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Stability of Child Temperament: Multiple Moderation by Child and Mother Characteristics

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Abstract

This 3-wave longitudinal study focuses on stability of child temperament from 3 to 6 years and considers child age, gender, birth order, and term status as well as mother age, education, anxiety, and depression as moderators of stability. Mothers of approximately 10,000 children participating in the ALSPAC rated child temperament. Stability coefficients for child temperament scales were medium to large, and stability was generally robust across moderators except child gender and birth order and mother age and education, which had small moderating effects on reports of stability of child temperament.

Developmental Stability and Its Significance

Development is readily taken to imply transformation and change (McCall, 1986), but not all constructs, structures, functions, or processes alter in development, and development equally involves consistency over time. Two complementary kinds of developmental consistency have been distinguished: stability (individual-order consistency) and continuity (group mean-level consistency). Order and level consistency are both developmentally informative and can co-exist conceptually and empirically as the two are independent (Bornstein, Putnick, & Esposito, 2017). Many features of human development remain (more or less) consistent over time, and notably consistency is more systematic and parsimonious than is change. The current study concerns stability in the ontogeny of child temperament. (For a general discussion of the significance of stability in developmental science, see the Supporting Information.)

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Child Temperament: Stability

Temperament in childhood is consensually defined as early appearing and constitutionally based biological variation in attention, motor skill, emotional reactivity, and self-regulation as exhibited in different contexts usually in response to stimulation (Chen & Schmidt, 2015; Rothbart, 2011). Besides expressing in early life and being biologically derived, child temperament is further characterized by two central features: first, temperament is manifest in individual observable behaviors, and, second, temperament (*contra*, say, emotions) is hypothesized to be relatively stable. That is, traits that are present in childhood but not stable (or do not have an apparent enduring impact on later development) are not usually considered to be a part of temperament (Buss, 1989; Buss & Plomin, 1984; Rothbart, 2011; Strelau, 1989; Thomas, Chess, Birch, Hertzig, & Korn, 1963; Wachs & Kohnstamm, 2001). Several empirical studies demonstrate stabilities of infant temperament (Bornstein, Gaughran, & Seguí, 1991; Carey & McDevitt, 1978b; Carranza Carnicero, González-Salinas, & Ato, 2013; McDevitt & Carey, 1981; Plomin et al., 1993). However, emerging scientific opinion about the stability of temperament is in flux. First, change generally is rapid and thoroughgoing in childhood, and, second, theoretical, methodological, and statistical perspectives contend that childhood temperament may be far from fixed. The fact that temperament might be biologically or even genetically based does not automatically mean that it is immutable or that experience has little impact on temperament. Genetics, neurohormones, and brain structures that likely underlie temperament emerge and change across childhood, and they may alter the expression and consequently the stability of temperament (Saudino, 2012; Shiner et al., 2012; Vandermeer et al., 2018). Thus, each of these factors might contribute to stability and to instability in child temperament (Saudino & Wang, 2012).

Temperament is also open to exogenous influences (Rothbart, 2011). For example, contextualist models assert the roles of experience and environment in the formation and expression of temperament (Goldsmith, Buss, & Lemery, 1997; Johnson et al., 2016; Rothbart, 2011). Sensitive, warm parenting engenders decreases in child negative reactivity, even controlling for initial levels (Bates, Schermerhorn, & Petersen, 2012), whereas harsh controlling parenting predicts increases in child negative reactivity, even controlling for initial levels (Braungart-Rieker, Hill-Soderlund, & Karrass, 2010). Thus, instability of temperament is expectable due to both maturation and experience.

Last, methodological considerations herald some revision of firm beliefs in the stability of temperament. Temperament researchers have commonly used different instruments in different studies, different instruments at different ages in the same study, and different levels of aggregation in measuring temperament, thereby compromising the assessment of stability of child temperament per se. Moreover, stability is normally indexed by (Pearson) correlation, and even “large” time-1 to time-2 correlations of, say, .50, leave 75% of the shared developmental variance in a temperament measure unaccounted. Thus, individual rank-order positions on indicators of temperament change, and even substantial correlations accord with stability as well as instability. It is possible that temperament is also moderated by age, being less stable early in life but becoming more stable as childhood progresses

(Caspi et al., 2003; Pfeifer, Goldsmith, Davidson, & Rickman, 2002; Roberts & DelVecchio, 2000).

