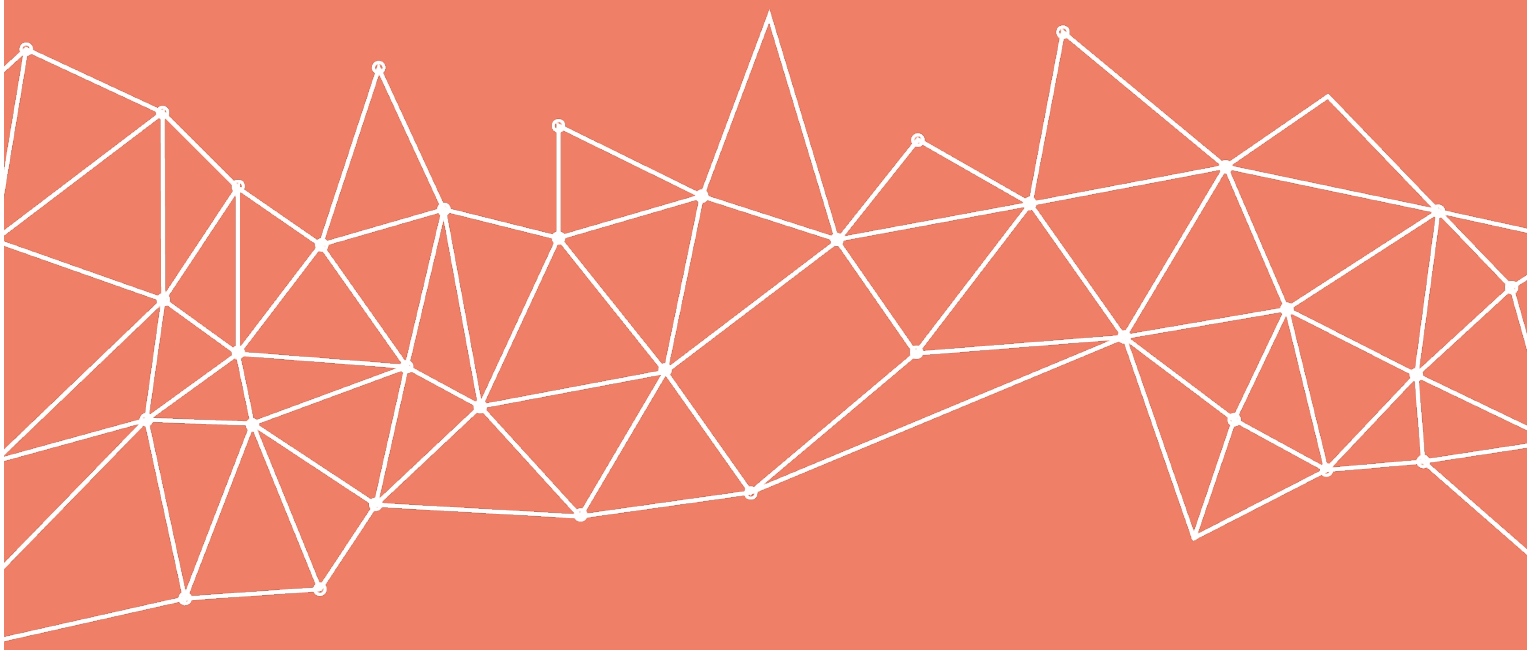
MAPX

technical guide



ASSESSIO

MAP-X Technical Manual

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1. Overview and Theoretical Rationale

One of the least attractive quirks of human nature is our individual and collective inability to see ourselves as we really are. Studies have shown that people consistently interpret events in a self-serving way and that, on average, in almost every culture, people see themselves as *above* average on nearly any skill or attribute one cares to name (Kaiser & Hogan, 2007; Mezulis, Abramson, Hyde, & Hankin, 2004; Williams, 2004).

Yet the benefits of seeing oneself objectively as others do are well documented. Individuals who show self-awareness are seen as higher performing (Church, 2005), increase their chances of promotion (Bass & Yammarino, 1991), improve workplace satisfaction in their subordinates (Wexley, Alexander, Greenawalt, & Couch, 2018), raise subordinate productivity (Moshavi, Brown, & Dodd, 2003), and make better decisions (Scott Ridley, Schutz, Glanz, & Weinstein, 1992).

On the other hand, flaws in self-knowledge and self-awareness cause otherwise skilled and talented individuals to make mistakes, underperform, or spectacularly derail. Consider the case of Lance Armstrong, a supremely talented cyclist who overcame testicular cancer before winning seven consecutive Tour de France races from 1999. Rumors about his use of performance enhancing drugs dogged him, despite his frequent public denials and claims of innocence. Armstrong even appeared on the 60 Minutes program to categorically deny any drug use. In 2012 he was stripped of an Olympic medal and all Tour de France titles in a global blaze of publicity. Armstrong maintained his innocence for another year, before finally confessing to doping throughout his cycling career.

Maladaptive behaviors like these might be innocuous if they were confined to the sporting area or our private individual lives. Yet, subtle, pervasive and unconscious patterns of behavior have been observed by researchers to wreak serious harm on teams, organizations, and even nations. Overconfidence, for example, has been shown to contribute to the significant under-representation of women in management, executive, and CEO roles (Chamorro-Premuzic, 2019), to lower work performance (Heidemeier & Moser, 2009), and to underpin disastrous military decisions that cost millions their lives (Penner & Dixon, 2006). Sidney Finkelstein of the Tuck School of business points out that in corporate failures the mistakes are seldom due to managerial incompetence or random events but instead are driven by habits of managerial self-delusion, such as domination, over-confidence, or ruthlessness (Finkelstein, 2004; Finklestein, 2006). The Harvard scholar Barbara Kellerman similarly describes followers being consistently failed by leaders who are selfish, rigid, intemperate, callous, corrupt, or insular (Kellerman, 2013).

However, as described above, even competent and otherwise well-adjusted people behave in ways that seem, on the surface, self-defeating and irrational. There are four explanations for why we behave thus. Firstly, extreme traits can be associated with positive outcomes, in keeping with the evolutionary axiom that all behavior is ultimately adaptive. For example, psychopaths are more prevalent in the higher echelons of corporate firms than would be expected by chance. Moreover they attract positive ratings of creativity, strategic thinking, and communication skills but negative ratings of being a team player, management skill, and overall achievement (Babiak, Neumann, & Hare, 2010). Narcissistic CEOs tend to be more

entrepreneurial and their firms attract greater valuations than companies led by more self-effacing individuals (Wales, Patel, & Lumpkin, 2013).

Secondly, all positive and adaptive traits that are otherwise valued in the workplace can have a negative side when performed too much or too often. For example, conscientious managers are welcomed at work because they are planful, organized, rule-following, and reliable. Yet carried to an extreme, to their staff they may seem picky, critical, and micromanaging. Unhappily, conscientiousness is associated with an increased incidence of abusive management (Camps, Stouten, & Euwema, 2016). A large and growing literature (Ames & Flynn, 2007; Debusscher, Hofmans, & De Fruyt, 2014; Grant, 2013; Le, Robbins, Ilies, Holland, & Westrick, 2010) underscores our view that:

- Curvilinear relationships are observed for all personality traits: performance worsens at the extremes.
- Middling scores may well be preferable in many contexts, particularly leadership roles. Boring, average leaders are less likely to get their teams into trouble.

Thirdly, in polite society people are expected to keep a rein on their impulses and behave appropriately. However, when angry, exhausted, intoxicated, emotionally upset, or simply past caring, people may become uninhibited. A case in point might be the Australian actor Mel Gibson, who when drunk was filmed making racist and anti-Semitic tirades that he subsequently recanted when sober. MRI research shows alcohol produces neurological changes that prevent planning and prime more emotive behavior in these situations (Denson, Blundell, Schofield, Schira, & Krämer, 2018; Denson, Pedersen, Ronquillo, & Nandy, 2009; Leary et al., 2013).

Finally, external checks and limits on behavior vary in different settings, inhibiting or potentiating displays of extreme behavior. Consider that as managers rise through organizations, they accumulate greater latitude to make decisions and are delegated wider decision rights. Additionally, higher rank in the hierarchy confers positional power, requiring subordinates to censor or suppress their views, defer to the boss, and carry out their requests. Many scholars have commented on the way in which power and control remove inhibition and dilute self-control, excusing self-indulgent displays of power and wealth, bad behavior, and abusive control (Kaiser & Hogan, 2010; O'Reilly, Doerr, Caldwell, & Chatman, 2014; Schoel, Bluemke, Mueller, & Stahlberg, 2011).

These extreme dispositions harm an individual's ability to make effective decisions, work with their colleagues, and navigate stressful situations — all of which diminish organizational performance and individual and team effectiveness (Gaddis & Foster, 2013; Zeigler-Hill & Marcus, 2016). This occurs even though the individual may remain unaware of their extreme behavior or fail to even see the link between that and negative outcomes (Bortolotti & Mameli, 2012).

1.1. How Best to Measure Extreme Traits?

Human personality is best understood as enduring behavioral dispositions that help people navigate their social world. Humans are all motivated to greater or lesser degrees to maximize their popularity by getting along with others and at the same time to maximize their status relative to other members of the group (Hogan, 2007). Behavioral dispositions

are useful or dysfunctional to the extent they help or interfere with an individual's capacity to get along or get ahead.

A broad consensus holds that the most robust and empirical model for classifying personality is the Five-Factor Model (FFM; John, Angleitner, & Ostendorf, 1988). The FFM is a taxonomy that postulates five broad personality dimensions: Conscientiousness, Emotional Stability, Agreeableness, Extraversion, and Openness to experience. Psychologists have generally operated under the assumption that for all traits, more is better. In the world of love, for example, it is true that high scores on Conscientiousness and Agreeableness are associated with higher satisfaction with dating (Ozer & Benet-Martínez, 2006).

A moment's thought exposes the irrationality of thinking that more of a particular trait is always better. One of the most trenchant critics of this view, Thomas Widiger, argues that maladaptive behavior exists at both extremes of the FFM dimensions – that there is such a thing as being too nice, for example, which can lead to being taken advantage of (Widiger, 2019).

In our view, traits are intrinsically adaptive (Nettle, 2006) but sometimes lead to the development of unhelpful behaviors, beliefs, and problems in living. These characteristic problems depend on their trait levels (Carter, Miller, & Widiger, 2018; McCrae, 2010), a point made thousands of years ago when Aristotle argued all human qualities can become dysfunctional if they are too extreme. Low scores on Emotional Stability are associated with a wide range of adverse work and life outcomes due to the individual being self-critical and prone to worry and anxiety (Lahey, 2009); middle scores on Extraversion better predict the performance of salespeople than scores at extremes (Grant, 2013).

