

Difficult Toddler Temperament – Prevalence and Associated Factors at 18-Month Follow-Up of a Birth Cohort

A'ishah Bhadelia^{1,*}, Karlen R Barr^{2,*}, James Rufus John¹⁻³, Bin Jalaludin^{3,4}, Cheryl Dissanyake⁵, Katrina Williams⁶, Susan Woolfenden⁷, Valsamma Eapen¹⁻³

¹School of Clinical Medicine, University of New South Wales, Sydney, NSW, Australia; ²South Western Sydney Local Health District, Liverpool, NSW, Australia; ³Ingham Institute of Applied Medical Research, Liverpool, NSW, Australia; ⁴School of Population Health, University of New South Wales, Sydney, NSW, Australia; ⁵School of Psychology and Public Health, La Trobe University, Melbourne, VIC, Australia; ⁶Department of Paediatrics, Monash University, Melbourne, VIC, Australia; ⁷Sydney Medical School, University of Sydney, Sydney, NSW, Australia

*These authors contributed equally to this work

Correspondence: Valsamma Eapen, ICAMHS, LI MHC, Liverpool Hospital, Elizabeth Street, Liverpool, NSW, 2170, Australia, Tel +61 02 96164205, Email v.eapen@unsw.edu.au

Purpose: Difficult temperament coupled with other risk factors may lead to mental health problems in childhood and have long-lasting effects in adolescence and adulthood. This study aimed to investigate the prevalence of parental perception of difficult temperament in toddlers and identify significant factors associated with individual and family-level sociodemographic risk factors.

Patients and Methods: The prevalence of parental perception of difficult temperament was derived from items in the 18-month follow-up questionnaire within the Watch Me Grow (WGM) longitudinal birth cohort study in a multicultural and socioeconomically disadvantaged community in Sydney, Australia. Data was available for 500 children and their parents. Descriptive analysis was used to calculate the participant characteristics and the prevalence of parental perception of difficult temperament, whereas multivariable logistic regression analysis was used to assess significant risk factors associated with a difficult temperament.

Results: Parental perception of difficult temperament in the cohort was 7.3% (n = 492). Findings of the multivariable logistic regression showed that screen time >2 hours a day (AOR 2.43, 95% CI: 1.2, 4.9), child not being read to (AOR 3.92, 95% CI: 1.8, 8.5), and family history of mental health problems (AOR 2.69, 95% CI: 1.1, 6.5) significantly increased the odds of having a difficult temperament.

Conclusion: Toddlers with difficult temperament were less likely to have received stimulatory experiences, and their families were more likely to be under greater stress. The findings emphasize the importance of parental support and anticipatory guidance in promoting nurturing care to facilitate child health and development, particularly in disadvantaged communities.

Keywords: difficult temperament, childhood, toddlers, risk factors

Introduction

Temperament refers to a “behavioral style” or how an individual behaves when facing events and people.¹ Temperament presents early in life, is moderately stable throughout life, and is a result of distinctive biological mechanisms interacting with environmental influences.²⁻⁵ Broadly speaking, temperament can be classified into three categories: “difficult”, “slow-to-warm” and “easy”.^{6,7} Children with a difficult temperament are characterized as having negative mood, low regularity in routine, low adaptability and high intensity.⁸ Parental reports are often used to measure child temperament due to the unsuitability of self-report in young children and the costs and poor reliability of child observations.⁹ Studies have shown that parent-reported difficult temperament in infancy and toddlerhood is associated with greater psychopathology in childhood and adolescence, greater depression, lower wellbeing, and unemployment in adulthood.¹⁰⁻¹⁵ Children with difficult temperaments often struggle to regulate their emotions and behaviors, which can lead to difficulties in forming and maintaining

positive relationships with peers, teachers, and family members. Over time, these interpersonal challenges can contribute to social withdrawal, loneliness, and even social rejection, which may persist into adulthood.^{10–15} Furthermore, difficult temperament in childhood is associated with an increased risk of developing internalizing and externalizing problems such as anxiety, depression, and conduct disorder. These mental health difficulties can have long-term consequences for individuals' educational attainment, employment prospects, and overall well-being in adulthood. Therefore, understanding the current prevalence of difficult temperament and associated risk factors is important for early identification and targeted interventions.¹⁰

The prevalence of difficult temperament in children is approximately 10%.^{7,16,17} However, there is a lack of current prevalence data for difficult temperament among Australian infants and toddlers. Representation of culturally and linguistically diverse (CALD) populations is also missing in this literature.¹⁶ For example, the Australian Temperament Project studies dating from the 1980s do not accurately represent the current multiculturalism that exists in the Australian population today.^{18,19} Therefore, prevalence data and associated risk factors for difficult temperament in a culturally diverse and socioeconomically disadvantaged population are needed.²⁰ This information can help shape relevant early interventions to support multicultural parents who perceive their child as having a difficult temperament in order to ensure optimal developmental and behavioral outcomes.

