



Conscientiousness

The Science of Resilience

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Definition

Conscientiousness is one of “the Big Five” personality traits alongside agreeableness, openness to experience, extroversion and neuroticism (Goldberg, 1992, 1993). Conscientiousness is the personality trait of being organized, punctual, careful, diligent, and efficient (Costa & McCrae, 1992). People high in conscientiousness can be characterized by their self-discipline, planning, neatness, and reliability, in comparison to people low in conscientiousness who tend to be more disordered, careless, impulsive, with poor time management. Levels of conscientiousness can be measured in self-report questionnaires measuring personality traits, such as the NEO-PI-R (Costa & McCrae, 1992; 1999) or HEXACO model (Ashton & Lee, 2014).

While similar, the facets of conscientiousness differ across these personality measures. In Goldberg’s (1999) IPIP model the facets are listed as: self-efficacy, orderliness, dutifulness, achievement-striving, self-discipline, and cautiousness. Costa & McCrae (1992) list them as: competence, order, dutifulness, achievement-striving, self-discipline, and deliberation. In the Big Five Aspects Scale (BFAS), DeYoung et al. (2007) break down conscientiousness into orderliness (the tendency to keep things tidy, follow a schedule, enjoy routine and order, adhere to rules, and have every detail taken care of), and industriousness (the tendency to not waste time, find it easy to get right to work, carry out plans, finish what’s been started, not get distracted, and finish goals quickly). In short, orderliness is more focused on keeping things structured, and industriousness with productivity and work ethic. Across all models, conscientiousness is a collection of constructs that describe differences in one’s tendency to set goals, abide by the rules, be self-controlled, hardworking, orderly, and feel a sense of responsibility to others (Roberts et al., 2017a).

As a personality trait, conscientiousness has an effect on, or is in part responsible for, the automatic patterns of thoughts, feelings, and behaviors that people experience throughout their lives. Conscientious people are also more cautious, a likely reason for why they do not tend to engage in risky behaviours like smoking and drinking, and spend more time investing in fitness and physical health (Hill & Jackson, 2016; Turiano et al., 2012). Hill & Jackson (2016) therefore propose in their ‘Invest-and-Accrue’ (IAM) model of conscientiousness that this propensity for foresight should be paramount in explaining why conscientiousness tends to predict a variety of positive life outcomes, as people high in conscientiousness are more likely to invest in themselves and others, and grow from their gains.

Conscientiousness is the primary personality trait for predicting positive job performance, lower occupational stress, higher lifelong earnings, good relationship quality and duration, physical health and longevity (Kern & Friedman, 2008), a lower frequency of memory problems (Hill et al., 2019), and even the onset of Alzheimer’s with lower levels of conscientiousness being a risk factor (Lewis et al., 2018; Roberts et al., 2017a). High

conscientiousness predicts lower incidence of anxiety disorders and depression in adolescents (Smith et al., 2017). Higher conscientiousness has also been associated with marital stability and lower divorce rates (Boertien et al., 2015; Roberts et al., 2014), with possible explanations being that conscientious people are less likely to abuse drugs or alcohol, lose control of their emotions, or engage in risk-taking behaviour that could endanger their marriage. As alluded to by Hill & Jackson (2016), while highly conscientious people may be less likely to engage in risky behaviours such as in relation to driving (Senserrick et al., 2009), the risks that they do take are likely to be more calculated.

Bogg and Roberts (2004) state that another reason for the association with longevity is that higher conscientiousness increases engagement in positive health behaviours. Other data from Australian adults has shown an association between high conscientiousness and increased levels of fruit and vegetable intake, increased physical activity, decreased alcohol consumption, and decreased smoking involvement (Allen et al., 2015). A recent study on weight loss maintenance showed that individuals who were able to maintain the weight they had lost reported small-to-moderately higher levels of conscientiousness compared to those who regained weight (Gold et al., 2020), which may attribute to the propensity for higher conscientious people to set and stick to goals. Similarly, people high in conscientiousness are more likely to adhere to their prescribed medical regimens and remember to take their pills, which an estimated 50% of individuals do not, including for the oral contraceptive pill which if forgotten can lead to calamitous social, psychological and medical risks (Eustace et al., 2018). As such, Bogg and Roberts (2013) argue for an increase of education into the importance of conscientiousness into public health, epidemiological, and medical research. More recently in research following the COVID-19 pandemic, Bogg and Milad (2020) stated that higher conscientiousness in individuals was associated with greater adherence to the COVID-19 guidelines put in place during the initial 15-day period advocated by the White House.

Relation to Sleep

Higher conscientiousness scores have been positively associated with brain cortical thickness in a variety of regions, including the “bilateral parahippocampal gyrus, bilateral fusiform gyrus, left cingulate gyrus, right medial orbitofrontal cortex, and left dorsomedial prefrontal cortex” (Lewis et al., 2018, p. 25), and these areas have been found to reduce in thickness when stress and smoking status are factored in. Another factor related to brain matter and conscientiousness is sleep and chronotype (i.e., the propensity of an individual to sleep at a certain time), with left-thinkers tending to be morning-people, and morning people tending to be more conscientious (Escribano & Díaz-Morales, 2016).

As with people high in conscientiousness, morning types tend to be more satisfied with life and score higher on the left-thinking scale (Randler, 2008). Right-thinking types, who are more likely to be evening-types, are creative, impulsive, intuitive, feeling- and perceiving-oriented people who tend to develop affective and social learning strategies, have a high

tolerance of ambiguity, and lean toward cultural individualism (Fabbri et al., 2007). In contrast, left-thinking types rely on sense over emotion, are thinking- and judging-oriented people who develop cognitive and meta-cognitive learning strategies, have a low tolerance for ambiguity, and lean toward cultural collectivism in terms of conformism and adherence to laws and social norms. Right-thinkers tend to exhibit more emotional, learning, and behavioural problems (including drug use), but are more creative thinkers with higher adaptability to change and tend to occupy the social sciences compared to applied sciences (Fabbri et al., 2007). In examining this, Ram-Vlasov et al. (2016) found that compared to social science students, visual arts students had poorer sleep quality, longer sleep duration, and later sleeping times (i.e., were more likely to be evening-types). They also state that the common neurotransmitter dopamine is associated with both insomnia and creativity, and in adults less sleep and poorer sleep quality predicted more creativity in visual expression.