Similarly, while conscientiousness is generally considered to be a positive personality feature (Roberts, Kuncel, Shiner, Caspi, & Goldberg, 2007) individuals who are "overly conscientious" are seen as rigid and inflexible, whereas those who are "not conscientious enough" may be impulsive and undependable (Hogan & Holland, 2003). Finally, individuals who score high on Agreeableness may be interpersonally naive and enter overly dependent relationships in which they are exploited, whereas those who score low on Agreeableness can alienate others via rude and condescending behavior.

To reiterate, it is easy to picture circumstances in which any extreme personality feature may be socially aversive. We suggest that traits are "extreme" when they lead to interpersonal difficulties across a variety of contexts, even when only modest levels of these features are present.

We review three prominent attempts to capture aspects of extreme personality and research below.

1.2. Dark Triad

The dominant model to explore such dispositions is the Dark Triad, which describes three malevolent and dysfunctional non-clinical dimensions: psychopathy, narcissism and Machiavellianism (Paulhus & Williams, 2002). Machiavellianism is characterized by a cynical, unprincipled belief in interpersonal manipulation as the key for life success; narcissism is

marked by grandiosity, entitlement, dominance, and superiority; psychopathy is characterized by high levels of impulsivity and thrill-seeking, along with low levels of empathy and reactivity. This construct has received considerable attention given its robust psychometric properties and validity. For example, a meta-analysis by O'Boyle and colleagues found the Dark Triad predicted counterproductive work behaviors, such as mistreatment of co-workers, theft, and sabotage (O'Boyle, Forsyth, Banks, & McDaniel, 2012). As they hypothesized, Machiavellianism and psychopathy were associated with lower job performance, and all three Dark Triad traits were positively associated with increased counterproductive work behaviors. A recent and more general review reported similar trends for negative social and behavioral outcomes to be associated with the Dark Triad (Muris, Merckelbach, Otgaar, & Meijer, 2017). These researchers noted links between the Dark Triad and interpersonal problems, morality concerns (theft, cheating), anti-social behavior, and bullying.

1.3. Axis II Taxonomies

Hogan and his colleagues took a different approach, taking as a starting point the clinical taxonomy of Axis II personality disorders from the Diagnostic and Statistical Manual IV of the American Psychiatric Association (Hogan & Hogan, 2004). This taxonomy (Hogan Development Survey, HDS) suggested 11 dysfunctional dimensions, grouped into three themes: moving toward people, moving away from people, and moving against people. Hogan expected such behaviors to offer possible short-term advantages but dysfunction for the self or other's problems over the long term. Importantly, Hogan theorized that these tendencies would not be reliably present, but would show up intermittently in response to stress. Research with the HDS has indeed shown associations with positive outcomes and negative outcomes, mainly in the leadership realm (Furnham, Trickey, & Hyde, 2012; Gaddis & Foster, 2013; Spain, Harms, & Lebreton, 2014).

1.4. Multidimensional Approaches

In our view there is evidence for an overlap between normal-range personality and clinical-level personality disorders: traits in both domains share latent dimensions (Harms & Spain, 2015; Hopwood et al., 2018; Widiger & Mullins-Sweatt, 2008). For example, Kate Walton and her colleagues examined the overlap between a measure of normal personality and a measure of psychopathy. Contrary to their expectation that the psychopathy measure would be more extreme than normal personality traits, both measures substantially mapped the same latent domain (Walton, Roberts, Krueger, Blonigen, & Hicks, 2008).

Clinical psychiatry has similarly seized on the FFM as a solution to its own issues in adequately measuring dysfunctional personality disorders (PDs). Diagnostic categories were developed in a traditional medical model that saw mental disorders as qualitatively distinct conditions. However, descriptions of various disorders shared common features and the reliability of diagnoses between clinicians was poor. In the face of mounting evidence that PDs are dimensional in nature (Eaton, Krueger, South, Simms, & Clark, 2011; Hopwood et al., 2018) the latest manual from the American Psychiatric Association has an experimental diagnostic model based on the idea that the behavioral dispositions which fall at the extremes of the FFM are likely to be dysfunctional, maladaptive, and strain interpersonal relationships, while personalities that lie in the middle are more likely to be adaptive and functional.

Widiger and his colleagues have done considerable work on the dimensional approach to dysfunctional personality disorders and have created a lexical map of descriptive words to highlight the negative consequences of extreme scores (see Table 1; Vachon et al., 2013; Widiger, 2015; Widiger, Gore, Crego, Rojas, & Oltmanns, 2016). The fact that these words are used to describe the behavior of others strongly suggests that many individuals will display these traits. It is noteworthy that, based on the relative frequency of terms, low scores likely hold greater valence, a point we have incorporated into guidelines for interpretation.

Table 1: Lexical Descriptions of Extreme FFM Dimensions

Trait	Terms for extremely high negative traits	Terms for extremely low negative traits
Agreeableness	• Deceivable	• Deceitful
	• Dependent	• Heartless
	• Ingratiating	• Treacherous
	• Transparent	• Violent
Conscientiousness	• Overbookish	• Careless
	• Overcautious	• Disorderly
	• Stringent	• Heedless
	• Tight	• Reckless
Extraversion	• Blustery	• Aloof
	• Exaggerative	• Humorless
	• Flaunty	• Reclusive
	• Showy	• Somber
Openness	• Overindulgent	• Dogmatic
	• Rebellious	• Prejudiced
	• Unconformable	• Unimaginative
	• Unconventional	• Unreflective
Emotional stability	• Conscienceless	• Defensive
	• Emotionless	• Moody
	• Inexcitable	• Hypersensitive
	• Inhuman	• Self-destructive

1.5. The Assessio Extremes Model

On the basis of the literature and prior efforts to characterize negative behavior, we feel justified in developing a measure of extreme personality dispositions based on our FFM assessment tool MAP. It is important to emphasize that the approach we have followed represents a break from prior psychometric efforts and can be seen as a more modern and up-to-date conceptualization of dark personality traits. In addition, MAP-X has the utility of being quickly calculable from the administration of a single personality assessment.

In Table 2 we present the five dimensions of the MAP-X labelled as the extreme poles of the corresponding FFM construct. We also outline the potential ways in which these behaviors may manifest in an individual's life and detract from workplace success.

While the psychometric development and validation of the MAP-X scales are described in significant detail in later chapters, it is important to provide a description of the scales and how they are labelled. The MAP-X measures five dimensions, each of which are analogous to the FFM. Each pole of these dimensions has a label that summarizes the associated behavioral dysfunction. As we have already argued, behavioral dispositions, on any point of the spectrum, are simultaneously adaptive and maladaptive and what is considered high or low is dependent on the context of which the behavior is being assessed in. As such, we refer to the MAP-X scales as having dual labels. For example, the Extraversion scale can be described as being the "Unrestrained" scale (where high means to describe someone who is dominating and attention-seeking) or described as the "Withdrawn" scale (where high describes someone who is cautious and socially reserved).

Such labels provide practitioners with a more flexible vocabulary to talk about dysfunctional dispositions, and ultimately help people better understand themselves. Further, reporting scores on scales that only have one label, that can be either socially desirable or undesirable, falsely leads individuals to assume higher scores are better and that they have the "wrong" personality profile. The labelling system developed for the MAP-X counters how other assessment tools operate, is more intuitive, better reflects the nature of personality, and offers an improved user experience.

In Chapter 2 we present a guide to scale interpretation and evidence for the maladaptive potential of extreme scores.

In developing our assessment of dark side behavior, we followed exciting developments in both the clinical and organizational psychology literatures, but we emphasize that this tool makes no attempt to measure clinical personality disorders, and nor should it be used for clinical purposes.

Table 2: MAP-X scales and high-level definitions

Extreme Low	FFM	Extreme High
Intense	Stability	Unemotional
Reactive, distressed, insecure. May show intense emotional reactions, take criticism personally and foster intense, volatile relationships. Will not display resilience.	Emotionally flexible, controlled and self-assured	Detached, self-assured, indifferent. Overconfident and unreflective, may not admit mistakes. Will ignore feedback and be out of touch with other's distress.
Withdrawn	Extraversion	Unrestrained
Reserved, cautious, humorless. Cold, distant and asocial, will shun groups and resist efforts to connect. Can miss social cues.	Outgoing, sociable, socially-skilled	Dominating, dependent, superficial. Unheeding of others' needs, grandiose and entitled. Expects people to fall into line.
Insensitive	Agreeableness	Oversensitive
Selfish, candid, manipulative Blunt, heartless and uncaring of other's emotions. Rude, disloyal and untrustworthy.	Warm, empathic, trustworthy	Naïve, selfless, overinvolved Eager to please and to go along with others. Naïve, unassertive and dependent. Will want others to look after them.
Impulsive	Conscientiousness	Obsessive
Uncommitted, disorganized, hasty Amoral, rule-breaking and mischievous. Easily distracted and impulsive. Finds it hard to focus.	Organized, reliable, focused	Strongminded, inflexible, cautious Rigid, inflexible and obsessive. Will have high standards and be perfectionistic to a fault.
Conformist	Openness	Eccentric
Practical, utilitarian, concrete Closed to new ideas, people and experiences. Rigidly conventional and judgmental. Finds it hard to express any emotion.	Curious, open to ideas, thoughtful	Idealistic, novel, abstract Eccentric and absorbed by thoughts ideas and schemes. Ignores convention and seems unaware of rules or boundaries.

2. Interpreting the Scales

In this chapter we provide suggestions and cases to guide users in interpreting MAP-X scores.

There are a number of points to bear in mind when interpreting scores on the MAP-X. Firstly, our principal intention is to facilitate the improvement of an individual's life functioning through insight and awareness. Personality change is possible, it's just hard (Damian, Spengler, Sutu, & Roberts, 2018). The first step to becoming one's better self is to receive feedback about the ways one may obstruct effective interpersonal functioning or foil the growth of positive relationships.

Secondly, the data show that *everybody* behaves in ways that get in the way of effective social functioning. It is very likely that an individual will have one or more of these characteristics, which may manifest in particular circumstances. Importantly, an extreme score does not mean that a person *will* act in these ways, just that they are more likely to; after all, some people master their proclivities and manage their dark sides effectively. Rather, extreme behaviors will be demonstrated when the individual has exhausted their ability to manage normal behavior and achieve outcomes they want in socially acceptable ways. Alternatively, if cultural norms facilitate socially inappropriate behavior (think of an adolescent locker room, or the meetings of nationalistic right-wing groups) then the inhibitions on behaving in an extreme way will be reduced.