These contrasting considerations about stability constituted one major motive for our re-visiting the question of stability of temperament in childhood.

Moderation of the Stability of Child Temperament

The second and third motives for a broader assessment of the stability of temperament in childhood are intertwined. The second is the likely sensitivity of stability to moderation, and the third is the focus of the extant temperament literature on mean-level differences in moderators. Child temperament could be moderated by characteristics of the child, the reporter, or the environment. We chose to study several prominent child and mother characteristics *qua* moderators -- child age, gender, birth order, and term status as well as mother age, education, anxiety, and depression -- because they are the most proximal to child temperament. Moreover, the clear majority of reports about moderating factors in child temperament research have focused on mean levels of temperament (main effects) between groups at particular ages, a non-developmental approach. For example, gender differences in child temperament are fundamental to gender research, but the long-standing focus has fallen almost exclusively on girl-boy mean-level differences in facets of temperament and not on relative stability or instability of temperament in girls and boys (Casalin, Luyten, Vliegen, & Meurs, 2012; Else-Quest, Hyde, Goldsmith, & Van Hulle, 2006; Gartstein et al., 2006, 2010; Montirosso et al., 2011). Similarly, mean-level facet comparisons by birth order (Bates, 1987; Honjo et al., 1998; Keresteš, 2006) and term status (Goldberg & DiVitto, 2002; Oberklaid, Prior, & Sanson, 1986; Riese, 1987a, 1987b) have figured prominently in the child temperament literature. In this study, we focus on how child age, gender, birth order, and term status as well as mother age, education, anxiety, and depression moderate *developmental stability* of temperament. Therefore, extant mean-level group comparisons in the literature are relevant only insofar as they may have implications for group moderation of stability.

Statistically, stability of two groups is independent of mean differences between the groups. Psychologically, however, it could be that a higher or lower level in a group at the start instigates evocative effects that inflect stability over time. For example, a child who tantrums quickly and forcefully may be more likely to evoke parental responses which alter temperament than a more placid child. As this argument applies to each moderator, some consideration of main effects is therefore warranted. To the degree that patterns of stability are the same or differ according to child age, gender, birth order, and term status, and mother age, education, anxiety, and depression, failing to probe stability by these moderators has resulted in failure to attain a more complete understanding of the ontogeny of child temperament. (A fuller discussion of each moderator of temperament stability appears in the Supporting Information.) To our knowledge, these several child and mother moderators of the stability of child temperament have not previously been examined generally nor specifically in childhood after infancy. Because stability constitutes a central feature of temperament, and most of empirical evidence in the extant scant literature points to the

overall medium stability of temperament, we hypothesized that stability of temperament would be relatively robust to moderation in children across three years of life.

The first goal of our study was to re-examine the stability of temperament between different points in early childhood, and the second goal was to evaluate multiple potential moderators of stability in children and mothers to explore more deeply the developmental nature of child temperament. Test-retest correlations in this longitudinal study sample have been reported elsewhere (Bould, Joinson, Sterne, & Araya, 2013), but the methodology we apply varies from that report in both handling missing data and statistical analysis, and important moderation effects have not been explored.

