



Adulthood temperament and educational attainment: A population-based cohort study



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ARTICLE INFO

Article history:

Received 12 December 2013

Received in revised form

29 June 2015

Accepted 13 July 2015

Available online xxx

Keywords:

Temperament

Educational attainment

Lifelong learning

Academic achievement

Behavioral style

ABSTRACT

The aim of the study was to examine the associations of temperament traits and temperament profiles (i.e., the combinations of multiple traits) with adulthood educational attainment. The participants were 837 women and 592 men from a population-based cohort study. Temperament was assessed with the Temperament and Character Inventory (TCI) based on the Psychobiological Model of Temperament and Character. Analyses were conducted with linear regression analyses and with analysis of variance (ANOVA). In both genders, high harm avoidance was associated with lower educational attainment. High persistence among women and high reward dependence among men were related to higher educational attainment. Novelty seeking was not associated with educational attainment in either gender. Among men explosive and methodical temperament profiles were associated with lower educational attainment while reliable and passionate temperament profiles were associated with higher educational attainment. Temperament may play an important role in lifelong learning and academic performance over different developmental transitions.

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1. Introduction

Educational attainment – that is, individual's educational level – predicts his/her career success (Judge, Cable, Boudreau, & Bretz Jr., 1995) and is a significant factor for life satisfaction and general well-being with several health consequences (Hampson, Goldberg, Vogt, & Dubanoski, 2007). Educational attainment is a component of socioeconomic status (SES), which also has been found to be associated with individuals' higher subjective happiness and well-being (Clark, Frijters, & Shields, 2008; Diener & Biswas-Diener, 2002). It also functions as a protective factor, e.g., against social exclusion (Van Bragt, Bakx, Bergen, & Croon, 2011).

Educational attainment in adulthood reflects an individual's

long-term learning, sometimes even lifelong learning, and cumulatively growing educational capital (Arnett, 2000; Roberts, Caspi, & Moffitt, 2003). Although several environmental factors, such as parental education and SES, have been shown to predict educational attainment (Conger & Donnellan, 2007), individual factors may also contribute to this process (Roberts, Kuncel, Shiner, Caspi, & Goldberg, 2007). Temperament – which reflects an individual's innate emotional and behavioral way of approaching and reacting to the environment (Goldsmith et al., 1987) – and personality – which reflects an individual's values, attitudes and coping strategies learned as a result of socialization with the surrounding environment (McAdams & Olson, 2010) – have been shown to be among the contributing individual factors (Hampson et al., 2007; Ozer & Benet-Martinez, 2006; Roberts et al., 2007). In the present study, we examine whether adulthood temperament traits and temperament profiles (i.e., the combinations of multiple temperament traits) as indicated by the Psychobiological Model of Temperament and Character (Cloninger, 1987; Cloninger, Svrakic, &

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Przybeck, 1993) are associated with long-term learning and educational attainment in adulthood among Finnish population-based data.

Temperament traits are biologically based behavioral styles or behavioral tendencies that have heritable underpinnings (Keller, Coventry, Heath, & Martin, 2005), appear in early childhood and are found to be relatively stable across various situations and over the course of time (Goldsmith et al., 1987). Temperament traits are predictive of individual differences in learning and behavior in adulthood (Cloninger et al., 1993; Sigvardsson, Bohman, & Cloninger, 1987). Temperament is seen as an emotional foundation for later personality development. Temperament and cumulative experience together form personality (Cloninger, 1994b; Goldsmith et al., 1987; Goldsmith, Lemery, Aksan, & Buss, 2000).

One of the established temperament models is the Psychobiological Model of Temperament and Character (Cloninger et al., 1993). This model comprises four temperament traits underpinned by four regional brain activity systems that are related to associative conditioning and procedural learning, which, in turn, further influence an individual's cognitive performance (Cloninger, 1994a; Cloninger, Przybeck, Svrakic, & Wetzel, 1994) and motivated behavior (Gillespie, Cloninger, Heath, & Martin, 2003). These temperament traits are *novelty seeking* (a tendency towards exploratory activity, impulsive decisions and intense excitability in response to novel stimuli) underpinned by behavioral activation system, *harm avoidance* (a tendency toward inhibitive behavior and the avoidance of punishment and novelty) underpinned by a behavioral inhibition system, *reward dependence* (a tendency to respond intensely to social reward and learning to maintain rewarded behavior) underpinned by a behavioral dependence system, and *persistence* (a tendency toward persevere behavior despite frustration and exhaustion) underpinned by behavioral persistence system (Cloninger, 1987, 1994b; Cloninger et al., 1993).