Thirdly, behaviors falling at the extremes of the FFM are often unconscious to those displaying them. As discussed earlier, people adapt the narratives of their interactions in order to enhance their self-image, denying things they have said or done or claiming that it 'wasn't really like that' (current famous examples of people who deny having said something that has been recorded include the President of the United States, Donald Trump, the Prime Minister of England, Boris Johnson, and the President of the Philippines, Rodrigo Duterte). Since people don't realize that their habitual quirks of interpersonal behavior need improvement, MAP-X affords a reliable way to bring them to conscious awareness, so they can be worked on.

Finally, currently dysfunctional behavior at the extremes of personality may result from habitual or adaptive responses to life events, trauma, or unusual circumstances. In this regard, extremes may be seen as strengths overused (Kaiser & Kaplan, 2013; Piedmont, Sherman, & Sherman, 2012; Wales et al., 2013). In our view, providing information about a maladaptive behavior should take into account the view from the individual that there may be some utility in acting this way. For example, individuals who score low on the MAP-X Agreeableness scale (otherwise described as high on the Insensitive scale) can be unpleasant, unfriendly, and boorish – yet they may also get their way more often than not. Steve Jobs, the iconoclastic founder of Apple was widely seen as a jerk, yet uncommonly good at selling his ideas. Research seems to suggest that disagreeableness is related to the uptake of novel ideas (Hunter & Cushenbery, 2015).

2.1. Intense

The Intense scale measures the low pole of the Emotional Stability dimension of the FFM, and appraises the relatively stable tendency to respond to threat, frustration, or loss with negative emotions (Lahey, 2009). Stable individuals tend to be less reactive to stress, are even-tempered, and unlikely to feel tense. In contrast emotionally unstable (also termed neurotic) people are tense, easily rattled, prone to negative feelings, and are self-critical. Research shows that neuroticism is widely associated with depleted coping, unhappier job experiences, and difficulty in work and life relationships (Judge, Heller, & Mount, 2002; Lahey, 2009; Roberts et al., 2007).

High scorers on the Intense scale tend to be anxious, worried, and tense. Setbacks, feedback, and criticism will be interpreted through a lens of personal inadequacy, leading to feelings of failing, not living up to expectations and pervasive disappointment with life, self, and the future. Alert to risk, individuals are more likely to interpret events pessimistically and doubt their abilities to surmount difficulties. They ruminate and obsess, seeming intense, dark and emotive, predominantly because they think about things too much (Perkins, Arnone, Smallwood, & Mobbs, 2015). They may feel simultaneously self-conscious, vulnerable, anxious, hostile, and bruised, particularly when things are tough and even more if they feel unsupported.

In a team setting, when at their worst these individuals can miss opportunities by focusing too much on risks and problems. They may ramp up the emotional tone of a discussion and unconsciously steer it to interpersonal concerns, rather than objective facts. Teams which contain a proportion of neurotic members have been shown to underperform and have a higher incidence of interpersonal disagreements (O'Neill & Allen, 2011; Peeters, Van Tuijl, Rutte, & Reymen, 2006) and create emotional contagion (i.e. bringing others down). These individuals may need frequent soothing from others, and want colleagues to pay attention to their problems, worries, and distress, which can be wearing. Others may find these people too intense and overly negative.

On the other hand, high scorers on the Intense scale are motivated to prove themselves and to repair perceived faults in the eyes of others. They are more open to feedback. Evidence suggests Intense individuals use anxiety and unhappiness to drive increased effort (Smillie, Yeo, Furnham, & Jackson, 2006; Tamir, 2005) and Nettle pointed to the positive aspects on performance of anxiety, although this may come at the cost of burnout and reduced resilience (Nettle, 2006).

2.2. Unemotional

The Unemotional scale measures the high pole of the Emotional Stability dimension of the FFM. Emotionally stable individuals respond to loss, pressure, or threats by remaining even-tempered, calm, and unemotive. It is important to note that these people are not necessarily optimistic and positive; rather, they do not experience negative moods (Chamorro-Premuzic & Furnham, 2010) or anxiety. They tend not to experience negative emotions and are less self-reflective or self-doubting.

As described above, FFM research has tended to assume that more of a trait is better, and indeed a mountain of evidence suggests that high levels of emotional stability are better for

job performance (Barrick & Mount, 1991), wellbeing (Lahey, 2009; Roberts et al., 2007), marital satisfaction (Botwin, Buss, & Shackelford, 1997), and longevity (Terracciano et al., 2008). However, this view is rapidly becoming obsolete as more sophisticated research designs and more thoughtful analyses show that more is not always better. As Miller and his colleagues noted "Anxiety is a useful trait for anticipating negative outcomes and risks. Indeed, it would seem, in theory, for the fearlessness of some psychopathic persons to be potentially quite maladaptive, contributing to a willingness to take risks and chances that would lead to arrest, injury, or even death" (Carter et al., 2018). In line with this suggestion, Le and his colleagues conducted a wide ranging review of curvilinear relationships between various FFM traits and job performance, offering compelling data showing performance decrements and dysfunctional behavior at both the high and low ends (Le et al., 2010). A similar result was found in other studies (Debusscher et al., 2014).

In the domain of personality disorders, high scores on a FFM of emotional stability were associated with a targeted measure of psychopathy (Lynam, Gaughan, Miller, Mullins-Sweatt, & Widiger, 2011). This suggested that high scorers were seen as excessively self-assured, invulnerable and unconcerned.

Together, these findings suggest that extreme scorers on the Unemotional scale will be stable, calm, and emotionally in control most of the time. Although they are free from anxiety, worry, or self-doubt, they will equally be unmoved or unresponsive to threats or legitimate concerns to an unusual degree. While they will rarely lose their cool, they will be closed or blind to feedback, or feel that it doesn't apply to them (i.e. "the feedback is wrong"). The most probable explanation for this insouciance is because they are so immune to negative emotions and self-assured that they are disinclined to think about themselves or see themselves as invulnerable to consequences.

This framing suggests that in team settings these people can play a positive role, except:

1. When the work is routine, repetitive, or very familiar they may get bored and disinterested. They may show no interest in helping others who cannot cope; they may be unaware of their distress.
2. They will be unaware of risks or threats, or they may downplay them to a degree that leads others to wonder if they are in touch with reality. This may lead the team to respond slowly, not at all, or haphazardly to emerging trends and concerns.
3. They will be arrogant and disinterested in feedback. They will discount the need to change, not see that it has anything to do with them or find ways to continue behaving as they were.
4. They will generally be unresponsive to coaching (seeing no need for particular change).

2.3. Withdrawn

The Withdrawn scale is a measure of the low pole of the FFM Extraversion dimension. A portrait of an individual low in extraversion is of a shy, contained, quiet person who displays little outward energy and doesn't seek the company of others. Although not necessarily unhappy, they display less positivity, especially in social settings (Lischetzke & Eid, 2006).

Introverted behavior is not inherently asocial but as group size increases more extraverted individuals spend a disproportionately large amount of time talking (Wilt & Revelle, 2015b).

A great deal of research has shown strong associations between extreme introversion and schizoid, schizotypal, and avoidant personality disorders (Brandes & Bienvenu, 2006; Saulsman & Page, 2004; Widiger & Mullins-Sweatt, 2008; Wiggins & Pincus, 1989), although it should be noted that neuroticism is also a co-marker for avoidant and schizotypal personality disorder. These individuals may have trouble forming close relationships, discomfort with others becoming close, trouble being in social settings, being expected to undertake interpersonal tasks, or repairing their relationships (Lischetzke & Eid, 2006). Some research suggests they are seen as odd, if not eccentric (Ashton & Lee, 2012).

As described in future chapters, our own analyses show strong correlations between the Withdrawn scale and measures of withdrawal, anhedonia, intimacy avoidance and anxiety, social withdrawal, and emotional detachment. The strength of relationships between lowered social functioning, avoidance of intimacy, anhedonia, and extreme introversion indicates that individuals scoring high on the Withdrawal scale will avoid close relationships and have trouble forming and maintaining them. These individuals will seem cold, withdrawn, disinterested and ill-at-ease in social settings. They may avoid intimacy. They will draw little pleasure from social encounters and feel uncomfortable in groups, due to feeling inadequate and hypersensitive to social judgments.

In teams Withdrawn people will not join in, dislike working closely with others, and avoid leadership roles. They are unlikely to sabotage teamwork, but will contribute little to team morale or esprit de corps.

2.4. Unrestrained

The Unrestrained scale measures the high pole of the Extraversion factor of the FFM. More extraverted individuals are characterized by energy, dominance, spontaneity, and sociability, whereas more introverted individuals tend to be described as more lethargic, inhibited, reflective, and quiet. Extraversion is relatively stable across the life span and is known to be heritable (van den Berg et al., 2016). Concerning its neurobiology, extraversion is linked to regions of the brain implicated in reward sensitivity, the behavioral activation system, and positive emotions. This suggests that the core of extraversion is seeking social attention, enthusiasm, positivity, and seeking rewards (Wilt & Revelle, 2015a). On the positive side, work contexts that require greater personal initiative, social interaction, more task variety, complexity, and status enhance extraversion's positive effects (Wilmot, Wanberg, Kammeyer-Mueller, & Ones, 2019).

On the other hand, more extraverted individuals had a higher likelihood of hospitalization for accident or illness and have a higher number of extra-marital sexual partners (Nettle, 2005, 2006). In line with Nettle's findings, people falling at this end of the continuum are more likely to be sexually promiscuous, emotionally intrusive, and engage in excessive self-disclosure and thrill-seeking behaviors (McCrae, Löckenhoff, & Costa, 2005). People with high levels of extraversion are also more likely to have difficulties with substance abuse (Atherton, Robins, Rentfrow, & Lamb, 2014). There has long been an interest in the relationship between extraversion and personality disorders. In 1989 Pincus and Wiggins

found high scores predicted histrionic and narcissistic personality disorders (Wiggins & Pincus, 1989).

These findings indicate that Unrestrained scorers will be confident, upbeat, and seek out the company of others. They will feel social, cheerful, and energetic, and at times will be fun to be around. Yet they will also tend to dominate groups and individuals, listen poorly and talk too much. They will show-off and want to be in the limelight, growing resentful if others are center stage. They will be prone to bluster and boasting and seem indifferent to feedback. They may be impulsive, self-interested and expect others to pay them heed. They may trample others' boundaries and ignore their feelings.