Risk factors that have been associated with difficult temperament include male gender, children with chronic health conditions, low socioeconomic status, certain cultural/ethnic backgrounds, and marital dissatisfaction.^{17–19,21–24} Adverse parent–child relationships, maternal characteristics such as depression, poor “goodness-of-fit” or mismatch between child's temperament and the response from the environment including the parent's lack of sensitivity to their child's temperament are also identified risk factors.^{17–19,22–26} The likelihood of an adverse outcome increases when there are multiple environmental and psychosocial risk factors compounding difficult temperament, particularly when parents are unable to appropriately respond to their child.²⁷ As many of the risk factors regarding temperament were identified 20 to 30 years ago, current evidence is required to understand risk factors that may be Australian affecting children today, including screen time. For example, watching television for more than 2 hours daily has been associated with higher rates of behavioural problems^{28,29} particularly in the domains of withdrawn behavior, attention, externalizing behaviours and total problems, and this in turn has been shown to be a precursor for significant adverse behavioural and mental health outcomes.

To address the knowledge gap, this study's aim was to investigate the prevalence of maternal perceptions of difficult child temperament at the 18-month follow-up of a multicultural birth cohort recruited from South West Sydney (SWS), Australia. A secondary aim was to determine significant biological and psychosocial factors associated with a difficult temperament.

Methods

Participants and Setting

The “Watch Me Grow” (WMG) study is a longitudinal birth cohort study consisting originally of 2025 parent–infant dyads with the main aim of evaluating the uptake of current developmental surveillance in a rapidly growing multicultural population in South West Sydney with significant socioeconomic disadvantage.³⁰

The recruitment, participant characteristics and representativeness of the cohort have been previously reported, and summarized in [Figure 1](#).^{31,32} A total of 2025 participants enrolled in the WMG study at birth, and the 18-month follow-up questionnaire data were available for 500 participants.

Data Collection and Measurement of Child and Family Socio-Demographic Risk Factors

Data were collected using self-reported questionnaires which were derived and developed by the team based on existing literature and other questionnaires from other Australian cohort studies, such as the Longitudinal Study of Australian Children (LSAC) (2004 – current). Using the bio-ecological model as a framework, the impact of child, parent and family, and socio-demographic characteristics that are available in the WMG cohort data were analyzed, as outlined in [Table 1](#).³³ A composite measure of household disadvantage was created using three variables – a household income of less than AUD 25,001, mother's education (less than high school), and/or father being unemployed. Additional

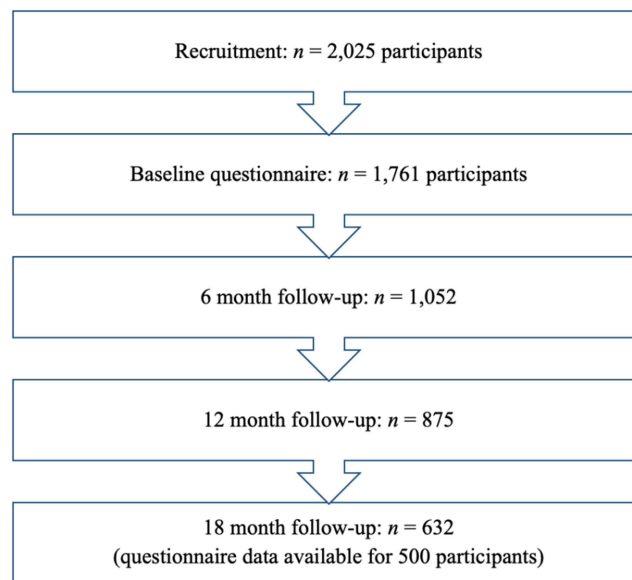


Figure 1 Initial recruitment and retention of participants.

information was obtained through electronic medical records, including maternal depression scores.³⁴ Further details on the study variables have been detailed in previous publications.^{30,31}

Measurement of Temperament

The questions were derived from the temperament questionnaire developed for use in the Longitudinal Study of Australian Children (LSAC) based on the 12-item Toddler Temperament Scale.³⁵ Examples are given below:

1. *My child is often fearful or anxious.*
2. *My child is often angry or defiant.*

These statements were rated on a Likert scale of 1 to 5 corresponding to “not at all how I feel” to “exactly how I feel”, respectively. A child was considered to have a “difficult” temperament if 4 or 5 was marked on any one of these questions.

Data Analysis

Descriptive statistics were used to calculate the clinical, psychosocial, and sociodemographic characteristics of the 18-month follow-up group who had questionnaire data ($n = 500$). Estimates of prevalence of parental perception of difficult temperament were calculated with frequency counts and percentages.

Table 1 Child, Family and Socio-Demographic Characteristics Included in the Analysis

Individual Child Characteristics	Parental and Family Characteristics	Socio-Demographic Factors
Prematurity (<37 weeks gestation)	Maternal antenatal mental health (Edinburgh Depression Scale score >13)	Maternal education
Low birth weight (birth weight <2500g)	Marital status	Paternal occupation
Gender	Family history of mental health	Household income (AUD < 25,001 a year)
Sleeping and feeding habits	Stressful life events within the past 2 years	Area level disadvantage based on Socio-Economic Indexes for Areas, Index of Relative Socio-Economic Disadvantage
Screen time	Social support	English as a second language
Child being read to	Number of siblings	Mother born overseas

To determine the risk factors associated with difficult temperament at 18 months, univariate logistic regression was initially used to assess the associations between parental perception of difficult temperament and the individual child, family and socio-demographic characteristics and composite measures. Multivariable logistic regression was then used to identify independent predictors for parental reporting of difficult temperament. All factors significant at the $p < 0.25$ level in the univariate logistic regression models were considered in the multivariable model. To ensure a minimum ratio of 10:1 events per variable, we limited the multivariable logistic regression model to a maximum of 3 variables.³⁶ The Bayesian information criterion (BIC) and p -values were used to determine the final multivariable model. Lower BIC values are considered better model fit whilst models with BIC values within 2 units of each other are generally considered similar to each other. All analyses were conducted using Statistical Package for Social Sciences (SPSS – version 29, IBM, Chicago). P -value < 0.05 was considered significant.

