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# Virtues in action are related to the integration of both temperament and character: Comparing the VIA classification of virtues and Cloninger's biopsychosocial model of personality

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## ABSTRACT

Evidence supports three principal virtues of Self-Control, Caring, and Inquisitiveness that represent socially-constructed notions of desirable behaviors. In Study 1 ( $n = 509$  adults), we demonstrate that the three-virtue structure identified in the VIA-IS also emerges in the VIA-72. In Study 2 ( $n = 659$  adults) we examine the relationship between virtues and personality using correlations and person-centered analyses. Cloninger's character dimensions, which capture the sociocognitive component of personality – Self-Directedness, Cooperativeness, Self-Transcendence – showed moderate overlap with the three virtues, but remained distinct in its silent and subjective transpersonal aspects that were excluded from VIA. People with positive development of all three character traits were the most virtuous. The specific virtues of a person depended on integrated profiles of both temperament and character. We conclude that virtues are expressed when habits are persistently regulated by all three character traits to the extent that they express self-transcendent goals and values.

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A key aim of Positive Psychology is to develop our understanding of positive personality traits and how they help foster health, wellbeing, and overall positive functioning (Seligman & Csikszentmihalyi, 2000). Arguably, two of the most productive tools for generating research toward this goal has been Peterson and Seligman's (2004) Virtues-In-Action (VIA) Inventory of character strengths and virtues and Cloninger's Temperament and Character Inventory (TCI) (Cloninger, 2004; Cloninger et al., 1993). They share the goals of measuring reliable individual differences in personality traits that can be intentionally cultivated so that a person's life flourishes in terms of personal and social aspects of well-being, but have not previously been systematically compared. Both are evidence-based, but differ in the way their component traits were identified, measured, and validated. Therefore, it is useful to briefly summarize key features of the VIA and TCI to interpret their comparison.

Peterson and Seligman (2004) chose not to provide general definitions of character or virtue to guide their development of the VIA model. Rather they selected 24

distinct personality traits from those that had been proposed to be natural units for assessing the strengths or virtues described by moral philosophers and religious thinkers in multiple cultures. Their selection was based on 10 review criteria related to content, measurement, and development. In terms of content, the traits were expected to contribute to a happy and good life, i.e., to fill the life of the individual with satisfaction and meaning, to be morally valued in its own right, and not to diminish others when displayed. The opposite of the strength was expected not to be so felicitous. In terms of measurement, strengths were measured as behavioral traits that are stably manifest across many situations, are distinguished from other strengths, and are represented by the behavior of paragons (prototypic exemplars). In terms of development, each strength was regarded as a behavioral trait that could be cultivated and acquired in ways provided by society (i.e., without necessarily invoking any higher or divine power). Although not necessary for all strengths, some people were prodigies for that strength whereas others failed to develop it at all. Thus the character strengths of the VIA model are

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behaviorally defined traits that are presumed to be acquired by learning in a social context. However, genetic, biological, or the subjective experience of transcendent influences on variability in predisposition to character strengths were not excluded.

Arguably, these criteria represent a secular and cognitive-behavioral view of character strengths that is tolerant but skeptical of the religious or spiritual ideas of many people who have described them (Cloninger, 2005). For example, a wise perspective is measured by self-reports of having a mature view of life and being described by others as wise. Consequently, the advice columnist Ann Landers was chosen by Peterson and Seligman (2004) as a paragon of a wise perspective because she offered useful advice to others about everyday life.

Likewise, spirituality (religiousness) is measured in VIA by self-reports of being spiritual, practicing 'my religion', and identifying with 'my faith'. Such statements do not distinguish between spirituality based on transpersonal experiences and religiousness based on conformance to dogma favored by a person's family and other socio-cultural influences. However, its paragon, a charismatic and caring Baptist minister, reported experiences of God and prophetic dreams that she said resulted in her speaking in tongues and eventually committing herself to a vocation of prayer and service to others.

Subjective experiences are sometimes self-reported in VIA items (e.g., 'I experience deep emotions when I see beautiful things', 'I awaken with a sense of excitement about the day's possibilities', 'I enjoy being kind to others'). Usually, subjective processes are simply implied by reported behaviors (e.g., 'Others call me wise', 'I have a great sense of humor') or assertions about identity (e.g., 'Faith is important to who I am') without having to specify what is meant by wisdom, faith, or a sense of humor in terms of the underlying processes of learning and understanding that occur within the person.

Hence VIA items are highly focused on behavioral acts and experiences of daily living. Furthermore, there is a reliance on external settings to shape change in the predispositions that a person brings to learning in that setting: 'We rely on the new psychology of traits that recognizes individual differences that are ... shaped by the individual's setting and thus capable of change' (Peterson & Seligman, 2004, p. 10) and the 'larger society provides institutions and associated rituals for cultivating strengths and virtues' (Peterson & Seligman, 2004, Criterion 10, p. 27). Their appreciation of the importance of person-situation interactions is reasonable and does not itself exclude a potential role for growth in virtue and well-being by practicing rituals for mindfulness or contemplation. However, silence, including the silencing

of the analytical intellect, was rejected as a strength in VIA because its authors opined that silence was a 'characteristic not valued across all cultures' (Peterson & Seligman, 2004, p. 15). This decision reflects the authors' behavioral-intellectual perspective, which may be popular among academics in secular societies, but is scientifically doubtful: all populations of *Homo sapiens* have valued their quiet sages, like the narrative artists who created the beautiful and inspired cave paintings of Lascaux over 40,000 years ago (Zwir et al., 2019, 2021). Historically, most, if not all, cultures have valued having at least a minority of their members as contemplative seekers of insight, even those with little education or those who sought silence and solitude as hermits (Cloninger, 2004; Keady, 2011). Experimentally, the brain network for self-awareness is activated specifically when a person lets go of attention to effortful control of external tasks (i.e., enters a default mode in which brain metabolic activity actually increases) (Zwir et al., 2019, 2021). Such brain activation in silence frees a person to become intuitively aware of internal inspirations from the subconscious without use of effortful and logical analysis by the intellect. Silence is typical of states of creative insight, which is expressed behaviorally in acts of improvisation and flow, and in self-transcendent experiences of the universal unity of being in contemplation (Cloninger, 2004). Consequently, the VIA classification of strengths is likely to be restricted in its description of strengths and its ability to account fully for the role of Self-Transcendence in the development of strengths and virtues because it excludes a key capacity for human learning in silence.

Peterson and Seligman (2004) grouped the 24 strengths they identified to form 6 virtues in action; that is, behavioral manifestations of virtues in daily life. The six virtues in action and their constituent strengths were Wisdom and Knowledge (creativity, curiosity, judgment, love of learning, perspective), Courage (bravery, perseverance, honesty, zest), Humanity (love, kindness, social intelligence), Justice teamwork, fairness, leadership), Temperance (forgiveness, humility, prudence, self-regulation), and Transcendence (appreciation of beauty, gratitude, hope, humor, spirituality). This and alternative groupings will be discussed in detail in the following section.

In contrast, the TCI was developed by Cloninger in three stages (Cloninger, 1986, 1987; Cloninger et al., 1993, 1997). Cloninger adopted a developmental and evolutionary perspective that has enabled him to show that human personality depends on three distinct systems of learning and memory: associative conditioning, intentionality, and self-awareness (Cloninger, 1994, 2009; Zwir et al., 2021). These evolved sequentially and

are partially dissociable, but function in a cooperative and integrative manner under conditions that promote physical, mental, and social well-being (Cloninger et al., 2019; Zvir et al., 2021). Personality is defined as the organization within the individual of the biopsychosocial processes by which a person shapes and adapts to an ever-changing internal and external environment. The TCI is thus focused on measuring learning processes within individuals over a wide range of conditions, rather than measuring fixed traits. Nevertheless, all the TCI traits are meta-stable, as are those of the VIA; that is, the traits of the TCI and the VIA have strong stability in most people except under special conditions that promote plasticity and re-integration (Cloninger et al., 1997).

First, a model of temperament was developed in terms of associatively conditioned habits and irrational emotional drives that humans share with other animals and which are moderately heritable and stable across the life span, although they can be modified by life experiences and behavioral conditioning (Cloninger, 1987; Cloninger et al., 2019; Zvir et al., 2020b). The TCI measures four temperament dimensions that have been empirically confirmed by neurobehavioral studies, functional brain imaging, and genomics to quantify individual differences in associative conditioning and related human habitual behaviors: Harm Avoidance (i.e., fearful, pessimistic vs. risk-taking, optimistic), Novelty Seeking (i.e., impulsive, exploratory (curious) vs. deliberate, reserved), Reward Dependence (i.e., friendly, sentimental vs. detached, objective), and Persistence (i.e., determined [persevering], ambitious vs. easily discouraged, underachieving). Each temperament has four subscales reflecting responses of the person in different situations. Both behavioral and subjective aspects were considered because the model is intended to measure the learning process within the individual, not just observable differences in behaviors between persons. Nearly all the heritability for temperament has now been explained by clusters of over 400 genes in multiple countries with different cultures and environments (Cloninger et al., 2019). The genomic findings show that the genes for these temperament dimensions code for different configurations of the four temperaments, rather than the individual dimensions which are distinguished by the conditioning external stimulus (Cloninger et al., 2019).

Second, character scales were added to the TCI to measure the rational self-regulatory domain of personality when it became clear that a person with any temperament profile can learn to function at either high or low levels of well-being (Cloninger et al., 1993). Character was defined as what people make of themselves intentionally and/or creatively (Kant, 1797; Zvir

et al., 2020a). Three dimensions of character were identified that were not explained by TCI temperament traits, matured in a stepwise manner into adulthood, and influence personal and social effectiveness (Cloninger et al., 2019, 1993). As a model of mental self-government (Cloninger, 2004), executive functioning is measured as TCI Self-Directedness with subscales for being resourceful, purposeful, self-accepting, responsible, and self-actualizing. Legislative functioning is measured as TCI Cooperativeness with subscales for being tolerant, helpful (kind), empathic, principled (fair), and compassionate (forgiving). Judicial functioning is measured as TCI Self-Transcendence (i.e. insight in appraisal of values and theories allowing intuitive awareness of participation in something greater than the individual self) with subscales for idealism (i.e., valuing ideals like truth, goodness, moderation more than consumption and material possessions), self-forgetfulness (i.e., absorbed in state of spontaneity and flow without self-preoccupation), transpersonal identification (i.e., oceanic feelings, joyful peak experiences, sense of union with humanity, nature, or God), contemplation (i.e., devoted to quietly listening to one's conscience or inner voice), and spiritual acceptance (i.e., faith in the divine, felt experience of guidance by a spiritual force greater than any human being, not just belief in 'my religion').