In teams these people may want to lead or dominate. Others may feel they leave little room for them in discussion and feel dismissed. They can be disruptive as they are loud, impulsive and don't listen. They will expect attention and may grow aggressive if challenged.

2.5. Insensitive

The Insensitive scale measures the maladaptively low extreme of the FFM agreeableness trait. Whereas agreeable individuals are more likely to work cooperatively with others, seem amiable, understanding, warm, and diplomatic, those who are disagreeable will seem uncooperative, blunt, insensitive, uncaring, and selfish (Graziano & Eisenberg, 1997). Disagreeable individuals tend to place their self-interest above the needs and feelings of others. They are unconcerned with others' welfare and thus unlikely to extend themselves for other people.

Agreeableness is not an unalloyed good. Hogan, Chamorro-Premuzic & Kaiser (2013) showed that agreeableness is useful for getting a job but is not related to subsequent advancement. Indeed, disagreeableness, at least in men, was associated with higher salaries (Judge, Livingston, & Hurst, 2012) and strongly related to climbing the corporate ladder (Boudreau, Boswell, & Judge, 1999). Research investigating the 'Steve Jobs effect' found that being argumentative, egotistical, aggressive, and headstrong had no effect on producing useful and original ideas but was related to having those ideas taken up (Hunter & Cushenbery, 2015), because these people pushed and cajoled others to adopt them.

Research on the extremes of low agreeableness has consistently found relationships with antisocial behavior (delinquency, bullying, criminal offending, and aggression). While other personality traits (emotional stability and conscientiousness) are also related, the effect size for agreeableness was the strongest and most consistent of the five domains (Jones, Miller, & Lynam, 2011). These authors also found a clear and strong link between agreeableness and aggression, particularly the facets of compliance, altruism, and straightforwardness. Other findings point to strong links between disagreeableness, Machiavellianism, and psychopathy (Muris et al., 2017)

This clear pattern of research findings indicates that Insensitive individuals will be seen as suspicious, mistrustful, and oppositional. Because they have little regard for others, and take an instrumental view of relationships, they can act in deceptive, manipulative or exploitative ways and their selfish needs will take precedence. Our own findings show

strong relationships between high scores on the Insensitive scale and measures of emotional detachment, hostile aggression, callousness, and manipulation.

In team settings these individuals may be socially plausible and shrewd. They may seek to dominate or manipulate others or engage in outright aggression: they are unlikely to back down, and if crossed will feel vengeful. Colleagues may fear or even respect them, but there is little chance of their being liked.

2.6. Oversensitive

The Oversensitive scale is designed to capture extreme high scores on the FFM Agreeableness scale. Previous research has found that agreeableness is one of the strongest personality predictors of team collective performance, yet one of the weakest personality predictors of individual-level job performance (Bradley, Baur, Banford, & Postlethwaite, 2013). High scores on this trait have been associated with leader emergence (Cogliser, Gardner, Gavin, & Broberg, 2012) and cohesion in groups as agreeable individuals not only want to be liked but also dislike conflict and prefer interpersonal harmony (Bell & Brown, 2015). Highly agreeable individuals want to create and maintain positive relationships with other people and have fewer negative reactions to people different from themselves. Other people find Agreeable individuals warm, caring, empathic, nurturing, trustworthy, and considerate (Graziano & Bruce, 2008; Graziano & Eisenberg, 1997).

While these traits are obviously useful in maintaining relationships, research shows that too much of a good thing can lead to deleterious effects for the individual. Since agreeable individuals are obedient and trustworthy and are considerate, modest and cooperative they may be at risk of being taken advantage of, or not asserting themselves. For example, experimental studies have shown that increases in agreeableness scores lower the likelihood of getting higher pay, a finding that is stronger in men than women (Judge et al., 2012). Our own research indicates that agreeableness is strongly associated with measures of integrity and honesty; this finding is confirmed by research showing high scores on agreeableness decrease the likelihood of diagnosis with the anti-social or paranoid personality disorders (Saulsman & Page, 2004).

These data strongly suggest that Oversensitive individuals may be guileless, naïve, and overly trusting of others. Their preference for fitting in and maintaining harmony may mark them out as submissive and meek. Although they may not always interpret in these ways, they may be gullible (Gore, Presnall, Miller, Lynam, & Widiger, 2012) and prone to compromise their interests in favor of others.

In teams and groups, they will work to maintain good relationships and may devote excessive time to soothing others or efforts to promote social harmony. Because Oversensitive individuals tend to be dutiful and reluctant to criticize others, they may not offer a position or seem to hold strong views, which can antagonize and frustrate team members. Deferring to others may paradoxically increase fractionalization in teams as Oversensitive team members listen and empathize with complaints, gripes, and defensiveness.

2.7. Impulsive

The Impulsive scale is designed to measure the extreme low end of the FFM conscientiousness trait. Conscientiousness plays an integral role in nearly every consequential life outcome, from success in school to achieving at work, and living a longer, healthier life. Correlations between conscientiousness and these life outcomes are at levels equal to, if not better than, gold-standard predictor variables such as intelligence or socioeconomic status (Roberts et al., 2007).

Being low in conscientiousness has wide ranging negative effects. Those low in conscientiousness are less likely to save money and more prone to gamble. These individuals are more likely to engage in criminal behaviors, be arrested more often, and spend a longer time in prison (Bogg & Roberts, 2004; Mike, Harris, Roberts, & Jackson, 2015; Nettle, 2006; Roberts et al., 2007). Because conscientiousness is a broad trait, encompassing elements of orderliness, industriousness, responsibility, and self-control, very low scorers tend to have trouble controlling their impulses, fail to plan ahead, disregard rules and conventions, reject responsibilities, cut corners, give up easily, and shirk hard work.

Extremely low scores of conscientiousness are powerfully implicated in nearly every personality disorder, particularly in association with low scores on various FFM traits (Malouff, Thorsteinsson, & Schutte, 2005). Malouff and colleagues found low conscientiousness spanned both mood and conduct disorders, suggesting that a lack of industriousness and orderliness underpins many dysfunctions. Similarly, strong relationships have been found between conscientiousness facets of low dutifulness and low deliberation and the Dark Triad domain of psychopathy (Furnham, Richards, & Paulhus, 2013; Paulhus & Williams, 2002).

In our validation studies, extremely strong relationships were observed between MAP-X Impulsiveness and measures of non-perseverance, non-playfulness, norm-violation, irresponsibility, and cognitive problems. There were also strong relationships with measures of distractibility, irresponsibility, and disinhibition. The Impulsive scale was positively correlated with The Dark Triad dimensions, Machiavellianism and psychopathy, and negatively correlated with measures of integrity.

These findings indicate Impulsive scorers will behave erratically, impulsively and with little regard for rules, norms or conventions if it suits their ends. They are unlikely to be planned, which may lead to frequent, repeated mistakes and dangerous, careless behavior with little regard for their own or others' safety. Colleagues will describe them as careless, heedless, and easily distracted. They will cut corners, shrug off failures, and avoid responsibility.

In teams, this pattern is clearly destructive. If trust is predicated on benevolence, competence and integrity, Impulsive team members fail on all counts and may damage cohesion through poor performance or heedless disregard for goals. They may or may not show up on any given day and will perform erratically.

2.8. Obsessive

Persons falling within the normal range of the FFM trait of Conscientiousness tend to do well at work, are ordered, organized, and thorough (McCrae & Costa, 1997). Conscientious

employees are generally more reliable, virtuous, harder working, and show lower rates of absenteeism and counterproductive work behaviors (Chamorro-Premuzic & Furnham, 2010; Hogan & Holland, 2003; Roberts, Chernyshenko, Stark, & Goldberg, 2005).

That said, a number of findings indicate there is a considerable down side to being over-conscientious, which is the trait measured by the Obsessive scale. Desirable characteristics such as rule-orientation, industriousness, self-control, and responsibility have a dark side. Thus, research has shown relationships between measures of conscientiousness and obsessive-compulsive personality disorder (Coker, Samuel, & Widiger, 2002; Samuel & Gore, 2012; Saulsman & Page, 2004). Behaviors associated with these disorders include workaholism, perfectionism, punctiliousness, inflexibility, and doggedness. In a long series of research, Flett and Hewitt have shown that perfectionism is associated with psychological maladjustment, especially rigidity, negative self-evaluation, anxiety, and setting unobtainable and high expectations of performance and attainment (Hewitt, Flett, & Mikail, 2017; Hewitt & Flett, 1991; Stoeber, Otto, & Dalbert, 2009).

Our own findings mirror this literature. Significant negative correlations were seen between the Obsessive scale and measures of distractibility, irresponsibility and impulsivity; positive correlations were seen with negative affectivity. Positive correlations between MAP-X conscientiousness and measures of perfectionism were found; negative correlations were observed with non-planfulness, irresponsibility, and non-impulsivity.

These findings indicate high scorers on the Obsessive scale will strongly identify with the need to be ordered, assume responsibility, and maintain very high standards. They prefer order and control and will be distressed and unhappy with unplanned disruptions or spontaneous behavior in others. Having their preferred ways being disturbed will lead to stress, anxiety, and negative mood. They will feel upset by disorder and randomness, or by not being able to meet standards.

In team settings high scorers will struggle with unplanned, on-the-fly activity. They will want certainty and predictability, pressing team members for details and firm deadlines; in contrast they may struggle with change and the need to respond flexibly. They may dither and have trouble making decisions, or not accept outputs that are not at 100%. Colleagues may find them fussy, tight, over-controlled, tense, critical, controlling, and unadaptable.

2.9. Conformist

The Conformist scale of the MAP-X provides a measure of the extreme low end of the Openness trait. Much research has concentrated on the creative, ideational, aesthetic end of Openness; low scorers by contrast have trouble adapting to change, display a low tolerance for different lifestyles, and a narrow range of interests (Piedmont et al., 2012). Characteristic of people with low scores is a significant lack of interest and even antipathy to exercising their imaginations. This manifests as being disinterested in understanding how things work or why things are as they are, and in being content with surface explanations. Research has shown that alexithymia (an inability to identify feelings) is associated with low scores on openness, and is influenced particularly by an inability to fantasize and notice feelings (Taylor & Bagby, 2004; Zimmermann, Rossier, De Stadelhofen, & Gaillard, 2005). Conformist scores are significantly correlated with measures of social detachment and

anhedonia, suggesting that people scoring high on the Conformist scale avoid intimacy and are prone to negative affect.

