DEVELOPMENTAL STABILITY OF TEMPERAMENT CHARACTERISTICS: A REVIEW

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ABSTRACT
It has been argued that personality features, such as temperament or traits, possess a certain level of developmental stability (Thomson, Winer & Goodwin, 2011). In this review, attempts are made to explain why temperament may, or may not, remain stable over time by addressing the influence of genetic, environmental and cultural factors on temperament and the interaction between such influences. This essay will also address the notion of temperamental stability in the context of different developmental stages.

INTRODUCTION
To begin with a definition of temperament might be appropriate: temperament is defined as a person’s characteristic emotional and behavioural modes of response to environmental events. Such responses might include irritability, activity level, sociability and fearfulness (Shaffer & Kipp, 2007) or threshold for distress (Marysko et al., 2010). Significant correlations between different measures of temperament have been found (Worobey, 1986). This has been borne in mind while dealing with the issues below; delineations within temperament shall remain as defined by specific researchers in specific studies. This position is adopted under the assumption that significant correlations would be found using different measures in studies similar to those dealt with.

The development of the aforementioned aspects of personality is of critical importance to adult development; therefore an understanding of the reasons and mechanisms behind the stability of temperament is vital. A broad consensus has been reached that temperament has a biological basis (Kagan, 2005). This view has been supported by Buss and Plomin (1984, in Zentner & Bates, 2008) arguing that temperament is observable early in human ontogeny, hinting at genetic influences. Evidence has been
found in support of this view however, there are a number of aspects of temperament which do not necessarily remain stable at all times during development.

**Peas in a Pod: Twin Studies and Molecular Genetics Support Stability**

Temperament is thought to have 3 aspects. The first is that it is constitutional; this dictates a biological basis for temperament, including the interaction of genes, maturation and experience. Secondly, temperament possesses relative consistency, meaning individual characteristics are stable and relative comparisons against age-matched controls will likely remain consistent across time, but not necessarily rigid. Finally, temperament interacts with all aspects of the environment (Bornstein & Lamb, 2011). Some characteristics are more susceptible to change than others, which may occur in certain contexts or at particular developmental milestones.

The importance of heredity in the development of temperament has been underlined by twin/sibling adoption studies. Greater similarity has been demonstrated between identical twins than fraternal twins on measures of temperament. Braungart et al. (1992) found evidence of genetic influences on temperament at both 12 and 24 months. The authors studied both identical & fraternal twins and adoptive & non-adoptive siblings. Greater similarities were found between identical twins than fraternal twins and non-adoptive sibling pairs than adoptive sibling pairs. Similarities were found for a number of characteristics of temperament, including activity levels. Cyphers et al. (1990) found heritability to be a predictor of between-twin scores on 8 of 9 scales measuring temperament. They also found environmental factors to be predictors on 3 of the 9 scales. Their study involved infant and toddler participants. Gjone and Stevenson (1997) have also found evidence for the genetic basis of temperament in twin studies of behavioural problems. For twins to possess similar temperaments at differing developmental stages would suggest the role of biological factors in temperamental stability. The increased similarity of identical twins over fraternal twins supports this notion.

Research in molecular genetics has found a common genetic basis for temperament. Ebstein, Benjamin and Belmaker (2000) found genetic polymorphism in the dopamine D4 receptor, an area found to be relevant
to novelty-seeking. The researchers also found polymorphism in the serotonin transporter promoter, thought to be associated with harm avoidance. Results showing stability of temperament across time (Braungart et al., 1992), with the likelihood that genetic factors play a vital role (Ebstein et al., 2000) would reinforce the idea of general stability of temperament under biological influence, a view supported by Koms, Raikon, Peson, Heinonen, Kesivaara et al. (2006).

