

SELF-TRANSCENDENCE AS A MEASURABLE TRANSPERSONAL CONSTRUCT

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ABSTRACT: The term self-transcendence has been used to refer both to a process of movement beyond one's immediate self-boundaries, and to a quality which emerges as a result of this process, culminating in a broadened worldview. Self-transcendence has appeared as a key theme in several disciplines including transpersonal psychology, personality theory, and nursing theory. The scarcity of widely accepted methods of quantifying this construct with valid, reliable measures has caused some difficulty in the research arena. Scientific literature to date is presented here surrounding self-transcendence as quantified by the Temperament and Character Inventory (TCI). The author's purpose is to expound a coherent account of TCI self-transcendence research, and to establish self-transcendence as a measurable transpersonal construct with observable features and correlates. Data regarding molecular and quantitative genetics, neuroanatomy, aging, spirituality, religion, culture, and psychopathology are discussed. In light of this evidence, self-transcendence is presented as a complex but quantifiable construct of the utmost relevance to psychology.

INTRODUCTION

The term self-transcendence has been widely used to refer both to a process of expansion, or movement beyond one's immediate self-boundaries (Levenson, Jennings, Aldwin, & Shiraishi, 2005; Reed, 1991b), and to a quality which emerges as a result of this process, culminating in a generally stabilized and broadened worldview (Maslow, 1971; Wilber, 2000). In psychology, Viktor Frankl (1966) posited self-transcendence as an integral part of the human ability to create meaning, and Abraham Maslow offered this definition:

Transcendence refers to the very highest and most inclusive or holistic levels of human consciousness, behaving and relating, as ends rather than means, to oneself, to significant others, to human beings in general, to other species, to nature, and to the cosmos. (1971, p. 269)

More recently, the phenomenon of self-transcendence has emerged as a key theme in several disciplines including transpersonal development (Levenson et al., 2005; Wade, 1996; Wilber, 2000), personality theory and psychiatric genetics (Cloninger, Svrakic, & Przybeck, 1993), nursing theory (Coward, 1996; Reed, 1991b; Runquist & Reed, 2007), and gerontology (Braam, Bramsen, van Tilburg, van der Ploeg, & Deeg, 2006; Tornstam, 1996), among others.

In each of these domains scholars have posited distinct definitions and theoretical underpinnings in an attempt to understand and explain self-transcendence from the standpoints of their respective fields. Accordingly, a

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number of assessments have been proposed as means of measuring self-transcendence, and discovering what, if any, are its component facets. These include the self-transcendence subscale of the Temperament and Character Inventory (TCI) devised by Cloninger et al. (1993), the Self-Transcendence Scale developed by Reed (1991a), the Spiritual Transcendence Scale created by Piedmont (1999), and the Adult Self-Transcendence Inventory (Levenson et al., 2005). Using such measures in empirical research, interrelationships between self-transcendence and other biological, psychological, and spiritual constructs have been explored across a variety of populations and cultures, yielding considerable results. However, the scarcity of widely accepted methods of quantifying self-transcendence with a single valid, reliable measure has caused some difficulty in the research arena (Akyalcin, Greenway, & Milne, 2008; MacDonald & Friedman, 2002).

This article presents research from diverse fields surrounding self-transcendence as quantified by the Temperament and Character Inventory (TCI), a self-report measure of seven personality dimensions developed by Cloninger et al. (1993), who define self-transcendence as “the extent to which a person identifies the self as...an integral part of the universe as a whole” (p. 975). This report specifically focuses on the construct of self-transcendence (ST) as defined by Cloninger et al.’s (1993) psychobiological model of temperament and character for several reasons. First, this theory is unique in its inclusion and acknowledgement of self-transcendence, an inherently transpersonal phenomenon, as a major contributing factor determining human personality. Second, as Maitland, Nyberg, Backman, Nilsson, and Adolfsson (2009b) note, since its inception, the TCI has been employed in almost 400 published studies (Pelissolo et al., 2005), providing an ample foundation of empirical data. Finally, TCI research has spanned a variety of paradigms and methodologies, including psychometrics, neuroimaging, and genetics (Akyalcin et al., 2008; Ando et al., 2004; Kaasinen, Maguire, Kurki, Bruck, & Rinner, 2005), thereby offering a wide array of information.

In reviewing the range of literature pertaining to this construct, the author’s purpose is twofold: first, to present a coherent account of the TCI self-transcendence research to date, and second, to work towards establishing self-transcendence as a measurable transpersonal construct, with observable, scientifically valid features and correlates. In order to situate this material within the larger context of multidisciplinary self-transcendence research, alternative models and findings regarding self-transcendence will be briefly reviewed below. Afterwards, the psychobiological model of temperament and character and TCI will be introduced in more detail, followed by a concise presentation of significant research findings relating specifically to TCI self-transcendence, and a discussion on the relevance of this construct to transpersonal psychology.

THEORIES OF TRANSCENDENCE

Two major theories of transcendence have emerged from the standpoint of aging and lifespan development (Reed, 1986, 1991b; Tornstam, 1996).

Specifically, the nursing theory of self-transcendence formulated by Reed (1991b, 2003), and the theory of gerotranscendence proposed by Tornstam (1996, 1997), have offered useful definitions, which have been operationalized and researched with the Self-Transcendence Scale (STS; Reed, 1991a), and the Adult Self-Transcendence Inventory (ASTI; Levenson et al., 2005) respectively. Reed's (1991a) Self-Transcendence Scale has been studied extensively in ill and elderly populations, producing significant results regarding self-transcendence, mental health, well-being, coping skills, and end of life issues (Coward, 2006; Reed, 2003). It is useful to note that nursing research in self-transcendence has employed some qualitative methods (Reed, 1991a), incorporating the views and experiences of participants, as opposed to the majority of research using the Temperament and Character Inventory, which has focused almost exclusively on quantitative analysis.