Method

Participants

This three-wave prospective longitudinal study uses data from the Avon Longitudinal Study of Parents and Children (ALSPAC; Golding, Pembrey, Jones, & ALSPAC Study Team, 2001), designed to investigate health and development across the life course. All births in the former Avon Health Authority around Bristol, United Kingdom, with an expected date of delivery between 1 April 1991 and 31 December 1992 were eligible. The final study sample consisted of 9,713 white singletons, whose temperament data were obtained from mothers when they were 3, 5, and/or 6 years old (for exclusion criteria see Supporting Information). Missing data points were handled in EQS 6.1 (Bentler, 2006) using full information maximum likelihood with a two-stage Expectation-Maximization estimation of the model and the MLF (Jamshidian & Bentler, 1999). Subsamples included 4,706 girls and 5,007 boys; 4,283 firstborns and 5,174 laterborns (256 missing data points); 9,287 term or post-term (*M* gestation = 39.78 weeks, *SD* = 1.30, range = 37 to 47) and 426 preterm (*M* gestation = 34.33 weeks, *SD* = 2.37, range = 25 to 36) children; 282 children whose mothers were teens at child birth, 5,398 whose mothers were in their twenties, 3,913 whose mothers were in their thirties, and 120 children whose mothers were in their forties at child birth; 5,982 children of mothers who had compulsory education only or lower (low education group) and 3,690 children of mothers whose education was noncompulsory secondary or university level (high education group; 41 missing data points). On average, children were 3.21 years (*SD* = 0.10, *n* = 9,115), 4.78 years (*SD* = 0.10, *n* = 8,577), and 5.80 years of age (*SD* = 0.11, *n* = 7,893) at the first, second, and third waves (hereinafter referred to as 3, 5, and 6 years old, respectively). Mothers averaged 28.59 years old (*SD* = 4.72, *range* = 15 to 44) at child birth; maternal education was collected at 32 weeks of pregnancy and ranged over minimal education or none (16.4%), compulsory secondary level (up to age 16 years; 46.4%), noncompulsory secondary level (up to age 18 years; 24.2%), or post–school university level education (14%).

Procedures, Measures, and Moderators

Mothers completed the Emotionality Activity Sociability Temperament Survey for Children (EAS; Bus & Plomin, 1984) at each wave. Twenty statements assessing 4 scales (five items each) were each rated on a 5-point Likert-type scale (1 = child's behaviors are *not at all like* this; 5 = child's behaviors are *exactly like* this). The four scales corresponded to traits

described by Buss and Plomin (1984) as Activity (preferred level of activity, e.g., “is very energetic”), Emotionality (tendency to show distress, e.g. “often fusses and cries”), Shyness (tendency to be inhibited with unfamiliar people, e.g., “takes a long time to warm up to strangers”), and Sociability (tendency to prefer the company of others, e.g. “likes to be with people”). Items were summed (after reverse coding for items worded in reversed direction) with higher scores indicating greater appraised levels of the trait being measured. The EAS has good psychometric properties (Walker, Ammaturo, & Wright, 2017) of reliability and validity (Abulizi, Pryor, Michel, Melchior, van der Waerden, & EDEN Mother-Child Cohort Study Group, 2017; Elovainio, et al., 2015; Bould, et al., 2014; Lindhout, Markus, Hoogendijk, & Boer, 2009; Mathiesen & Tambs, 1999; Spinath, 2000) and has been translated into a variety of languages (Spinath, 2000). Across 3 data collection waves, internal consistency (α) estimates in the current sample ranged from .77 to .78 on the Activity scale, all were .84 on the Emotionality scale, ranged from .78 to .83 on the Shyness scale, and ranged from .61 to .63 on the Sociability scale.

Maternal self-reports of anxiety and depression were assessed by the ALSPAC-modified Crown Crisp Experiential Index (CCEI; Crown & Crisp, 1979) and the Edinburgh Postnatal Depression Scale (EPDS; Cox, Holden, & Sagovsky, 1987), respectively, when children were 33 months old. The Anxiety subscale of the CCEI was the summary score from 8 items (e.g., “Do you get troubled by dizziness or shortness of breath?”, “Do you feel uneasy and restless?”). Mothers’ responses on varying response scales were re-coded into a 3-point scale: 0 = *never*, 1 = *not very often*, or 2 = *often*, or *very often*. The CCEI has demonstrated reliability and validity (Alderman, Mackay, Lucan, Spry, & Bell, 1983; Heron, O’Connor, Evans, Golding, & Glover, 2004). A cut-off score ≥ 8 has been used to identify “anxious” mothers who scored in the highest 15% of the ALSPAC maternal anxiety data (Glovera, O’Connor, Heron, Golding, & the ALSPAC Study team, 2004). Applying this criterion to the current study sample, 6,578 mothers were identified as not anxious ($M = 3.27$, $SD = 1.99$, *range* = 0–7), and 1,461 mothers were anxious ($M = 10.71$, $SD = 2.26$, *range* = 8–16), $t(1990.20) = -116.22$, $p < .001$ (1,674 missing data points).