The eight possible configurations of high and low scores on the three TCI character dimensions are strongly predictive of individual differences in physical, mental, and social well-being (Cloninger & Zohar, 2011; Zvir et al., 2020a). People who are highly developed in all three character dimensions have the highest levels of physical, mental, and social well-being, and are typically described as insightful, humanistic, creative, and post-materialistic in their values (Cloninger, 2004). This configuration is designated as the 'creative character profile' and predicts healthy longevity, prosocial behavior, as well as fulfillment, creativity, mindfulness and other indicators of enhanced awareness of the transcendental unity of being (Cloninger, 2004; Zvir et al., 2019, 2021). Nevertheless, people with 'organized character profiles' (i.e., who are high only in Self-Directedness and Cooperativeness, but not Self-Transcendence) have often been held up as the model of healthy personality in modern secular societies in which Self-Transcendence has traditionally been suppressed and regarded with skepticism (Cloninger, 2013). People with organized characters are individualistic, materialistic, and may be high-functioning, but are unlikely to help others unless it is mutually beneficial for them. Organized characters are also less self-actualizing than creative characters because Self-Transcendence and Persistence are the strongest predictors of growth in positive personality

traits (i.e., those that promote well-being through the maturation and integration of personality) and the enlargement of consciousness, as described elsewhere (Cloninger, 2004, 2007) and later in this article. The opposites of the creative and organized profiles (i.e., 'apathetic' with all three characters weakly developed and the 'disorganized' with only Self-Transcendence strongly developed) are the least healthy character configurations (Cloninger & Zohar, 2011; Zvir et al., 2020a).

Third, to learn about the conditions for cultivating healthy personality development and well-being, the developmental dynamics of temperament and character in relation to well-being was evaluated as a complex adaptive system using data from longitudinal studies (Cloninger, 2003; Cloninger et al., 1997; Josefsson et al., 2013). Later, functional brain imaging and genomics were used as tools to deconstruct the underlying structure and functions of temperament and character, as presented elsewhere (Cloninger et al., 2019; Zvir et al., 2019). These studies identified three distinct networks for human learning and memory that evolved in the human lineage: associative conditioning of emotional reactivity as a network in primates over 41 mya, intentional Self-Control over the past 1.8 mya in *Homo ergaster* ('working man'), and creative self-awareness over the past 100,000 years in behaviorally modern *Homo sapiens* ('wise man') (Zvir et al., 2021). These can be specified by configurations of joint temperament-character networks that represent different developmental paths that can be creatively shaped and self-actualized by the insights and aspirations of *Homo sapiens*.

The foregoing research on the TCI has provided a thorough understanding of the complex hierarchical structure and functions of temperament and character that we can now use to understand the joint relations of virtues, as measured by VIA, with temperament and character as measured by the TCI. Virtues have been defined generally by philosophers as 'strong and habitual dispositions to do what is good for both oneself and others' (Hursthouse & Pettigrove, 2018). Cloninger has suggested that the TCI character dimensions represent a person's understanding of the theological virtues of hope, love and faith, as described in a variety of religious, contemplative, and wisdom traditions (Cloninger, 2004, 2007). From these wisdom perspectives, a person's understanding of these principal virtues in a self-transcendent way (i.e., in an unselfish and spiritually elevating way that promotes virtue) is expressed and cultivated by particular practices in daily life (i.e., virtues in action): hopeful self-direction by letting go (i.e., accepting whatever happens

without worry or fighting), loving cooperation by working in the service of others, and faithful Self-Transcendence by seeking awareness in silent contemplation of an inseparable connection with something beyond human existence, thereby creating a sense of union with the world and the unifying creative source of all life (Cloninger, 2004, 2007).

Arguably, at this level of virtues in action, the three VIA virtues of Self-Control, Caring, and Inquisitiveness can be understood as corresponding to letting go, working in the service of others, and seeking to grow in awareness to the extent to which the VIA appears to be open to reports of the range of self-transcendent experiences in the TCI. It is also noteworthy that for a person to put their understanding into action, habits need to be integrated with goals and values by persistent discipline and letting go of opposing fears and selfish desires. According to Cloninger's model, the development of a healthy, happy, and good life, as well as practical clinical therapeutics, requires attention to a process of integration of habits, intentions, and values with insight in self-awareness (Cloninger & Cloninger, 2011, 2021).

Cloninger's model and prior empirical findings (Cloninger et al., 1997; Josefsson et al., 2013; Zvir et al., 2021) suggest that Self-Transcendence and Persistence play crucial roles in the process of cultivating virtue and well-being, whereas the authors of VIA simply emphasize the multiplicity of paths to virtuous living without particular emphasis on the strengths of perseverance, spirituality, or transcendence in the dynamics of the underlying complex adaptive system. The TCI temperament of Persistence and the VIA character strength of Perseverance are behaviorally similar, but the two models measure spirituality and transcendence differently because the authors of VIA simply rejected silence as a possible strength. In VIA, spirituality involves individuals practicing their own religion with conviction, whereas TCI spirituality develops when people use their learning network for self-awareness not only to appreciate beauty in the world but also to seek awareness of what is good and mysterious beyond human existence in contemplative silence. Given such differences in use of descriptive labels, in this article we have chosen to focus strictly on precisely specified quantitative measures to compare components of VIA and configurations of TCI dimensions in the same sample. We do so to clarify the relationships between what is measured by the two inventories and to assess the relative importance of Self-Transcendence, Persistence, and other TCI traits for virtues in action.



## The Three-Virtue Model

Since Peterson and Seligman (2004) formulated their conceptual model of character strengths and virtues, and its associated instruments (i.e., the VIA-IS and its shortened versions such as the VIA-72), a number of studies have examined the latent structure of the character strengths using scale-level exploratory methods (Brdar & Kashdan, 2010; Duan et al., 2012; Littman-Ovadia & Lavy, 2012; McGrath, 2014; Shryack et al., 2010). Most of these studies – which aim to identify which subsets of strengths co-occur – failed to replicate the original six-virtue model.<sup>1</sup> Specifically, these studies identified a range of factor solutions, reflecting between three (Shryack et al., 2010) and five virtues (McGrath, 2014), and while many of the factors had a conceptual overlap across studies, there was also substantial variability in content. It has been argued that these inconsistencies may reflect methodological and cultural differences across studies (McGrath, 2014). It is noteworthy that recent research not applying factor analysis, and instead interested in testing whether subsets of strengths share core characteristics, is more supportive of the original classification (Ruch et al., 2021; Ruch & Proyer, 2015).

A deeper critique of this research was that the empirically derived latent factors did not correspond well with traditional cultural understandings of virtue, which may in part be due to idiosyncrasies of the VIA-IS (McGrath, 2015). Consequently, McGrath (2015) investigated the latent structure of character strengths, using various versions of the VIA assessments and a hierarchical exploratory approach (Goldberg, 2006), with the aim of identifying a latent structure of virtues that was culturally meaningful. In all three studies, McGrath identified the same three-component structure. These components – labelled Self-Control, Caring, and Inquisitiveness – were deemed consistent with widespread cultural understandings of desirable social functioning. Self-Control reflected one's ability to function effectively in the world (a self-regulatory domain of virtue including intrapersonal strengths such as self-regulation and perseverance), and thus strengths related to the self. In contrast, Caring captured interpersonal strengths pertaining to others, such as kindness, love, and teamwork (a moral domain of virtue). Finally, Inquisitiveness is manifested by strengths having to do with one's interaction and engagement with the world such as creativity, curiosity, and zest (an intellectual domain of virtue). In short, these self-regulatory, moral, and intellectual virtues captured what can be thought of broadly as strengths for the appetites, moral feelings, and reason, which have been distinguished as the 'gut',

'heart' and 'head' in Plato's body metaphor (Plato's Timaeus) and as the 'unruly black horse', 'noble white horse', and the charioteer in Plato's chariot metaphor (Plato's Phaedrus) (Cloninger & Cloninger, 2021; Cloninger et al., 2015; Keady, 2011). An analysis of 12 independent samples by McGrath et al. (2018) has shown that this three-component structure is reliable, but highlighted that the three constructs are strongly correlated. McGrath and colleagues (McGrath, 2020; McGrath et al., 2018) have aptly described how these three virtues correspond closely to constructs identified in a wide range of sources, including both traditional philosophy and popular literature. Because of the intuitive appeal and cultural prominence of this three-virtue model, the VIA Institute on Character has recently published specific scales for measuring these virtues (McGrath, 2019b).<sup>2</sup>

## Possible Correspondence of VIA Virtues, TCI Character Dimensions, and Joint Temperament-Character Networks

There appears to be at least some direct correspondence between the three TCI character dimensions and the three VIA virtues in action. Both the three-virtue VIA model and the three TCI character dimensions describe constructs in the intrapersonal domain that exerts executive control of appetites (VIA Self-Control and TCI Self-Directedness) and in the interpersonal domain that legislates the moral rules for getting along with one another (VIA Caring and TCI Cooperativeness). Also, the third domain of rational judicial functions measured by TCI character Self-Transcendence involves seeking greater awareness of the beauty and wonders of the world, as does VIA Inquisitiveness, but also differs from VIA Inquisitiveness, which does not include reports of transpersonal experiences, such as oceanic feelings or peak experiences of union with nature or God that most people report experiencing at least occasionally (Cloninger, 2004; Hay, 2007). Although VIA Inquisitiveness lacks the transpersonal content of Self-Transcendence, some VIA components of Inquisitiveness (creativity, curiosity, and zest) do correlate moderately with TCI Self-Transcendence according to prior empirical findings with similar scales (Chavez-Eakle et al., 2006; Cloninger, 2010; Zwir et al., 2021). However, the fact that spirituality has been found to load more strongly on Caring rather than Inquisitiveness (McGrath et al., 2018) suggests some conceptual divergence between the constructs of TCI Self-Transcendence and VIA Inquisitiveness and/or differences in what the VIA and TCI define as spirituality. We previously noted that VIA items are behavioral and intellectual, and deliberately

exclude transpersonal experiences and contemplative silence that are essential features of TCI Self-Transcendence. Self-Transcendence involves the awareness of being an inseparable and unconditional participant in something greater than one's individual self; such as a community, humanity, nature, the universe, or God (Cloninger & Cloninger, 2021). Such transpersonal awareness goes beyond traits cultivated through social institutions and analytical reasoning, as discussed by various neuroscientists and philosophers (Chalmers, 1996).

In any case, TCI character traits alone are unlikely to be sufficient to account for the relationships of virtues to personality. Some VIA character strengths, such as curiosity and perseverance are nearly identical to TCI temperament traits, which have distinct learning properties and neuro-genetic bases from TCI character traits. More generally, the development of personality and well-being depend on complex interactions among both temperament and character dimensions. Temperament influences the salience of what is experienced, and character gives what is perceived meaning and purpose. In turn, the appraisal of values and meaning influences salience. While character traits function to regulate temperament, emotional states also bias perception and behavior. Consequently, the reciprocal interactions among temperament and character traits create a complex adaptive system that is self-organizing (Cloninger et al., 1997). The self-organization of temperament and character traits has been shown to produce joint temperament-character configurations that are meta-stable; that is, that are moderately stable and resilient. However, they can mature in a step-like manner at tipping points under particular conditions that facilitate a person learning to integrate of their goals, values, and habits to enhance their well-being (Cloninger et al., 1997).