In nursing theory, Reed's definition of self-transcendence has evolved since 1991; however, the most current formulation is as follows:

the capacity to expand self-boundaries intrapersonally (toward greater awareness of one's philosophy, values, and dreams), interpersonally (to relate to others and one's environment), temporally (to integrate one's past and future in a way that has meaning for the present), and transpersonally (to connect with dimensions beyond the typically discernible world). (2003, p. 147)

Although somewhat lengthy, the definition is thorough, and suggests that an individual's relationships to oneself, to others, to the environment, and to unseen cosmic forces are all influenced by self-transcendence. Therefore, it is hypothesized that a person's ability to experience connectedness in these domains is the extent to which he or she exhibits the trait self-transcendence. Hence, the STS attempts to measure self-transcendence using 15 self-report items that tap these relationships. For example, the STS asks participants to rate on a 4-point Likert scale their current levels of "accepting death as a part of life," and "helping others in some way" (Reed, 1991a, p. 6).

Since the initial development of the Self-Transcendence Scale in 1991, a considerable amount of research has been conducted around self-transcendence and related concepts in nursing (for a detailed review see Coward, 2006; Reed, 2003). The majority of research has focused on sick and elderly populations, in keeping with Reed's original emphasis (e.g., Klaas, 1998; Neill, 2002), and has largely found an inverse relationship between self-transcendence and depressive symptoms. For instance, significant negative correlations have been found between depression and self-transcendence in both middle-aged and older adults (Ellerman & Reed, 2001; Klaas, 1998), as well as negative correlation between self-transcendence and desire for death in elders hospitalized for depression (Buchanan, Farran, & Clark, 1995). Furthermore, in a study of 152 healthy adults ages 19 to 85 (mean age= 46), Coward (1996) found positive correlations between self-transcendence, hope, purpose in life, and cognitive and emotional well-being, suggesting that the construct and assessment may carry over in usefulness to more general populations. (NOTE:

In the context of this article all results cited exhibit at least a $p < .05$ level of statistical significance. Exact values for each are omitted in the interest of textual clarity. Interested readers are encouraged to refer to the original articles listed in the reference section.)

A related theory from gerontology (Tornstam, 1996, 1997) has demonstrated some congruence with Reed's self-transcendence theory. Taking a similar lifespan developmental stance towards aging and transcendence, Tornstam (1996) defined the concept of gerotranscendence thus, "a shift in metaperspective, from a midlife materialistic and rational vision to a more cosmic and transcendent one, accompanied by an increase in life satisfaction" (p. 38). Working from this model, Levenson et al. (2005) devised the Adult Self-Transcendence Inventory. Initial research findings using this assessment have found that self-transcendence as measured by the ASTI exhibits significant negative correlation to neuroticism, and is positively related to meditation practice (Levenson et al., 2005). Furthermore, a recent dissertation which employed the ASTI demonstrated positive correlations between self-transcendence, psychological and subjective well-being, quality of life, and mindfulness (Zappala, 2007).

These theories display some parallels with that of Piedmont (1999), who proposed spiritual transcendence as a sixth factor of human personality, in addition to the five factors as identified by Costa and McCrae's (1992) Five Factor Model (i.e., Openness, Conscientiousness, Extraversion, Agreeableness, and Neuroticism). Piedmont (1999) defines spiritual transcendence as, "the capacity of individuals to stand outside their immediate sense of time and place to view life from a larger, more objective perspective" (p. 988). The construct has been criticized for conflating spirituality, religiosity, and transcendence (Slater, Hall, & Edwards, 2001). However, spiritual transcendence has demonstrated significant positive correlations with forgiveness of others (Leach & Lark, 2004), and effective substance abuse recovery (Piedmont, 2004).

Self-transcendence has also played a role in studying social value orientation (Joireman & Duell, 2005); although in the interest of relevance and space, this research will be left for future discussion. In conclusion, different versions of the concept 'self-transcendence' have been used to frame diverse research questions in various fields. However, more interdisciplinary research on overlap and divergences between models, theories, and measures remains necessary at this time. As a first step in this direction, current findings are reviewed regarding self-transcendence as operationalized by the psychobiological model of temperament and character, and the TCI (Cloninger et al., 1993).

THE PSYCHOBIOLOGICAL MODEL OF TEMPERAMENT AND CHARACTER

Several models have been proposed regarding the structure and development of individual personality (Cloninger, 1987; Cloninger et al., 1993; Costa & McCrae, 1986, 1992). In 1993, Cloninger et al. developed a seven-factor model

of personality known as the psychobiological model of temperament and character. This theoretical framework proposed four temperament factors (harm avoidance, reward dependence, novelty seeking, and persistence), as well as three character dimensions (self-directedness, cooperativeness, and self-transcendence). The distinction between temperament and character is primarily based on differentiated memory systems believed to underlie each.

The four dimensions of temperament were hypothesized to be “automatic, preconceptual responses to perceptual stimuli, presumably reflecting heritable biases in information processing by the perceptual memory system” (Cloninger et al., 1993, p. 977). By this reasoning, temperament was considered a loosely pre-programmed system of behavioral dispositions relative to particular classes of stimuli such as reward or harm, and thereby more likely to be genetically transmitted. In contrast, the three character dimensions were proposed to be concept-based, intentional, and procedural, residing in a distributed “cortico-limbo-diencephalic” memory system (Cloninger et al., 1993, p. 977), and therefore less influenced by genetics than temperament. Research to date, however, has not provided conclusive evidence for the differentiation of temperament and character as measurably distinct constructs (Farmer & Goldberg, 2008a; Maitland, Nyberg, Backman, Nilsson, & Adolfsson, 2009a). Furthermore, the hypothesized differences in heritability between temperament and character have not been supported by genetic research employing the TCI (Ando et al., 2004; Gillespie, Cloninger, Heath, & Martin, 2003; Herbst, Zonderman, McCrae, & Costa, 2000; Kirk, Eaves, & Martin, 1999), points which will be revisited below in more detail.