Sleep is a crucial component to establishing and maintaining a consistent daily routine, and in contributing to overall health and well-being, factors common among people high in conscientiousness. An individual's chronotype – also known as circadian typology or diurnal preference (i.e., the propensity of an individual to sleep at a certain time) – tends to be half influenced by genetics, and half by factors such as age, gender, culture, environment and nutrition (Randler, 2008). A study from the US (n = 53,689; 56.3% female, 43.7% male) showed that about one in four people are morning risers, another one in four are evening people, leaving about 50% of the population somewhere in between (Fischer et al., 2017). Morning people tend to be more persistent, self-directed and cooperative, present stronger learning motivation and set higher learning and performance goals which relate to improved self-reported academic performance (Escribano & Díaz-Morales, 2016), are less likely to smoke, drink, or be depressed (Kim et al., 2019), and report higher positive affect or sense of well-being (Biss & Hasher, 2012; Randler, 2008). Avoidant psychological 'defense mechanisms', such as avoidant procrastination, has also been shown to be associated more with evening types (Escribano & Díaz-Morales, 2016; Kim et al., 2019). Unsurprisingly, multiple research studies have shown a strong association between conscientiousness and morning-types, with a meta-analysis affirming conscientiousness as the strongest personality predictor of "morningness" (Tsaousis, 2010).

One such study examining the relation between personality traits and sleep patterns in German adolescents and adults found that morningness ('morning-types' or 'morning people') correlated positively with agreeableness and conscientiousness in the overall sample (n = 1231; 652 female, 579 male; 431 boys and 492 girls aged 10-17; and 148 men, and 160 women; Randler, 2008). Neuroticism was more closely associated with "eveningness" in females and adolescents (10-17 years old), and in adults (age 18-47) only conscientiousness was correlated with morningness. Morning people go to bed earlier and wake easier, and as such tend to achieve better academic grades, similar to people high in conscientiousness. Other research has shown that men are slightly more evening-oriented than women (Randler, 2008), and that women tend to be higher in morningness, conscientiousness, and agreeableness, although the

effect of gender on chronotype was weak albeit significant (Hogben et al., 2007). Further research showed, however, that only conscientiousness and not agreeableness was associated with morningness in females in a study of German university students ($n = 669$; 73.4% female, 26.4% male; mean age 22.24). On the topic of gender, Costa et al. (2001) note no significant difference in gender regarding conscientiousness.

Other research on sleep and personality traits has shown that higher conscientiousness has been associated with fewer sleep complaints, and lower conscientiousness with insomnia (Emert et al., 2017; Hisler & Križan, 2019). Possible reasons for this are that conscientious people tend to act with more self-discipline and planning rather than spontaneity, so may have better sleep hygiene routines and stricter sleep schedules (Hisler & Križan, 2019). This tendency for order and future preparedness may also contribute to having less stress and anxiety over things seemingly out of one's control, which may be why more neurotic and less conscientious individuals exhibit greater sleep disturbances (Hisler & Križan, 2019). Another possibility for better, consistent, more restorative sleep among people high in conscientiousness is that they tend to live healthier lives, avoid alcohol and drugs which inhibit the benefits of sleep, and engage in behaviours that promote sleep, like exercise and bedtime routines (to avoid "sleep procrastination"; Hisler & Križan, 2019).

Better sleep may also promote facets of conscientiousness, as people with consistent, restful sleep are more coherent and better able to perform at work or school, and better at maintaining self-control (Hisler & Križan, 2019). Conversely, irregular sleep may weaken manifestations of conscientiousness, "suggesting causal processes that may flow in both directions" (p. 144). The authors of this study also state how sleep quality can affect *and* be affected by marriage quality, health, and job performance, and that their may be overlapping genetic influences.

Another study on diurnal preference looked at the relation of psychological defense mechanisms (measured using the Korean version of the Horne and Östberg Morningness–Eveningness Questionnaire (MEQ), and the Korean version of the Defense Style Questionnaire; DSQ) in a sample of community-dwelling Korean adults (i.e., connected in some way to apartment buildings, churches, hospitals and public health centers; 207 participants, 122 males and 85 females, mean age 42 years; Kim et al., 2019). Defense mechanisms are unconscious mental processes that protect the self from feeling anxiety and discomfort from cognitive conflicts. Immature defense styles are marked by inappropriate methods of coping with impulses or drives, are more commonly found among people with anxiety, depression and eating disorders, and include alexithymia (the inability to identify or describe emotions), insecure attachment, distancing or avoidance coping strategies, personality disorder traits, and deliberate self-harm.

Kim et al. (2019) found that eveningness was associated with the avoidance behaviours of withdrawal and resignation, and the immature and self-inhibiting defense styles of acting out (having a tantrum, or drinking to cope); splitting (the tendency to think of the self or others in

extremes; only good or only bad with no middle ground); fantasy (retreating from stress into a fantasy world); and consumption (of alcohol, food or drugs; associated with problematic eating or drinking). Splitting and consumption in relation to eveningness were only found in female participants, and fantasy only in males which the researchers state has been associated in other research with problematic internet use and addictive nighttime gaming. All of these are issues with impulse control and emotional regulation.

Therefore, theoretically, if interventions aim to improve conscientiousness through shifting diurnal preference to morningness, therapies ought to also focus on correcting the above-mentioned defense mechanisms associated with eveningness, as well as improving sleep hygiene. While evidence for successfully shifting from eveningness to morningness is slim, improving sleep-related behaviours, such as sticking to a consistent sleep schedule, may be more important for increasing conscientious behaviour without having to switch from an owl to a lark. [For more information on interventions to improve sleep quality, duration and consistency, which may improve conscientiousness, see our write-up on sleep].

One can see the commonalities between left-thinkers, morningness and conscientiousness (Escribano & Díaz-Morales, 2016). Of course, correlation does not equal causation, and plenty of perfectly healthy, successful people are night-owls. Sociological reasons may also account for negative evening-type mood disorders, such as society being designed around early work and school schedules (Fabbri et al., 2007; Jankowski, 2015; Hisler & Križan, 2019). Further, attempts to shift chronotype may not prove effective in increasing conscientiousness or its characteristics, as one study of 117 undergrads showed no change in mood or life satisfaction for those who shifted toward an earlier chronotype, although they did decrease “social jetlag” (i.e., the difference in sleep duration between weekdays and weekends, when evening types are more likely to recover lost sleep; Jankowski, 2015). Therefore, rather than attempting to increase conscientiousness by altering heavily biologically-determined sleep styles, it may make more sense to address the psychologically-related deficiencies that tend to be found more in evening-types, which interfere with their productivity, interpersonal relationships, propensity for resilience, and life satisfaction.