Results

Participants and Characteristics

The characteristics of the 18-month group with completed questionnaires are presented in Table 2. In the 18-month follow group as a whole ($n = 500$), the mean age of the participants at the point of data collection was 21 months (S.D. 1.87). Just fewer than half of the participants (47.2%) were male, 9.8% were preterm, and 7.0% were born with low birth weight. Close to 10% experienced poor sleeping (9.2%) and feeding habits (8.4%). Six percent of toddlers had mothers who did not have partners, 14% had not completed high school and approximately half of mothers were born overseas. One-third reported experiencing a stressful life event within the past two years and 16% felt that they received inadequate social support at the 18-month follow-up. Almost 20% of the households were considered to be at a disadvantage at 18-month follow-up, with either a household income less than AUD 25,001 per year, a mother who did not complete high school and/or a father who was unemployed.

Table 2 Characteristics of Participants

Characteristics	18-Month Group Data N=500 n (%)
Individual Child Characteristics	
Male gender	236 (47.2%)
Mean gestational age	39.03
Prematurity (<37weeks)	49 (9.8%)
Mean birth weight	3305.31
Low birth weight (<2500g)	35 (7.0%)
Poor sleeping habits	46 (9.2%)
Poor feeding habits	42 (8.4%)
Screen time >2 hours a day	193 (38.6%)
Child not read to	72 (14.4%)
Parent and Family Characteristics	
EDS High Risk (Score>13) antenatally	26 (5.2%)
Single Mother	34 (6.8%)
Family history of mental health	62 (12.4%)
Stressful life event (within the past 2 years)	167 (33.4%)
Inadequate social support	58 (11.6%)
More than 2 siblings in the family	56 (11.2%)
Socio-demographic Characteristics	
Mother did not complete high school*	72 (14.4%)
Father unemployed	49 (9.8%)
Household income (AUD<25,001 a year)	57 (11.4%)
SEIFA IRSD decile 1 (most disadvantaged)	165 (33%)
English as a second language	170 (34.0%)
Mother born overseas	261 (52.2%)
Composite Measures	
Household disadvantage	99 (19.8%)

Prevalence of Parental Concerns of Difficult Temperament as Indicated by the 18-Month Questionnaire

Of the 500 toddlers, 18 (3.7%) parents scored 4 or 5 on the statement “my child is often fearful or anxious” and 23 (4.7%) scored 4 or 5 with the statement “my child is often angry or defiant” (Table 3). Thirty-six parents (7.3%) scored 4 or 5 on either or both statements, classifying their child as having a “difficult temperament”.

Factors Associated with Parental Concerns Indicating Difficult Temperament Developmental Risk on Univariate Logistic Regression

The results of the univariate logistic regression are presented in Table 4. Three risk factors were significant, ie, more than two hours of screen time per day (OR = 2.32, 95% CI: 1.2, 4.6), the child not being read to (OR = 3.37, 95% CI: 1.6, 7.1) and experience of stressful life events within the past two years (OR = 2.05, 95% CI: 1.0, 4.1).

Table 3 Prevalence of Difficult Temperament

	Child Fearful Anxious N=492 n (%)	Child Angry Defiant N=493 n (%)	Difficult Temperament* N=492
Difficult	18 (3.7%)	23 (4.7%)	36 (7.3%)
Not Difficult	474 (96.3%)	470 (95.3%)	456 (92.7%)

Table 4 Risk Factors for Reported Difficult Temperament in the 18-Month Follow-Up Group

Characteristics	Unadjusted OR (95% CI)	p-value
Individual Child Characteristics		
Male gender	1.44 (0.7, 2.8)	0.306
Prematurity (<37weeks)	1.51 (0.6, 4.1)	0.413
Low birth weight (<2500g)	1.71 (0.6, 5.2)	0.332
Poor sleeping habits	1.67 (0.6, 4.5)	0.312
Poor feeding habits	1.03 (0.3, 5.5)	0.969
Screen time >2 hours a day	2.32 (1.2, 4.6)	0.014
Child not read to	3.37 (1.6, 7.1)	0.001
Parent and Family Characteristics		
EDS score>13 antenatally	1.22 (0.3, 5.5)	0.794
Single Mother	1.87 (0.7, 4.7)	0.180
Family history of mental health	2.13 (0.9, 4.9)	0.071
Stressful life event (within the past 2 years)	2.05 (1.0, 4.1)	0.035
Inadequate social support	1.51 (0.7, 3.4)	0.326
Big family (>2 siblings)	1.13 (0.4, 3.0)	0.813
Socio-demographic Characteristics		
Mother did not complete high school	0.98 (0.4, 2.6)	0.971
Father unemployed	1.06 (0.3, 3.6)	0.930
Household income (AUD<25,001 a year)	0.59 (0.2, 2.0)	0.398
SEIFA IRSD decile I (most disadvantaged)	1.37 (0.7, 2.8)	0.383
English as a second language	1.09 (0.5, 2.2)	0.817
Mother born overseas	1.18 (0.6, 2.3)	0.642
Composite Measures		
Household disadvantage	0.54 (0.2, 1.6)	0.255