The fact that personality develops as a complex adaptive system toward a state of integration or coherence is strongly grounded in rigorous research that is described elsewhere with detailed demonstrations of multifinality and equifinality of personality configurations (Cloninger, 2004; Cloninger et al., 1997; Zvir et al., 2020b, 2020a). For example, the resilience and plasticity of personality development depends on a specific brain circuit for TCI Persistence, which modulates resistance to extinction of habits and links it with brain systems underlying the executive direction of a person's goals (i.e., TCI character of Self-Directedness as a driver's accelerator) and the emotional inhibition of goal-seeking (i.e., TCI temperament of Harm Avoidance as a driver's brake) (Cloninger et al., 2012; Gusnard et al., 2003). Essentially, this complex adaptive system regulates the meta-stability of

personality by which the brain circuit for Persistence serves as an integrative bridge between a person's character profile and their temperament profile. In this way, a person's habits can be self-conditioned to be congruent with their goals and values. As a result, joint temperament-character configurations capture the dynamic process of self-actualization more fully than temperament or character profiles alone, so they are empirically more strongly correlated with the three underlying genetic and brain networks for human learning and memory than are either temperament or character alone empirically (Zvir et al., 2021a) and theoretically are expected to function in ways consistent with ancient wisdom literatures about the development of human flourishing (Cloninger & Cloninger, 2021; Cloninger et al., 2015; Cloninger & Zohar, 2011).

In prior work, we have used latent profile and latent class analyses to identify naturally occurring clusters of TCI temperament and/or character configurations (Moreira et al., 2021a). We have found that naturally occurring clusters of people with distinct temperament-character configurations differ markedly in their physical, emotional, social, cognitive, and spiritual aspects of well-being (Moreira et al., 2015; Zvir et al., 2019), and in particular aspects of strengths and virtues (2021), behavioral and emotional problems (Moreira et al., 2021a), humor (Moreira et al., 2021b), and creativity (Zvir et al., 2021). This prior work has shown the importance of considering integrated configurations of temperament and character. For example, we have found that the strength of a person's sense of humor, but not their comic style, varies with their temperament profile, whereas their comic style, but not the strength of their sense of humor, varies with their character profile. Furthermore, a joint temperament-character network distinguished by emotional instability and little character development had darker comic styles than those with greater character development. In this article, we will relate the joint TCI temperament-character configurations associated with individual differences in three systems of learning and memory to the three-virtue model measured by VIA.

In sum, current research suggests that the character strengths described by the VIA model are manifestations of three virtues: Self-Control, Caring and Inquisitiveness (McGrath, 2015, 2020; McGrath et al., 2018). These virtues are intuitive, culturally meaningful, and prominent across various literatures (McGrath et al., 2018). We highlighted that these three virtues (representing sets of positive attributes/traits) share substantial conceptual similarity with the character dimensions of Cloninger's psychobiological model of personality. No study has tested the distinctiveness of these overlapping



constructs, and thus our first aim is to analyze the association between character and virtues. Specifically, the major aim of the present article is to examine the relationship of TCI temperament and/or character traits and their configurations to the three virtues uncovered from the VIA.

Finally, because we used a measure of the VIA classification that has not had its latent structure explored (the brief version of the VIA-IS, the VIA-72), we took the preliminary step of performing a principal component analysis to evaluate whether a three-factor solution is consistent with the empirically derived three-virtue model from prior works (e.g., McGrath, 2015). Our reasoning was that the identification of a consistent structure would serve as evidence that our chosen VIA classification instrument measures what it purports to measure, i.e., constructs that are consistent with widespread cultural conceptions of virtues.

## STUDY 1

### Method

#### Sample

The sample consisted of adults ( $n = 509$  adults; 51.7% women) participating in a study testing the properties of the VIA-72. To obtain this sample, we used a convenience sampling strategy. Specifically, we approached undergraduate students from several degree programs at the authors' university. Students wishing to be participants were also given questionnaire packs to distribute to friends and family (specifying that these people should be adults and proficient in Portuguese). Participants were only included if they signed and returned an informed consent form, were proficient in Portuguese, and responded to  $\geq 75\%$  of scale items. The mean age of this sample was 31.6 years ( $SD = 12.4$ ), with most participants aged between 22.0 (Q1) and 38.0 (Q3) years. Most participants were full-time university students (44%) or employed (45%), with a smaller number unemployed (3%) or retired (2%). The majority had at least a secondary level of education (85%) and 51% had an undergraduate or postgraduate degree. Most participants (97%) were Portuguese. Participants did not receive any type of personal compensation for their involvement in the study. Ethical approval for the study was granted by the ethics committee at Universidade Lusíada, Porto.

### Measure

We used the European Portuguese version of the VIA-72. As described on the VIA Institute on Character website (viacharacter.org), this measure was developed by selecting the three most internally consistent items from the 24 character strength scales of the VIA-IS. For each item, participants indicate how much the statement represents them from 1 (*very much unlike me*) to 5 (*very much like me*). For each of the scales we calculated a mean average score. Composite reliability (McDonald's omega,  $\omega$ ) for each of the character strength scales ranged from .61 to .81 (Supplementary Table S1).

### Statistical procedure

To evaluate the latent structure of the VIA-72 at the scale level, we tested a 3-component solution using principal component analysis (PCA). Consistent with the analyses

**Table 1.** Loadings for promax-rotated principal component analyses performed in study 1.

	Component 1		Component 2		Component 3	
	Pattern	Structure	Pattern	Structure	Pattern	Structure
Fairness	<b>.95</b>	<b>.86</b>	-.09	.50	-.04	.51
Authenticity	<b>.87</b>	<b>.81</b>	.08	.54	-.18	.43
Kindness	<b>.86</b>	<b>.82</b>	-.19	.45	.13	.56
Teamwork	<b>.78</b>	<b>.84</b>	-.05	.55	.15	.62
Leadership	<b>.70</b>	<b>.82</b>	.01	.57	.18	.63
Love	<b>.67</b>	<b>.78</b>	-.06	.52	.24	.63
Perseverance	<b>.59</b>	<b>.71</b>	.27	.60	-.08	.47
Judgment	<b>.53</b>	<b>.72</b>	.52	.72	-.23	.43
Gratitude	<b>.47</b>	<b>.74</b>	.29	.68	.13	.61
Bravery	<b>.46</b>	<b>.67</b>	.07	.53	.25	.59
Social IQ	<b>.42</b>	<b>.76</b>	.17	.66	.34	.72
Forgiveness	<b>.40</b>	<b>.59</b>	.21	.53	.08	.47
Beauty	<b>.38</b>	<b>.69</b>	.20	.62	.28	.65
Prudence	.27	.58	<b>.81</b>	<b>.77</b>	-.35	.34
Self-regulation	-.35	.23	<b>.78</b>	<b>.62</b>	.11	.38
Spirituality	-.12	.36	<b>.66</b>	<b>.63</b>	.07	.41
Perspective	.09	.59	<b>.65</b>	<b>.78</b>	.12	.58
Humility	.21	.57	<b>.63</b>	<b>.72</b>	-.08	.45
Learning	-.25	.30	<b>.52</b>	<b>.57</b>	.34	.50
Humor	.04	.42	-.31	.29	<b>.91</b>	<b>.74</b>
Creativity	-.08	.54	.27	.65	<b>.68</b>	<b>.80</b>
Curiosity	.07	.62	.19	.65	<b>.66</b>	<b>.83</b>
Zest	.01	.59	.27	.67	<b>.62</b>	<b>.80</b>
Hope	.32	.66	.08	.57	<b>.47</b>	<b>.72</b>
Eigen values		11.91		1.43		1.14
% var		.28		.17		.15
Factor Correlation Matrix						
Component 1						
1						
Component 2						
2	.65		1			
Component 3						
3	.64		.63		1	

PCA with promax rotation. Primary loadings are in **bold**. Secondary factor loadings  $> |.40|$  are in italics.

performed by McGrath et al. (2018), and because we did not assume factor independence, we applied an oblique promax rotation.

## Results

Table 1 shows the pattern and structure loadings from the PCA. Component 1 was most strongly associated with strengths that captured one's style of behaving in relation to others. Indeed, most of the strongest loadings were for strengths considered behavioral manifestations of the virtue Caring (fairness, kindness, teamwork, leadership, and love). Several of the strengths with weaker loadings on this component can also be argued to be interpersonal in nature, namely social intelligence and bravery. Component 2 was most strongly associated with strengths that are exemplars of the ability to regulate and control oneself to function effectively in the world (e.g., prudence, self-regulation, and humility) but also included some intellectual strengths (love of learning and perspective). Curiously, this component was associated with spirituality. Finally, Component 3 reflected one's ability to think and feel in a way that expands and transcends the self, and comprised uniquely of strengths that are considered manifestations of Inquisitiveness (humor, creativity, curiosity, zest, and hope). Readers interested in the hierarchical structure of strengths and virtues can see the output of additional analyses in Supplementary Materials.

## STUDY 2

### Method

#### Sample

The sample comprised adults ( $n = 659$ ; 70.4% women) participating in a study on virtues, values, humor, and personality. We obtained this sample using the same convenience sampling strategy described in Study 1. Participants were only included if they signed and returned an informed consent form, were proficient in Portuguese, responded to  $\geq 75\%$  items of the study measures (which excluded 23 respondents), and if they correctly responded to  $\geq$  four of five validity-check items (which excluded 85 respondents). The mean age of participants was 32.1 years ( $SD = 15.5$  years), with most aged between 19.0 years (Q1) and 44.0 years (Q3). Overall, 84.2% of the sample had at least a secondary school level of education and 27% had a university degree. Most individuals were full-time university students (44.6%) or in employment (35.4%), with a smaller percentage being unemployed (3.8%),

retired (7.1%) or part-time students (5.3%). Most individuals (95.6%) had a Portuguese nationality. Participants did not receive any personal compensation for their involvement in the study. Ethical approval for the study was granted by the ethics committee at Universidade Lusíada, Porto.

### Measures

In addition to the VIA-72 (see Study 1), participants also responded to the European Portuguese version of the Revised Temperament and Character Inventory (TCI-R; Moreira et al., 2017). The TCI-R is a 240-item self-report measure of the 7 dimensions of Cloninger's psychobiological model of personality: Novelty Seeking, Harm Avoidance, Reward Dependence, Persistence, Self-Directedness, Cooperativeness, and Self-Transcendence. In the study sample, omega coefficients for the seven dimensions, ranging from .79 (Novelty Seeking) to .92 (Harm Avoidance), revealed good internal consistency. For the study, we calculated mean scores for each of the seven TCI-R dimensions.

### Statistical Procedures

#### Exploring a three-factor model of virtue

Before exploring the relationship between virtues and personality, we sought to replicate the three-virtue model identified in Study 1. To do this, we performed the same scale-level promax-rotated PCA as in Study 1.