Ten items from the EPDS (e.g., In the past week “I have felt scared or panicky for no very good reason,” “I have been so unhappy that I have had difficulty sleeping”) were each rated on a 4-point scale (0 = *No, not at all*, 3 = *Yes, most of the time*, or *Yes, quite a lot*). Items were summed with higher scores indicating a higher level of depression. This 10-item version of the EPDS has demonstrated reliability and validity (Cox, Chapman, Murray, & Jones, 1996). A cut-off score ≥ 13 has been used to identify mothers with high levels of depression (Glovera et al., 2004) because of its predictive validity on clinical depression diagnosis. Applying this criterion to the current study sample, 7,094 mothers were identified as non-depressed ($M = 4.84$, $SD = 3.49$, *range* = 0–12) and 943 mothers as depressed ($M = 15.94$, $SD = 3.05$, *range* = 13–30), $t(1292.43) = -103.22$, $p < .001$ (1,676 missing data points).

Results

Preliminary Analyses and the Analytic Plan

Temperament stability was evaluated by standardized regression coefficients from path analysis models using Maximum Likelihood Functions (MLF) and followed the mathematical models of Bentler and Weeks (1980) as implemented in EQS. Two separate stability models for each of the EAS subscales were first tested on the full sample: One in which 2 direct paths from 3-year to 5-year and from 5-year to 6-year subscale scores were tested, and the other in which a direct path from the 3-year to 6-year scores were tested. We then performed multiple-group analysis on the moderators: child gender (girls vs. boys), birth order (firstborns vs. laterborns), and term status (term and post-term vs. preterm children), and maternal age (teenage mothers vs. mothers in their twenties, thirties, and forties), education (low vs. high education), anxiety (normal vs. high levels of anxiety), and depression (normal vs. high levels of depression). Because mean-level differences in moderators could have implications for moderation of stability, we first conducted *F*-tests to assess mean-level differences in temperament across moderator groups at each age. Forty-three out of the 84 tests were significant at the level of .05 or better. The magnitude of all significant mean differences was quite small with eta-squared values ranging from .001 to .027, and so stability moderation was not attributable to any sizable mean differences in the moderators. Stability estimates for groups were obtained from multiple-group analyses without placing any constraints on the estimates. Relative stability across groups within a moderator (or across time) was compared by placing equality constraints on the stability estimates being compared. If the change in chi-square values between models were significant, the null hypothesis of equal stability was rejected which suggested the stability estimates were not equal between the groups. If the change in chi-square values were not significant, it suggested that the stability estimates being compared were not different. To avoid the problem of capitalization on chance due to the number of the equality constraints tested, and because of the large sample sizes for some subgroups that would overpower the chi-squares (Cheung & Rensvold, 2002), a chi-square value of 5 or more was required to deem the test significant (Jöreskog & Sörbom, 1984; Scott-Lennox & Lennox, 1995).

Descriptive Statistics and Temperament Stability on the Full Sample

Table 1 shows the *M*s, *SD*s, and ranges of the EAS scale scores and stability coefficients on the total sample. Stability was large across all data collection waves on all 4 EAS scales. The stability estimates from 5 to 6 years were larger than the stability estimates from 3 to 5 years on all 4 scales, χ^2s ranged from 45.70 to 86.30, *p*s < .001.

Moderators of Temperament Stability

Table 2 shows stability coefficients across time for groups of moderators. Overall, stability was large across all data collection waves on all 4 EAS scales for all groups, and differences in stability across moderators were generally small.