According to the psychobiological model, character dimensions are related to an individual’s sense of self, conceptualized across three increasingly expansive levels (Cloninger et al., 1993). The first, self-directedness (SD), refers to an individual’s self-concept in relation to oneself, including factors such as purposeful self-regulation, and foresight (Cloninger, 2008). On a broader scale, cooperativeness (CO) deals with the individual in relation to humanity, taking into account a person’s social attitudes and agreeability. Finally, self-transcendence (ST) is concerned with one’s self-concept in relation to the entire cosmos, or “the extent to which a person identifies the self as...an integral part of the universe as a whole” (Cloninger et al., 1993, p. 975).

TEMPERAMENT AND CHARACTER INVENTORY (TCI)

The seven factor psychobiological model of temperament and character has developed in tandem with the Temperament and Character Inventory (TCI), a self-report questionnaire designed to measure these dimensions and their dynamics (Cloninger et al., 1993; Cloninger, Przybeck, Svrakic, & Wetzel, 1994). The TCI was originally designed in English as a 226 item true-false questionnaire with a total of seven dimensions and 29 subscales. It has subsequently been translated into at least 18 different languages (Maitland et al. 2009b), revised to a 240 item version using a 5-point Likert scale (TCI-R; Cloninger, 1999b), and administered for research purposes in a variety of

languages and disciplines (Gutierrez et al., 2001; Kijima, Tanaka, Suzuki, Higuchi, & Kitamura, 2000; Parker, Cheah, & Parker, 2003; Pelissolo & Levine, 2000). The wide proliferation of the TCI in various languages has resulted in considerable data surrounding cross-cultural differences in the manifestation of temperament and character (Farmer et al., 2003; Parker et al., 2003), although it remains unclear the extent to which culture and language influence the assessment of these constructs. The observed relationship between culture, gender, and TCI self-transcendence will be examined in more depth ahead.

As the TCI has evolved, the theoretical foundations of the psychobiological model of temperament and character have been adapted to account for observed data (Cloninger, 1999b, 2008). Although this has served to keep the model grounded in empirical observation (Cloninger, 2000; Svrakic et al., 2002), it has also become a point of contention concerning the theory's frequent reformulations, the variability of TCI forms used in research, and consequent difficulties in producing testable hypotheses (Farmer & Goldberg, 2008b; MacDonald & Holland, 2002). Criticism of the TCI has also been forthcoming regarding the validity of its psychometric structure, and appropriate methods of mathematical analysis (Farmer & Goldberg, 2008a, 2008b; Maitland et al., 2009b). On the latter point, Maitland et al. (2009b) remark, "even within the same data set, different levels of support are found depending on the statistical method used to examine the data and the level of analysis" (p. 83). Hence, different approaches to data analysis have resulted in conflicting readings and appraisals of both the TCI as an assessment, and the psychobiological model as a personality theory. These critiques demonstrate some of the more challenging issues in the interpretation of TCI research in particular, and highlight the still indefinite nature of personality theory and measurement in general. Despite disagreements in the field, the TCI as an assessment has shown adequate internal consistency of scales, high test-retest reliability, and general overall validity, making it a useful and frequently employed tool in personality assessment and psychological research (Brandstrom et al., 1998; Hansenne, Delhez, & Cloninger, 2005; Pelissolo & Levine, 2000).

TCI SELF-TRANSCENDENCE AND SUBSCALES

According to the psychobiological model of temperament and character, "self-transcendence refers generally to identification with everything conceived as essential and consequential parts of a unified whole" (Cloninger et al., 1993, p. 981). This construct was originally hypothesized to develop through three stages measured by three corresponding subscales: self-forgetful vs. self-conscious experience (ST1), transpersonal identification vs. self-isolation (ST2), and (ST3) spiritual acceptance vs. rational materialism (Cloninger et al.). Subsequent revisions have included two additional components of self-transcendence (Cloninger, 1996), namely enlightened vs. objective (ST4), and (ST5) idealistic vs. practical (MacDonald & Holland, 2002). In their analysis of the five-factor TCI self-transcendence scale, MacDonald and Holland (2002) obtained an alpha coefficient of .90 for the overall ST scale and "satisfactory

reliability and adequate convergent and criterion validity as manifested through correlational results with the Expressions of Spirituality Inventory and ANOVA findings involving religious involvement and reported spiritual experience” (pp. 1023–1024). However, current TCI-R forms have returned to the original three-facet model of ST (Cloninger, 1999b).

The psychobiological theory posits a developmental sequence of self-transcendence from ST1 through ST3. Hence, as an individual’s capacity for ST1 self-forgetfulness crystallizes, transpersonal identification (ST2) becomes more accessible, and likewise, as ST2 develops, it forms the basis for ST3, spiritual acceptance. Self-forgetful experience (ST1) is characterized by a state of absorption in external events, and represents the momentary dissolution of self-other boundaries thought to occur during such instances. ST1 is assessed in the TCI with items such as, “Sometimes I have felt as if I was part of something with no limits or boundaries in time or space” (Cloninger et al., 1993, p. 982). Self-forgetful experiences are theorized to lay the groundwork for transpersonal identification. Transpersonal identification refers to a relatively steady sense of unity with objects outside the individual self (Cloninger et al.), as opposed to more fleeting occasions of self-forgetfulness. One example of an item in the TCI transpersonal identification subscale is, “I sometimes feel so connected to nature that everything seems to be part of one living organism” (Cloninger et al., 1993, p. 982). High scores on the ST2 subscale in particular have demonstrated significant correlations with some forms of psychopathology (Anderson, Carter, McIntosh, Joyce, & Bulik, 2002; Birt, Vaida, & Prelipceanu, 2006), a point which will be examined further ahead.