#### Personality and virtues

First, we calculated correlation coefficients to describe the strength of associations between personality dimensions and virtues. Next, to describe how dynamic intra-individual organizations of psychobiological processes relate to virtues we used a person-centered approach to analysis. Specifically, we formed temperament profiles by dividing participants into groups reflecting those above and below the normative median (based on a representative sample of the adult Portuguese population; Moreira et al., 2021c) for each of the four temperament dimensions. Participants were then grouped according to the 16 possible combinations of high and low values. The same procedure was followed to group participants into the eight possible combinations of high and low character scores on Self-Directedness (S or s), Cooperativeness (C or c), and Self-Transcendence (T or t). To represent the three phenotypic networks we grouped participants with the four unhealthy sct, scT, sCt and sCT character profiles (emotional-unreliable network); with the healthier Sct, ScT and SCt character profiles (organized-reliable network); and the creative SCT character

profile (creative-reliable) as in prior work. The average ages and gender distributions for all profiles and networks are available in Supplementary Materials. A chi-squared test indicated that the distribution of temperament profiles across the derived phenotypic networks differed significantly from what would be expected by chance,  $\chi^2(30) = 150.93, p < .001$ . The pattern of standardized residuals for this association aligned with the networks presented by Zwir et al. (2021) and validated our method for forming the phenotypic networks (see Supplementary Figure SF1).

After forming profiles, we performed a series of MANCOVAs to test differences in virtues across the temperament profiles, character profiles, and integrated networks controlling for participant age and gender.

## Results

### Exploring a Three-Factor Model of Virtue

Table 2 presents the pattern and structure loadings from the PCA. The strengths associated with Component 1, from highest to lowest loadings, were fairness, kindness,

**Table 2.** Loadings for promax-rotated principal component analyses performed in study 2.

	Component 1		Component 2		Component 3	
	Pattern	Structure	Pattern	Structure	Pattern	Structure
Fairness	<b>.86</b>	<b>.81</b>	-.22	.37	.18	.44
Kindness	<b>.85</b>	<b>.75</b>	-.20	.31	.02	.29
Teamwork	<b>.72</b>	<b>.72</b>	.00	.41	.00	.31
Love	<b>.58</b>	<b>.67</b>	.35	.56	-.25	.19
Leadership	<b>.54</b>	<b>.66</b>	.04	.48	.24	.49
Authenticity	<b>.54</b>	<b>.64</b>	-.10	.40	.36	.54
Forgiveness	<b>.54</b>	<b>.55</b>	.16	.37	-.19	.13
Beauty	<b>.43</b>	<b>.59</b>	.20	.50	.09	.38
Zest	-.06	.42	<b>.94</b>	<b>.83</b>	-.14	.32
Hope	-.08	.36	<b>.89</b>	<b>.75</b>	-.16	.26
Curiosity	-.12	.38	<b>.84</b>	<b>.78</b>	.03	.41
Creativity	-.10	.37	<b>.59</b>	<b>.68</b>	.29	.55
Gratitude	.35	.58	<b>.53</b>	<b>.64</b>	-.18	.25
Spirituality	-.08	.18	<b>.53</b>	<b>.43</b>	-.11	.14
Social IQ	.31	.59	<b>.39</b>	<b>.64</b>	.13	.47
Humor	.18	.36	<b>.39</b>	<b>.44</b>	-.11	.17
Bravery	.13	.41	<b>.29</b>	<b>.50</b>	.27	.48
Prudence	.04	.28	-.26	.23	<b>.90</b>	<b>.78</b>
Judgment	.18	.41	-.22	.31	<b>.82</b>	<b>.78</b>
Perspective	-.07	.34	.34	.55	<b>.48</b>	<b>.63</b>
Self-regulation	-.37	.04	.34	.38	<b>.48</b>	<b>.50</b>
Learning	-.08	.23	.18	.38	<b>.47</b>	<b>.53</b>
Humility	.18	.33	-.09	.26	<b>.47</b>	<b>.50</b>
Perseverance	.19	.42	.14	.43	<b>.36</b>	<b>.51</b>
Eigen values	7.65		1.84		1.73	
% var	.17		.17		.13	
Factor Correlation Matrix						
Component 1						
Component 2	.58		1			
Component 3	.52	.44		1		

PCA with promax rotation. Primary loadings are in **bold**.

**Table 3.** Composition of the three-virtues based on mean pattern loading across the two PCA solutions (shown in brackets). ICC values indicate component convergence between the two solutions.

Self-Control; ICC = .76, CI [.51, .88]	Caring; ICC = .94, CI [.88, .97]	Inquisitiveness; ICC = .85, CI [.70, .93]
Prudence (.86)	Fairness (.91)	Zest (.78)
Judgment (.67)	Kindness (.86)	Curiosity (.75)
Self-Regulation (.63)	Teamwork (.75)	Hope (.68)
Perspective (.57)	<u>Authenticity (.71)</u>	Humor (.65)
Humility (.55)	Love (.63)	Creativity (.64)
<u>Love of Learning (.50)</u>	Leadership (.62)	Social Intelligence (.37)*
	Forgiveness (.47)	<u>Spirituality (.30)</u>
	Appreciation of Beauty (.41)	
	Gratitude (.41)	
	<u>Perseverance (.39)</u>	
	<u>Bravery (.30)</u>	

Underlined strengths are those that deviate from virtue structure identified by McGrath et al. (2018; see table 3). \*Social intelligence had the same mean factor loading for the Caring and Inquisitiveness virtues, but was included under Inquisitiveness for theoretical consistency.

teamwork, love, leadership, honesty, forgiveness, and appreciation of beauty. This suggested a strong convergence with Component 1 from Study 1. Component 2 was associated with zest, hope, curiosity, creativity, gratitude, and spirituality, and was thus similar to Component 3 from Study 1. Finally, Component 3 was associated with prudence, judgment, perspective, self-regulation, love of learning, and humility, and was thus similar to Component 2 from Study 1. Perseverance was most strongly associated with this component, but with a pattern loading less than .40. The mean component correlation was .57 ( $SD = .10$ ), suggesting the relationships between the virtues were not trivial.

To evaluate the consistency between the 3-component solutions obtained in Study 1 and Study 2 we calculated intraclass correlations for each of the three promax components (see Table 3). These values indicated a high level of consistency between the two solutions: mean ICC = .85 ( $SD = .09$ ). Because of this convergence, we define three virtues based on the mean pattern loading across solutions for each strength (see Table 3). It was immediately clear that the three subsets of interrelated strengths had a close resemblance to those describing VIA virtues of Self-Control, Caring, and Inquisitiveness (McGrath et al., 2018) and so we assigned the same labels. Notable divergences were that authenticity [honesty] was more strongly associated with Caring rather than Self-Control, and that love of learning was associated with Self-Control rather than Inquisitiveness. We also found that the VIA spirituality measure was most strongly associated with Inquisitiveness rather than Caring, although overall it was not strongly linked to any of the three components.

**Table 4.** Pearson's correlation coefficients between biopsychosocial personality dimensions and the 24 character strengths and three virtues. Values < |.20| have been omitted.

	Temperament				Character		
	NS	HA	RD	PS	SD	CO	ST
Appreciation of Beauty			.31	.21		.31	.49
Bravery		-.20		.37			.25
Creativity		-.24		.41			.38
Curiosity		-.44	.20	.48	.22		.38
Fairness			.33	.29		<b>.50</b>	.20
Forgiveness			.35			<b>.51</b>	
Gratitude			.24	.27	.29	.29	.36
Honesty	-.20			.34	.24	.31	.21
Hope		<b>-.51</b>		.36	.36		.25
Humility	-.28						
Humor				.23			.20
Judgment	-.35			.29		.25	
Kindness			.39	.21		.44	
Leadership			.25	.32	.20	.28	.22
Love of Learning				.26			.26
Love			<b>.50</b>		.25	.34	.31
Perseverance	-.20	-.28		<b>.56</b>	.40	.23	
Perspective				.43			.25
Prudence	<b>-.50</b>			.24			
Self-regulation	-.21	-.23		.24	.20		
Social IQ		-.33	.21	.40	.33	.26	.26
Spirituality							<b>.54</b>
Teamwork			.32	.25	.26	.48	
Zest		-.44	.23	.41	.30		.31
Self-Control	-.38			.41	.23		.23
Caring		-.20	.43	.45	.34	<b>.54</b>	.39
Inquisitiveness		-.45	.28	.47	.31	.22	<b>.53</b>

Values in **bold** represent moderate correlations of  $r > |.50|$ . NS = Novelty Seeking; HA = Harm Avoidance; RD = Reward Dependence; PS = Persistence; SD = Self-Directedness; CO = Cooperativeness; ST = Self-Transcendence.

### Personality Dimensions and Virtues

Table 4 presents correlations between the dimensions of the TCI-R and the three virtues. Correlations with the character strengths are also presented. There were associations of moderate strength between Self-Transcendence and Inquisitiveness ( $r = .53$ ), and between Cooperativeness and Caring ( $r = .54$ ), aligning with the expected conceptual overlap between models. Self-Directedness and Self-Transcendence contributed to all three VIA virtues, but the correlations of virtues with Self-Transcendence were as strong as or stronger than those of Self-Directedness. Other notable findings were the correlations between Novelty Seeking and Self-Control ( $r = -.38$ ), Harm Avoidance and Inquisitiveness ( $r = -.45$ ), Reward Dependence and Caring ( $r = +.43$ ). It was noteworthy that Persistence had correlations greater than .40 with all three virtues, as expected from its previously identified role in the integration of habits, goals, and values.

### Temperament Profiles and Virtues

The multivariate analysis using Pillai's trace ( $V$ ) indicated there was a significant effect of temperament profile on virtues after controlling for age and gender ( $V = .53$ ,  $F(45$ ,