One of the consequences of being unimaginative is rigidity and mental inflexibility. This results in difficulty empathizing with others, or being able to see things from another's point of view. In line, a number of researchers have found that very low Openness scores are associated with forming prejudicial attitudes (Flynn, 2005). It has reliably been found that the tendency to be hierarchical, conventional, and intolerant, and indeed to hold right-wing authoritarian attitudes are associated with lower scores on Openness (Butler, 2006; Peterson, Smirles, & Wentworth, 1997). Our own validation research shows that Conformist scores are significantly correlated with the measures of social dominance orientation (Ho et al., 2015; Pratto, Sidanius, Stallworth, & Malle, 1994). This scale measures one's attitude towards supporting inequality between social groups. Scores on this scale are correlated with holding racist attitudes, expressing anti-immigrant sentiment, and endorsing nationalist political policies.

Another way of seeing this tendency is that of an individual who is fundamentally closed to experiences – either their own, or those of another person. These people urgently need cognitive closure in the face of threatening ambiguous information and they work to maintain their view for as long as possible (Kruglanski & Webster, 2018).

This constellation of behavioral dispositions indicates high scorers on the Conformist scale will dislike settings in which morally ambiguous decisions have to be made, or where threats to internal values occur. Changes to processes, routines or underlying purpose will be interpreted as threatening and produce reactions ranging from denial to hostility. Conformist individuals do not engage in self-reflection and assume they are right; they can be dogmatic, stubborn, and oppositional. They hold opinions fervently and will not change their views in the face of contradictory evidence. They are closed to new thinking, ideas or experiences, and will seem emotionally blocked or unaware. Importantly, the=is factor is not correlated with intellect and reluctance to engage with facts or counterfactual argument should not be seen as 'being dumb'.

In teams these people can inhibit performance by being stubborn and recalcitrant. Colleagues may waste time trying to convince them or become diverted trying to change their attitudes and views. Although they may raise the negative emotional tone of the group, they will not be aware of that and may deny that they have any responsibility.

2.10. Eccentric

The Eccentric scale of the MAP-X measures the extreme high pole of the Openness trait. Within the FFM openness is the broadest domain, incorporating a mix of traits relating to curiosity, intellectual interests, creativity, artistic interests, emotional and imaginative richness, and unconventionality. The unifying theme of this broad personality domain is cognitive exploration (Deyoung, Grazioplene, & Peterson, 2012; Kaufman, 2013).

There has been a long history of linking openness with unusual thinking, creativity and maladaptive functioning. Simms and colleagues showed markers of schizotypy and dissociation (having odd, strange, weird, unusual, eccentric, or bizarre ideas) was linked to

higher Openness scores (Simms, Yufik, Thomas, & Simms, 2008). Piedmont and colleagues have shown Openness is related to fragmented thinking, diffuse identity, unstable goals and non-conformity with societal norms (Piedmont et al., 2012). Other research has shown strong links between openness and the 'odd or eccentric' cluster of personality disorders of the DSM-IV (Ashton & Lee, 2012).

These data indicate that high scoring individuals on the Eccentric scale will see themselves as different to others and enjoy that sense of being different. They come across as spiritual, artistic or creative and have unusual beliefs (openness has been linked to an increased likelihood to believe in extra-sensory perception and other paranormal phenomena; Smith, Johnson, & Hathaway, 2009), lifestyles, and behaviors. They will be particularly prone to live an active fantasy life and may have trouble drawing clear lines between reality and fiction. More than others they are likely to immerse themselves in emotional and sensory experiences, and see meaningful patterns where none exist (Carter et al., 2018).

Because these tendencies make it hard to follow Eccentric scorers' thinking patterns and logic teammates frequently find these people strange, sometimes frightening, and odd. Research suggests that extreme openness scores had opposing effects on work role performance – it was positively related to individual and organizational proactivity but negatively related to team effectiveness (Neal, Yeo, Koy, & Xiao, 2012). Eccentric individuals dislike structure and rule following and may have trouble keeping to deadlines, boundaries, roles, or tasks. Although they can be creative and inventive they also see connections and patterns where others do not, drawing unlikely inferences and conclusions, potentially wasting time and distracting colleagues (Deyoung et al., 2012; Piedmont et al., 2012).

3. Scale Construction

The following chapter describes the process and methodology used to develop the MAP-X assessment. We first outline our process for identifying and developing items. We then present information related to the assessment's psychometric properties.

3.1. Item Development

To develop the MAP-X assessment, a rigorous and scientific methodology was followed. This involved robust psychometric techniques, cutting-edge machine-learning methods, and large volumes of data from working adults.

As outlined in previous chapters, the MAP-X measures an individual's dysfunctional behavioral tendencies. That is, problematic dispositions that can get in the way of them leading successful personal and professional lives. The MAP-X follows the dimensional model of personality disorders as described in the DSM-V (American Psychiatric Association, 2013). This modern approach moves beyond categorical conceptualizations of personality disorders and instead views them as continuous dimensions that closely follow the Five-Factor Model (FFM) of personality (Skodol et al., 2005). The advantages of this model have been made in previous chapters and again listed in Widiger and Trull (2007).

Given that the DSM-V model of personality disorders is based on the FFM, the 200-items that form the MAP assessment served as the initial item pool of the MAP-X. This decision was made for numerous reasons: first, these items have already been expertly crafted to measure FFM behavioral dispositions in applied contexts (Sjöberg, Svensson, & Sjöberg, 2019); second, they have already been widely validated (Sjöberg et al., 2019); last, there is a large global database of responses on the MAP items thereby assisting in normative scoring in high stakes situations. Given this, it was reasonable to assume that from the MAP item-pool there would be a smaller subset of items that best samples and predicts maladaptive and dysfunctional behavioral dispositions. To do this we leveraged advanced machine-learning methods. Such methods enabled us to keep the assessment as short as possible while maximizing its reliability and validity.

To identify the MAP-X items, a sample of 208 working adults completed the MAP assessment alongside the "Personality Inventory for the DSM-5" (PID-5; Krueger, Derringer, Markon, Watson, & Skodol, 2012). The PID-5 is a 220-item self-rated personality assessment for adults and measures the dimensional conceptualization of personality disorders that have been described previously. It assesses 25 dysfunctional personality trait facets, which can be combined to yield indices of the five broader trait domains of DSM-V personality disorder model: Negative Affect (*Emotional Stability*), Detachment (*Extraversion*), Antagonism (*Agreeableness*), Disinhibition (*Conscientiousness*), and Psychoticism (*Openness*). Respondents are asked to rate how well the item describes him or her. The PID-5 has been well-validated and is primarily a tool for research and clinical applications (Al-Dajani, Bagby, & Bagby, 2016). Given all of this, the PID-5 served as a suitable target assessment to select MAP items against. This was achieved using a particular machine-learning methodology called "genetic algorithms" (Yarkoni, 2010).

Genetic algorithms are a machine-learning method that uses evolutionary principles to select features that maximize "fitness". In this case, the optimal combination of personality

items that produce the largest correlation with a PID scale. Within the domain of personality assessment development, this methodology is growing in popularity as it keeps the number of items in a scale low, while ensuring the scale has optimal convergent validity. This is best demonstrated in Yarkoni (2010), who used the algorithm to configure a pool of 200 items to accurately measure 200 personality constructs.

Like most machine-learning algorithms, there are numerous parameters to configure when building genetic algorithms. In this case: item cost was set to .001; the maximum number of items that could be selected per scale was 20; the maximum number of algorithm iterations was 200; and the dataset was cross-validated on a training and test set (for information on these parameters, see Yarkoni, 2010). The algorithm was run five times, once for each MAP-X scale. For each of the five models developed, the predictors were the 40 items that belong to a MAP scale and the target variable was the analogous PID scale. For example, one model contained 40 Agreeableness MAP items as predictors and the PID-5 Antagonism scale as the target variable. Table 3contains the summary results of each model produced by a genetic algorithm.

As displayed in Table 3 each model produced very positive results. First, for each scale, a subset of items less than 20 were selected, with the lowest being Emotional Stability/Negative Affectivity and the highest being Openness/Psychoticism. Second, the Cronbach's Alpha for each of the selected subset of items is satisfactory to good. Last, the correlations between items and PID-5 scales are strong[1] (indicating high convergent validity) and consistent across both training and test samples (indicating model generalizability). As a result of these analyses, the initial MAP-X item pool was identified.

Table 3: Summary of Model Development

Predictor Items	Target Scale	Selected Items	α	Train *r*	Test *r*
Agreeableness	Antagonism	14	.69	.60	.67
Conscientiousness	Disinhibition	8	.73	.68	.71
Emotional Stability	Negative Affectivity	6	.81	.79	.85
Extraversion	Detachment	10	.73	.74	.70
Openness	Psychoticism	16	.71	.44	.35

Note: N = 208. Training N = 156, Test N = 52; α = Cronbach's Alpha.

Before the MAP-X items could be finalized, a team of subject matter experts (SMEs) with advanced degrees in I-O psychology and psychometric assessment reviewed the selected items against the scale definitions outlined in Chapter 2. This was to ensure congruency between theoretical and sampled behaviors (content validity) and item appropriateness (face validity). As a result of this process, one item was removed from the Extraversion/Detachment pool, and two were removed from the Openness/Psychoticism pool. At the end of this process, the MAP-X assessment comprised of 51 items.

[1] Of the five models, Openness-Psychoticism has the lowest correlations. This is in line with other research that has correlated FFM assessments designed to be used in non-clinical environments with the PID-5 (Al-Dajani et al., 2016).

3.2. Descriptive Statistics, Reliabilities & Factor Analysis

With the MAP-X items empirically selected and confirmed by a team of SMEs, the next step was to further explore the psychometric properties of each scale. This was achieved using the large MAP data archive, which contained responses from over 256,000 working adults.

The descriptive statistics for the five MAP-X scales are presented in Table 4. For each scale, the mean score and its standard deviation are presented alongside the minimum and maximum scores, and an estimate of the scale's reliability.

Each item is a statement describing one's tendency to think, feel or behave in a certain way (i.e. "I've heard people say that I am hot-tempered" & "I'd rather not know about other people's problems"). Individuals respond to items using a four-point Likert scale (Strong Disagree/Disagree/Agree/Strongly Agree). Given that the number of items per scale varies, so does the minimum and maximum total score. As described in Chapter 5.3, scores are normalized into percentile scores to account for such scale variation and ease score interpretation.