As transpersonal identification is integrated into the personality, a sense of spiritual acceptance (ST3) is purported to develop. Spiritual acceptance is defined as a stable shift in worldview towards belief in forces that cannot be rationally comprehended or objectively proven. The spiritual acceptance vs. rational materialism (ST3) subscale contains items such as, “Sometimes I have felt my life being guided by a spiritual force greater than any human being” (Cloninger et al., 1993, p. 982). The ST3 subscale in particular has demonstrated substantial correlation with genetic factors related to the dopaminergic and serotonergic systems, raising questions about the role of heritability and neurotransmitters in spiritual acceptance (Borg, Andree, Soderstrom, & Farde, 2003; Comings, Gonzales, Saucier, Johnson, & MacMurray, 2000; Lorenzi et al., 2005; Nilsson et al., 2007). Although TCI self-transcendence is proposed to develop through these three stages, the psychobiological model of temperament and character does not explicitly specify when such shifts are expected to occur. The overall development of character, however, has been further elaborated upon (Cloninger, Svrakic, & Svrakic, 1997; Svrakic, Svrakic, & Cloninger 1996), and will be reviewed ahead.

PSYCHOMETRIC PROPERTIES

The original TCI self-transcendence scale includes 11 items for ST1, nine items for ST2, and 13 items for ST3 subscales, with a total of 33 True/False items

producing a range of scores from 0 to 33 (Cloninger et al., 1993). In the more recent TCI-R (Cloninger, 1999b), ST has been shortened to 26 items rated on a 5-point Likert scale (10 items for ST1, 8 items for ST2, and 8 items for ST3), though retains the same three-facet structure of the original formulation. A recent study of the TCI-R found alpha coefficients of .90 for the overall revised ST scale, .79 for ST1, .77 for ST2, and .90 for ST3, demonstrating adequate to high internal consistency (Farmer & Goldberg, 2008a), although for the purposes of the present discussion the original 33 item ST scale which has been used most often in research (Cloninger et al., 1993; Maitland et al., 2009a) will be employed unless otherwise noted.

The TCI self-transcendence scale has manifested as one of the most variable personality dimensions across individuals (Cloninger et al., 1993), and demonstrates more stability over time than self-direction, cooperativeness, novelty seeking, harm avoidance, reward dependence, and persistence (Brandstrom et al., 1998). Administering the TCI to a sample of 300 Americans from the general population, Cloninger et al. (1993) found high internal consistency for ST and adequate internal consistency for its three subscales, with a Cronbach's alpha of .84 for the overall ST scale, and alpha ranging from .72 to .74 for the subscales. In another recent study, conducted by Akyalcin et al. (2008) with a sample of 233 Australian individuals, ST again exhibited an internal consistency of .84, though subscales ST1 and ST2 obtained slightly lower alpha measures of .63 and .67 respectively, while ST3 obtained a somewhat higher internal consistency measure of .83.

RECIPROCAL INFLUENCE AND DEVELOPMENT

From a developmental standpoint, Svrakic, Svrakic, and Cloninger (1996) remark that character "matures in a stepwise manner in incremental shifts from infancy through late adulthood" (p. 251). This does not, however, imply a fixed schedule of personality development, as the three character dimensions, four temperament dimensions, environment, culture, and life experience interact with reciprocal influence throughout the lifespan, following nonlinear dynamics (Cloninger, Svrakic, & Svrakic, 1997; Svrakic et al., 1996). Therefore, different temperamental dispositions will develop along different trajectories and be subject to the effects of sociocultural learning and random events that cannot be predicted beforehand (Cloninger et al., 1997).

According to their analyses of TCI data and mathematical modeling of average childhood personality development, Svrakic et al. (1996) proposed that self-transcendence emerges first in imaginative tendencies and fantasy play (2–5 years), followed by cooperativeness in conforming to social norms (6–12 years), and finally self-directedness materializes as autonomy forms (13+ years). Again, this is meant to describe a general tendency in development through adolescence, assuming neutral (as opposed to extreme) temperament and environmental conditions.

Regarding adult development, Cloninger (1999a) suggested a model of optimal character development whose projected endpoint is high self-directedness, high cooperativeness, and high self-transcendence. This character subtype is labeled “creative,” and has been found to be associated with significantly higher levels of subjective wellbeing and fewer instances of mental disorder (Cloninger, Bayon, & Svrakic, 1998). Citing TCI data from 804 individuals in the general population, Cloninger noted, “what is objectively clear is that high self-transcendence, when combined with high self-directedness and cooperativeness, is associated with optimal happiness” (1999a, p. 181). Furthermore, high TCI self-transcendence is considered psychologically adaptive in old age as issues of mortality and loss inevitably arise (Cloninger et al., 1993), in agreement with Reed’s (1991b; 2003), and Tornstam’s (1996) formulations of self-transcendence.