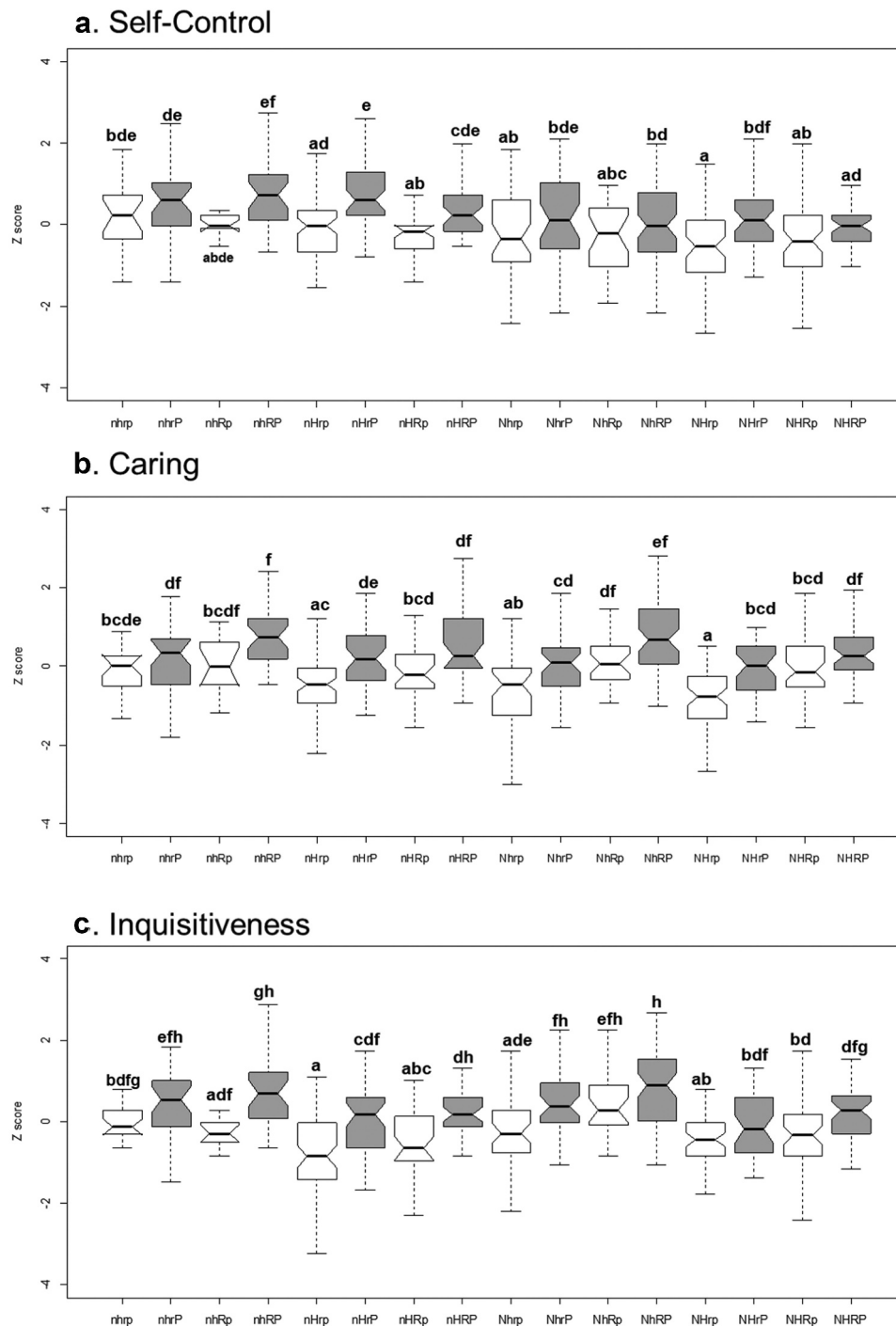
1917) = 9.19,  $p < .001$ ). Separate univariate ANCOVAs on the outcome variables indicated the significant, albeit weak, effects of temperament profile, after controlling for age and gender, on Self-Control ( $F(15, 639) = 8.84$ ,  $p < .001$ ,  $\omega^2 = .15$ ), Caring ( $F(15, 639) = 14.68$ ,  $p < .001$ ,  $\omega^2 = .24$ ), and Inquisitiveness ( $F(15, 639) = 15.57$ ,  $p < .001$ ,  $\omega^2 = .25$ ).

The letters superimposed on Figure 1 illustrate the significance of post-hoc pairwise comparisons. Profiles not sharing the same letter are significantly different at  $p < .05$ . It is possible to evaluate the non-linear influence of temperament dimensions, controlling for interactions with other traits, by comparing pairs of profiles in which all other dimensions remain constant (e.g., nhrp vs. Nhrp). This results in a total of eight comparisons per dimension. For all three virtues, most of these comparisons were not significant. Novelty Seeking was linked to lower Self-Control for 2/8 comparisons, while Persistence was linked to higher Self-Control for 3/8 comparisons. Neither Harm Avoidance nor Reward Dependence was linked to differences in Self-Control. Both Reward Dependence and Persistence were linked to higher Caring for 3/8 comparisons. Neither Harm Avoidance nor Novelty Seeking was linked to differences in Caring. Finally, Harm Avoidance was linked to lower Inquisitiveness for 3/8 comparisons while Persistence was linked to increased Inquisitiveness for 4/8 comparisons. Neither Novelty Seeking nor Reward Dependence were linked to Inquisitiveness.

### Character Profiles and Virtues

The multivariate analysis using Pillai's trace indicated there was a significant effect of character profile on virtues after controlling for age and gender ( $V = .45$ ,  $F(21, 1941) = 16.15$ ,  $p < .001$ ). Separate univariate ANCOVAs on the outcome variables indicated there were significant effects of character profile, after controlling for age and gender, on Self-Control ( $F(7, 647) = 10.32$ ,  $p < .001$ ,  $\omega^2 = .09$ ), Caring ( $F(7, 647) = 36.90$ ,  $p < .001$ ,  $\omega^2 = .28$ ), and Inquisitiveness ( $F(7, 647) = 35.89$ ,  $p < .001$ ,  $\omega^2 = .27$ ). We note that the size of the effects was weak for Self-Control and moderate for Caring and Inquisitiveness.

In Figure 2 there are four paired comparisons for each character dimension in which the remaining dimensions remain constant (e.g., sct vs. Sct). Higher Self-Directedness and Self-Transcendence were linked to higher Self-Control for 2/4 comparisons, while change in Cooperativeness was not associated with any significant differences. For Caring, higher Cooperativeness and Self-Transcendence were linked to elevations for 3/4



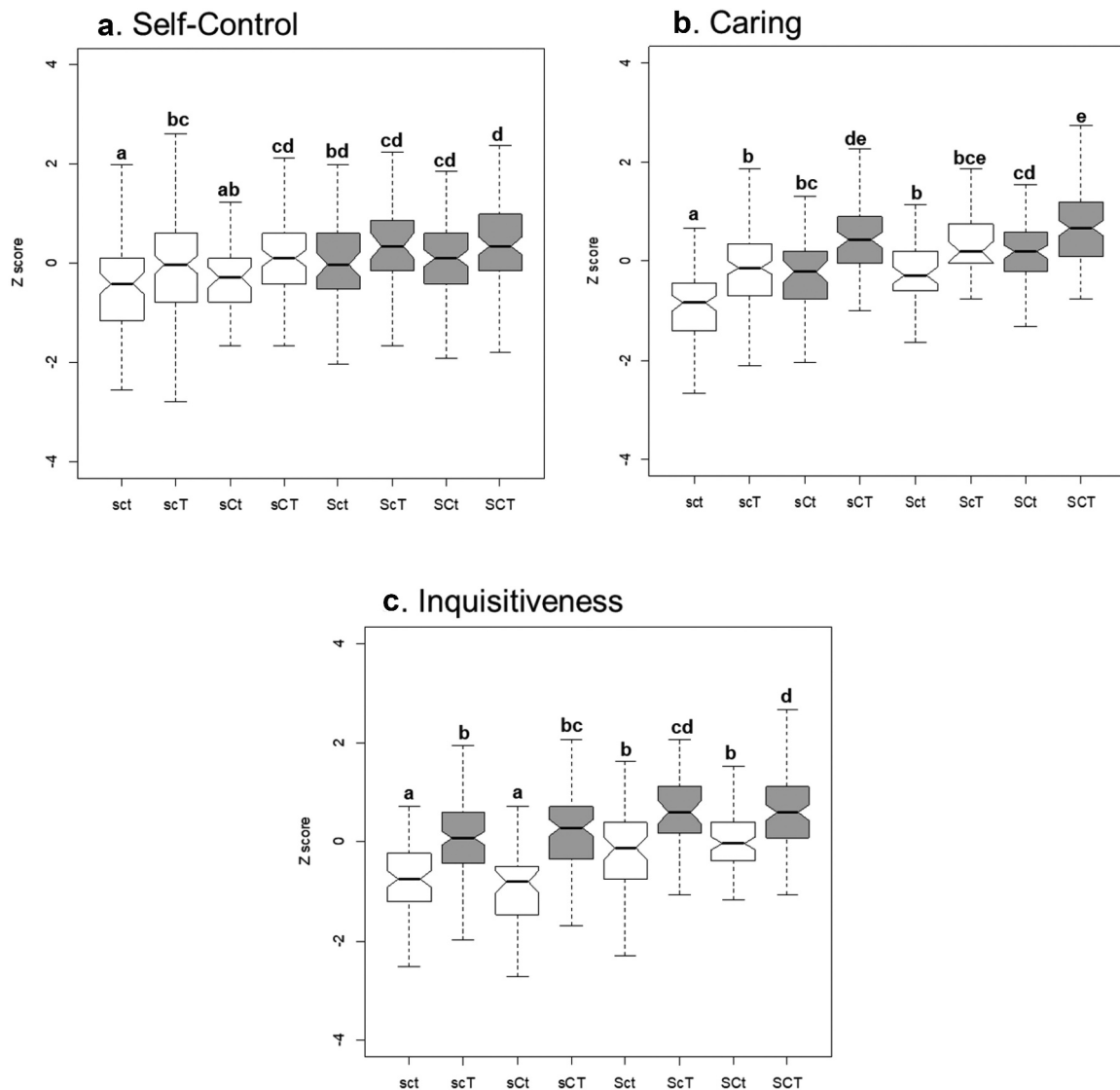
**Figure 1.** Box plots of (a) Self-control, (b) Caring, and (c) Inquisitiveness z scores across the temperament profiles. Outliers are not presented. Profiles not sharing the same letter are significantly different at  $p < .05$ . Plots in grey reflect temperament profiles with high Persistence.

comparisons, while higher Self-Directedness was only associated with a significant change between sct and Sct. Finally, higher Self-Directedness and Self-Transcendence were linked to higher Inquisitiveness for all 4 comparisons, while change in Cooperativeness was not associated with any significant differences.