Table 5 Significant Risk Factors Associated with Development of Difficult Temperament

Risk factor	Adjusted OR (AOR) (95% CI)	p-value
Screen time >2 hours a day	2.43 (1.2, 4.9)	0.015
Child not read to	3.92 (1.8, 8.5)	0.001
Family history of mental health problems	2.69 (1.1, 6.5)	0.027

Factors Associated with Parental Concerns Indicating Difficult Temperament Developmental Risk on Multivariable Logistic Regression

Five risk factors with $p < 0.25$ on univariate analysis were considered in the multivariable logistic regression models: screen time >2 hours a day; child not read to; family history of mental health problems; stressful life event; and being a single mother. Based on the BIC and p-values, the final model showed that a toddler who watched more than two hours of screen time per day (AOR: 2.43, 95% CI: 1.2, 4.9); toddlers who were not read to (AOR: 3.92, 95% CI: 1.8, 8.5); and who had a family history of mental health problems (AOR: 2.69, 95% CI: 1.1, 6.5) were associated with higher odds of having difficult temperament (Table 5).

Discussion

This study aimed to investigate the prevalence of maternal perceptions of difficult toddler temperament at 18-month follow-up of a birth cohort recruited from a culturally diverse and socioeconomically disadvantaged community, and to identify risk factors associated with report of a difficult temperament. The prevalence of difficult temperament in this population of toddlers was 7.3%, similar to previous findings in the general population.^{7,17} To our knowledge, this is the first study to show associations between toddler temperament and family and home environmental determinants such as increased screen time, not being read to, and family history of mental health problems. The results from this study are important in identifying support needs for toddlers and parents raising children with a difficult temperament to prevent mental health problems in the future.

The current study showed that toddler screen time of more than two hours a day was related to difficult temperament. This is congruent with previous research which has shown a bidirectional relationship between effortful control and screen time in young children.^{37,38} There is emerging evidence that excessive screen time can limit social interactions and have adverse effects on health and developmental outcomes, particularly social and language development, and can impact social and emotional growth by interfering with the ability of children to interpret and regulate emotions and lead to aggressive conduct.^{39,40} Further, while increased screen time may not have a direct impact on the development of toddler temperament, it could have indirect effects via interacting with the temperamental traits to exaggerate the functional impacts, particularly in the long run. Examples include children with inhibited temperament resorting to more screen time and social media for friendships and social connections rather than engaging in real-time face-to-face interactions. Therefore, future research is needed to determine whether there is a link between difficult temperament and screen time in toddlers or whether the relationship is compounded by sociodemographic factors indicative of psychosocial disadvantage and lack of stimulatory experiences and nurturing care. Behavioral interventions that address temperamental difficulties coupled with parenting support may be helpful for these toddlers and their families.⁴¹ Working with families to understand what factors influence excessive screen time could also help in the provision of relevant, focused interventions.⁴²

A difficult temperament was also found to be associated with children who were not read to. This finding may be explained by parents being overwhelmed with challenges that arise with children with difficult temperaments, which may result in parents having less capacity to spend time reading with their children.⁴³ Previous research has shown that not reading to children is related to multiple risk factors, including child's low task attention, maternal psychological distress, and low maternal warmth.⁴⁴ Evidence suggests that early reading to infants with a difficult temperament can improve language and literacy skills in kindergarten.⁴⁵ Early reading can also benefit the parent-child relationship, including decreased parental stress.⁴⁶ Therefore, early identification of child and family risk factors, including difficult temperament, may help target

families who might benefit from support for early reading, although it is unclear whether a causal relationship exists. Further, parent–child reading interventions which address psychosocial risk factors are recommended.⁴⁴ It may be important for practitioners to ask about the barriers to reading to better inform individualized interventions.⁴⁴ Future research is required to model the relationship between difficult temperament, psychosocial risk factors, and early reading in order to support early identification and intervention for temperamental difficulties in toddlers and their families.

A family history of mental health problems was also related to difficult temperament in this study. While previous studies have shown a relationship between parental mental health problems and child temperament, research is limited regarding family history.^{43,47–50} This finding may highlight the relationship between family history of mental health challenges and specifically parental mental health problems, although this was not a focus of this study.⁵¹ Interestingly, the current study found that maternal antenatal depression was not related to difficult temperament. Familial psychopathology may be an important risk factor for difficult temperament that could be identified during the prenatal and postpartum stages. Early interventions that target maternal prenatal and postpartum depression and anxiety may be beneficial to promote positive parent–child interactions and also maternal perceptions of child’s temperament.^{52,53} However, if other members of the family have this history, it may be more difficult to identify and intervene. Future research is needed to examine the relationship between toddler temperament, familial psychopathology and parental mental health problems.