Relationship to Resilience

Both morningness and conscientiousness have been associated with greater resilience (Friborg et al., 2015¹). While research on the association of conscientiousness and resilience has shown a positive association between the two, such studies have defined resilience as the ability to “bounce back” and adapt to crises, as measured by the Connor–Davidson Resilience Scale (Campbell-Sills et al., 2006). Such research was also able to find a positive association between resilience and task-oriented coping (i.e., the ability to focus on and commit to solving

¹ Resilience Scale for Adults (RSA; Hjemdal, Friborg, Martinussen and Rosenvinge, 2001): <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4471935/>

a task), with the latter mediating the relationship between resilience and conscientiousness. However, as Campbell-Sills et al. (2006) acknowledge in their conclusion, a more holistic rather than responsive conceptualization of resilience (i.e., Ungar's socioecological model) would be beneficial in examining its relation to the positive effects of conscientiousness and task-oriented coping mechanisms in preparation for adversity:

A comprehensive biopsychosocial understanding of resilience could aid in the promotion of mental health and development of treatments that emphasize the building of psychological strength rather than simple remediation of symptoms. Existing results (including those of the present study) suggest that developing task-oriented coping skills and increasing access to experiences that elicit positive emotions and/or social support may help to promote resilience in the face of stress and adversity. (p.597)

Similarly, Eskreis-Winkler et al. (2014) found conscientiousness to be strongly associated with 'grittiness', i.e., the ability to "work diligently toward the same higher-order goals over extremely long stretches of time" (p. 2). The researchers found that grittier people were more likely to graduate from high school, keep their jobs, stay married (for men but not women; however participants higher in conscientiousness were more likely to be married and remain married), and grittier soldiers were more likely to complete a special forces selection course. Another study on German soldiers (n = 235; 143 men, 92 women; age 17-41, mean age 24.1) found higher conscientiousness, extraversion, and resilience² scores than the norm population (Klee & Renner, 2016). The authors refer to similar findings among American and Canadian military personnel, and state that high conscientiousness is needed in such high-stakes environments where there is no room for mistakes.

While some might imagine that soldiers need to embody ruthlessness, in reality they need to display cooperation and teamwork in order to work as a unit. While conscientiousness is good for discipline in the military and other workplace settings, it is also demonstrated by the ability to help others. Of the Big Five personality traits, conscientiousness was the strongest predictor in workplace settings for 'organizational citizenship behaviours', i.e., behaviours and attitudes that complement and promote the effective functioning of an organization (Gore et al., 2012). This was also found to be true for 'academic conscientiousness' and academic citizenship behaviours (e.g., the tendency to attend class, which Webb et al., (2007) found to be associated with conscientiousness). While agreeable people are more likely to take on extra

² "Resilience was assessed with the German version of the resilience scale (RS-25) by Schumacher et al. (2005) that consists of 25 items to be rated on a seven-point Likert scale (1 = "No"/"I don't agree"; 7 = "Yes"/"I totally agree"). Sample items (translated by the authors) are: "Usually I can manage everything.", "I like myself." and "My life has meaning." Schumacher et al. (2005) report an internal consistency of $\alpha = .95$, in our sample it was $\alpha = .86$. The validity of the RS-25 (Schumacher et al., 2005) could be supported by correlation with self-efficacy and norms were derived from a representative sample of N = 2.031 (947 males and 1.082 females between 14 and 95 years)." (Klee & Renner, 2016, p. 262)

- <https://www.resiliencecenter.com/products/resilience-scales-and-tools-for-research/the-original-resilience-scale/>

roles in the workplace, conscientious people were found to be the most helpful, perhaps because they want to make sure the task is done right for the good of the organization (Gore et al., 2012). Similarly, conscientious students who attend class may be more likely to help a fellow student with an assignment. This social aspect of conscientiousness was also demonstrated by Hudson and Roberts (2016) who showed that increased interactions with coworkers led to an increase in conscientiousness, and a decrease in social aspects of work led to lower conscientiousness overtime.

Worth noting, just as the socioecological concept of resilience embodies both an individual's 'rugged' qualities and their accessibility to relied upon social 'resources', the positive outcomes from having higher levels of conscientiousness and living conscientiously also appears to be reliant upon the personality traits of one's social network. Research by Solomon and Jackson (2014) showed that occupational success (which, as mentioned earlier, tends to be found among workers high in conscientiousness) is also influenced by the personality of one's spouse. After accounting for the worker's conscientiousness levels, the five-year research project showed that having a partner high in conscientiousness contributed to future job satisfaction, income, and the likelihood of promotion for both male and female participants (n = 4,544). The researchers hypothesize that a spouse's personality can influence their partner's daily practices that overtime help to determine whether they see a raise, promotion, or career shift. Three theories were put forward for why this was: (a) individuals can "outsource" certain activities to their conscientious spouses, relying on them to handle their share of chores, finances, and other home responsibilities through a negotiation of one another's strengths; (b) having an ordered and smooth-running personal life may reduce stress and increase focus at work; and (c) a worker may emulate the conscientious habits of their spouse, such as diligence or reliability, at work. Fitzsimons and Finkel (2015) call this phenomenon "goal interdependence".

After controlling for socioeconomic status, one recent study found that the only personality trait associated with car accidents among men was conscientiousness (Eduardo & Ildefonso, 2020). Citing evidence from past research showing that less conscientious drivers are more likely to disobey traffic norms and engage in risky driving behaviour, the researchers posit that "a one standard deviation increase in the level of conscientiousness at age 10 would lower men's likelihood of having at least one injurious traffic crash by approximately 3 percentage points... improving personality traits through educational programs could lower traffic crashes and risky driving behaviours." The authors also cite research showing how a resilience-building program, but not a driver-training program, for high-school students resulted in a 44% reduced relative risk for crash (Senserrick et al., 2009). Therefore, while not directly connected, it appears fair to state that high-conscientious individuals are less likely to take risks, and resilience-focused programs act to reduce risk-taking behaviour.

Conscientiousness has also been associated with relationship quality. Holland & Roisman (2008) found that self-reported conscientiousness was corroborated by their partners'

reports in dating and engaged couples, that people high in conscientiousness reported higher quality relationships, and that married couples reported higher levels of conscientiousness. As mentioned earlier, conscientiousness is also positively associated with marital stability (Boertien et al., 2015; Roberts et al., 2014), which may be in part to superior emotional management and impulse control.

Impulse control

The association between conscientiousness and impulse control has been demonstrated in numerous studies (Roberts et al., 2014), such as one showing how individuals highest in conscientiousness were the least likely to take part in compulsive buying (Otero-López & Pol, 2013). Roberts et al. (2017a) ascribe the ability to delay gratification to the trait of conscientiousness, but state that this ability is more likely to occur when people live in stable, consistent and supportive environments. By having an orderly, scheduled and fairly predictable life organized around rules, individuals who are already high in conscientiousness are best able to save money for the future, are less likely to encounter unanticipated problems, and are therefore less likely to experience anxiety over such issues. When they do encounter such issues, they will have higher resolve, confidence, and self-efficacy in being able to overcome them.

People high in conscientiousness are less likely to procrastinate because they are more likely to make and stick to contracts with themselves to meet the deadline, not become overly anxious as the deadline approaches, and be able to order themselves to switch tasks when need be (Fee & Tangney, 2000; Rabin et al., 2011; Roberts et al., 2014). Procrastination is strongly associated with low conscientiousness and self-regulatory failure, and has a strong relationship with guilt (Steel, 2007). As it turns out, conscientiousness is also related to guilt, in that it is negatively related to the *experience* of guilt but positively related to guilt *proneness* (Fayard et al., 2012). This suggests that conscientious individuals are more likely to use guilt to guide their behaviour, so that they accomplish the things they want to do, and act in ways they think they and others ought to behave. In being *prone* to guilt, conscientious people thereby tend to avoid the *experience* or feeling of guilt that would come from doing the inverse of those things. As an example, a recent study found that even when people higher in conscientiousness did procrastinate, they were still more likely to meet deadlines (Zanjani et al., 2020).