On the basis of a neurobiological learning model, the distinction between temperament and personality corresponds to the neurobiological differentiations in individuals' associative/perceptual and conceptual learning, respectively (Cloninger, 1994a; Cloninger et al., 1994). Consequently, temperament corresponds to procedural learning, which indicates differences in habits and skills, whereas personality corresponds to propositional learning, which indicates differences in goals and values (Cloninger, 1994a). Although temperament is more visible in early childhood and only modestly correlated with intelligence (for reviews, see Cloninger, Przybeck, & Svrakic, 1991; Guerin, Gottfried, Oliver, & Thomas, 2003; Kristal, 2005) and cognitive skills (Hintsanen, Alatupa, et al., 2012; Oliver, Guerin, & Gottfried, 2007), it also shapes adult behavior and reactions, and may play an important role in lifelong learning and educational achievement (Cloninger et al., 1993; Goldsmith et al., 1987; Thomas & Chess, 1977).

The previous research evidence supporting the association between personality and educational attainment comes almost solely from personality assessment as indicated by the Five Factor Model (for reviews, see Poropat, 2009; Vecchione, Alessandri, & Barbaranelli, 2012), which does not differentiate temperament from personality (McCrae & Costa, 1987, 2003). Thus, the distinctive effect of temperament (i.e., the biological and stable aspect of personality) on adulthood educational attainment has been virtually unexplored. Concentrating specifically on the biological and stable core of personality (i.e., temperament) would add an important new supplement to the issue and broaden the perspective when combined with the previous information. In the following chapters, we take a closer look at the associations between temperament, learning and education, and explore the mechanisms that link temperament with long-term learning and adulthood educational attainment.

1.1. Associations between temperament and learning

Characteristics of temperament – such as task orientation (a composite of activity, persistence, and distractibility), inhibition (shyness), negative emotionality, and mood – have been found to be associated with several sub-processes needed for effective learning, such as student academic/achievement emotions (Pekrun, 2005, 2006; Pekrun, Goetz, Titz, & Perry, 2002; Pham, 2007; Valiente, Swanson, & Eisenberg, 2012), affective and behavioral responses in achievement situations (Hirvonen, Aunola, Alatupa, Viljaranta, & Nurmi, 2013; Pretz, Totz, & Kaufman, 2010), the focusing of attention (Curtindale, Laurie-Rose, Bennett-Murphy, & Hull, 2007), the learning style and working strategies selected (Curby, Rudasill, Edwards, & Pérez-Edgar, 2011; Davis & Carr, 2002), homework effort (Trautwein, Lüdtke, Schnyder, & Niggli, 2006), and a student's interests, engagement and general enjoyment of school (Elliot & Thrash, 2002; Guerin et al., 2003; Valiente, Lemery-Chalfant, & Swanson, 2010). Temperament has also shown to contribute to teacher–student interaction (Coplan & Prakash, 2003; Rudasill & Rimm-Kaufman, 2009; Viljaranta et al., in press), teacher-perceived student educational competence (i.e., cognitive ability, motivation and maturity), teachability (i.e., a student's ability to receive and internalize teaching in an expected way, as perceived by the teacher) (Mullola et al., 2010) and to the school grades assigned by the teacher (Guerin et al., 2003; Hintsanen, Alatupa, et al., 2012; Hughes & Coplan, 2010; Martin & Bridger, 1999; Mullola et al., 2011, 2010).

Temperament can affect learning through several pathways. First, temperament shapes an individual's emotional responses toward environmental stimuli, especially novel ones (Cloninger, 1994a). Second, temperament influences the expression of the initial emotional reactions (Cloninger, 1994a). Third, temperament affects the rate and style of associative learning and information processing, and motivation through individual differences in willingness to approach or withdraw from new and/or challenging tasks, as well as the ability to be persistent and focus on the task at hand (Cloninger, 1987; Cloninger et al., 1993; Gillespie et al., 2003; Martin & Bridger, 1999; Thomas & Chess, 1977; Windle, 1992; Windle & Lerner, 1986). Substantial evidence supports the idea that temperament plays an important role in learning and achievement between 5 and 19 years of age, all the way from kindergarten to high school (i.e., between 5 and 19 years of age) (for reviews, see Keogh, 2003; Kristal, 2005; Martin & Bridger, 1999).

In adulthood, research on the role of temperament traits in learning and educational attainment, however, has been limited or even lacking. The studies conducted among adults have examined the contribution of personality traits to the various outcomes of educational achievement and the evidence is derived almost solely from personality assessments, such as the Five Factor Model (McCrae & Costa, 1987, 2003). A number of individual studies (Duckworth & Seligman, 2005; Heaven & Ciarrochi, 2012; John, Caspi, Robins, Moffitt, & Stouthamer-Loeber, 1994; Komaraju, Karau, & Schmeck, 2009; Nofle & Robins, 2007; O'Connor & Pautonen, 2007; Richardson & Abraham, 2009; Wagerman & Funder, 2007) and a large meta-analysis (Poropat, 2009) based on the Five Factor Model of personality have demonstrated associations between personality traits and academic performance.

However, as far as we know, no previous studies have investigated the effects of adulthood temperament on educational attainment beyond the stage of post-adolescence. It has been demonstrated that the motivation to learn and achieve is relatively stable across the different educational transitions (Chouinard & Roy, 2008; Tuominen-Soini, Salmela-Aro, & Niemivirta, 2008). Therefore, it is reasonable to assume that relatively stable dispositions, such as temperament characteristics, may have a strong

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