In the current study, stressful life events (eg, parental divorce) were related to difficult temperament, a finding that aligns with other research showing a link between stressful life events and emotional and behavioral difficulties in young children.⁵⁴ Positive temperament characteristics have been shown to act as a protective factor for the child to cope with “stressful” parent relationships.⁵⁵ This study may indicate that the converse is also true, whereby children with a difficult temperament may be more likely to act out during a stressful event. It is recommended that clinicians be aware of stressful life events that may be impacting the families they support, and appropriate support and intervention be made available, such as parenting resources.^{54,56} Culturally diverse families may be at higher risk for stressful life events and should be given particular attention.⁵⁷

Understanding and responding to a toddler’s needs may be more difficult for parents who have a negative perception of their child’s temperament.⁴³ In this regard, research has shown that parental perceptions of difficult temperament are related to greater parenting stress, lower mindful parenting, lower parenting sense of competence, and lower parenting efficacy.^{43,58} Providing parents with education and support for difficult temperament may help to increase parenting efficacy.^{59,60} Mindfulness-based interventions for parents are recommended to improve the parent–child bond and perceptions of child temperament.^{61–63} Parent–child interaction interventions which focus on emotion regulation may also be important in reducing future psychopathology in children with difficult temperaments.^{10,64} Fearful temperament in toddlerhood is related to conflictual co-parenting; therefore, early interventions that address co-parenting conflict may be helpful.⁶⁵ Increasing availability of interventions and improving pathways of care may be particularly important for culturally diverse and socioeconomically disadvantaged families who are less likely and less able to access services.^{66,67}

Limitations

This study has several limitations. A potential limitation is the validity of the two statements “My child is often fearful or anxious” and “My child is often angry or defiant” as a substitute for formal measurement of temperament type. However, parental temperament rating can be a good proxy despite being subjective due to their own understanding and perceptions of “normal” child behavior.⁹ Given that the statements in the present study were self-reported, there is possibility that the responses may be biased due to social desirability. Additionally, the self-report nature may result in single rater bias. In terms of the longitudinal nature of data and the long-term follow-up, there was a loss of follow-up with only 500 participants at 18 months. Whilst having a sample size of 500 participants, another limitation is the small proportion of children with a difficult temperament (7.3%) which severely limits the power to detect smaller effects. Future research using more robust parental ratings and objective measures is needed to replicate current findings.

Conclusion

Research into difficult temperament in infants and toddlers and ways to optimize their developmental and behavioral trajectories deserve attention. Our findings suggest that excessive screen time, children not engaging in reading and stressful life events can interact with temperamental traits and this is consistent with previous research that has shown

that these factors can adversely impact the behavioural trajectory of children. In this regard, our work has shown that excessive screen time of more than 2 hours a day in children as young as 18 months is associated with less time spent by parents in reading to the child and that the excess screen time was more pronounced among those from disadvantaged background characterized by mothers without a partner, not having outdoor equipment at home and fewer than five outings per week.³⁹ This observation taken together with the findings by Cheng et al⁶⁸ that daily and excessive screen time can impact reward sensitivity and the development of inhibitory control would suggest the critical role of these factors in the longitudinal health and mental health outcomes. These authors also suggested that screen time could also impact future habitual seeking behavior due to activation of the dorsal striatum connectivity. This has implications for service providers in including screen time as a critical factor to be included in the developmental assessment of children. Further, in keeping with the Nurturing Care Framework of the World Health Organization (WHO),⁶⁹ it is important for policy makers to plan targeted supports to enhance play and stimulation, particularly for those children from disadvantaged backgrounds without easy access to green space and outdoor leisure and play activities in line with the nurturing care agenda of the WHO.

Data Sharing Statement

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Ethics Approval and Informed Consent

The study was approved by the Human Research Ethics Committees of the South Western Sydney Local Health District and the University of New South Wales (HREC/11/LPOOL/281) and was conducted in accordance with the principles outlined in the Helsinki Declaration. Informed consent was obtained from all participating parents prior to enrolment into the study.

Acknowledgments

This paper has been uploaded to Research Square as a preprint: <https://www.researchsquare.com/article/rs-3349988/v1>.

We thank the Child and Family Health Nurses in the Liverpool/Fairfield/Bankstown areas, the staff of the postnatal wards at Liverpool and Bankstown hospitals and the staff at the Clinical Information Department at Liverpool Hospital as well as Child and Family Health Nurse managers Trish Clarke, Victoria Blight and Wendy Geddes. We also thank the Watch Me Grow Study Group: Murphy S, Eastwood J, Silove S, Short K, Prior M, Descallar J, Axelsson E, Overs B., Harvey S., Hendry A., Walter A., Matthey S., Shine T., Ha MT., Wong O., Garg P., Deering A., Cleary JA., Nguyen, V., Ha M., Butler C., Yakob, B. We also would like to thank the families who participated in this study.

Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

Funding

This study (APP 1013690) was funded by the National Health and Medical Research Council of Australia, through a partnership grant with the NSW Kids and Families (NSW Health) and in-kind support from University of New South Wales, La Trobe University, South Western Sydney Local Health District and Sydney Children's Hospital Network.

Disclosure

The authors declare that they have no competing interests in this work.