People with high self-control also report more guilt and less shame, the former having beneficial effects compared to the negative effects of the latter (Tangney et al., 2004). Similarly, earlier research found that the tendency to procrastinate was associated with a tendency to feel shame rather than guilt (Fee & Tangney, 2000). Said study found that shame-proneness, but not guilt-proneness, was also associated more with perfectionism, low-self-esteem, and the fear of negative evaluation, as shame-prone individuals tend to perceive others as expecting them to be perfect. Shame-proneness, which is more common among people low in conscientiousness, may contribute to feeling unable to either start a task or carry it to

completion (Costa & McCrae, 1992). Conversely, high conscientiousness positively associates with the temperament dimension of persistence and the character dimension of self-directedness in Cloninger's Temperament and Character Inventory (De Fruyt et al., 2000).

Tangney et al. (2004) also examined the relationship between self-control and academic performance, as well as conscientiousness and self-control, and found a substantially positive correlation between self-control and conscientiousness. The authors reported positive correlations between self-control and a variety of factors, including emotional stability, better grades (in part brought about by a tendency to not procrastinate), fewer impulse control problems (e.g., binge eating and alcohol abuse), better psychological adjustment, higher self-esteem or self-acceptance, better interpersonal relationships (i.e., family cohesion and less family conflict), more secure attachment styles compared to problematic styles (e.g., avoidance or ambivalence), high empathy scores optimal for interpersonal functioning, and less of a likelihood of succumbing to personal distress. Interestingly, the study also found less of an association between self-control and perfectionism, stating that perfectionists tend to have less of a problem with impulse control, as they do with being unable to relinquish control, relax and turn in an 'okay' product (Tangney et al., 2004).

Other research has shown that individuals high in conscientiousness experienced favourable treatment outcomes in grief therapy for both interpretive and supportive therapy (Ogrodniczuk et al., 2003). Research has shown that individuals high in conscientiousness fare better in stressful situations because they tend to engage in realistic planning and problem solving (Sesker et al., 2015). Because conscientiousness involves being mindful of not only one's own behaviour, but one's behaviour in relation to those around them, conscientious people tend to display (a) mindfulness techniques, such as not engaging in avoidant coping strategies; and (b) having prosocial relationships. In one study that looked at the relationship between mindfulness and coping after controlling for the other Big Five traits, the researchers found that conscientiousness and mindfulness predicted problem-focused coping, and conscientiousness also inversely predicted emotion-focused coping, compared to neuroticism which predicted emotion-focused coping (Sesker et al., 2015).

Individuals with high self-control are also less likely to get angry and are better able to manage it when it arises (Tangney et al., 2004). Low conscientiousness has also been associated with aggression, as children with low levels of conscientiousness and agreeableness are more likely to initiate fights and be reported for bullying (Trninić et al., 2008). This may be a result of low impulse control, with frustration being expressed as aggression. This also shows a relationship with "the Dark Triad" of personality traits associated with narcissism, Machiavellianism (i.e., manipulation), and psychopathy (i.e., callous affect), with low agreeableness correlating with primary psychopathy (e.g., "selfishness, callousness, lack of interpersonal affect, superficial charm and remorselessness"), and low conscientiousness and high neuroticism correlating with secondary psychopathy ("anti-social lifestyle and behaviours"; Jakobwitz & Egan, 2006, p. 332). Agreeableness and conscientiousness are important in

regulating frustration, with the former being important in the regulation of frustration due to others, and conscientiousness being important in regulating frustration from tasks (Koolen et al., 2012).

Important to note, while conscientiousness seems to be associated with cognitive functioning, it has not been directly correlated with higher intelligence. However, conscientiousness tends to have the largest and most consistent association with academic performance compared to the other personality traits, and this association becomes stronger when intelligence is factored in (Dumfart & Neubauer, 2016; Gore et al., 2012; Murray et al., 2014; Poropat, 2009; Richardson et al., 2012; Ryberg et al., 2017; Schneider & Preckel, 2017; Wolfe & Johnson, 1995). Research has also shown a positive relationship between high levels of conscientiousness and time management skills, which may also contribute to better academic performance (Persky & Mierzwa, 2018). In higher education the association between conscientiousness and academic achievement tends to be about as strong as the relation between academic achievement and intelligence (Schneider & Preckel, 2017). More recent research has shown a connection between conscientiousness and cortical grey matter volume in the frontoparietal network, revealing “a potential brain-personality-achievement pathway for predicting academic performance in which gray matter structures affect academic performance through trait conscientiousness” (Wang et al., 2019, p. 1). Along with doing better academically, adolescents high in conscientiousness have also been found to have a high likelihood of acceptance in social circles and have quality friendships (Jensen-Campbell & Malcolm, 2007). Having more positive peer relationships is likely due to these individuals being reliable, respectful of plans, and displaying behavioural inhibition, rather than being impulsive and unpredictable.

Because of the multiple studies showing correlations between conscientiousness, self-control and academic success, Wolfe & Johnson (1995) go so far as to recommend that self-control and conscientiousness assessment measures be used in the college admission process. While conscientiousness has been proven multiple times to be associated with academic performance and success, it is important to remember that it does not equate with intelligence, and is not strongly associated with innovation or creativity (as discussed earlier in relation to eveningness). Importantly, people low in conscientiousness do still hold important and valuable occupations and positions in society. As Kern et al. (2019) demonstrate in their study of 128,279 Twitter profiles representing 3,513 occupations, software programmers, scientists, and top chemistry researchers appeared to be higher in openness but lower in agreeableness and conscientiousness, which was the opposite for top athletes. Librarians and doctors presented mixed profiles, and still others were higher in other traits, like architects who were high in openness and emotional stability and low in agreeableness. All of these require reliability, attention to detail, and integrity. While highly conscientious people are good at following norms, keeping order, and sticking to tasks, it may fall on people higher in other traits like openness to break free of those lines and think up new abstract ideas.

ADHD

As stated above, while conscientiousness is not directly associated with intelligence, it is associated with certain behaviour characteristics—such as the organization of goals and control over how they are ordered and enacted—that make achieving success in school or the workplace less complicated than for those low in conscientiousness. As it happens, there is a population of individuals known for having low conscientiousness scores and ongoing issues with impulse control, people with attention-deficit/hyper-activity (ADHD; Archer & Kostrzewa, 2012; De Pauw & Mervielde 2011; Martel et al., 2009). ADHD is a highly heritable, neuropsychiatric developmental disorder characterized by higher levels of hyperactivity, impulsivity, and/or inattention that often carries over from childhood into adulthood (Rosenfield et al., 2008). Symptoms of ADHD tend to be the exact opposite of characteristics of high conscientiousness: being often easily distracted by extraneous stimuli; having difficulty stopping activities or behaviour when they know they should; difficulty sustaining attention in tasks; and difficulty organizing tasks and activities. Rosenfield et al. (2008) cite studies showing that when compared to community samples, people with ADHD tend to report lower levels of educational attainment, increased risk of substance use, poorer driving records, have lower salaries, were less punctual, and were more likely to be disciplined by supervisors, all of which are the opposite of what is found in people high in conscientiousness, as mentioned earlier.