### Phenotypic Networks and Virtues

In Figure 3, it was clear that the creative-reliable network was associated with highest levels of all three virtues, whereas the emotional-unreliable network was associated with the lowest levels of all



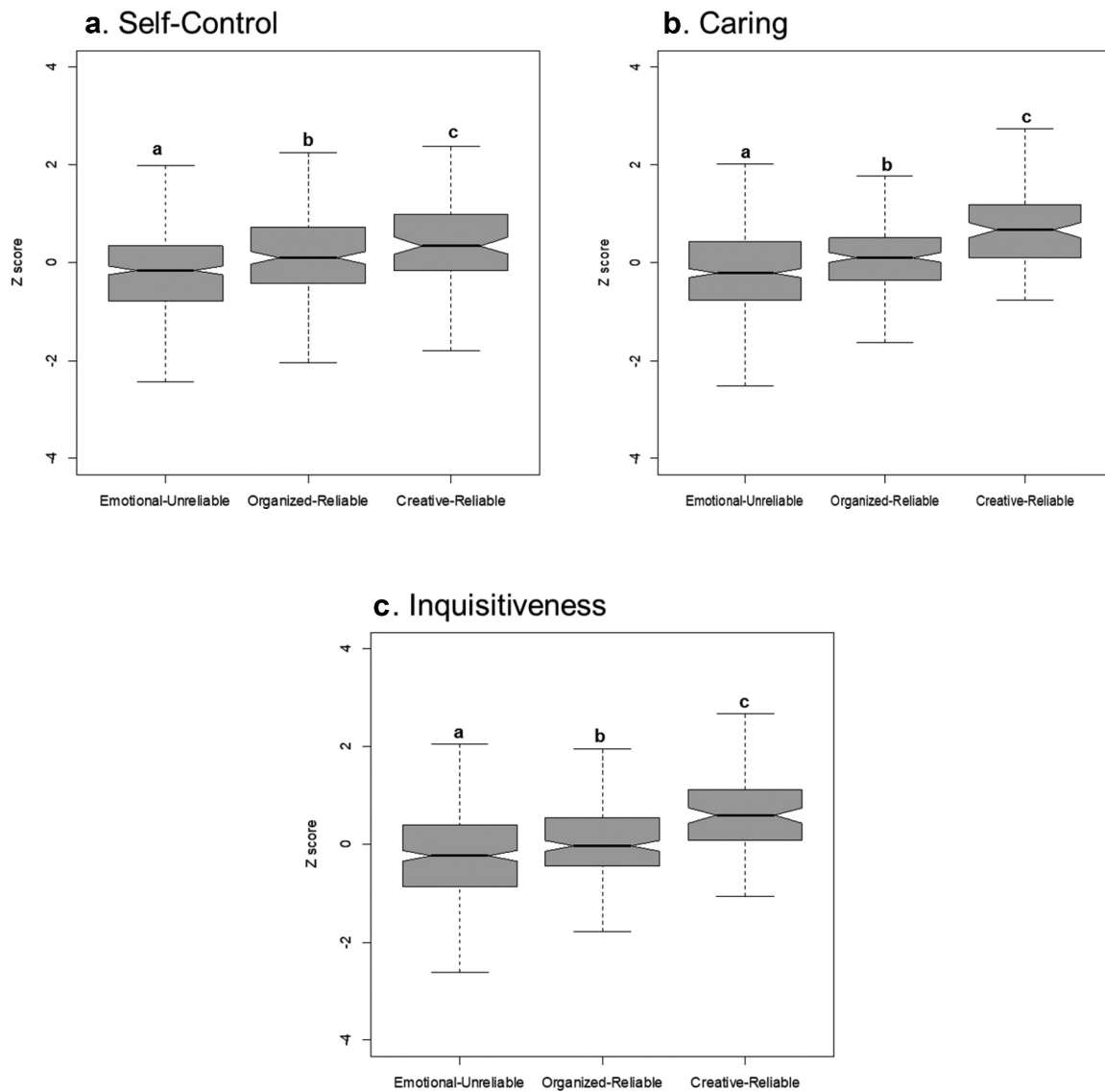


**Figure 2.** Box plots of (a) Self-control, (b) Caring, and (c) Inquisitiveness z scores across the character profiles. Outliers are not presented. Profiles not sharing the same letter are significantly different at  $p < .05$ . Plots in grey reflect character profiles with (a) high Self-Directedness, (b) high Cooperativeness, and (c) high Self-transcendence.

three virtues. The MANCOVA indicated there was a significant effect of phenotypic network on virtues after controlling for age and gender ( $V = .15$ ,  $F(6, 1302) = 17.30$ ,  $p < .001$ ). The individual univariate analyses confirmed that there were effects of network, albeit small, on Self-Control ( $F(2, 652) = 17.51$ ,  $p < .001$ ,  $\omega^2 = .05$ ), Caring ( $F(2, 652) = 48.28$ ,  $p < .001$ ,  $\omega^2 = .13$ ), and Inquisitiveness ( $F(2, 652) = 39.86$ ,  $p < .001$ ,  $\omega^2 = .11$ ). Post-hoc comparisons indicated that the effects of the three networks were significantly different for all three virtues.

## General Discussion

Prior to exploring the relationship between virtues and personality, we sought to establish whether the VIA-72 had a latent structure consistent with the three-virtue model. With the availability of two independent samples, we performed principal component analyses. This approach tests whether certain subsets of strengths tend to co-occur. Although there were some differences in the factor loadings obtained across studies, both sets of analyses revealed three components that were



**Figure 3.** Box plots of (a) Self-control, (b) Caring, and (c) Inquisitiveness z scores across the three phenotypic networks. Outliers are not presented. Networks not sharing the same letter are significantly different at  $p < .05$ .

consistent with virtues focused on personal functioning (Self-Control), on interactions with others (Caring), and on interactions with the wider world (Inquisitiveness). It was noteworthy that not every strength fit well with the three identified virtues. Spirituality, for example, did not load strongly on any of the three components in either study. Conversely, some strengths had substantial cross loadings. Nevertheless, we found the components were broadly consistent with those observed in a range of past samples that also employed factor analysis (McGrath et al., 2018), and therefore, concluded that the VIA-72 had construct validity. It is worth acknowledging that there is some contention whether factor analysis, which assumes that virtues are defined by inter-correlations between strengths, is appropriate for defining virtues (Ruch & Proyer, 2015). For example, Peterson

and Seligman (2004) stated that individuals would rarely display all strengths of a given virtue because there may be multiple routes to each virtue, which is a characteristic feature of complex adaptive systems. Indeed, with alternative approaches there has been stronger support for the six-virtue model (Ruch et al., 2021; Ruch & Proyer, 2015). However, the purpose of the present study was to evaluate the validity of the three-factor structure of the VIA-72 in our sample, not to propose modifications to Peterson and Seligman's virtue classification.

Next, we explored the associations between virtues and personality. We had predicted that there might be specific linear associations between virtues and Cloninger's character dimensions due to conceptual overlap, but had argued that full understanding of

the role of personality on virtues requires a model that acknowledges the interactions that occur between character and temperament as aspects of a complex adaptive system that is self-organizing and regulates its own plasticity in a search to optimize its well-being as internal and external conditions change. Therefore, we adopted a similar procedure from past studies (e.g., Moreira et al., 2021a; Moreira et al., 2021d; Moreira et al., 2021e; Moreira, Inman, Rosa et al., 2021) to study how personality, at its increasing levels of complexity from (a) temperament and character dimensions, to (b) multi-trait temperament or multi-trait character profiles, to (c) integrated temperament-character networks relates to virtues.

We argued in the introduction that virtues of Self-Control, Caring, and Inquisitiveness share some theoretical and empirical correspondence to Cloninger's character dimensions of Self-Directedness, Cooperativeness, and Self-Transcendence. This was largely confirmed by our correlational analysis. Specifically, we found moderate positive associations between TCI Self-Transcendence and VIA Inquisitiveness, and between TCI Cooperativeness and VIA Caring. The association between TCI Cooperativeness and VIA Caring appeared largely driven by the positive correlation between TCI Cooperativeness and the strengths of fairness and forgiveness. In turn, the association between TCI Self-Transcendence and VIA Inquisitiveness appeared largely driven by the positive correlation between TCI Self-Transcendence and the strength spirituality. Despite this last correlation, it was noteworthy that spirituality did not load strongly on any of the components in PCA, which suggests it may represent an aspect of functioning that is not well captured by the three-virtue model, but better captured by Cloninger's model of personality (as we also discussed in our introduction in terms of VIA emphasizing behavioral and intellectual processes and excluding silence as a strength). Finally, we anticipated that TCI Self-Directedness would be linked to elevated VIA Self-Control, and indeed it was most strongly correlated with this virtue relative to the others. The fact that the correlation was weaker indicates that TCI Self-Directedness, representing a person's ability to intentionally self-regulate in accordance with personal goals and values, is largely distinct from other aspects of VIA Self-Control, such as perseverance, judgment and prudence. In short, our results suggested that virtues and character dimensions were related-yet-distinct constructs. We suggest that this is because the development of virtue is related to the integration of both temperament and character as components of a complex adaptive system that shapes and adapts itself in a search to optimize well-being. Thus, virtues represent the

differentiated and complex expressions of biopsychosocial systems that result from the interactions among multiple systems of learning and memory that allow a person to bring their habits into congruence with their goals and values.

There is now robust evidence that sets of genes code for distinct temperament and character profiles rather than individual dimensions (Cloninger et al., 2019; Zvir et al., 2020b, 2020a). Using a person-centered approach, we grouped participants into all theoretically possible temperament profiles. A first finding was that temperament profiles were associated with differences in 'virtuousness' across the three virtues: some profiles showing consistently higher levels than others. More importantly, people with different temperament profiles had different dominant virtues. For example, those with an independent (nhrP) temperament or a methodical (nhRP) temperament tended to score highest in Self-Control relative to other virtues. In contrast, those with an adventurous (NhrP) profile tended to manifest strengths pertaining to Inquisitiveness. Participants with a passionate (NhRP) profile displayed elevated levels of Caring and Inquisitiveness, but were lower in Self-Control. Finally, those with a reliable (nhRP) profile displayed elevated levels of all three virtues, implying this specific configuration of temperament dimensions is particularly adaptive. Indeed, this result aligns with studies that have shown the steady (reliable) temperament is linked to increased student engagement (Moreira, Inman, Cloninger et al., 2021) and better learning approaches (Moreira, Inman, Rosa et al., 2021) in school students; lower psychological reactance (Moreira et al., 2021c), fewer emotional and behavioral problems (Moreira et al., 2021a), less ill-being and more well-being (Zvir et al., 2020b), and better social functioning (Rettew et al., 2008). In short, the type of positive attributes a person has appeared to be related to their basic temperamental profile, with a steady (reliable) profile being most linked to an overall 'good character'.

With the same analytical procedure, we also identified four distinct character profiles that were consistent with theoretically expected (Cloninger, 2004), and empirically derived configurations (Moreira, Inman, Rosa et al., 2021; Zvir et al., 2020a). Our key finding was that the most healthy and coherent character, defined by high levels of all three character dimensions (i.e., the creative profile), was the most virtuous while low levels of all three character dimensions (i.e., the apathetic profile), was the least virtuous. Indeed, this suggests that the maturity of character depends on all three TCI character dimensions and is directly related to levels of virtue measured

by VIA in this study. Likewise, a creative TCI character profile is associated with healthy adaptive functioning indicated by other measures of physical, emotional, social, and cognitive well-being in extensive prior work (Cloninger & Zohar, 2011; Moreira et al., 2021a; Moreira & Inman, 2021; Moreira, Inman, Rosa et al., 2021; Zwir et al., 2020b, 2020a, 2019, 2021). Unlike with temperament profiles, this pattern was consistent across all three virtues suggesting that the integration (coherence) of all aspects of character is fundamental to the degree to which one is virtuous, but not to the specific virtues that are manifested. This observation is similar to the finding that character distinguishes people with healthy (virtuous) personality organization from those with any personality disorder, whereas particular temperament profiles distinguish subtypes of personality disorder and their specific vices (Cloninger, 2011; Cloninger et al., 1993; Svrakic et al., 1993).

Although the general effect of character maturity was broadly consistent across the three virtues, paired comparisons evaluating the non-linear influences of character dimensions revealed differences. An important finding was that people with higher TCI Cooperativeness typically had higher VIA Caring when the level of TCI Self-Directedness and TCI Self-Transcendence was controlled. In contrast, TCI Cooperativeness consistently had no impact on VIA Self-Control and VIA Inquisitiveness. This finding, consistent with our hypotheses from prior research, indicates that TCI Cooperativeness has some specific overlap with the concept of VIA Caring in terms of fairness, kindness, and teamwork. However, the fact that TCI Self-Directedness and TCI Self-Transcendence also had an impact on VIA Caring, as well as VIA Self-Control and VIA Self-Transcendence, suggests that the three virtues do not describe traits that are discrete. This is also supported by the substantial correlations among the three virtues as noted by McGrath.