References

1. Thomas A, Chess S. *Temperament and Development*. Brunner/Mazel; 1977.
2. Buss AH, Plomin R. *Temperament: Early Developing Personality Traits*. Lawrence Erlbaum; 1984.
3. Goldsmith HH, Buss AH, Plomin R, et al. Roundtable: what is temperament? Four approaches. *Child Development*. 1987;58:505–529. doi:10.2307/1130527
4. Kagan J, Reznick JS, Snidman N, Gibbons J, Johnson MO. Childhood derivatives of inhibition and lack of inhibition to the unfamiliar. *Child Development*. 1988;59:1580–1589. doi:10.2307/1130672
5. Cloninger CR, Cloninger KM, Zwir I, Keltikangas-Järvinen L. The complex genetics and biology of human temperament: a review of traditional concepts in relation to new molecular findings. *Transl Psychiatry*. 2019;9(1):290. doi:10.1038/s41398-019-0621-4
6. Oberklaid F, Prior M, Golvan D, Clements A, Williamson A. Temperament in Australian infants. *J Paediatr Child Health*. 1984;20(3):181–184. doi:10.1111/j.1440-1754.1984.tb00074.x
7. Thomas A, Chess S. Temperament and its delineation. In: *Temperament and Development*. Brunner/ Mazel; 1977.
8. Thomas A, Chess S, Birch HG, Hertzog ME, Korn S. *Behavioral Individuality in Early Childhood*. New York University Press; 1963.
9. Freund J-D. Early temperament in parental report and scientific observation. *Early Child Develop Care*. 2019;189(14):2318–2333. doi:10.1080/03004430.2018.1450252
10. Wu TC, Meehan AJ, Rijlaarsdam J, Maughan B, Fearon P, Barker ED. Developmental pathways from toddler difficult temperament to child generalized psychopathology and adult functioning. *J Affective Disorders*. 2022;301:14–22. doi:10.1016/j.jad.2022.01.012
11. Kostyrka-Allchorne K, Wass SV, Sonuga-Barke EJS. Research Review: do parent ratings of infant negative emotionality and self-regulation predict psychopathology in childhood and adolescence? A systematic review and meta-analysis of prospective longitudinal studies. *J Child Psychol Psychiatry*. 2020;61(4):401–416. doi:10.1111/jcpp.13144
12. Paulus FW, Möhler E, Festag L, Joas J. Preschool temperament as a factor of risk and protection for later childhood psychopathology. *Orig Res*. 2022;13. doi:10.3389/fpsy.2022.803959
13. Olino TM, Finsaas MC, Dyson MW, Carlson GA, Klein DN. A multimethod, multiinformant study of early childhood temperament and depression and anxiety symptoms in adolescence. *J Psychopath Clin Sci*. 2022;131(7):741–753. doi:10.1037/abn0000769
14. Schröder M, Seker S, d’Huart D, et al. The relationship of temperament and character, parental stress, and mental health problems with attachment disorders among children. *Int J Environ Res Public Health*. 2022;19(23):15458. doi:10.3390/ijerph192315458
15. Wu TC, Maughan B, Moreno-Agostino D, Barker ED. Not in education, employment and training: pathways from toddler difficult temperament. *J Child Psychol Psychiatry*. 2022;63(11):1234–1242. doi:10.1111/jcpp.13557
16. Japel C, Tremblay RE, McDuff P, Boivin M. Longitudinal study of child development in Québec. *Temperament*. 2000;1:1.
17. Prior M, Sanson A, Smart D, Oberklaid F. Pathways from infancy to adolescence. *Austral Temp Proj*. 2000;2000:1.
18. Prior M, Kyrios M, Oberklaid F. Temperament in Australian, American, Chinese, and Greek Infants: some issues and directions for future research. *J Cross-Cult Psychol*. 1986;17(4):455–474. doi:10.1177/0022002186017004005
19. Prior M, Garino E, Sanson A, Oberklaid F. Ethnic influences on “difficult” temperament and behavioural problems in infants. *Australian Journal of Psychology*. 1987;39(2):163–171. doi:10.1080/00049538708259045
20. Australian Bureau of Statistics. *Cultural Diversity of Australia*. Australian Bureau of Statistics; 2022.
21. Maziade M, Cote R, Boudreault M, Thivierge J, Caperaa P. The New York longitudinal studies model of temperament: gender differences and demographic correlate in a French-speaking population. *J Am Acad Child Adolesc Psychiatry*. 1984;23:582–587. doi:10.1016/S0002-7138(09)60351-4
22. Prior M, Sanson A, Oberklaid F. The Australian Temperament Project. In: Kohnstamm G, Bates J, Rothbart M, editors. *Temperament in Childhood*. John Wiley; 1989:537–556.
23. Dunn K, Kendrick C. *Siblings: Love, Envy & Understanding*. Grant McIntyre; 1982.
24. Rutter M, Birch H, Thomas A, Chess S. Temperamental characteristics in infancy and the later development of behavioural disorders. *Br J Psychiatry*. 1964;110:651–661. doi:10.1192/bjp.110.468.651
25. Putnam SP, Sanson AV, Rothbart MK. Child temperament and parenting. *Handbook Parenting*. 2002;1:255–277.
26. Andreadakis E, Laurin JC, Joussemet M, Mageau GA. Toddler temperament, parent stress, and autonomy support. *J Child Family Stud*. 2020;29(11):3029–3043. doi:10.1007/s10826-020-01793-3
27. Edwards B, Hawkins M, Letcher P, et al. *The Australian Temperament Project: The First 30 Years*. Australian Institute of Family Studies; 2013.
28. Özmert E, Toyran M, Yurdakök K. Behavioral correlates of television viewing in primary school children evaluated by the child behavior checklist. *Arch Pediatr Adolesc Med*. 2002;156(9):910–914. doi:10.1001/archpedi.156.9.910
29. Yousef S, Eapen V, Zoubeidi T, Mabrouk A. Behavioral correlation with television watching and videogame playing among children in the United Arab Emirates. *Internat J Psych Clin Pract*. 2014;18(3):203–207. doi:10.3109/13651501.2013.874442
30. Woolfenden S, Eapen V, Axelsson E, et al. Who is our cohort: recruitment, representativeness, baseline risk and retention in the “Watch Me Grow Study?”. *J Article BMC Pediatr*. 2016;16(1):46. doi:10.1186/s12887-016-0582-1
31. Eapen V, Woolfenden S, Williams K, et al. “Are you available for the next 18 months?” - methods and aims of a longitudinal birth cohort study investigating a universal developmental surveillance program: the ‘Watch Me Grow’ study. *BMC Pediatric*. 2014;14:234. doi:10.1186/1471-2431-14-234
32. Woolfenden S, Eapen V, Axelsson E, et al. Who is our cohort: recruitment, representativeness, baseline risk and retention in the “Watch Me Grow” study? *BMC Pediatr*. 2016;16:46. doi:10.1186/s12887-016-0582-1
33. Bronfenbrenner U, Ceci S. Nature-nurture reconceptualised in developmental perspective: a bioecological model. *Psychol Rev*. 1994;101:568–586. doi:10.1037/0033-295X.101.4.568
34. Cox J, Holden J, Sagovsky R. Detection of postnatal depression: development of the 10-item Edinburgh Postnatal Depression Scale. *Br J Psychiatry*. 1987;150:782–786. doi:10.1192/bjp.150.6.782
35. Lewis AJ, Olsson CA. Early life stress and child temperament style as predictors of childhood anxiety and depressive symptoms: findings from the longitudinal study of Australian children. *Depress Res Treat*. 2011;2011:1–9. doi:10.1155/2011/296026