As conscientiousness is viewed as a cognitive control process (Jarrett et al., 2016), studies have shown that lower levels of conscientiousness have been related to both the inattentive and the hyperactive clusters of ADHD. Martell et al. (2009) label the former “top-down” processes, as they involve cognitive effort control, and the other “bottom-up” processes, which are influenced more by immediate incentive or affective response. The former is believed to be influenced by the brain’s prefrontal circuitry, and the latter by stimulus-driven activation in the parietal cortex or subcortex. Behaviourally, individuals with the inattentive top-down processes require more effortful control in being goal-directed, resource-demanding, and planful, and in overcoming immediate stimuli to stay focused on a goal. Specifically, research has shown that individuals in the “top-down” cluster who exhibit high amounts of inattention and disorganization are associated with low conscientiousness, and those in the “bottom-up” cluster who exhibited hyperactivity, impulsivity and oppositional behaviour were associated with low agreeableness and in some cases high extraversion or neuroticism (Nigg et al., 2002; Jarrett et al., 2016)

Other research on conscientiousness has shown a positive association between conscientiousness and executive functioning in terms of mental set shifting, or “the ability to adapt to changing environmental contingencies and task demands... the attention shifting or switching component of [executive functioning]” (Fleming et al., 2016, p. 357). Interestingly, the study did not find an association between conscientiousness and other facets of executive

functioning, name inhibition (important for impulse control), and working memory updating. As such, the authors state that success and well-being associated to conscientiousness may be more a result of this ability to be flexible and adaptable as they wish, rather than characterized by a rigid adherence to rules. Therefore, those with the inattentive subtype of ADHD, may have more difficulty having control over both where their attention strays, and moving attention away from something. As such, certain interventions catered to their cognitive processes may prove beneficial. If interventions for this population can achieve positive outcomes, perhaps they would also prove effective for others with low levels of conscientiousness.

Interventions

Given the importance of conscientiousness across many areas of life, it is becoming common for people to want to better understand and learn how to increase it. The debate continues around whether they are fixed or can be altered, or ought to be changed. Some researchers have stated that repeated or extended attempts to change one's personality may lead to growing decrements in well-being (Polivy & Herman, 2002). While the ability to increase the *trait* conscientiousness may be untenable or advantageous, an individual may find improvements in adopting a conscientious *state* by implementing or increasing conscientious qualities and characteristics that are in line with their own interests and make them feel important (Magidson et al., 2014).

Hudson & Fraley (2016) conducted a longitudinal study of the association between goal setting, attempts to change personality, and psychological well-being in 158 undergraduate psychology students over 16 weeks (66% female; 47% White, 35% Asian, 12% Hispanic, 8% Black and 1% Native American; mean age = 20.13). Students used a website every five days for a total of 16 'waves' to self-report personality traits using the 44-item Big Five Inventory (BFI), as well as their trait change goals using the Change Goals Big Five Inventory (C-BFI) which reworded the BFI items (e.g., "I am talkative" to "I want to be talkative") and rated³ items on a scale running from *much less than I currently am* (-2) to *I do not wish to change* (0) to *much more than I currently am* (+2). Psychological well-being was self-reported and measured using the 5-item Satisfaction With Life Scale (SWLS) and the 20-item Positive and Negative Affect Schedule (PANAS). Baseline and all subsequent measures captured personality traits and life satisfaction, and trait change goals were measured every fifth wave (6th, 11th, 16th).

The findings showed that trait levels of extraversion, agreeableness, conscientiousness, and emotional stability were positively correlated with life satisfaction. However, where other change goals were unrelated to changes in life satisfaction, goals to change conscientiousness and openness to experiences appeared to lead to relative decreases in life satisfaction. In

³ "Items were averaged to form composites for goals to increase in extraversion, agreeableness, conscientiousness, emotional stability, and openness to experience (Time 6 α s ranged from .81 [goals to change conscientiousness] to .83 [goals to change extraversion/goals to change stability])" (Hudson & Fraley, 2016, p. 606)

contrast, people who were satisfied with where they were at where predicted to slightly increase in life satisfaction. This may be less to do with a decrease in satisfaction, than a lack of investment in other areas of life which foster well-being (Hudson & Fraley, 2016). This may be due to these students being burdened with work, and therefore having more stress in accomplishing their goals. Importantly, this study did not intervene and provide techniques and strategies to increase conscientiousness; it simply measured students personality traits, recorded their intent to increase, then observed changes over four months. By not having a plan, student already low in conscientiousness may have become increasingly stressed (and therefore dissatisfied with themselves) as they took a weekly test on how they were doing with becoming conscientious. As such, the takeaway ought to be that having too broad of a goal is not effective in changing personality, and it is more likely that concrete steps need to be taken consistently.

To improve the specific areas of initiation, planning, and organization skills among college students, Rabin et al. (2011) cite past research to suggest that students be taught to set sub-goals and reasonable expectations about the amount of effort required to complete a task. Goal-setting and achievement strategies may include creating contracts for periodic work completion, holding recurring quizzes until the topic is mastered, and developing short assignments that build off each other with regular deadlines and feedback provided. These strategies act to reduce procrastination by narrowing the ‘intention-action gap’ to make deadlines seem less distant, and improve self-efficacy and self-respect in the students as they feel empowered to finish a task on time, which may counter the aversiveness felt by students who procrastinate. The authors also suggest that counselling may help procrastinators to avoid seeking temporary stress relief and concentrate on self-management and long-term goal attainment (Rabin et al., 2011). Suggested steps are for students to develop awareness of the emotions that jeopardize success, develop volitional skills to manage intrusive thoughts or urges, gain control over impulses through establishing routine for both learning and leisure, set small attainable goals, be mindful of resources needed to carry out tasks, identify and troubleshoot any problems that arise, and employ working memory and task monitoring skills.

Rabin et al. (2011) go further to point out that personality traits are not easily modifiable, but that “the negative effects of low conscientiousness can be ameliorated through techniques focused on organization and the stimulation of self-control” (p. 353). Citing past research, the authors suggest that strategies to increase self-control and prevent distraction among students include (a) removing short-term temptations, such as by working in a library, having a clean desk, and keeping their office door closed; (b) practicing achievement-motivation by setting more difficult academic goals, thereby learning to enjoy learning for its own sake and reducing aversion to due dates; and (c) having accountability through peer-monitoring with consequences for behavioural failure.