CULTURAL DIFFERENCES

As the TCI has been translated and administered across a wide variety of populations and nationalities, some findings pertaining to the cultural nature of self-transcendence have been forthcoming (Farmer et al., 2003; Parker et al., 2003). For instance, in a sib-pair study conducted in Wales with a population of 108 depressed individuals and their closest aged siblings, and 105 healthy control subjects and their closest aged siblings, Farmer et al. (2003) found both depressed and healthy Welsh subjects yielded significantly lower mean scores of 12.35 on TCI self-transcendence than American population samples with a mean of 19.2. These findings await further replication, however, as normative studies in Spanish and Swedish populations have not shown significant differences in TCI scores when compared to American populations (Brandstrom et al., 1998; Cloninger et al., 1993; Gutierrez et al., 2001).

Regarding sex differences in self-transcendence, Farmer et al. (2003) found that women tended to score significantly higher on TCI self-transcendence than men. These results are generally in accord with the findings of Cloninger et al. (1993) which exhibited significantly higher scores for the ST3 subscale among women in a normative American population sample; Kirk et al. (1999), which found significantly higher TCI self-transcendence scores in Australian women over 50 as opposed to men in the same age group; and MacDonald and Holland (2002), who obtained similar results in a sample of 376 undergraduate students. On the other hand, Parker et al. (2003) found that males scored markedly higher on TCI self-transcendence among a sample of 535 nonpsychiatric Chinese Malaysians. Also, in a sample of 617 Japanese twin pairs aged 15 to 30, Ando et al. (2004) found that males scored significantly higher on subscale ST2 and females scored significantly higher on subscale ST1. It is important to note that observed gender differences in ST most likely reflect both biological and cultural influences, with no simple methods of disambiguating the two. Nevertheless, these results suggest the possibility of substantial cultural, national, and gender variability in the expression of self-transcendence, in addition to a demonstrably significant genetic basis to which we will now turn our attention (Farmer et al., 2003; Kirk et al., 1999).

GENETIC INFLUENCE

A great deal of genetic research has been conducted in conjunction with TCI personality measures (Ando et al., 2004; Comings et al., 2000; Comings, Gade-Andavolu, Gonzales, Wu, Muhleman, Blake et al., 2000; Gillespie et al., 2003; Kirk et al., 1999). In a study of Australian twins over age 50, measures for physical and psychological wellbeing and TCI self-transcendence scales were administered (Kirk et al., 1999). No significant results were found between self-transcendence and health or wellbeing. However, by analysis between scores of monozygotic and dizygotic twin pairs, additive genetic effects were found to account for approximately 37% of self-transcendence in men, and 41% in women. This is a substantial genetic effect considering that the original psychobiological model of temperament and character hypothesized character traits such as self-transcendence to be only weakly heritable, and more a product of insight learning and environmental influences (Cloninger et al., 1993). In keeping with such results, Cloninger (2004) has rejected the originally hypothesized differences in heritability between temperament and character.

In another genetic study conducted with a sample of 2517 Australian twins over age 50, Gillespie et al. (2003) obtained similar results. TCI self-transcendence was calculated to be approximately 45% heritable and overall no significant differences in heritability were observed between temperament and character dimensions (Gillespie et al., 2003). In fact, additive genetic effects were calculated to account for 30 to 41% of total temperamental variance and 27–44% of overall character variance. Furthermore, in keeping with the seven-dimensional psychobiological model of temperament and character, seven genetic factors were required to account for observed genetic variance in personality (Gillespie et al.).

Contributing to the relevant research in this area, Ando et al. (2004) performed a multivariate genetic analysis on a sample of 617 adolescent and young adult twins from Japan. While their results regarding the average heritability of temperament and character (34% and 38% respectively) are in agreement with the data presented above, multivariate genetic analyses derived four genetic and three nonshared environmental factors, as opposed to the seven genetic factors obtained by Gillespie et al. (2003). There is an important distinction to be made here, though, regarding methodological avenues of approach. In the Australian study described above, Gillespie et al. (2003) work from a forward genetics paradigm, beginning with observed phenotypic variation in personality, and relating these back to genetic structure (McClearn & Vogler, 2001). On the other hand, Ando et al. (2004) employ a backward genetics perspective:

[u]sing the degree of common genetic influence to redevelop scales is a “bottom-up” approach that allows biology to define the personality phenotype, and is a departure from the usual “top-down” approach that accepts existing phenotypes and does little more than determine their heritability. (p. 381)

Hence, using genetic data as the basis of their investigation, Ando et al. obtained results which are not fully congruent with the seven factor model described by Cloninger et al. (1993) and Gillespie et al. (2003), and propose a rearrangement of TCI scales into four genetic and three nonshared environmental factors to account for observed variance. Such methodological quandaries are not only reflective of the complexity of the information at hand, but are also reminiscent of the conflicts raised above between different approaches to data analysis in TCI psychometric research (Maitland et al., 2009b).

In regards to the self-transcendence character dimension, its three subscales were found to be genetically and environmentally cohesive, meaning that all ST items were correlated to either one environmental or one genetic factor, demonstrating the construct's overall integrity (Ando et al., 2004). Self-transcendence did however exhibit some shared genetic homogeneity with other character and temperament dimensions, including positive correlation with the sentimentality facet of reward dependence, and negative correlations with responsibility and self-acceptance subscales from the self-directedness measure, suggesting a genetic link between these qualities and self-transcendence (Ando et al.). In terms of environmental factors, self-transcendence and its three subscales loaded as a discrete factor when combined with cooperativeness, persistence, and sentimentality, suggesting that these facets of personality develop interdependently through interaction with environmental influences (Ando et al.).

