0.001			
Depression (4 years)	1.08	1.04 to 1.12	<0.001	1.07	1.03 to 1.12	0.001
(5 years)	1.11	1.06 to 1.16	<0.001	1.09	1.05 to 1.15	<0.001
(6 years)	1.10	1.06 to 1.15	<0.001	1.09	1.04 to 1.13	<0.001

Prediction rate

4 years		59.4*			60.2*	
5 years		64.8*			62.8*	
6 years		63.5*			65.6*	

Table 3b

Random Forests Analyses Predicting Child Anxiety Disorders at Age Six Years

Prediction rate	*Overall*	*No anxiety disorder*	*Anxiety disorder*
4 years	55.87	69.83	35.62
5 years	58.67	73.71	36.88
6 years	65.05	76.29	48.75
Full model	60.59	63.88	57.08

Table 4a

Predicting Child Clinical Internalizing Problems at Age Five Years

Family Variables	Individual Predictors			Multivariate Model		
	OR	95% CI	*p*	*OR*	95% CI	*p*
Parenting Practices (child age)						
Nurturing (4 years)	0.97	0.94 to 1.00	0.039			
(5 years)	0.97	0.95 to 1.00	0.034			
Harsh discipline (4 years)	1.06	1.02 to 1.10	0.003	1.07	1.02 to 1.11	0.002
(5 years)	1.10	1.06 to 1.15	<0.001	1.10	1.06 to 1.16	<0.001
Over-involved/protective (4 years)	2.56	1.26 to 5.19	0.009			
(5 years)	2.27	1.29 to 4.63	0.026			
Parent Wellbeing (child age)						
Stress (4 years)	1.05	1.02 to 1.09	0.003			
(5 years)	1.07	1.04 to 1.11	<0.001			

Anxiety (4 years)	1.06	1.01 to 1.11	0.012			
(5 years)	1.09	1.03 to 1.16	0.002			
Depression (4 years)	1.06	1.02 to 1.10	0.002			
(5 years)	1.10	1.06 to 1.15	<0.001	1.09	1.04 to 1.14	<0.001

Table 4b

Random Forests Analyses Predicting Child Clinical Internalizing Problems at Age Five Years

Prediction rate	*Overall*	*Normal*	*Internalizing problems*
4 years	70.56	74.87	42.37
5 years	74.83	78.24	52.54
Full model	75.96	80.31	47.46

Table 5a

Logistic Regression Predicting Child Clinical Internalizing Problems at Age Six Years

Family Variables	Individual Predictors			Multivariate Model		
	OR	95% CI	*p*	*OR*	95% CI	*p*
Parenting Practices (child age)						
Nurturing (4 years)	0.99	0.97 to 1.02	0.624			
(5 years)	0.98	0.95 to 1.00	0.093			
(6 years)	0.98	0.96 to 1.01	0.170			
Harsh discipline (4 years)	1.05	1.01 to 1.09	0.011			
(5 years)	1.11	1.06 to 1.15	<0.001	1.09	1.04 to 1.14	<0.001
(6 years)	1.10	1.05 to 1.15	<0.001	1.08	1.03 to 1.13	0.002
Over-involved/protective (4 years)	3.23	1.52 to 6.87	0.002			
(5 years)	2.96	1.38 to 6.30	0.005			
(6 years)	3.49	1.63 to 7.50	0.001			

Parent Wellbeing (child age)

Stress (4 years)	1.06	1.03 to 1.10	0.001			
(5 years)	1.09	1.05 to 1.13	<0.001			
(6 years)	1.09	1.06 to 1.13	<0.001			
Anxiety (4 years)	1.12	1.06 to 1.19	<0.001			
(5 years)	1.17	1.10 to 1.25	<0.001			
(6 years)	1.18	1.11 to 1.25	<0.001			
Depression (4 years)	1.10	1.06 to 1.14	<0.001	1.10	1.05 to 1.15	<0.001
(5 years)	1.12	1.08 to 1.17	<0.001	1.10	1.05 to 1.15	<0.001
(6 years)	1.11	1.07 to 1.16	<0.001	1.10	1.06 to 1.15	<0.001

Table 5b

Random Forests Analyses Predicting Child Clinical Internalizing Problems at Age Six Years

Prediction rate	*Overall*	*Normal*	*Internalizing problems*

4 years	65.10	70.64	33.33
5 years	72.77	76.16	53.33
6 years	71.29	75.58	46.67
Full model	74.01	78.78	46.67

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