36. Peduzzi P, Concato J, Kemper E, Holford T, Feinstein A. A simulation study of the number of events per variable in logistic regression analysis. *J Clin Epidemiol*. 1996;49(12):1373–1379. doi:10.1016/S0895-4356(96)00236-3
37. Leppänen MH, Sääksjärvi K, Vepsäläinen H, et al. Association of screen time with long-term stress and temperament in preschoolers: results from the DAGIS study. *Eur J Pediatr*. 2020;179(11):1805–1812. doi:10.1007/s00431-020-03686-5
38. Fitzpatrick C, Harvey E, Cristini E, Laurent A, Lemelin J-P, Garon-Carrier G. Is the association between early childhood screen media use and effortful control bidirectional? A prospective study during the covid-19 pandemic. *Front Psychol*. 2022;13:918834. doi:10.3389/fpsyg.2022.918834
39. Chandra M, Jalaludin B, Woolfenden S, et al. Screen time of infants in Sydney, Australia: a birth cohort study. *BMJ open*. 2016;6(10):e012342. doi:10.1136/bmjopen-2016-012342
40. Muppalla SK, Vuppapapati S, Pulliahgaru AR, Sreenivasulu H, Kumar Muppalla S. Effects of excessive screen time on child development: an updated review and strategies for management. *Cureus*. 2023;15(6).
41. Jones A, Armstrong B, Weaver RG, Parker H, von Klinggraff L, Beets MW. Identifying effective intervention strategies to reduce children's screen time: a systematic review and meta-analysis. *Int J Behav Nutr Phys Act*. 2021;18(1):126. doi:10.1186/s12966-021-01189-6
42. Carson V, Janssen I. Associations between factors within the home setting and screen time among children aged 0–5 years: a cross-sectional study. *BMC Public Health*. 2012;12(1):539. doi:10.1186/1471-2458-12-539
43. Fernandes DV, Canavarro MC, Moreira H. The mediating role of parenting stress in the relationship between anxious and depressive symptomatology, mothers' perception of infant temperament, and mindful parenting during the postpartum period. *Mindfulness*. 2021;12(2):275–290. doi:10.1007/s12671-020-01327-4
44. Taylor CL, Zubrick SR, Christensen D. Barriers to parent–child book reading in early childhood. *Internat J Early Childhood*. 2016;48(3):295–309. doi:10.1007/s13158-016-0172-2
45. de Bondt MG, Bus AG. Tracking the long-term effects of the Bookstart intervention: associations with temperament and book-reading habits. *Learn Individual Differences*. 2022;98:102199. doi:10.1016/j.lindif.2022.102199
46. Canfield CF, Miller EB, Shaw DS, Morris P, Alonso A, Mendelsohn AL. Beyond language: impacts of shared reading on parenting stress and early parent-child relational health. *Developmental Psychology*. 2020;56(7):1305–1315. doi:10.1037/dev0000940
47. Sechi C, Vismara L, Rollè L, Prino LE, Lucarelli L. First-time mothers' and fathers' developmental changes in the perception of their daughters' and sons' temperament: its association with parents' mental health. *Front Psychol*. 2020;11:2066. doi:10.3389/fpsyg.2020.2066
48. Davies SM, Silverio SA, Christiansen P, Fallon V. Maternal-infant bonding and perceptions of infant temperament: the mediating role of maternal mental health. *J Affective Disorders*. 2021;282:1323–1329. doi:10.1016/j.jad.2021.01.023
49. Kryski KR, Olinio TM, Dyson MW, Durbin CE, Klein DN, Hayden EP. Associations between observed temperament in preschoolers and parent psychopathology. *Person Mental Health*. 2018;12(2):131–144. doi:10.1002/pmh.1406
50. Frigerio A, Nazzari S. Antenatal maternal anxiety, maternal sensitivity and toddlers' behavioral problems: an investigation of possible pathways. *Early Human Dev*. 2021;157:105364. doi:10.1016/j.earlhumdev.2021.105364
51. Zacher Kjeldsen -M-M, Bricca A, Liu X, Frokjaer VG, Madsen KB, Munk-Olsen T. Family history of psychiatric disorders as a risk factor for maternal postpartum depression: a systematic review and meta-analysis. *JAMA Psych*. 2022;79(10):1004–1013. doi:10.1001/jamapsychiatry.2022.2400
52. Leng LL, Yin XC, Ng SM. Mindfulness-based intervention for clinical and subthreshold perinatal depression and anxiety: a systematic review and meta-analysis of randomized controlled trial. *Comprehensive Psychiatry*. 2023;122:152375. doi:10.1016/j.comppsy.2023.152375
53. Newton K, Taylor Buck E, Weich S, Uttley L. A review and analysis of the components of potentially effective perinatal mental health interventions for infant development and mother-infant relationship outcomes. *Develop Psychopathol*. 2022;34(1):37–54. doi:10.1017/S0954579420001340