Using the minimum and maximum score as a reference, the means reveal that there is a slight left skew in the distribution of scores. This is to be expected due to the "high stakes" nature that the data has been collected in, thereby increasing attempts to "fake good". This is not a concern, however. When inspecting histograms of each scale, it is revealed that scores are normally distributed however this occurs towards the upper end of the range of possible scores. Further, Skewness statistics for each scale do not exceed ± 1 and Kurtosis statistics are close to zero. Together these indices indicate that the distributions are normal and symmetrical.

The internal consistency of each scale, as measured by Cronbach's Alpha, is greater than .60 (ranging between .64 & .71). The internal consistency of scale ranges between "satisfactory" to "good". Although it would have been possible to achieve a higher level of internal consistency for each scale by including more items, this would have introduced redundancy and needlessly increased the length of each scale. As outlined previously, we wanted to keep the number of items low, while ensuring as much of the behavioral domain was sampled and maintaining good convergent validity.

To ensure that this assumption was empirically met, two additional analyses were conducted. First, we studied the reliability results for each scale to identify whether removing any items would improve the scale's overall level of internal consistency. This was not possible. From the selected items, the scales already have the optimal level of internal consistency. Second, exploratory factor analyses revealed each scale to load onto a single factor explaining between 15% (Openness) to 29% (Emotional Stability) of the variance in scores. Together, these analyses demonstrate the scales to have good levels of internal consistency.

Table 4: Descriptive Statistics & Reliabilities

Scale	M	SD	Med	Min	Max	Skew	Kurt	α	*N* Items
Agreeableness	42.64	4.38	43	14	56	-.14	21	.64	14
Conscientious	27.97	2.74	28	8	32	-.56	.12	.71	8
Emotional Stability	19.98	2.66	20	6	24	-.67	.46	.69	6
Extraversion	29.27	3.24	29	9	36	-.37	.15	.71	9
Openness	40.88	4.40	41	14	56	.00	.05	.66	14

Note: *N* = 256,742; M = Mean; SD = Standard Deviation; Med = Median; Min = Minimum; Max = Maximum; Skew = Skewness; Kurt = Kurtosis; α = Cronbach's Alpha.

3.3. Scale Correlations

The correlations between MAP-X scales are presented in Table 5. Overall, the scales hold small to moderate positive correlations with each other. Unsurprisingly, this is similar to what is observed in the full MAP assessment (Sjöberg et al., 2019), and it is reflective of other FFM research that shows a "socially desirable" profile where by an individual will score high on each scale (Gerlach, Farb, Revelle, & Nunes Amaral, 2018). Taking a closer at the correlations, Agreeableness was most correlated with Conscientiousness. Interpreting this relationship using the theoretical framework outlined in Chapter 2, individuals who are highly sensitive and acquiescing, are likely to be overly rigid and inhibited. Further, Conscientiousness was correlated to Emotional Stability scores, suggesting there is a relationship between being rigid and inflexible with being aloof and detached. Last, while Extraversion holds a moderate correlation with Openness scores (suggesting that spirited and socially dominating people are likely to be more imaginative and colorful), the remaining scales hold a weak relationship with Openness. Despite these general trends, the differential size of the correlations indicate that each scale is sampling a distinct behavioral domain.

Table 5: The Correlation Between MAP-X Scales

	1.	2.	3.	4.
1. Agreeableness	—			
2. Conscientious	.44	—		
3. Emotional Stability	.37	.49	—	
4. Extraversion	.34	.44	.36	—
5. Openness	.20	.26	.08	.52

Note: *N* = 256,742; all correlations are statistically significant ($p < .05$).

4. Validity

Chapter 3 demonstrated that the scales exhibit good internal reliability and factor structure. In this chapter, we explore the scales' construct validity.

First, we answer the question: "to what extent do scores on the dimensions correlate with well- established psychological constructs?" Where convergent validity tests the extent to which a scale correlates with other variables that are hypothesized to measure a similar behavioral domain, discriminant validity tests the extent to which a scale does not correlate with variables that measure different behavioral domains. Establishing convergent and discriminant validity is important in psychometric construction as it places the scales within a nomological network of psychological constructs. This serves as additional evidence that the scales are measuring the intended behaviors and increases the interpretability of scores. Second, we provide evidence that demonstrates the scales' concurrent validity, thereby answering the questions: "to what extent do scores on the dimensions correlate with relevant work behaviors and outcomes?".

Although the below analyses demonstrate multiple forms of construct validity for the scales, further evidence is needed to confirm the scales' predictive validity. That is, their ability to predict future work outcomes. As stated by the American Psychological Association's guidelines and regulations, it is critical to demonstrate predictive validity if these scales are to be used in applied settings and inform selection or hiring decisions. When used in this way, Deeper Signals will partner with organizations to conduct such validation studies.

4.1. Convergent & Discriminant Validity

The below section describes the measures used to test the convergent and discriminant validity of the scales, alongside the presentation and interpretation of these analyses. To test the scales' convergent and discriminant validity, we chose inventories that were related to the assessment's theoretical model, and widely validated within research and applied contexts.

4.1.1. Measures

Assessio "Measuring and Assessing individual Potential" Inventory (MAP; Sjöberg et al., 2019)

Assessio's MAP assessment is a personality inventory based on the Five Factor Model of personality. The assessment contains 200 items (40 per scale), which are scored into composites representing each dimension of the FFM. Further, there are five sub-scales per FFM dimension. Participants respond to items using a 4-point Likert scale (Strongly Disagree / Disagree / Agree / Strongly Agree). The MAP assessment can be used for screening and selection to predict workplace behavior, at the individual contributor, manager and leader level. The technical manual reports the assessment to have optimal levels of internal reliability (> .80), a robust factor structure, and to be predictive of critical outcomes, such as managerial performance.

Assessio "Measuring Integrity" Inventory (MINT; Sjöberg, Svensson, & Sjöberg, 2012)

Assessio's MINT assessment measures the extent to which an individual typically acts and behaves with integrity. The assessment contains 60 items, and participants respond to items

using a 4-point Likert scale (Strong Disagree / Disagree / Agree / Strongly Agree). The technical manual reports the MINT assessment to have desirable psychometric properties and good construct and criterion validity. For example, higher scores on the MINT assessment are correlated with increased ratings of job performance and organizational citizenship behaviors, while negatively correlated with counterproductive work behaviors, such as bullying and misusing organizational resources.

The Computerized Adaptive Assessment of Personality Disorders (CAT-PD; Simms et al., 2011)

The CAT-PD was developed to measure the previously described alternative DSM-V model of personality disorders. The assessment contains 216 items, measuring 33 specific problematic dispositions that can be organized into the five overarching domains. Given the applied nature of the MAP-X, data was not collected on all CAT-PD sub-scales due to their emotional sensitivity (i.e. depression, self-harm, etc.) or irrelevance (i.e. romantic disinterest). Participants respond to each item using a five-point Likert scale (Very untrue of me / Untrue of me / Neutral / True of me / Very True of Me). The average level of internal consistency for the scales was .83.

The Dark Triad Dirty Dozen (Jonason & Webster, 2010)

The Dirty Dozen is a 12-item inventory for The Dark Triad of personality. The Dark Triad represents three broad malevolent and agentic dimensions of personality: Psychopathy, Narcissism and Machiavellianism. Individuals who score highly on these three dimensions of personality are likely to be callous, uncaring, and selfish (Psychopathy), egotistical and over-confident (Narcissism), and manipulative and exploitative (Machiavellianism). These dimensions have been found to predict job performance, engagement, and work-related behaviors (Furnham et al., 2013). Participants responded to each item using a five-point Likert scale (Strongly Disagree / Disagree / Neutral / Agree / Strongly Agree). Each scale was found to have acceptable levels of internal consistency ($\alpha > .70$).

The Deeper Signals Core Drivers Diagnostic (Akhtar, Ort, Winsborough, & Premuzic, 2019)

The Deeper Signals Core Drivers (CD) diagnostic consists of 60 forced-choice adjective pairs. The assessment requires individuals to choose adjectives that best describe them. It consists of six dimensions that are based on the Five Factor Model of personality (Donnellan, Oswald, Baird, & Lucas, 2006). These are: Outgoing (Extraversion-Sociability), Drive (Extraversion-Proactivity), Considerate (Agreeableness), Disciplined (Conscientiousness), Stable (Emotional Stability) & Curious (Openness). The scales display good levels of internal consistency ($\alpha > .70$), and a high level of convergent validity with other measures of the Five Factor Model ($r > .50$), and other psychometric inventories. Adjective-based assessments such as the CD offer improvements to traditional statement-based assessments as they sample different aspects of personality dimensions (i.e. reputation), are easier to complete, and harder to fake (Meade, Pappalardo, Braddy, & Fleenor, 2018).

The HEXACO Personality Inventory (Lee & Ashton, 2004)

The HEXACO model of personality consists of six different factors of personality: Honesty/Humility, Emotionality, Extraversion, Agreeableness, Conscientiousness, and Openness along with four facets of each factor. For the purposes of this analysis, participants only completed items from the Honesty/Humility scale. Persons with very high

scores on the Honesty-Humility scale avoid manipulating others for personal gain, feel little temptation to break rules, are uninterested in lavish wealth and luxuries, and feel no special entitlement to elevated social status. Conversely, persons with very low scores on this scale will flatter others to get what they want, are inclined to break rules for personal profit, are motivated by material gain, and feel a strong sense of self-importance. Participants were asked their agreement (Strongly Disagree / Disagree / Neutral / Agree / Strongly Agree) with the statements. The scale consists of 10 items, has high levels of internal consistency and is found to be a valid predictor of life and work outcomes (Lee & Ashton, 2004)**.**

The Hogan Development Survey (HDS; Hogan, 2009).
The HDS is a contextualized measure that seeks to identify dysfunctional traits that impair work performance. The HDS taxonomy is closely related to classical personality disorders (PD) described by the DSM–IV–TR (American Psychiatric Association, 2000). The HDS consists of 154 items that are completed by participants stating either their agreement or disagreement. The items score for 11 scales: Excitable (borderline PD); Skeptical (paranoid PD); Cautious (avoidant PD); Reserved (schizoid PD); Leisurely (passive- aggressive PD); Bold (narcissistic PD); Mischievous (antisocial PD); Colorful (histrionic PD); Imaginative (schizotypal PD); Diligent (obsessive-compulsive PD); and Dutiful (dependent PD). The measure has been found to predict a variety of work outcomes (Gaddis & Foster, 2013), with the manual reporting internal reliabilities ranging between .50 and .79

The Hogan Personality Inventory: International Personality Item Pool Form (HPI; (Goldberg et al., 2006; Hogan & Hogan, 2007)
This inventory is a non-commercial version of the HPI — a popular personality assessment used in selection and development contexts. The HPI has been found to predict a range of relevant work outcomes, such as job performance, leadership effectiveness, and innovation (for a review, see Akhtar, Humphreys, & Furnham, 2015). The HPI measures seven behavioral dimensions: Adjustment, Ambition, Sociability, Interpersonal Sensitivity, Prudence, Inquisitiveness, and Learning Approach. The inventory consists of 70 items, with participants responding to each item using a five-point Likert scale (Strongly Disagree / Disagree / Neutral / Agree / Strongly Agree). The average correlation between the HPI and HPI scales is .70, suggesting a high level of convergent validity between the commercial and non-commercial version of the assessment.