An important note to add is that attempting to improve a personality trait does not mean having to decrease the traits one has scored high in (e.g., one does not have to sacrifice

agreeableness for conscientiousness). Rather, individuals attempting to increase their conscientiousness levels can practice certain behaviour traits common among people who score particularly high in that trait. Although this will very likely involve more effort than for those who it comes naturally too, creating a routine, consistently checking in with progress, and having social supports may prove effective. Examples of tasks or habits to increase conscientiousness may include cleaning up after oneself; making task lists; setting short and long term goals; sticking to and checking in on those goals (so not to get caught up and side-tracked with other goals); and setting and meeting deadlines with some form of accountability. The idea is not to make everything orderly and industry-focused, but increasing these in certain areas will increase predictability, thereby decreasing stress.

Improving physical health

Other more general strategies for improving conscientiousness may include changes to physical health. As mentioned above, Allen et al. (2015) used survey data collected from 11,133 adults who had completed the 2010 and 2014 Household, Income and Labour Dynamics in Australia (HILDA) project. The authors found that for baseline measures, high physical activity was associated with an increase in conscientiousness and openness, fruit intake was positively associated with change in conscientiousness, and smoking was negatively associated with conscientiousness and agreeableness. Low-levels of fruit-intake at baseline was associated with less of an increase in conscientiousness, and high-levels of cigarette smoking at baseline was associated with less of an increase in conscientiousness and agreeableness. For change in health-related behaviour over four years, increases in physical activity coincided with decreases in neuroticism, and increases in extraversion, openness, agreeableness, and conscientiousness. In particular, change in vegetable intake was positively associated with change in conscientiousness, and physical activity proved overall to be the most important of the health-related factors for personality change.

The above study therefore speaks to the importance of access to resources in relation to conscientiousness. Similarly, Roberts et al. (2017) posit that a stable, consistent, and supportive environment over a long period of time ought to be factored in when considering the effectiveness of interventions to promote conscientiousness. Besides a stable environment, participants ought to also have various opportunities to ingrain those specific behaviours, thoughts or feelings, as changing a personality trait “necessitates practicing changes in that trait until they become automatic” (Roberts et al., 2017, p. 202). Therefore, the length of time as well as variability of time, and the uptake of certain activities to alter behaviours, ought to be placed into consideration for each individual participant’s particular goals.

Behavioural therapies

Behavioural therapies are another possible means of increasing conscientiousness. Javaras et al. (2019) list three types of interventions that may be enacted to improve

conscientiousness in different age groups: (a) Behavioral and Cognitive–Behavioral Therapies; (b) Metacognitive Techniques for Setting and Achieving Goals; (c) and Cognitive Remediation Therapies. For more of a blueprint format, Roberts et al. (2017) designed the Sociogenomic Trait Intervention Model (STIM) for establishing and testing concrete ideas of change.

Cognitive behavioural therapy (CBT) requires the individual to examine themselves and question their automatic responses. Therapy involves developing a detailed historical template for understanding a patient’s belief system and what influences these beliefs have on automatic thoughts, emotions, physiological responses, and behaviors (Rosenfield et al. 2008). In a self-perpetuating cycle, these core beliefs can influence and be influenced by emotional, cognitive, and behavioural responses that affect (and are affected by) the external environment. CBT involves developing case conceptualization to identify specific developmental learning experiences that may have contributed to one’s core beliefs, which may have once been contextually relevant but have become irrelevant and maladaptive. Maladaptive beliefs are often rooted in frustrations with work, school, relationships, and self-efficacy, but can become over-generalized and create problems in pursuing goals.

Metacognition involves the ability to think and be aware of one’s own thinking process. Goal-related metacognitive techniques involve looking into the future at what one would like to accomplish. Sometimes goals can be too grandiose and unattainable, so one technique known as ‘mental contrasting’ has individuals imagine a path to the goal, list the various possible obstacles along the way, and develop contingencies for such obstacles. By focusing on the path, goal-setting is made more realistic and easier to stick to. Cognitive remediation therapies are designed to enhance cognitive processes and skills, such as attention, memory, and social awareness, using cognitive activities and exercises (Javares et al., 2019).

Cognitive-behavioural therapy (CBT) has emerged as the psychosocial treatment model with the strongest evidence base for individuals with ADHD (Rosenfield et al., 2008). Adults who grew up without a diagnosis may develop maladaptive ‘cognitions’ (thoughts or beliefs) that interfere with beneficial coping strategies. CBT can assist in helping them understand how ADHD affects their lives, help develop effective coping strategies, and identify and modify any cognitions that interfere with implementing those strategies to enhance resilience and improve well-being. Rosenfield et al. (2008) present a case study example of a 30-year-old man with clinically diagnosed severe ADHD of the ‘mixed’ hyper-active inattentive subtype. This man, given the pseudonym “Ralph”, had been fired from nine jobs during the first five years of his marriage, which was on the brink of divorce. His unreliability and inattentiveness made his wife feel disrespected, and his recurrent tardiness, inability to follow directions, forgetfulness, procrastination, and clashes with peers and supervisors had cost him his jobs. He had developed an expectation that he would fail, and experienced feelings of helplessness, which he distracted himself with by engaging in avoidance behaviours of going on the computer or doing tasks around the house.

The researchers first did a history-gathering interview, including review of Ralph's childhood diagnosis and input from his wife, and had him complete a psychiatric evaluation with a variety of adult ADHD measures, showing clinical elevations of both hyperactivity/impulsivity and inattentive symptoms, with high emotional lability, inattention, memory problems, problems with self-concept, and minor depressive episodes. Ralph had stopped taking medication in college, so was recommended to start a combined pharmacotherapy-CBT treatment, as well as marital therapy with a therapist specializing in ADHD.

Through information gathered from the diagnostic interview and early CBT sessions, three principle maladaptive schema were identified: *failure* ("I've failed at everything important in life"), *defectiveness/shame* ("I'm a social embarrassment"), and *entitlement* ("People should know I have ADHD and accommodate me because I cannot change"; Rosenfield et al., 2008, p. 479). These were common sense notions held by Ralph based on and bolstered by his life experiences. Further, rather than trying new coping behaviours and strategies, Ralph engaged in avoidance behaviours to avoid the discomfort from these maladaptive schemas. He also used "*magical thinking*" to avoid stress (e.g., "it will all work out"). These are known in CBT as "compensatory strategies", and act to shift focus away from making adaptive changes.

Ralph's CBT sessions were 50 minutes long and were held weekly. During the first session he was made to identify specific treatment goals from his more ambiguous objective of saving his marriage and finding a job. Subsequent sessions focused on removing his cognitive reliance on medication, enhancing his motivation, and challenging his core beliefs of being a failure and avoiding discomfort. The therapist examined cognitions associated with avoidance ("What thoughts went through your mind?"), and brought to light issues such as unrealistic job expectations, pessimism, disorganization, poor time management and procrastination. Each of these barriers were addressed by introducing "cognitive restructuring" to adjust task-interfering thoughts, and implementing specific coping strategies "(e.g., break down project into manageable steps, keep track of activities in a schedule book, etc.)" Even if Ralph was unable to do a task, he would identify and write down the obstacles in his "Daily Thoughts Records" (p. 482). Procrastination and subsequent self-criticism were reframed as moments to learn how to manage more effectively, such as using "cognitive rehearsal via visual imagery" to interrupt sullen thoughts and take steps to update his resume. The "feared fantasy" technique of imagining worse-case scenarios was also used.