54. Fang Y, Raat H, Windhorst DA, et al. The association between stressful life events and emotional and behavioral problems in children 0–7 years old: the CIKEO study. *Int J Environ Res Public Health*. 2022;19(3):1650. doi:10.3390/ijerph19031650
55. Kyrios M, Temperament PM. Stress and family factors in behavioural adjustment of 3–5-year-old children. *Int J Behavioral Develop*. 1990;13(1):67–93. doi:10.1177/016502549001300105
56. Platt R, Williams SR, Ginsburg GS. Stressful life events and child anxiety: examining parent and child mediators. *Child Psychiatry Human Dev*. 2016;47(1):23–34. doi:10.1007/s10578-015-0540-4
57. Berge JM, Mountain S, Telke S, et al. Stressful life events and associations with child and family emotional and behavioral well-being in diverse immigrant and refugee populations. *Families Syst Health*. 2020;38(4):380–395. doi:10.1037/fsh0000524
58. Grady JS, Karraker K. Mother and child temperament as interacting correlates of parenting sense of competence in toddlerhood. *Inf Child Develop*. 2017;26(4). doi:10.1002/icd.1997
59. Mouton B, Roskam I. Confident mothers, easier children: a quasi-experimental manipulation of mothers' self-efficacy. *J Child Family Stud*. 2015;24(8):2485–2495. doi:10.1007/s10826-014-0051-0
60. Carey WB. Teaching Parents About Infant Temperament. *Pediatrics*. 1998;102(Supplement_E1):1311–1316. doi:10.1542/peds.102.SE1.1311
61. McDonald HM, Sherman KA, Kasparian NA. How mindful awareness and psychological distress influence mother-infant bonding and maternal perceptions of infant temperament. *Mindfulness*. 2022;13(4):955–966. doi:10.1007/s12671-022-01848-0
62. Fernandes DV, Monteiro F, Canavarro MC, Moreira H. A web-based, mindful, and compassionate parenting training for mothers experiencing parenting stress: results from a pilot randomized controlled trial of the mindful moment program. *Mindfulness*. 2022;13(12):3091–3108. doi:10.1007/s12671-022-02016-0
63. Potharst ES, Zeegers M, Bögels SM. Mindful with your toddler group training: feasibility, acceptability, and effects on subjective and objective measures. *Mindfulness*. 2021;12(2):489–503. doi:10.1007/s12671-018-1073-2
64. Luby JL, Barch DM, Whalen D, Tillman R, Freedland KE. A randomized controlled trial of parent-child psychotherapy targeting emotion development for early childhood depression. *Am J Psychiatry*. 2018;175(11):1102–1110. doi:10.1176/appi.ajp.2018.18030321
65. Metz M, Majdandžić M, Bögels S. Concurrent and predictive associations between infants' and toddlers' fearful temperament, coparenting, and parental anxiety disorders. *J Clin Child Adolesc Psychol*. 2018;47(4):569–580. doi:10.1080/15374416.2015.1121823
66. Eapen V, Walter A, Guan J, et al. Maternal help-seeking for child developmental concerns: associations with socio-demographic factors. *J Paediatr Child Health*. 2017;53(10):963–969. doi:10.1111/jpc.13607
67. Eapen V, Stylianakis A, Scott E, et al. Stemming the tide of mental health problems in young people: challenges and potential solutions. *Aust N Z J Psychiatry*. 2023;57(4):482–488. doi:10.1177/00048674221136037

68. Chen -Y-Y, Yim H, Lee T-H. Negative impact of daily screen use on inhibitory control network in preadolescence: a two-year follow-up study. *Develop Cognit Neurosci.* 2023;60:101218. doi:10.1016/j.dcn.2023.101218
69. World Health Organization. Nurturing care for early childhood development; 2018. Available from: <https://iris.who.int/bitstream/handle/10665/272603/9789241514064-eng.pdf?sequence=1>. Accessed May 04, 2024.

Neuropsychiatric Disease and Treatment

Dovepress

Publish your work in this journal

Neuropsychiatric Disease and Treatment is an international, peer-reviewed journal of clinical therapeutics and pharmacology focusing on concise rapid reporting of clinical or pre-clinical studies on a range of neuropsychiatric and neurological disorders. This journal is indexed on PubMed Central, the 'PsycINFO' database and CAS, and is the official journal of The International Neuropsychiatric Association (INA). The manuscript management system is completely online and includes a very quick and fair peer-review system, which is all easy to use. Visit <http://www.dovepress.com/testimonials.php> to read real quotes from published authors.

Submit your manuscript here: <https://www.dovepress.com/neuropsychiatric-disease-and-treatment-journal>