The Personality Inventory for DSM-5—Adult (PID-5; Krueger et al., 2012)
The PID-5 is a 220-item self-report inventory developed to index the five proposed DSM-5 personality domains and their respective sub-domains (25 in total). Participants respond to items on four-point Likert scale (Very False / Sometimes False / Sometimes True / Very True). As previously reported, the PID-5 scores were used to identify and select items for the MAP-X. The assessment has optimal psychometric properties, and like the CAT-PD, is designed for use in research and clinical contexts. The PID-5 has been widely used in research and clinical contexts and found to have excellent psychometric properties (Al-Dajani et al., 2016).

The Mini-IPIP Big Five Personality Inventory (Donnellan et al., 2006)
The Mini-IPIP Big Five inventory is a 20-item version of the widely used IPIP Big Five inventory (Goldberg et al., 2006). It measures five dimensions: Extraversion, Agreeableness, Conscientiousness, Emotional Stability and Openness. The Big Five model of personality has become the *de facto* taxonomy for organizing, describing, and measuring personality dimensions. The taxonomy has found to predict a host of life and work-related outcomes (Barrick & Mount, 1991). Participants responded to each item using a five-point Likert scale (Strongly Disagree / Disagree / Neutral / Agree / Strongly Agree).

The Social Dominance Orientation Inventory (Ho et al., 2015)
Social Dominance Orientation (SDO) measures one's attitude towards supporting inequality between social groups and has been found to play a central role in a range of intergroup attitudes and behaviors. The SDO scale consists of 16 items that are rated by a seven-point Likert scale (Strongly Oppose to Strongly Support) and has high levels of internal consistency ($\alpha > .70$). Scores on this scale are correlated with holding racist attitudes, expressing anti-immigrant sentiment, and endorsing nationalist political policies (Ho et al., 2015).

4.1.2. Convergent & Discriminant Validity Results

The following sections describe the convergent and discriminant validity of the MAP-X assessment. Attention is paid to highlighting and interpreting the largest correlations. We first discuss how the MAP-X correlates to assessments based on the Five-Factor Model (e.g. the MAP, Core Drivers, HPI, & Mini-IPIP), before discussing relationships held with narrow measures of personality (e.g. MINT & Honesty-Humility), and inventories measuring dysfunctional dispositions (e.g. PID-5, CAT-PD, HDS, & Dark Triad).

Table 6 displays the correlations between the MAP-X and MAP assessment. When looking at the analogous scales, the MAP-X is strongly correlated to the MAP. This indicates that while the MAP-X scales are comprised of just a fraction of the number of items of their MAP counterpart, a large amount of variability is still captured. Further, these analyses suggest that MAP-X accurately measures its intended behavioral domains, including their sub-domains. This is expected given that the MAP-X items were selected to measure the extreme ends of each personality domain. It can be argued that high correlations between the MAP and MAP-X should be expected given that the MAP-X scales are a subset of the MAP. It is for this reason we correlated MAP-X scores against a variety of other FFM-based assessments, thereby allowing us to ascertain the assessment's convergent validity.

Table 6: The Correlation Between The MAP-X & MAP Assessment

	MAP X				
	Agreeableness	Conscientious	Emotional Stability	Extraversion	Openness
MAP Agreeableness	.87	.50	.39	.52	.36
Trust	.58	.35	.41	.36	.17
Communication	.73	.41	.35	.22	.08
Altruism	.66	.39	.23	.44	.37
Compassion	.56	.28	.11	.28	.29
Affection	.60	.35	.28	.59	.40
MAP Conscientiousness	.41	.86	.40	.51	.39
Intensity	.33	.73	.40	.52	.37
Diligence	.38	.70	.31	.40	.26
Ambition	.25	.57	.27	.49	.38
Self-Discipline	.40	.79	.40	.42	.27
Decision Making	.26	.55	.17	.17	.25
MAP Emotional Stability	.47	.68	.84	.47	.18
Emotions	.34	.50	.84	.45	.14
Temper	.44	.54	.71	.33	.16
Confidence	.33	.48	.68	.52	.22
Self-Control	.37	.51	.44	.02	-.09
Stress	.34	.60	.54	.44	.28
MAP Extraversion	.21	.33	.25	.86	.56
Social Need	.30	.30	.22	.74	.42
Social Image	.09	.21	.22	.52	.34
Pace of Life	.17	.36	.19	.64	.41
Excitement Seeking	-.08	.04	.01	.52	.43
Cheerfulness	.30	.35	.27	.75	.48
MAP Openness	.18	.17	-.01	.42	.85
Imagination	-.15	-.24	-.30	.07	.53
Aesthetics	.09	.12	-.07	.27	.57
Emotional Sensitivity	.42	.22	.12	.40	.50
Experiences	.25	.37	.25	.56	.63
Mindset	.10	.15	.04	.17	.59

Note: N = 256,742; all correlations are statistically significant ($p < .05$).

Table 7, Table 8 and Table 9 display the correlation between the MAP-X and three FFM-based personality inventories: *The Deeper Signals Core Drivers Diagnostic, The Hogan Personality Inventory* and *The Mini-IPIP Inventory*. As illustrated in these tables, the MAP-X dimensions hold strong convergent validity. This is evident in the large correlations between the MAP-X scales and the analogous scales measured by the Core Drivers Diagnostic, HPI, and Mini-IPIP inventory. The presented analyses also demonstrate that the scales have good discriminant validity. Specifically, the largest correlations are held between analogous scales. For example, the correlation between Agreeableness and Candid-Considerate is

much larger than the correlations between Agreeableness and the remaining five Core Drivers scales. Across three separate measures of the FFM of personality, the presented results demonstrate that the MAP-X scales have good construct validity and accurately sample behaviors from the Big Five behavioral domain.

Table 7: The Correlation Between The MAP-X and The Core Drivers Diagnostic

	MAP-X				
	Agreeableness	Conscientious	Emotional Stability	Extraversion	Openness
Candid-Considerate	.31*	.04	.03	.05	.25
Flexible-Organized	.14*	.44*	.13	-.13	-.40*
Laid Back-Driven	-.18*	-.01	.21*	.42*	-.12
Reserved-Outgoing	.11	-.02	.19*	.54*	.15
Pragmatic-Curious	.00	-.16*	-.09	.16	.34*
Passionate-Stable	.20*	.14*	.56*	.52*	.08

Note: $N = 238$; * $p < .05$.

Table 8: The Correlation Between The MAP-X & The HPI

	MAP-X				
	Agreeableness	Conscientious	Emotional Stability	Extraversion	Openness
Adjustment	.29*	.42*	.66*	.37*	-.03
Ambition	.28*	.42*	.45*	.51*	.24
Sociability	-.13*	-.05	-.03	.62*	.52*
Interpersonal Sensitivity	.47*	.28*	.39*	.57*	.21
Prudence	.41*	.45*	.34*	.10	-.40*
Inquisitive	.12*	.22*	.21*	.27*	.38*

Note: $N = 326$; * $p < .05$.

Table 9: The Correlation Between The MAP-X & The IPIP Big Five Inventory

	MAP-X				
	Agreeableness	Conscientious	Emotional Stability	Extraversion	Openness
Extraversion	.10*	.07	.16*	.58*	.20*
Agreeableness	.48*	.15*	.10*	.34*	.41*
Conscientious	.31*	.51*	.32*	.14	.18
Openness	.31*	.26*	.14*	.25*	.51*
Neuroticism	-.24*	-.40*	-.59*	-.44*	.00

Note: $N = 407$; * $p < .05$.

Table 10 displays the correlation between the MAP-X, the Assessio MINT inventory, and the Honesty-Humility scale from the HEXACO inventory. Each of the MAP-X scales were significantly and positively correlated with the MINT scores. The strongest relationships were held with Conscientiousness and Emotionality Stability. Interpreting these relationships at the extreme end of the personality continuum, individuals who tend to be rigid, inflexible, emotionally aloof, and detached, are likely to act with integrity, have firm

moral beliefs, and unlikely to bend the rules to advance their own agenda, unlike individuals who are impulsive, slack, and emotionally intense. Furthermore, Agreeableness, Emotional Stability and Conscientiousness scales were moderately correlated with Honesty-Humility. Interpreting these relationships at the extreme end of the personality dimension indicates that oversensitive, rigid, and emotionally detached individuals are more likely to act with fairness, humility, and sincerity, as opposed to being dishonest, impulsive, and emotionally volatile individuals.

Table 10: The Correlation Between The MAP-X, MINT & Honesty-Humility

	MAP-X				
	Agreeableness	Conscientious	Emotional Stability	Extraversion	Openness
MINT	.41*	.49*	.59*	.42*	.11*
Honesty-Humility	.57*	.28*	.33*	.20	.06

Note: MINT N = 31,384; Honesty-Humility N = 244; * $p < .05$.

Table 11 contains the correlations between the MAP-X and the PID-5, a measure of DSM-V alternative model of personality disorders. The PID-5 produces a single score for each of the five personality disorder dimensions, alongside three sub-scales per dimension. The table presents the correlation between each of the five domains (in bold) alongside the sub-domains. Studying the relationship between the MAP-X scales and their PID-5 counterparts reveals very high levels of convergent and discriminant validity: individuals who score high on the Emotional Stability dimension are likely to experience little negative affectivity, emotionality lability, anxiousness, or separation anxiety. Individuals with high Extraversion scores are unlikely to experience social detachment and withdrawal, anhedonia, and avoid intimacy. Individuals with high Agreeableness scores are unlikely to be antagonistic, manipulative, deceitful, and grandiose. Individuals with high Conscientiousness scores are unlikely to be uninhibited, distracted, irresponsible, and impulsive. Last, individuals with high levels of Openness are more likely to hold unusual beliefs, behave eccentrically, and experience strange sensations.