Although highly complex dynamics and some conflicting data have been obtained thus far, future research in the fields of quantitative and molecular genetics will continue to inform personality theory on the role of genes and environment in the expression and structure of observable personality traits (Cloninger, 1999a; Ebstein, 2006). Regarding the TCI and genetics, Ebstein (2006) pointed out the inherent limitation of self-report questionnaires in determining the molecular genetic architecture of complex traits, and suggested the inclusion of interdisciplinary experimental paradigms including evoked potential and prepulse inhibition designs. As technology and methodologies have evolved, so has our understanding of genetic structure and its influence on personality. Cloninger (1999a, p. 176) remarked that research has shifted away from searching for single genes with linear, causal relationships to phenotypic traits of interest, and towards “searches for multiple genes with small to moderate effects that interact with one another and environmental influences.”

SELF-TRANSCENDENCE, MOLECULAR GENETICS, AND THE BRAIN

A number of studies have shown significant association between the expression of self-transcendent qualities as measured by the TCI, and monoaminergic gene alleles. Hamer (2004) found a moderate association between ST scores and the VMAT 2 gene, which encodes a membrane protein called vesicular monoamine transporter 2 (VMAT2). VMAT2 encapsulates and transports monoaminergic neurotransmitters in the brain, such as dopamine, serotonin,

and norepinephrine. According to these findings, individuals whose DNA included the genetic polymorphism A33050C on chromosome 10 scored significantly higher on self-transcendence. Hamer commented, “while this one gene might not make one a saint, a prophet, or a seer, it was enough to tip the spiritual scales and predispose one toward spirituality” (2004, p. 74). Other genes have also been found to effect self-transcendence, including those influencing the 5-HT1A, 5-HT2A, 5-HT6, and Dopamine D4 receptors (Comings, Gonzales et al., 2000; Ham et al., 2004; Lorenzi et al., 2005).

In a study examining the role of 59 candidate genes in the expression of TCI personality traits, Comings, Gade-Andavolu et al. (2000), performed a multivariate genetic analysis of 204 male subjects, 81 of whom were college students, and 123 individuals from an addiction treatment unit. Participants were administered the TCI, and DNA samples were collected. Significant correlations were found between TCI self-transcendence scores and DRD4, GABRA1, CD4, and AR genes at $p \leq 0.01$, and 16 additional genes at $p \leq 0.05$. Hence, in line with Cloninger’s (1999a) above remark, no one gene wholly accounts for the expression of self-transcendent character traits, though many have demonstrated significant association with ST.

In a follow up study using the same sample of male subjects cited above, Comings, Gonzales et al. (2000) genotyped participants for Dopamine receptor D4 (DRD4) gene alleles. Significant positive correlations were found between the DRD4 gene and TCI self-transcendence scores, and particularly with subscale ST3, spiritual acceptance. These results must be interpreted with caution however, as the relationship between the DRD4 gene, cortical Dopamine D4 receptor density, levels of dopaminergic activity, and self-transcendence are still unclear at this time (Comings, Gade-Andavolu et al., 2000; Comings, Gonzales et al., 2000). In conclusion, Comings, Gade-Andavolu et al. remark:

We were intrigued by the considerable role of dopamine genes, and the *DRD4* gene in particular, in spiritual transcendence. Dopamine receptors, including the D4 receptor, play an important role in the function of the prefrontal cortex. Spirituality may especially utilize the prefrontal cortex and thus predominantly utilize dopaminergic systems. (2000, p. 382)

Regarding the serotonergic system and associated genes, some significant results have been noted in association with the self-transcendence character dimension, and the spiritual acceptance ST3 subscale in particular (Borg et al., 2003; Lorenzi et al., 2005; Nilsson et al., 2007). For example, in a study conducted by Ham et al. (2004) in a sample of 146 healthy Korean adults, significant relationships were found between self-transcendence scores and two gene alleles related to the serotonergic system. Specifically, ST scores were correlated with the 5-HT2A receptor A-1438G genotype, and the 5-HT6 receptor C267T genotype (Ham et al., 2004). Along similar lines, Lorenzi et al. (2005) recently conducted a genetic study of 5-HT1A genes with a sample of 40 remitted mood disorder patients. Results found that individuals carrying a specific genotype (5HT1A C/C) scored significantly lower on self-transcendence.

dence overall, as well as subscales ST2 and ST3. These findings suggest a significant role for serotonin, and 5HT1A receptors in particular, relative to the manifestation of self-transcendence.

Neuroimaging studies have also added to the body of knowledge surrounding serotonin and self-transcendence (Borg et al., 2003). In their study of personality traits and 5HT1A receptor density, Borg et al. administered the TCI in conjunction with positron emission tomography (PET). Examining a sample of 15 normal male subjects in Sweden, mean age 27, results exhibited significant correlations between scores for subscale ST3 and 5-HT1A binding potential in the dorsal raphe nuclei, the hippocampal formation, and the neocortex (Borg et al., 2003). More specifically, higher scores on spiritual acceptance were found to be accompanied by lower density of 5-HT1A receptors in the above-mentioned serotonergic cortical projection areas (Borg et al.). Whether these results indicate more or less serotonergic activity in the specified brain regions is not entirely clear, though a genetic study of TCI dimensions by Nilsson et al. (2007) may offer some insight.

In their study of the genetic correlates of personality dimensions in 200 Swedish adolescents, Nilsson et al. (2007) found significant correlations between self-transcendence scores and the presence of two functional polymorphisms affecting the serotonergic system. Furthermore, in both cases, the entire basis of correlation was found to be the spiritual acceptance (ST3) subscale of the self-transcendence measure. Taking this data into account, Nilsson et al. concluded:

both the serotonin and the dopamine systems are involved in the expression of TCI Spiritual Acceptance and Self-Transcendence in boys and girls... Thus, homozygosity for the long 5-HTTLPR gene allele, as well as presence of the short AP-2 β intron 2 allele contributes to the development of a large central serotonin system associated with high scores on Spiritual Acceptance. (2007, p. 236)

Neuroimaging data on elderly populations have contributed additional insight on ST and aging. In their study of personality and brain structure in the elderly, Kaasinen et al. (2005) administered the TCI to 42 healthy adults, mean age, 59.5 years. These scores were compared with structural MRI data for each of the subjects, and voxel-based morphometry (VBM) was conducted to calculate the regional proportions of grey matter (GM), white matter (WM), and cerebrospinal fluid (CSF) in each person's brain. Citing Ashburner and Friston (2000), Kaasinen et al. define VBM as "an objective analysis method based on spatial normalization of MR [Magnetic Resonance] images, segmentation of the images to grey matter, white matter, and cerebrospinal fluid segments, modulation, smoothing, and voxel-level statistical testing" (2005, p. 316).