ENVIRONMENT AND CULTURE MAY AFFECT TEMPERAMENT
While Thomson et al. (2011) argue that temperament is biologically based, there is also evidence that the environment exercises some influence over temperament, especially with regard to temperamental changes. As well as finding genetic influences, Cyphers et al. (1990) also found the influence of environmental factors on temperament in 3 of 9 scales in twins. Goldsmith et al. (1999) found both genetic and environmental factors to be influential in a behavioural assessment of a sample of 140, 9-month old twins. The authors found that genetic factors were most influential on cotwin similarity for distress and activity level. Environmental factors accounted for similarity on measures of soothability. This view has been echoed by Gartstein and Rothbart (2003) in their assessment of the infant behaviour questionnaire, using children ranging in age from 3 – 12 months. While cultural or even environmental factors may not influence neonatal temperament, these factors may come into play at later points in life or in the occurrence of specific events. Such a specific event may be a change in living arrangements (e.g. Wachs, 1988)

Cultural effects have been seen by Kerr et al. (1996). In their comparison of Swedish adults and adults from the United States, the authors found a stark difference in career achievement between shy and outgoing participants. In males, shy Swedes’ careers were not impeded by their level of shyness, whereas, shy Americans’ careers were. Inter-cultural differences were not seen between Swedish and U.S. adults on predictions of parenthood and marriage. The question of whether culture impacts upon temperamental stability remains in question.

WEDNESDAY’S CHILD IS FULL OF WOE: TEMPERAMENTAL STABILITY IN NEONATES
Matheny, Riese and Wilson (1985) assessed the temperament of neonates, focusing on irritability, resistance to soothing, activity, and reinforcement
value. The researchers found that neonate temperament was a significant predictor of temperament in later life (9 months), with a generalised multiple correlation. This challenges the notion that early infancy is marked by temperamental change and instability (Lemery, Goldsmith, Klinnert and Mrazek, 1999).

Neonates across a number of cultures have been shown to share a common set of temperamental characteristics (Wachs et al., 2004). While studying neonates in developing countries, the authors found little difference between their study and previous studies undertaken in developed countries. The researchers were careful to acknowledge that cultural factors may play a part in temperamental differences at a later point in development. However, they also drew an interesting comparison to their findings with the inter-cultural consistency of the so-called ‘big 5’ personality dimensions in adults, across numerous cultures. One could tentatively suggest that culture is not influential in the formation or stability of temperament, or at least not in a major way. Between-cultures effects may not have been seen, but this does not necessarily negate the possibility of within-culture variability due to the influence of other environmental factors, such as parenting style (Bornstein & Zlotnik, 2008).

In a recent study, Jong et al. (2010) argued that neonatal pain cry parameters led to understanding of temperament in later development. They divided neonates’ cry response to a vaccine into two parts (pre-part and post-part), delineated by observer consensus. Neonates with shorter post-part breath intervals showed higher activity levels at one month, while neonates whose post-part cry was of higher pitch and whose post-part cry sounds were shorter, showed lower adaptability at the same point. This study hints at the possibility of neonatal temperament stability, at least showing behavioural correlates with later temperament. This suggests a biological basis for temperament, with stable changes being brought about by environmental changes. One could also argue that pain response is response to a biological change.

**Stability in Infants and Toddlers**
In early childhood, the importance of environmental factors becomes apparent. Lemery et al. (1999) found that temperament underwent change in early infancy but remained relatively stable from 24 to 48 months,
when measured by questionnaires distributed to mothers. Additionally, the authors note that while relatively stable, some aspects of temperament may differ in functionality over time. Activity levels, for example, may be employed in accordance with positive or negative emotional states.

Wachs (1988) has found that the physical environment brings its influence to bear on the temperament of toddlers at 12 months of age. The parents of the children involved in the study had varying socioeconomic backgrounds – 20% of children had parents who had not completed second level education, while in 29% of cases at least one parent had a postgraduate qualification. Furthermore, 48% of mothers in the study were working (either full-time or part-time). All children participating in the study were from two-parent families. The author found child temperament to be influenced by crowding in the home environment. Crowding could exist in the sense of poor ratio of room size relative to number of inhabitants. It was found that children displayed more undesirable characteristics of temperament, such as lower approachability and lower levels of adaptability. The author further noted that measures of personal space were predictors of temperament, while availability of objects or toys was actually a function of child temperament. The author also found that child temperament was not influenced by parent temperament. Thus we see that the physical environment can alter temperament, with a certain level of consistency.