Ralph became better able to describe the cognitions and behaviours that contributed to his avoidance behaviours, developed adaptive thoughts to his pessimistic reactions, including reciting what he had achieved in life rather than focusing on the negative, and tempered his magical thinking with activities like taking 15 minutes to practice job interview questions rather than leave it up to chance. He showed improved confidence, found a job, completed marriage counseling with his wife and avoided divorce. Important points were that medication alone was not relied on, and CBT was used to identify and consistently pay attention to the negative self-

beliefs developed from a lifetime of frustrations, and to develop and improve behavioral functioning techniques, including organization, problem solving, time management, and social skills.

Another example of therapy for the inattentive subtype of ADHD with low-conscientiousness problems of poor time management, organization, and planning is found in Solanto et al. (2007), who propose that meta-cognitive therapy (MCT) may prove useful for introducing more adaptive habits and functional routines with an emphasis on repetition (e.g., checking a planner every day) (See Appendix A for a list of therapeutic targets and component skills). As these individuals have issues with executive functioning and decision-making, the aim is for these repetitions to ultimately become more automatically relied on than the person's own executive functioning. Therapist led discussions include exercises on "commandments" or aphorisms, check-ins, as well as group work with others with similar behavioural challenges. Examples of strategies can be found in the appendix.

Using two measures for ADHD (Conners Adult ADHD Rating Scale–Self-Report: Long (CAARS-S:L); and the Brown ADD Scales; BADDs), and one for time management (On Time Management, Organization, and Planning Scale; ON-TOP), participants of the MCT program showed marked improvements in attention, activation, memory, effort, and affect (Solanto et al., 2007). For several participants at the end of treatment, mean scores of attention and memory were no longer in the clinical range. Worth noting, most patients were concurrently receiving pharmacotherapy. Another recent study by Janssen et al. (2019) found that mindfulness-based cognitive therapy (MBCT) sessions proved effective for adults with ADHD, but the authors suggest that the therapy may be more feasible for patients on ADHD medication, as those who did not take them were more likely to drop out, citing similar findings in other research studies.

Other work on improving outcomes for people with ADHD has shown that physical exercise plays a key role in reducing stress, negative affect, anxiety, depression, self-destructive behaviours, poor impulse control, and inattentiveness (Archer & Kostrzewa, 2012; Rommel et al., 2013). Interestingly, regular physical exercise was found to significantly increase brain-derived neurotrophic factor (BDNF), an important element in normal brain development for the promotion of health-associated behaviors and quality-of-life, which tends to be reduced in people with ADHD (Archer & Kostrzewa, 2012). [See our write-up on physical activity for more information on its beneficial effects.]

Pharmacotherapy

For those who find such therapeutic techniques unsuccessful, medication to stimulate certain areas of the brain may prove helpful. Recently, there has been a growing inquiry into the various medicinal benefits of psilocybin. In a study of 20 individuals (66% men) with moderate to severe treatment-resistant depression, Erritzoe et al. (2018) found that, from baseline to a three-months follow-up, psilocybin use (10 and 25mg oral doses, one week apart)

caused a significant decrease in neuroticism, a significant increase in openness and extraversion, no change in agreeableness, and a trend-level increase in conscientiousness in line with past observations of patients responding to antidepressant treatment (abnormally low to the levels of healthy non-depressed individuals). The researchers used the NEO-P-IR to measure personality traits, and the inclusion criteria for the participants were to have unipolar major depression of at least moderate severity, with no improvements following two courses of pharmacologically distinct antidepressant medications for an adequate duration (6 weeks minimum) within the current episode.

Although they saw overlap with other studies of the use of pharmacotherapy to treat depression, the authors stated that to their understanding, “this is the first time personality measures have been reported to change among patients undergoing psychedelic therapy for depression” (Erritzoe et al., 2018, p. 372). Similarities with past research testing the effects of the use of SSRIs on patients with major depression included patients in both trials showing decreased neuroticism facets of depression, vulnerability, self-consciousness, and anxiety; increased extraversion in the facets of warmth and positive emotions, and increases in conscientiousness in the facets of competence and self-discipline. Although Roberts et al., (2017b) confirmed in their systematic review of more than 200 studies that large, enduring personality changes are obtainable through a variety of therapeutic interventions, the authors state that to their knowledge there has been no changes as rapid or noticeable than with psychedelics, likening it to similarities of changes in outlook and behaviour seen in individuals who have undergone sudden religious conversion experiences.

Assessment

NEO Personality Inventory-Revised (Costa & McCrae, 1992)

- 240-item questionnaire of general personality traits (“The Big Five”)
- Measures the Big Five, and six facets of each (30 traits)
- 5-point Likert scale (strongly disagree to strongly agree)
- The NEO Five-Factor-Inventory (NEO-FFI) is a shorter 60-item measure without the facets
- 2 versions: Self-report (Form S) and observer rating (Form R)
- Internal consistency coefficients for both Forms R and S range from .86 to .95 for domain scales and from .56 to .90 for facet scales.
(<https://www.parinc.com/Products/Pkey/276>)
- “Costa and McCrae (1992b) list internal reliabilities for the facet scales ranging from .62 to .82” (DeYoung et al., 2007).
- “The reliabilities reported in the manual (Costa & McCrae, 1992) are adequate, with a mean of .78 across the five factors. The NEO-FFI scales are substantially correlated with

the NEO PI-R scales, suggesting that they inherit a substantial portion of the validity of the longer scales.” (John & Srivastava, 1999)

- Both are commercial controlled: <https://www.parinc.com/Products/Pkey/276>

Goldberg’s NEO International Personality Item Pool (IPIP; Goldberg 1999)

- Free, online open access to 274 labels for 463 IPIP scales
- <https://ipip.ori.org/newIndexofScaleLabels.htm>
- Agreeableness: (NEO Domain; 10-item scale alpha = .77; 20-item = .85), (Big-Five Domain; 10-item scale alpha = .82; 20-item = .88), (Big-7: 525; alpha = .77), (6FPQ: AG; alpha = .73), (BFAS: Agreeableness split into ‘Compassion’ with a 10-item scale with an alpha = .84, and ‘Politeness’ with a 10-item scale with an alpha = .75. The combined 20-item scale alpha = .84)
- Alphas: 10-item IPIP scale = .82 (conscientiousness = .81); 20-item = .89 (C = .90); 48-item = .91 (C = .91)
- https://ipip.ori.org/newNEO_DomainsTable.htm

The Big Five Personality Test (Goldberg, 1992)