These imaging results showed age related losses of GM volume in the frontal, temporal, and parietal regions. The only significant correlations between VBM and TCI data were found in relation to self-transcendence and GM volume in

bilateral temporal areas. Specifically, higher scores on self-transcendence correlated positively with relative GM volume in the left frontotemporal and right parietotemporal regions. Because these regions showed general age-related losses in the study sample, Kaasinen et al. remarked, “the results can be interpreted to indicate a relationship between self-transcendence and the preservation of GM in aging” (2005, p. 320).

SELF-TRANSCENDENCE, SPIRITUALITY, AND RELIGION

The relationship between TCI self-transcendence, religion, and spirituality has proven to be complex and multifaceted (Eurelings-Bontekoe, Hekman-Van Steeg, & Verschuur, 2005; Greenway, Phelan, Turnbull, & Milne, 2007; MacDonald & Holland, 2002). In their study of 376 undergraduate students using Cloninger’s (1996) five-factor TCI self-transcendence scale, MacDonald and Holland (2002) found significant correlations between self-transcendence scores and religious involvement, where participants who self-reported active involvement in a religion scored higher than those with no religious involvement. Also, subjects who reported having had a spiritual experience scored significantly higher on TCI self-transcendence than those who had not had such an experience (MacDonald & Holland, 2002).

In their study on personality, attachment, psychological distress, church denomination, and God concept conducted with a non-clinical sample of 208 churchgoing individuals in the Netherlands (mean age= 40.1), Eurelings-Bontekoe et al. administered a battery of psychometric assessments to 89 members of the Pentecostal church and 119 Orthodox Reform Christians. Results showed that both males and females from the Pentecostal church scored significantly higher on TCI self-transcendence, reported more positive feelings towards God, and perceived God as more supportive and less punitive than Orthodox Reform Christians (Eurelings-Bontekoe et al.). Many factors are taken into account here, and no direct lines of causality can be clearly distinguished, though Eurelings-Bontekoe et al. noted:

persons with a secure and dismissive attachment style, who are reward dependent, persistent, cooperative and self-transcendent hold positive feelings towards God and/or perceive God’s actions as supportive, irrespective of whether the level of psychological distress is high or low. (2005, p. 149)

In a similar study, Greenway et al. (2007) administered a battery of psychometric assessments related to transcendence, spirituality, and religious coping strategies, including the TCI self-transcendence scale, to a sample of 190 practicing Christians in Australia. They found that “perceiving that God cares for one and the use of positive coping strategies largely predicted self-transcendence” (Greenway et al., p. 331). Although these findings seem to be in general agreement with those of MacDonald and Holland (2002), the consideration of religious denomination, and perception of God add an additional layer of subtlety to the discussion, and illustrates the complex

dynamics of multiple factors surrounding personality, spirituality, self-transcendence, and religiosity.

SELF-TRANSCENDENCE AND PSYCHOPATHOLOGY

Empirical evidence has demonstrated a significant relationship between high scores on TCI self-transcendence and some aspects of psychopathology, including dysthymic disorder (Birt et al., 2006), self-harming behavior in individuals with bulimia nervosa (Anderson et al., 2002), and personality disorders (Svrakic et al., 2002). Furthermore, TCI self-transcendence has recently been found to be positively correlated with cannabis abuse and dependence in an Italian sample (Spalletta, Bria, & Caltagirone, 2007).

In a Romanian study comparing 41 patients with dysthymic disorder and 350 control subjects, dysthymic individuals scored significantly higher on TCI self-transcendence than control subjects (Birt et al., 2006). With regard to temperament, harm avoidance was also significantly higher and persistence scores were lower in dysthymic patients. In a study of 152 women suffering from bulimia nervosa, TCI data was collected and participants were assessed regarding non-lethal self-harming behavior (i.e., skin cutting, burning), and suicide attempts (Anderson et al., 2002). Results showed that in bulimic individuals with suicide attempts, TCI scores for harm avoidance and persistence were significantly higher and lower, respectively; similar to the personality profiles found in dysthymic patients described above. Furthermore, in bulimic women who exhibited self-harming behaviors with non-lethal intent, self-transcendence scores were significantly higher, particularly in relation to subscale ST2, transpersonal identification.

In a study of 84 male Italian cannabis users, Spalletta et al. (2007) administered a psychometric battery including the TCI and State-Trait Anxiety Inventory. Patterns of cannabis use were subdivided into occasional use, abuse, and dependence based on diagnostic criteria set forth in the DSM-IV. Results found that increased self-transcendence scores and elevated levels of state anxiety were significantly associated with more severe cannabis use (Spalletta et al., 2007). Also, multivariate analysis of variance showed scores on the transpersonal identification subscale ST2 to be significantly positively correlated with severity of cannabis use (Spalletta et al.).