It has been shown that levels of distress produced by novel stimuli at 4 months were associated with fear scores at 14 months (Marysko et al., 2010). The authors ascertained that these results were predicted by maternal judgement of infant stress at 4 months, lending credence to the notion of temperamental stability in infancy. According to Shaffer and Kipp (2007), such stability is indicative of biological basis for temperament. We can however see that the presentation of a novel stimulus is an environmental change, producing a relative change in temperament. The stability of temperament at later stages of development may arise from the experience of having been presented with novel environmental stimuli, wherein a process similar to conditioning may occur (Gross, 2005). Environmental and biological factors combine to enable stability of temperament.
OLD TRICKS: STABILITY IN OLDER CHILDREN AND LATER LIFE

Stability of temperament has been found widely in younger children. Mufson, Fendrich and Warner (1990) found that participants in a 2 year longitudinal self-report measure maintained the view that temperament remained stable over time. In the study, the authors found evidence of fair to moderate levels of temperamental stability in child self-report measures. Perhaps more interestingly, they also found moderate to good evidence of stability in reports of the same children’s temperamental stability by their mothers. Temperamental stability does not seem to be confined to younger children. Neppl, Donnellan, Scaramella, Widaman, Spilman, et al. (2010) found stability of temperament from toddlers (24 months) to middle childhood (6 – 10 years). This stability was found in positive and negative aspects of temperament and constraint.

Temperamental stability may increase over time. Using test-retest correlation, Roberts and Del Vecchio (2000) found that correlation coefficients for consistency increased from a mean of 0.31 in childhood to 0.54 in early adulthood (college years), to 0.64 at age 30. This rose to 0.74 for those aged 50 – 70. Such evidence would suggest the effect of biological experience on temperament, as well as increasingly stable environments across time. One would expect less temperamental stability in childhood, as it is characterised by rapid development, with adolescence being characterised by social, environmental and biological upheaval. Similarly, later adulthood often signifies fewer familial pressures and higher financial security relative to younger adulthood. Kerr, Lambert and Bem (1996) found further evidence for long-term stability of temperament. They found that timing of marriage and parenthood and career success in 35 year olds could be predicted by maternal ratings of shyness at age 8 – 10. In their case, those who were rated shy at age 8 – 10 married or became parents later than their non-shy counterparts.

Temperament can change, and temperament characteristics may not progress to adulthood. Often, the deciding factor mediating whether temperament is likely to change over time is the goodness of fit between a child’s temperament and parenting styles. Bates, Pettit, Dodge and Ridge (1998) detail the effect of restrictive parenting on the externalization of behaviour. Children who were temperamentally resistant showed lesser externalization of behaviour in response to restrictive parenting at age 7 – 10 years, than those who weren’t temperamentally resistant. Thus we see
early evidence of the effect of restrictive parenting on children with varying temperaments. Again, environmental influences can play a large part in temperamental variability, however it must be noted that such variability seems to remain consistent over time. Rothbart (1986) found that questionnaire scores of positive aspects of temperament (smiling, laughter, activity level, and vocal activity) increased with age; a consistent change in line with developmental progression. Participants in the study were aged from 3, 6, or 9 months.

DEVELOPMENT OF UNDERSTANDING: CONCLUDING REMARKS
We have seen that temperamental stability is influenced by both biological and environmental factors, as well as cultural factors in some cases. We have seen the possibility of temperamental stability across different stages of development, including neonates (Jong et al., 2010), infants and toddlers (e.g. Lemery et al., 1999) and in later life (e.g. Neppl et al., 2010). We have also seen that temperamental stability increases over time (e.g. Robers & DelVecchio, 2000), suggesting the role of biological experience in increases of temperamental stability across development. We also saw the influence of goodness-of-fit between temperament and environmental factors such as parenting style (Bates et al. 1998). This has allowed us to develop an understanding that temperament remains essentially stable across the lifespan of the individual, with slight questions hanging over the stability of temperament in the neonatal period.

However, a greater understanding of temperament requires further study of neonatal aspects of temperament. Furthermore, a life-length longitudinal study might be useful in order to generate a wider picture of temperamental development. Perhaps the continuation of previous longitudinal studies might make this task more manageable. Without a clear picture of temperament stability or changes across the whole lifespan of the individual, it might be unwise to conclude that temperament remains perpetually stable. For now, however, this view remains helpful.

REFERENCES
REVIEW