- This test uses the Big Five Factor Markers (BFFM) from the International Personality Item Pool (IPIP)
- Coefficient alpha for Agreeableness = 0.82 for 50 items, and 0.88 for 100 items; Total coefficient alpha = 0.84 for 50 items, and 0.90 for 100 items
- <https://ipip.ori.org/newBigFive5broadTable.htm>
- https://ipip.ori.org/new_ipip-50-item-scale.htm

HEXACO Model of Personality Structure (Ashton & Lee, 2014)

- Self-report and observer versions; 60- or 100-item versions
- Builds on the works of Costa & McCrae (1992), and Goldberg (1993)
- The six factors or dimensions include Honesty-Humility (H), Emotionality (E), Extraversion (X), Agreeableness (A), Conscientiousness (C), and Openness to Experience (O)
- The four facets of the conscientiousness domain are: organization, diligence, perfectionism, and prudence
- Cronbach alpha for Conscientiousness: .83 self-report / .88 observer-report (Ashton et al., 2014, p. 143, Table 4)
- https://ipip.ori.org/newHEXACO_PI_table.htm

Big Five Aspects Scale (BFAS; DeYoung, Quilty, & Peterson, 2007)

- Each domains is split into two facets, for 10 aspects (“Ten Aspects of the Big Five”). The 20-item scale for Conscientiousness (alpha = .84) is split into Industriousness (alpha = .81) and Orderliness (alpha = .80)

- “Cronbach’s alpha for the ESCS [Eugene-Springfield community sample (ESCS; 200 men and 281 women) who completed mail-in surveys since 1994] (M = 0.83, SD = 0.03), the initial university sample (M = 0.81, SD = 0.05), and the retest university sample (M = 0.83, SD = 0.05).” (p. 886)
- <https://ipip.ori.org/BFASKeys.htm#BFASConscientiousness>

The Big Five Inventory (BFI; John & Srivastava, 1990)

- 44-item inventory that measures an individual on the Big Five Factors (dimensions) of personality (Goldberg, 1993). Each of the factors is then further divided into personality facets.
- Conscientiousness vs Lack of Direction = Competence (efficient); Order (organized); Dutifulness (not careless); Achievement striving (thorough); Self-discipline (not lazy); Deliberation (not impulsive)
- <https://fetzer.org/sites/default/files/images/stories/pdf/selfmeasures/Personality-BigFiveInventory.pdf>
- Eskreis-Winkler et al. (2014) used the 44-item Big Five Inventory (BFI), and observed alphas ranging from 0.75 to 0.88.

Grit Scale (Duckworth & Quinn, 2009)

- 12- and 8-item scales; 8-item scale for children
- 5-point Likert (1 = “not at all like me”; 5 = “very much like me”)
- Eskreis-Winkler et al. (2014) conducted three studies using a “Short Grit Scale” (grit-s; Duckworth & Quinn, 2009). The Cronbach alphas for each study are:
 - (i) 8-item scale = 0.77
 - (ii) 8-item = 0.79
 - (iii) an adapted 4-item scale = 0.90
- <https://angeladuckworth.com/research/>

Hamburg Personality Inventory (HPI-K) by Andresen (2002)

- Klee & Renner (2016)
 - “The HPI-K measures the Big Five personality traits (N = nervousness, sensitivity and emotional instability; E = extraversion, liveliness and sociability; O = openness to experiences; C = controlledness and norm-orientation; A = altruism, solicitousness and helpfulness) plus risk and competition seeking”
 - “Andresen (2002) reports Cronbach's alphas above .80 for each scale; quite similar high internal consistencies were obtained in this study except for openness and resilience (see Table 1). Retest reliability ranges between .82 and .89 (Andresen, 2002).”

Multi-Construct IPIP Inventories:

- <https://ipip.ori.org/newMultipleconstructs.htm>

The Temperament and Character Inventory (TCI; Cloninger et al., 1993)

- 295-item adaptation of Cloninger, Przybeck, Svrakic, and Wetzel's (1994) multi-level inventory
- 35 lower-level scales subsumed by 7 higher-level constructs
- The domains of Novelty-seeking has a moderate negative association with conscientiousness, Persistence has a positive association, and Self-Directedness has a positive association.

The Sixteen Personality Factor Questionnaire (16PF; Cattell et al., 1993)

- Defines conscientiousness as “Self-Control”, with the opposite being “Unrestrained”
- Factors (or facets) are: rule-consciousness, perfectionism, seriousness, groundedness

International English Big Five Mini-Markers (Thompson, 2008)

- Items for the conscientious subscale: efficient (inefficient), organized (disorganized), neat (untidy), systematic (careless)
 - “The Conscientiousness sub-scale performed reasonably well except for its item *practical* that detracted from internal consistency and cross-loaded highly on Intellect or Openness”
- Internal consistency reliability for the Conscientiousness measure for native English-speakers is .90, and for non-native English-speakers is .86

Six Factor Personality Questionnaire (SFPQ)

- “The SFPQ is unique in that it encompasses and extends the popular Big 5 factors of personality with an improved model of Conscientiousness.”
 - Industriousness (Achievement Seriousness Endurance) and Methodicalness (Cognitive Structure Deliberateness Order)
- 180-item
- 6 higher level constructs (alpha = .80; industriousness = .69)
- 18 lower level constructs
- Internal consistency of the factor scales range from .76 to .86.
- <https://ipip.ori.org/new6FPQTable.htm>

Lexically-based Adjective Checklist (Jackson et al., 2009)

- 1-5 scale
- Alpha range = .77 to .91
- Conscientiousness sub-facets = impulse control, responsibility, industriousness, orderliness, and conventionality

- Alpha scores ranged from .61 to .85, except for industriousness (0.37) which had problematic items removed for an alpha of .52 (N=143) (Edmonds et al., 2009).
- For peer-reported conscientiousness, $\alpha = .96$. For the five facets of peer-reported conscientiousness alpha reliabilities ranged from .71 to .91. (Edmonds et al., 2009)

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Appendix A: MCT Targets and Skills

Solanto et al. (2007)

Table 1
Therapeutic Targets and Component Skills

Time Management, Behavioral Activation, and Procrastination

- Time estimation
- Effective use of daily planners and organizers
- Dismantling/breaking down complex tasks (“If you’re having trouble getting started, the first step is too big.”)
- Energy of activation
- Establishing priorities effectively
- Contingent self-reinforcement
- Positive and negative visualization of long-term rewards and consequences
- Minimization of distractions (“out of sight . . . out of mind”)

Organizational Skills

- “A place for everything . . . and everything in its place”
- Subdivision of physical space into organizational “zones”
- Organizational maintenance skills

Planning

- Coalescence of many of the aforementioned skills (e.g., breaking tasks into manageable chunks, prioritization, visualization, contingent self-reinforcement)
 - Flow-charting of goals and subcomponents
-



For more information about R2 or to discover how you can bring the program to your organization, business or educational setting, please contact us.

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