Stability by child gender.—Mothers' ratings of boys' activity from 3 to 5 years, χ^2 (1) = 5.33, $p = .021$, and shyness from 3 to 6 years, χ^2 (1) = 6.85, $p = .009$, were more stable than

were those of girls'. Otherwise, girls' and boys' stability coefficients did not differ (χ^2s ranged from 0.00 to 4.75).

Stability by child birth order.—Mothers' ratings of laterborns' sociability from 5 to 6 years, χ^2 (1) = 5.61, p = .018, were more stable than were those of firstborns. Otherwise, no differences emerged in stability between firstborns and laterborns (χ^2s ranged from 0.06 to 3.43).

Stability by child term status.—No differences emerged in stability between term and preterm children (χ^2s ranged from 0.00 to 4.46).

Stability by maternal age.—Ratings of child activity from mothers in their thirties were more stable than were those from teenage mothers, χ^2 (1) = 12.73, p < .001, and mothers in their twenties, χ^2 (1) = 11.08, p = .001, from 5 to 6 years. In addition, ratings of child activity from mothers in their twenties were more stable from 5 to 6 years than were those from teenage mothers, χ^2 (1) = 6.87, p = .009. Ratings of child emotionality from mothers in their thirties were more stable than were those from teenage mothers from 3 to 5 years, χ^2 (1) = 11.41, p = .001, and from 3 to 6 years, χ^2 (1) = 5.60, p = .018. Ratings of child emotionality from mothers in their thirties were also more stable than were those from mothers in their twenties from 3 to 5 years, χ^2 (1) = 10.49, p = .001, and from 3 to 6 years, χ^2 (1) = 5.00, p = .025. In addition, ratings of child emotionality from mothers in their twenties were more stable from 3 to 5 years than were those from teen age mothers, χ^2 (1) = 8.89, p = .003. No other significant differences emerged (χ^2s ranged from 0.00 to 4.68).

Stability by maternal education.—Ratings on all 4 scales from more educated mothers were more stable from 3 to 5 years (χ^2s ranged from 5.04 to 6.71, ps ranged from .01 to .03) than were those from the less educated mothers. In addition, highly educated mothers rated their children's sociability more stable from 5 to 6 years, χ^2 (1) = 7.04, p = .008, and from 3 to 6 years, χ^2 (1) = 12.99, p < .001, than did less educated mothers. No other significant differences emerged (χ^2s ranged from 0.11 to 3.94).

Stability by maternal anxiety.—No differences emerged in stability between mothers with normal versus high levels of anxiety symptoms (χ^2s ranged from 0.00 to 3.33).

Stability by maternal depression.—No differences emerged in stability between mothers with normal versus high levels of depressive symptoms (χ^2s ranged from 0.05 to 4.83).

Discussion

This study examined the stability of child temperament by maternal report over a range of 3 years in substantial numbers of girls and boys, firstborns and laterborns, and terms and preterms, comparing mothers of varying ages, educations, anxiety, and depression status, using a standard and well-established parent-report measure. The study of temperament stability enhances understanding of individual differences in childhood and has implications for other areas of development because child temperament has been integrated into models

of developing personality, links to children's perceptions and interpretations of their experiences, and shapes the quality of the child-caregiver relationship, processes associated with socialization, and parenting (Bates, 1987; Bates & Pettit, 2015; Chen & Schmidt, 2015; Paulussen-Hoogeboom, Stams, Hermanns, & Peetsma, 2007; Porter & Hsu, 2003; Shiner & Caspi, 2012).

Temperament theorists historically emphasized the centrality and prominence of stability of temperament as definitional to the construct. Whereas children's emotions may be fleeting or reactive, child temperament is thought to endure. Moreover, whereas short-term fluctuations in children's emotions are rarely thought to have long-term implications, temperament is believed to be meaningful because it is considered stable and prognostic, and often viewed as an early foundation for personality (Caspi et al., 2003; Chen & Schmidt, 2015; Rothbart, 2011). However, strong assertions about the stability of child temperament have come into question. Two principal advances of the present study are the examination of the stability of temperament across early childhood and the systematic exploration of moderation of developmental stability of child temperament by several child and maternal factors. A third advance was use of the same instrument (the EAS) at different ages and with different groups, thereby reducing method variance that has often weakened conclusions about child temperament.