In the final step of analysis, we grouped participants into phenotypic networks of joint temperament-character profiles. Prior research with very large samples has identified three such networks corresponding to people with poorly regulated temperament, those with well-developed self-regulatory abilities, and those with developed self-regulation and self-awareness (Zwir et al., 2019). People in this final network, reflecting a coherent personality in which a person's habits, goal, and values are well-integrated, have been found to have the highest levels of wellbeing (Zwir et al., 2019). Furthermore, according to recent studies comparing the genomes and behaviors of chimpanzees, Neanderthals, and *Homo sapiens*, the emergence of creativity, narrative

art and language, and spirituality in modern *Homo sapiens* (literally, wise man) depended on the evolution of capacities for both intentional self-regulation and self-awareness so that modern humans had both the wisdom to value what is good and the plasticity to change (Zwir et al., 2021). Comparing these networks, we found that people who tended to have a sensitive or explosive temperament (with tendencies to be either fearful and pessimistic or impulsive and disorderly) with little character development scored low in virtues. In contrast, people who had a reliable, cautious, or passionate temperament with healthy character (i.e., organized or creative profiles) scored high in virtues.

### **Importance of Dynamic Interactions for Developing Virtue**

Our current observations and prior prospective studies suggest that the structure of virtues and strengths measured by VIA are consistent with what is expected from the TCI to the extent that the VIA is open to a person's reports of their experiences of the transcendental unity of being. In prior prospective studies, the personality trait that predicts the most growth in personality development is high Self-Transcendence, along with additional contributions from high Persistence (Josefsson et al., 2013). Likewise in our current study, we found that high Self-Transcendence and Persistence are positively correlated with nearly all character strengths and virtues measured by the VIA (see Table 3). The key relationships of Self-Transcendence and Persistence to the development of virtues and character strengths is expected from Cloninger's previously described model corresponding to Plato's metaphor of the charioteer guiding an unruly black horse and a noble white horse, as reviewed in our introduction. Our current findings support the prior hypothesis that virtues are manifest in action when habits are persistently regulated by all three TCI character traits to be in congruence with self-transcendent goals and values. Put another way, self-actualization is the process by which rational insight is able to bring our habits into congruence with our goals and values, thereby giving rise to a well-integrated personality characterized by the flourishing of virtue in action and other aspects of well-being. Specifically a person's insight and understanding of the virtues of hope, love and faith are expressed in behavioral acts of letting go (i.e., VIA Self-Control expanding to hopeful TCI Self-Directedness), working in the service of others (i.e., VIA Caring for others expanding to unconditional love in TCI Cooperativeness), and seeking to grow in awareness (i.e., VIA Inquisitiveness expanding to faithful TCI Self-

Transcendence) to the extent that a person is open to experiences of the transcendental unity of all being (Cloninger, 2004).

### Study Limitations

The primary limitation of both studies is the sampling technique. Both studies recruited participants using a conventional convenience strategy, meaning that the sample is probably not fully representative of the overall Portuguese adult population, and the study is therefore likely to suffer from threats to external validity. That said, we formed personality profiles on the basis of data from the normative Portuguese population, which is a notable strength of the study. Nonetheless, we recommend caution in generalizing our results to the general population of Portuguese adults. We suggest future studies should seek to replicate our findings using a more sophisticated probabilistic sampling technique.

A second potential limitation of the work is the fact that we only used self-report measures. This type of data collection has been criticized for being open to biases (certain individuals may be more inclined to present themselves favorably rather than truthfully). However, the TCI has been extensively validated by clinical interviews, longitudinal studies of development using objective and subjective measures of well-being, as well as by neurobehavioral, neurogenetic and evolutionary studies.

### Conclusions

Recent evidence indicates that peoples' character strengths are manifestations of three virtues that reflect positive functioning in relation to the self, to others, and to the wider world (McGrath et al., 2018). We have argued that these three virtues share a conceptual similarity with the character dimensions described in Cloninger's model of personality, but also that a full understanding of the relationship between virtues and personality requires acknowledging the complex and dynamic interactions between character and temperament that influence a person's openness and learning from their experiences. Consistent with our theorizing, we found Self-Control was most strongly related with Self-Directedness; Caring was most strongly related with Cooperativeness; and Inquisitiveness was most strongly related with Self-Transcendence. However, the size of the correlations indicated the VIA constructs were related to those of the TCI but restricted by the exclusion of transpersonal experiences and contemplative silence. We showed that the type of virtues a person presents is dependent on their temperament profile. We also found that people with high TCI

character development were more virtuous overall than those with low TCI character development. Finally, we showed that virtues were elevated in people whose temperament and character traits were well-integrated compared to those whose temperament was weakly regulated by their character traits.

### Notes

1. Although it is acknowledged that this model was only intended as a starting point for research (McGrath, 2019a).
2. These scales were published after we had collected data for Study 1 and Study 2.

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### References

- Brdar, I., & Kashdan, T. B. (2010). Character strengths and well-being in Croatia: An empirical investigation of structure and correlates. *Journal of Research in Personality*, 44(1), 151–154. <https://doi.org/10.1016/j.jrp.2009.12.001>
- Chalmers, D. J. (1996). *The conscious mind: In search of a fundamental theory*. Oxford University Press.
- Chavez-Eakle, R. A., Lara, M. D. C., & Cruz-Fuentes, C. (2006). Personality: A possible bridge between creativity and psychopathology? *Creativity Research Journal*, 18(1), 27–38. [https://doi.org/10.1207/s15326934crj1801\\_4](https://doi.org/10.1207/s15326934crj1801_4)
- Cloninger, C. R. (1986). A unified biosocial theory of personality and its role in the development of anxiety states. *Psychiatric Developments*, 4(3), 167–226. [https://www.researchgate.net/profile/Robert-Cloninger/publication/19353093\\_Unified\\_biosocial\\_theory\\_of\\_personality\\_and\\_its\\_role\\_in\\_the\\_development\\_of\\_anxiety\\_states/links/00463537d00f1ce42d000000/Unified-biosocial-theory-of-personality-and-its-role-in-the-development-of-anxiety-states.pdf](https://www.researchgate.net/profile/Robert-Cloninger/publication/19353093_Unified_biosocial_theory_of_personality_and_its_role_in_the_development_of_anxiety_states/links/00463537d00f1ce42d000000/Unified-biosocial-theory-of-personality-and-its-role-in-the-development-of-anxiety-states.pdf)
- Cloninger, C. R. (1987). A systematic method for clinical description and classification of personality variants. *Archives of General Psychiatry*, 44(6), 573–588. <https://doi.org/10.1001/archpsyc.1987.01800180093014>



- Cloninger, C. R. (1994). Temperament and personality. *Current Opinion in Neurobiology*, 4(2), 266–273. [https://doi.org/10.1016/0959-4388\(94\)90083-3](https://doi.org/10.1016/0959-4388(94)90083-3)
- Cloninger, C. R. (2003). Completing the psychobiological architecture of human personality development: Temperament, character, and coherence. In U. M. Staudinger & U. Lindenberger (Eds.), *Understanding human development* (pp. 159–181). Springer. [https://doi.org/10.1007/978-1-4615-0357-6\\_8](https://doi.org/10.1007/978-1-4615-0357-6_8)
- Cloninger, C. R. (2004). *Feeling good: The science of well-Being*. Oxford University Press.
- Cloninger, C. R. (2005). Review of character strengths and virtues: A handbook and classification. *American Journal of Psychiatry*, 162(4), 820–821. <https://doi.org/10.1176/appi.ajp.162.4.820-a>
- Cloninger, C. R. (2007). Spirituality and the science of feeling good. *Southern Medical Journal*, 100(7), 740–743. <https://doi.org/10.1097/SMJ.0b013e318070d177>
- Cloninger, C. R. (2009). Evolution of human brain functions: The functional structure of human consciousness. *Australian and New Zealand Journal of Psychiatry*, 43(11), 994–1006. <https://doi.org/10.1080/00048670903270506>
- Cloninger, C. R. (2010). Personality and temperament: New and alternative perspectives. *Focus: The Journal of Lifelong Learning in Psychiatry*, 8(2), 161–163. <https://doi.org/10.1176/foc.8.2.foc161>
- Cloninger, C. R. (2011). Religious and spiritual issues in personality disorders. In J. R. Peteet, F. G. Lu, & W. E. Narrow (Eds.), *Religious and spiritual issues in psychiatric diagnosis: A research Agenda for DSM-5* (pp. 151–164). American Psychiatric Publishing.
- Cloninger, C. R. (2013). What makes people healthy, happy, and fulfilled in the face of current world challenges? *Mens Sana Monographs*, 11(1), 16–24. <https://doi.org/10.4103/0973-1229.109288>
- Cloninger, C. R., Keady, B., Lester, N., Kedia, S., & Cloninger, K. M. (2015). Empirical measurement of Plato's model of the human psyche: Validation by the neuroscience of personality. In D. Stoyanov (Ed.), *Towards a new philosophy of mental health: Perspectives from neuroscience and humanities* (pp. 128–155). Cambridge Scholars Publishing.
- Cloninger, C. R., & Cloninger, K. M. (2011). Person-centered therapeutics. *The International Journal of Person Centered Medicine*, 1(1), 43–52. <https://doi.org/10.5750/ijpcm.v1i1.21>
- Cloninger, C. R., & Cloninger, K. M. (2021). Self-Transcendence. In J. R. Peteet (Ed.), *The Virtues in Clinical Practice*. Oxford University Press.
- Cloninger, C. R., Cloninger, K. M., Zwir, I., & Keltikangas-Järvinen, L. (2019). The complex genetics and biology of human temperament: A review of traditional concepts in relation to new molecular findings. *Translational Psychiatry*, 9(1), 290. <https://doi.org/10.1038/s41398-019-0621-4>
- Cloninger, C. R., Svrakic, D. M., & Przybeck, T. R. (1993). A psychobiological model of temperament and character. *Archives of General Psychiatry*, 50(12), 975–990. <https://doi.org/10.1001/archpsyc.1993.01820240059008>
- Cloninger, C. R., Svrakic, N. M., & Svrakic, D. M. (1997). Role of personality self-organization in development of mental order and disorder. *Development and Psychopathology*, 9(4), 881–906. <https://doi.org/10.1017/S095457949700148X>
- Cloninger, C. R., & Zohar, A. H. (2011). Personality and the perception of health and happiness. *Journal of Affective Disorders*, 128(1–2), 24–32. <https://doi.org/10.1016/j.jad.2010.06.012>
- Cloninger, C. R., Zohar, A. H., Hirschmann, S., & Dahan, D. (2012). The psychological costs and benefits of being highly persistent: Personality profiles distinguish mood disorders from anxiety disorders. *Journal of Affective Disorders*, 136(3), 758–766. <https://doi.org/10.1016/j.jad.2011.09.046>
- Duan, W., Ho, S. M. Y., Yu, B., Tang, X., Zhang, Y., Li, T., & Yuen, T. (2012). Factor structure of the Chinese virtues questionnaire. *Research on Social Work Practice*, 22(6), 680–688. <https://doi.org/10.1177/1049731512450074>
- Goldberg, L. R. (2006). Doing it all Bass-Ackwards: The development of hierarchical factor structures from the top down. *Journal of Research in Personality*, 40(4), 347–358. <https://doi.org/10.1016/j.jrp.2006.01.001>
- Gusnard, D. A., Ollinger, J. M., Shulman, G. L., Cloninger, C. R., Price, J. L., Van Essen, D. C., & Raichle, M. E. (2003). Persistence and brain circuitry. *Proceedings of the National Academy of Sciences*, 100(6), 3479–3484. <https://doi.org/10.1073/pnas.0538050100>
- Hay, D. (2007). *Something there: The biology of the human spirit*. Templeton Press.
- Hursthouse, R., & Pettigrove, G. (2018). Virtue Ethics. In E. N. Zalta (Ed.), *The Stanford Encyclopedia of Philosophy*. Metaphysics Research Lab, Stanford University. <https://plato.stanford.edu/archives/win2018/entries/ethics-virtue>
- Josefsson, K., Jokela, M., Cloninger, C. R., Hintsanen, M., Salo, J., Hintsanen, T., Pulkki-Råback, L., & Keltikangas-Järvinen, L. (2013). Maturity and change in personality: Developmental trends of temperament and character in adulthood. *Development and Psychopathology*, 25(3), 713–727. <https://doi.org/10.1017/S0954579413000126>
- Kant, I. (1797). *Anthropology from a pragmatic point of view*. V. L. Dowdell & F. P. Van De Pitte, (eds.). Southern Illinois University Press.
- Keady, B. (2011). *Intuitive Virtue in Plato, Augustine, and Gandhi* (PhD Dissertation). University of Denver.
- Littman-Ovadia, H., & Lavy, S. (2012). Character strengths in Israel: Hebrew adaptation of the VIA inventory of strengths. *European Journal of Psychological Assessment*, 28(1), 41–50. <https://doi.org/10.1027/1015-5759/a000089>
- McGrath, R. E. (2014). Scale- and item-level factor analyses of the VIA inventory of strengths. *Assessment*, 21(1), 4–14. <https://doi.org/10.1177/1073191112450612>
- McGrath, R. E. (2015). Integrating psychological and cultural perspectives on virtue: The hierarchical structure of character strengths. *The Journal of Positive Psychology*, 10(5), 407–424. <https://doi.org/10.1080/17439760.2014.994222>
- McGrath, R. E. (2019a). Refining our understanding of the VIA Classification: Reflections on papers by Han, Miller, and Snow. *The Journal of Positive Psychology*, 14(1), 41–50. <https://doi.org/10.1080/17439760.2018.1528382>
- McGrath, R. E. (2019b). *Technical report: The VIA Assessment Suite for Adults: Development and initial evaluation* (rev. ed.). Cincinnati, OH: VIA Institute on Character