Taken as a whole, the above presented data sample seems to suggest certain observable personality patterns associated with particular psychopathological conditions, with implications for etiology and treatment (Svrakic et al., 2002). Although these results are not entirely generalizable due to the heterogeneity of the sample populations and symptomatology under consideration, some parallels may potentially be drawn. For example, what if any, is the relationship between cannabis dependence in men and non-lethal self-harming behavior in bulimic women, which both demonstrate positive correlations with transpersonal identification (ST2) scores? Such questions clearly indicate potential avenues for future research.

According to Tart “our paradigmatic commitments, our SoC’s [states of consciousness], make us likely to observe certain parts of reality and to ignore or observe with error certain other parts of it” (1972, p. 1205). Therefore, the relative dearth of material in Western developmental theory regarding transpersonal phenomena such as self-transcendence may be due at least somewhat to state-specific communication, the inability to successfully communicate between distinct (non-overlapping) states of consciousness (Tart, 1972; Wade, 1996). In other words, self-transcendence itself may be difficult to express and conceptualize through rational, analytic, or mathematical avenues of approach. Such issues remain problematic in the face of scientific (i.e., materialist) insistence on particular forms of data, which are not readily translatable between the measurement and experience of self-transcendence. Addressing this issue, MacDonald and Friedman remark,

the best way of understanding or knowing an experience or state of consciousness is to experience it oneself, any attempt to either communicate that to another or, indeed, to internally process that experience with conceptual thought is bound to be at least somewhat reductionistic.... [However] humanistic and transpersonal psychologies are not exclusively concerned with experience. (2002, p. 105)

Therefore, it is suggested that the development and standardization of refined psychometric assessments, such as TCI self-transcendence, would be helpful in quantifying the nature of transpersonal states and stages of development as accurately as possible (MacDonald & Friedman, 2002). Furthermore, by integrating this psychometric data with other scientific evidence including neurological and molecular genetic analyses, we may come to a more complete understanding of the nature of self-transcendence, and of human nature in general.

The complexity of the results under review is indicative of the early stages of integration between quantitative and qualitative data in which researchers and theorists are currently engaged. Certain elements of experience (e.g., transpersonal identification) are being tentatively linked to particular genetic structures, neurotransmitter systems, brain morphology, and psychopathological profiles. However, the exact nature of the relationships between self-transcendence as an experiential process, ST as a measured trait, and any biological, anatomical, developmental, and psychological correlates is vague for the time being. No direct lines of causation can be confidently inferred. Nevertheless, the detection of measurable neurophysiological and genetic correlates to TCI self-transcendence suggests a possible newfound validity for the construct insofar as it displays both observable physical components as well as broadly identifiable subjective dimensions.

This article highlights the empirically observable features of self-transcendence as measured by the TCI; further exploration of self-transcendence as a subjective experience is warranted at this time. The author does not take the

stance that the scientific, materialist data presented here provide indisputable proof for the reality of self-transcendence as a psychological construct or developmental process. However, from a pragmatic standpoint, any observable correlates in physical systems such as the brain or DNA deserve careful examination, as they offer researchers, theorists, and clinicians a broader base of information to work with. This does not presuppose the superiority of empirical, rational explanations, though it does acknowledge that these frameworks help clarify what abstract concepts such as transcendence might refer to, and provide useful referents in the form of shared, concrete terminology with which to discuss and deepen our shared understanding, an endeavor which lies at the heart of academic research. So although scientific observations may not be of particular interest to those who have directly experienced self-transcendence, such data have ultimately been gathered and reviewed here in an attempt to answer Maslow's call to "give more detailed meaning to the word self-transcendence" (1966, p. 112).

CONCLUSION

Some objections have been raised regarding factor structure of TCI scales (Farmer & Goldberg, 2008a; Maitland et al., 2009b), the use of different forms of the TCI, (MacDonald & Holland, 2002), and the inherent limitations of self-report questionnaires (Ebstein, 2006). Furthermore, MacDonald and Holland (2002) have suggested the revision of self-transcendence subscales to correspond with a four factor model derived from factor analysis, which includes spiritual and religious beliefs, unifying interconnectedness, belief in the supernatural, and dissolution of self in experience. These issues should not be overlooked when examining TCI research. Nevertheless, the TCI and its self-transcendence subscale have yielded a rich body of information surrounding this particular conceptualization of self-transcendence. A great deal of empirical research has been presented surrounding TCI dimensions in general, and self-transcendence in particular. Data from a variety of fields have helped to flesh out the construct and determine its mutual interrelatedness with diverse factors including human neurotransmitter systems (Borg et al., 2003), molecular and quantitative genetics (Gillespie et al., 2003; Nilsson et al., 2007), neuroanatomy and aging (Kaasinen et al., 2005), spirituality and religion (Greenway et al., 2007; MacDonald & Holland, 2002), cultural differences (Farmer et al., 2003), and psychopathology (Svrakic et al., 2002).

In light of this evidence, self-transcendence has emerged as a complex but quantifiable construct of the utmost relevance to psychology, including but not limited to humanistic and transpersonal paradigms. Future research using TCI self-transcendence scales in conjunction with other related measures such as Reed's (1991a) Self-Transcendence Scale from nursing theory, and Levenson et al.'s (2005) Adult Self-Transcendence Inventory may help shed light on some of the more problematic elements regarding the overall construct and its factor structure. Furthermore, inclusion of qualitative and mixed methodologies would be useful in examining participants' lived experience of self-transcendence (e.g., Coward, 1995; Reed, 1991), an issue which is largely overlooked in

TCI self-transcendence research. Deeper exploration into the distinction between self-transcendence as a temporary experiential state, and self-transcendence as a stable structure in personality, and the relationship between the two is clearly needed. However, continuing to engage multiple disciplines and types of data will encourage the integration of diverse definitions of self-transcendence and ultimately benefit our understanding of this construct and its components from a variety of perspectives.

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