Stability of Child Temperament

Childhood temperament appears generally stable, and stability of temperament is large in magnitude. However, as the Guttman simplex would predict, we found somewhat lower (though still large) stability estimates over the longer inter-assessment periods. Our stability findings across childhood generally accord with other research examining longer-term prediction from early appearing temperament (Kagan, 2013; Rothbart, 2011; Schwartz, Wright, Shin, Kagan, & Rauch, 2003). For example, Komsi and colleagues (2006) reported finding stability of temperament from 6 months to 5.5 years in Finnish children.

The present study also provides evidence of largely consistent temperament stability across multiple moderators. Stability correlations index the degree to which the order of individuals in a group is preserved from one assessment occasion to the next. Our developmentally sensitive analyses comparing children 3 to 5 to 6 years of age demonstrated consistent stability even across distinct developmental periods of childhood associated with growing and changing capabilities in motor, cognitive, language, and socioemotional functioning. When significant moderation was found, it was small in magnitude (i.e., .02 to .14 difference in standardized coefficients). Still, some moderators were more consistent than others. Child gender and birth order had small, unsystematic moderation of single temperament scales over single intervals. Maternal age moderated emotionality from 3 to 5 and 3 to 6 years, and activity from 5 to 6 years only, and in all cases stability was smallest for the youngest mothers (adolescents). Finally, maternal education moderated stability from 3 to 5 years for all temperament facets, and sociability between all temporal intervals; in all cases, stability was smaller for less educated mothers. The most consistent moderators, then, were maternal age and (particularly) education. The question that remains is whether maternal age and education are associated with slightly reduced stability because of reporting error (e.g.,

younger and less educated mothers may be less reliable reporters; Roberts, Burchinal, & Durham, 1999), whether younger and less educated mothers cultivate less optimal child rearing environments (Bradley & Corwyn, 2002), and/or whether their children carry developmental risks that slightly destabilize their temperaments over early childhood (Gilman, Kawachi, Fitzmaurice, & Buka, 2002; Huaqing Qi & Kaiser, 2003). Each of these explanations is plausible and supported by the literature.

Despite these small moderating effects, the overall pattern was for strong, although not complete, stability across all subgroups (stability ranged from .42 to .78 across moderators). Temperament may be stable in some significant degree, but we should not expect overt expressions of temperament to be completely invariant through time; expressions of temperament may still change due to maturation, experience, and the contexts in which temperament is manifest. Even genetic underpinnings do not imply immutability (Saudino, 2012): Genetic expression may manifest differently because of change during ontogeny (Naumova, Lee, Rychkov, Vlasova, & Grigorenko, 2013; Szyf & Bick, 2012; Vandermeer et al., 2018). Thus, relative stability should not be interpreted as indicative of lifelong consistency because developmental change and individual differences in developmental timetables always play some role. To be stable does not mean to be impervious. A great deal of change in individual differences in temperament across time occurs, and change in temperament might reflect children's changing and maturing biology, as well as reactivity to environmental change. In the life-span perspective of psychology, human beings are open systems. For example, a temperamentally fearful infant may learn self-soothing strategies that may make the same child appear less fearful; a child who is rewarded for smiling may smile even more later.

Moreover, even large stability estimates leave substantial variance unaccounted for. The stability correlations that emerged from our assessments were consistently statistically significant, but the range of shared variance in average stability in the total sample, including the 3–6 years interval, was on the order of 21–53%, suggesting that as much as 47–79% of the variance in child temperament at a later time point was not explained by child temperament at an earlier time point.

In short, organic systems work to maintain homeostasis, but the plastic nature of psychological functioning ensures adaptability. People (children included) exhibit both stability and instability in many personological characteristics (temperament included) throughout the life span. This finding leaves latitude for early intervention and may inform prevention and remediation strategies aimed at child temperament and early parent–child interactions.