- McGrath, R. E. (2020). Darwin meets Aristotle: Evolutionary evidence for three fundamental virtues. *The Journal of Positive Psychology*. Advance online publication. <https://doi.org/10.1080/17439760.2020.1752781>
- McGrath, R. E., Greenberg, M. J., & Hall-Simmonds, A. (2018). Scarecrow, Tin Woodsman, and Cowardly Lion: The three-factor model of virtue. *The Journal of Positive Psychology*, 13(4), 373–392. <https://doi.org/10.1080/17439760.2017.1326518>
- Moreira, P. A. S., Cloninger, C. R., Dinis, L., Sá, L., Oliveira, J. T., Dias, A., & Oliveira, J. (2015). Personality and well-being in adolescents. *Frontiers in Psychology*, 5, 1494. <https://doi.org/10.3389/fpsyg.2014.01494>
- Moreira, P. A. S., Cloninger, C. R., Rocha, M. J., Oliveira, J. T., Ferreira, N., Gonçalves, D. M., & Rózsa, S. (2017). The psychometrics of the European Portuguese version of the temperament and character inventory- revised. *Psychological Reports*, 120(6), 1178–1199. <https://doi.org/10.1177/0033294117711914>
- Moreira, P. A. M., Inman, R. A., & C. R. Cloninger. (2021). Reactance and personality: Assessing psychological reactance using a biopsychosocial and person-centered approach. *Current Psychology*. Advance Online: <http://doi.org/19.1007/s12144-020-01310-1>
- Moreira, P. A. S., Inman, R. A., & Cloninger, C. R. (2021a). Personality networks and emotional and behavioral problems: Integrating temperament and character using latent profile and latent class analyses. *Child Psychiatry and Human Development*, 52, 856–868. <https://doi.org/10.1007/s10578-020-01063-9>
- Moreira, P. A. S., Inman, R. A., & Cloninger, C. R. (2021b). Humor and personality: Temperament and character have different roles [Manuscript submitted for publication]. *Social Psychological and Personality Science*.
- Moreira, P. A. S., Inman, R. A., & Cloninger, C. R. (2021c). The revised temperament and character inventory: Continental Portuguese population norms. [Unpublished Manuscript]. Centro de Investigação em Psicologia para o Desenvolvimento (CIPD), Universidade Lusíada, Porto.
- Moreira, P. A. S., Inman, R. A., Cloninger, K. M., & Cloninger, C. R. (2021). Student engagement with school and personality: A biopsychosocial and person-centred approach. *British Journal of Educational Psychology*, 91(2), 691–713. <https://doi.org/10.1111/bjep.12388>
- Moreira, P. A. S., Inman, R. A., Rosa, I., Cloninger, K. M., Duarte, A., & Robert Cloninger, C. (2021). The psychobiological model of personality and its association with student approaches to learning: Integrating temperament and character. *Scandinavian Journal of Educational Research*, 65(4), 693–709. <https://doi.org/10.1080/00313831.2020.1739137>
- Moreira, P.A.S., & Inman, R.A. (2021). Psychometric Properties of the Comic Styles Markers - Portuguese version: applying bifactor and hierarchical approaches to studying broad versus narrow styles of humor. *Advance Online. Humor: International Journal of Humor Research*. <http://doi.org/10.1515/humor-2021-0039>
- Moreira, P.A.S., Inman, R.A., & Cloninger, C.R. (2021e). Reactance and personality: Assessing psychological reactance using a biopsychosocial and person-centered approach. *Current Psychology*. Advance Online. <http://doi.org/10.1007/s12144-020-01310-1>
- Peterson, C., & Seligman, M. E. P. (2004). *Character strengths and virtues: A handbook and classification*. Oxford University Press.
- Rettew, D. C., Althoff, R. R., Dumenci, L., Ayer, L., & Hudziak, J. J. (2008). Latent profiles of temperament and their relations to psychopathology and wellness. *Journal of the American Academy of Child and Adolescent Psychiatry*, 47(3), 273–281. <https://doi.org/10.1097/CHI.0b013e318160b403>
- Ruch, W., Gander, F., Wagner, L., & Giuliani, F. (2021). The structure of character: On the relationships between character strengths and virtues. *The Journal of Positive Psychology*, 16(1), 116–128. <https://doi.org/10.1080/17439760.2019.1689418>
- Ruch, W., & Proyer, R. T. (2015). Mapping strengths into virtues: The relation of the 24 VIA-strengths to six ubiquitous virtues. *Frontiers in Psychology*, 6(MAR), 1–12. <https://doi.org/10.3389/fpsyg.2015.00460>
- Seligman, M. E., & Csikszentmihalyi, M. (2000). Positive psychology. An introduction. *The American Psychologist*, 55(1), 5–14. <https://doi.org/10.1037/0003-066X.55.1.5>
- Shryack, J., Steger, M. F., Krueger, R. F., & Kallie, C. S. (2010). The structure of virtue: An empirical investigation of the dimensionality of the virtues in action inventory of strengths. *Personality and Individual Differences*, 48(6), 714–719. <https://doi.org/10.1016/j.paid.2010.01.007>
- Svrakic, D. M., Whitehead, C., Przybeck, T. R., & Cloninger, C. R. (1993). Differential diagnosis of personality disorders by the seven-factor model of temperament and character. *Archives of General Psychiatry*, 50(12), 991–999. <https://doi.org/10.1001/archpsyc.1993.01820240075009>
- Zwir, I., Arnedo, J., Del-Val, C., Pulkki-Råback, L., Konte, B., Yang, S. S., Romero-Zaliz, R., Hintsanen, M., Cloninger, K. M., Garcia, D., Svrakic, D. M., Rozsa, S., Martinez, M., Lyytikäinen, L. P., Giegling, I., Kähönen, M., Hernandez-Cuervo, H., Seppälä, I., Raitoharju, E., Cloninger, K. M., ... Cloninger, C. R. (2020a). Uncovering the complex genetics of human character. *Molecular Psychiatry*, 25(10), 2295–2312. <https://doi.org/10.1038/s41380-018-0263-6>
- Zwir, I., Arnedo, J., Del-Val, C., Pulkki-Råback, L., Konte, B., Yang, S. S., Romero-Zaliz, R., Hintsanen, M., Cloninger, K. M., Garcia, D., Svrakic, D. M., Rozsa, S., Martinez, M., Lyytikäinen, L. P., Giegling, I., Kähönen, M., Hernandez-Cuervo, H., Seppälä, I., Raitoharju, E., Cloninger, K. M., ... Cloninger, C. R. (2020b). Uncovering the complex genetics of human temperament. *Molecular Psychiatry*, 25(10), 2275–2294. <https://doi.org/10.1038/s41380-018-0264-5>
- Zwir, I., Del-Val, C., Arnedo, J., Pulkki-Råback, L., Konte, B., Yang, S. S., Romero-Zaliz, R., Hintsanen, M., Cloninger, K. M., Garcia, D., Svrakic, D. M., Lester, N., Rozsa, S., Mesa, A., Lyytikäinen, L. P., Giegling, I., Kähönen, M., Martinez, M., Seppälä, I., Cloninger, K. M., ... Cloninger, C. R. (2019). Three genetic-environmental networks for human personality. *Molecular Psychiatry*. Advance online publication. <https://doi.org/10.1038/s41380-019-0579-x>
- Zwir, I., Del-Val, C., Hintsanen, M., Cloninger, K. M., Romero-Zaliz, R., Mesa, A., Arnedo, J., Salas, R., Poblete, G. F., Raitoharju, E., Raitakari, O., Keltikangas-Järvinen, L., de Erausquin, G. A., Tattersall, I., Lehtimäki, T., & Cloninger, C. R. (2021). Evolution of genetic networks for human creativity. *Molecular Psychiatry*. Advance online publication. <https://doi.org/10.1038/s41380-021-01097-y>