Limitations and Future Directions

The study presented here makes a unique contribution to the field of child temperament by focusing on stability, by closely examining multiple significant moderators of stability, and by doing so in a systematic, unified, and comprehensive way in a large sample of young children. The analyses were adequately powered. Measuring stability calls for longitudinal within-subject designs that provide powerful analyses as they control for variance due to additional individual factors.

Some limitations and balanced strengths should be noted, however. The sample was not representative of the U.K. population. However, the study included a broad range of SES. Several potential moderators of stability of child temperament were examined, but additional ones, such as ethnicity (Bornstein, 1989; Wang & Dix, 2013), could be important to understanding stability of child temperament. Birth order was assessed, but this was a between- not within-family design, which should be considered in future methodological refinements. Stability of temperament in preterm children was studied, but the preterm sample was healthy, and stability of child temperament warrants investigation in fragile preterms and in other medically compromised child populations (Mayes, Bornstein, Chawarska, Haynes, & Granger, 1996).

The study used maternal report. Child temperament can be measured through caregiver reports, naturalistic home and structured laboratory observations, and physiological indicators (Bornstein, 2014; Gartstein et al., 2012; Rothbart, 2011). Each approach offers advantages and disadvantages. Caregiver report questionnaires are the most widely adopted approach (Rothbart, 2011) because they tap an extensive and rich knowledge base about the child from caregivers who occupy the unique vantage of having experienced their child in a wide variety of situations and across multiple contexts over the child's entire lifetime. Here we used a common, standardized, and validated caregiver report, the EAS. That said, cautions have been voiced about potential sources of error in caregiver report (Kagan, 2013; Rothbart, 2011). For example, caregivers may be unfamiliar with the behavior of other children with whom to compare their child, and subjective reports are also vulnerable to biases. Certain characteristics of a child may be amplified or attenuated in a caregiver's mind (Bates & Bayles, 1984; Mangelsdorf, McHale, Diener, Goldstein, & Lehn, 2000). However, maternal reports of child temperament are stable even controlling for maternal social desirability bias (Bornstein et al., 2014), and we found few differences in stability across mothers reporting on their first child, and mothers reporting on a laterborn child, suggesting that parenting experience did not disrupt temperament stability. Furthermore, utilizing caregiver report perforce means that observed stabilities can be inflated on account of the shared variance associated with using the same informant at different times (Winstanley et al., 2014). The EAS was specifically designed to redress many of these concerns, asking caregivers to report, on a 5-point scale, the relative frequency of occurrence of specific child behaviors. The EAS format relies on recognition and augments report accuracy by minimizing problems associated with recall. Nor does the EAS require caregivers to make comparative judgments with respect to other children, diminishing the need for familiarity with other children. Further to this parent report issue, mothers and fathers are likely influenced by somewhat different factors in perceiving their child's temperaments (Parade & Leerkes, 2008; Pesonen, Raïkkönen, Strandberg, Järvenpää, 2006). Here, we used mothers exclusively as informants. But fathers are believed to have more leeway in interacting with their children (Cabrera, Tamis-LeMonda, Bradley, Hofferth, & Lamb, 2000).

Further research on possible biological and environmental factors influencing stability and change of child temperament is needed. If features of temperament in childhood can be altered by maturation and experience, stability over long periods of time will be affected and may be subject to intervention and (if negative) remediation. Furthermore, multi-method

approaches (in which contributions associated with parent ratings and other avenues of measurement) can be adopted and compared (Gagne & Goldsmith, 2011). Aggregating temperament information from multiple sources might achieve greater convergence. In this vein, some investigators have compared and combined home-observation and matching parent-report procedures to assess child temperament (Bornstein et al., 1991), whereas others have compared laboratory-based assessments with home observations (Gagne, Van Hulle, Aksan, Essex, & Goldsmith, 2011). For future investigations, it would be revealing as well to continue researching stability and prediction of temperament into later stages of development and to examine its association with personality, education, and social development.

Conclusions

Child temperament is commonly thought of as enduring. Here we focused on stability of child temperament development from multiple perspectives of child age, gender, birth order, and term status, and mother age, education, anxiety, and depression over a 3-year period. Child temperament scales were generally stable across all moderating factors, and differences in estimates across moderators were small. Given the importance of replicating findings in science (Duncan, Engel, Claessens, & Dowsett, 2014), the reproduction of stability of scales of child temperament and its extension across multiple moderators lends credence to the robustness of the stability of child temperament.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Table 1

Descriptive Statistics and Stability Across Time on the Full Sample

	Descriptive statistics (years)						Stability (years)		
	3		5		6		3 → 5	5 → 6	3 → 6
	M	*SD*	*M*	*SD*	*M*	*SD*	β	β	β
Activity Level	21.62	3.11	20.66	2.94	20.45	2.98	.61	.71	.56
Emotionality	12.40	4.21	12.74	3.34	12.70	3.36	.59	.69	.54
Shyness	12.46	4.07	11.92	3.22	11.79	3.17	.63	.73	.57
Sociability	18.20	3.09	18.16	2.62	18.23	2.64	.51	.60	.46

Note. Sample sizes ranged from 9,704 to 9,713 for the 3- to 5-year, and 5- to 6-year models, and ranged from 9,493 to 9,503 for the 3- to 6-year models. Stability estimates are all significant, *p*s < .001.

Table 2

Stability Across Time by Moderator Groups

	Activity level (years)			Emotionality (years)			Shyness (years)			Sociability (years)		
	3 → 5	**5 → 6**	**3 → 6**	**3 → 5**	**5 → 6**	**3 → 6**	**3 → 5**	**5 → 6**	**3 → 6**	**3 → 5**	**5 → 6**	**3 → 6**
Child Gender												
Girls	**.60a**	.70	.55	.60	.69	.54	.62	.72	**.55a**	.51	.58	.45
Boys	**.62b**	.71	.56	.58	.69	.53	.65	.74	**.59b**	.51	.61	.46
Child Birth Order												
Firstborns	.62	.72	.56	.57	.68	.53	.65	.74	.58	.50	**.58a**	.45
Laterborns	.61	.71	.56	.61	.70	.55	.62	.73	.56	.51	**.61b**	.47
Child Term Status												
Term	.61	.71	.56	.59	.69	.54	.63	.73	.57	.51	.60	.45
Preterm	.65	.73	.55	.54	.65	.42	.66	.78	.65	.54	.58	.53
Maternal Age												
<20	.44	**.60a**	.38	**.53a**	.63	**.43a**	.54	.71	.46	.48	.64	.43
≥ 20 & <30	.60	**.70b**	.55	**.56b**	.67	**.52a**	.63	.73	.58	.49	.59	.45
≥ 30 & <40	.64	**.74c**	.58	**.62c**	.71	**.57b**	.64	.73	.57	.54	.61	.47
≥ 40	.55	**.65abc**	.49	**.62abc**	.67	**.60ab**	.62	.69	.53	.57	.51	.42
Maternal Education												
At or below O Level	**.59a**	.69	.55	**.57a**	.68	.53	**.62a**	.72	.56	**.49a**	**.58a**	**.43a**
Above O level	**.63b**	.73	.57	**.61b**	.69	.55	**.66b**	.74	.59	**.54b**	**.62b**	**.50b**
Maternal Anxiety[a]												
Normal	.62	.71	.57	.58	.68	.53	.64	.73	.57	.51	.60	.45
High Levels of Anxiety	.59	.72	.53	.53	.66	.47	.61	.73	.56	.50	.60	.51
Maternal Depression[b]												
Normal	.62	.72	.57	.58	.68	.53	.64	.73	.57	.50	.60	.45
High Levels of Depression	.59	.68	.53	.54	.68	.52	.59	.72	.54	.54	.63	.53

Note. Stability estimates are all significant, *p*s < .001. Coefficients in bold and with different subscripts within moderators and time intervals are significantly different from one another.

[a]A cut-off point ≥ 8 on the anxiety scale of CCEI was used: 6,578 mothers were normal, and 1,461 mothers had high levels of anxiety.

[b]A cut-off point ≥ 13 on EPDS was used: 7,094 mothers were normal, and 943 mothers had high levels of depressive symptoms.