When studying these relationships, there are three points worth highlighting. First, the correlations between the MAP-X and the PID-5 are significantly larger than those held between the MAP-X and the HPI, Core Drivers and Mini-IPIP inventories. This demonstrates that while the MAP-X is based on the FFM, it measures the dysfunctional and maladaptive dimensions (i.e. the extreme end of each Big Five dimension) with greater validity and precision than normal and adaptive personality dispositions. Second, the correlations between analogous scales are much larger than non-analogous scales, indicating congruent and discriminant validity. Third, Emotional Stability is moderately correlated to all PID-5 dimensions. This reflects the scientific literature that has found Emotional Stability to be correlated with many negative mental health outcomes and traditional personality disorders (Al-Dajani et al., 2016; Bagby, Costa, Widiger, Ryder, & Marshall, 2005).

Table 11: The Correlation Between The MAP-X & The PID-5

	MAP-X				
	Agreeableness	Conscientious	Emotional Stability	Extraversion	Openness
Emotional Lability	-.10	-.21*	-.67*	-.12	.20*
Anxiousness	-.10	-.20*	-.78*	-.30*	.03
Separation Insecurity	-.16*	-.22*	-.54*	-.05	.10
Negative Affectivity	**-.14***	**-.25***	**-.82***	**-.21***	**.12**
Withdrawal	-.31*	-.16*	-.26*	-.67*	-.26*
Anhedonia	-.27*	-.32*	-.47*	-.65*	-.33*
Intimacy Avoidance	-.16*	-.12	-.02	-.30*	-.17*
Detachment	**-.32***	**-.25***	**-.33***	**-.70***	**-.32***
Manipulativeness	-.36*	-.04	.00	.29*	.03
Deceitfulness	-.54*	-.29*	-.31*	-.02	-.09
Grandiosity	-.36*	-.03	-.11	.15*	-.01
Antagonism	**-.52***	**-.17***	**-.20***	**.14**	**-.04**
Distractibility	-.29*	-.65*	-.47*	-.23*	.06
Irresponsibility	-.33*	-.50*	-.35*	-.08	.07
Impulsivity	-.26*	-.50*	-.35*	.06	.08
Disinhibition	**-.35***	**-.69***	**-.50***	**-.14***	**.08**
Unusual Beliefs	-.06	-.04	-.09	.06	.14*
Eccentricity	-.24*	-.38*	-.36*	-.13	.15*
Perceptual Dysregulation	-.24*	-.38*	-.41*	-.12	.14*
Psychoticism	**-.23***	**-.35***	**-.36***	**-.10**	**.17***

Note: N = 208; **p* < .05. The table has been organized around the domain and sub-domain scores. Domain scores are in bold.

Table 12 displays the correlation between the MAP-X and the CAT-PD sub-scales. Similar to the PID-5, the CAT-PD measures the alternative DSM-V model of personality disorders. Although Table 11 and Table 12 present data from two separate samples, the correlations are largely the same. For instance, Agreeable individuals are unlikely to be grandiose, manipulative and skeptical. Conscientious individuals are unlikely to experience cognitive problems, act irresponsibly, lack perseverance, or be risk-taking.

Emotionally stable individuals are unlikely to experience affective lability, anger, or anxiety. Extraverted individuals are likely to experience exhibitionism, dominance, and unlikely to experience social withdrawal. Open individuals are likely to experience fantastical thinking and perceived as being peculiar. Studying these correlations in conjunction with those in Table 11, it can be concluded that the MAP-X accurately measures the five maladaptive personality dimensions as outlined by the DSM-V alternative model of personality disorders.

Table 12: The Correlation Between The MAP-X & The CAT-PD

	MAP-X				
	Agreeableness	Conscientious	Emotional Stability	Extraversion	Openness

Affective Lability	-.38*	-.53*	-.72*	-.12*	-.04
Anger	-.47*	-.51*	-.69*	-.14*	-.10*
Anhedonia	-.48*	-.45*	-.54*	-.32*	-.22*
Anxious	-.35*	-.45*	-.80*	-.20*	-.03
Callous	-.64*	-.32*	-.30*	-.05	-.12*
Cognitive Problems	-.46*	-.56*	-.61*	-.11*	-.03
Dominance	-.41*	-.17*	-.28*	.23*	.13*
Emotional Detachment	-.56*	-.32*	-.39*	-.24*	-.12*
Exhibitionism	-.26*	-.14*	-.11*	.40*	.19*
Fantasy	-.32*	-.33*	-.49*	.09*	.27*
Grandiosity	-.46*	-.24*	-.24*	.22*	.09*
Hostile Aggression	-.46*	-.35*	-.38*	.11*	.03
Irresponsibility	-.47*	-.62*	-.43*	-.10*	-.12*
Manipulation	-.55*	-.40*	-.35*	.04	-.03
Mistrust	-.53*	-.28*	-.48*	-.11*	-.02
Non-Perseverance	-.51*	-.70*	-.54*	-.14*	-.10*
Non-Planfulness	-.43*	-.55*	-.37*	.02	-.08*
Norm Violation	-.44*	-.44*	-.35*	.06	.01
Peculiarity	-.41*	-.36*	-.49*	-.07	.11*
Perfectionism	-.08*	.23*	-.09*	.24*	.20*
Rigid	-.50*	-.28*	-.40*	.05	.02
Risk Taking	-.35*	-.27*	-.22*	.21*	.07
Rudeness	-.40*	-.31*	-.27*	.17*	.05
Social Withdrawal	-.42*	-.30*	-.48*	-.43*	-.17*
Submissive	-.40*	-.40*	-.48*	-.04	-.08*
Unusual Beliefs	-.28*	-.22*	-.27*	.20*	.08*
Unusual Experiences	-.34*	-.28*	-.32*	.14*	.05
Workaholism	-.20*	.10*	-.19*	.16*	.13*

Note: N = 774; *p < .05.

Table 13 displays the correlation between the MAP-X and the HDS. As previously mentioned, the HDS taxonomy is closely related to the classical personality disorders described by the DSM–IV–TR (American Psychiatric Association, 2000). Although the two assessments have different taxonomies, some scales sample similar behaviors. This is reflected in the presented correlations. For instance, Agreeableness was correlated with the Skeptical, Leisurely, and Bold scales. Conscientiousness was correlated with Cautious and Diligent scales. Emotional Stability was correlated with the Excitable scale. Extraversion was correlated with the Reserved and Colorful scales. Openness was correlated with the Colorful and Imaginative scales. The HDS scale, Mischievous, was not correlated with the MAP-X. However the evidence presented in Table 11 and Table 12 demonstrate the MAP-X does indeed correlate with other measures of antisocial and manipulative behaviors. The Dutiful scale was not significantly correlated with a MAP-X scale.

It is important to explain why some HDS scales are correlated with more than one MAP-X scale. This is because the two assessments share different taxonomies. The HDS was

developed on the DSM-IV categorical approach, in which personality disorders were conceptualized as qualitatively different conditions, an assumption that is now facing serious challenge (Thoma Widiger & Trull, 2007). Since the MAP-X is based on the continuous and dimensional FFM, correlations with multiple HDS scales reveals the common dimensions underlying personality dysfunction. Basing the MAP-X on more recent models of personality disorders, creates a more inclusive framework for measuring and understanding such dispositions, as being low or high on a MAP-X dimension is associated with behavioral dysfunction as opposed to just being high on a dimension as described by the DSM-IV's conceptualization of dysfunctional personality dispositions.

Table 13: The Correlation Between The MAP-X & The HDS

	MAP-X				
	Agreeableness	Conscientious	Emotional Stability	Extraversion	Openness
Excitable	-.32*	-.22*	-.29*	-.38*	-.09
Skeptical	-.44*	-.25*	-.23*	-.33*	.00
Cautious	-.20*	-.22*	-.41*	-.24*	.00
Reserved	-.22*	-.13	-.17	-.23*	-.10
Leisurely	-.31*	-.07	-.13	-.28*	.08
Bold	-.23*	-.13	-.16	-.08	.17
Mischievous	-.16	-.05	.04	.03	.13
Colorful	-.08	-.02	.01	.19*	.21*
Imaginative	-.12	-.03	-.12	.00	.30*
Diligent	-.08	.19*	.00	.05	.14
Dutiful	-.04	-.08	-.17	-.04	.08

Note: N = 108; *p < .05.

Table 14 displays the correlations between the MAP-X and the Dark Triad. Of the five scales, Agreeableness, Conscientiousness, and Emotional Stability held moderate to strong negative correlations with each of the three dimensions of the Dark Triad. Over the three MAP-X scales that were correlated with the Dark Triad, Agreeableness held the strongest relationships. This is in line with existing literature on the relationship between Agreeableness and the Dark Triad (Furnham et al., 2013); and previously presented validity evidence that demonstrate the MAP-X Agreeableness scale to be correlated with measures of grandiosity, manipulation, deceitfulness, breaking rules, and dominance. These results demonstrate the MAP-X accurately measures socially malevolent dispositions.

Table 14: The Correlation Between The MAP-X & The Dark Triad

	MAP-X				
	Agreeableness	Conscientious	Emotional Stability	Extraversion	Openness
Machiavellianism	-.58*	-.31*	-.28*	-.16	-.05
Psychopathy	-.58*	-.38*	-.40*	-.20	-.15
Narcissism	-.27*	-.14*	-.25*	.19	.15

Note: N = 386; *p < .05.

Finally, Table 15 displays the correlation with measures of Social Dominance Orientation (SDO). SDO was negatively correlated with all MAP-X scales except Extraversion. Of the four scales, Openness held the strongest relationship. This is in line with existing literature that demonstrates that low Openness scores are associated with increased support for group inequality, social dominance, and intergroup hostility (Ho et al., 2015).

Table 15: The Correlation Between The MAP-X & Social Dominance Orientation.

	MAP-X				
	Agreeableness	Conscientious	Emotional Stability	Extraversion	Openness
SDO	-.25*	-.27*	-.18*	.14	-.30*

Note: N = 218; *p < .05. SDO = Social Dominance Orientation

4.1.3. Summary of Convergent & Discriminant Validity Evidence

The presented analyses effectively demonstrate that the MAP-X scales have good convergent and discriminant validity. Not only do these analyses place the scales within a psychological taxonomy of dysfunctional and maladaptive personality dispositions, the strong correlations provide evidence that the items are measuring the desired behaviors and overlap with adjacent psychological constructs.

4.2. Concurrent Validity

The following section describes the concurrent validity of the diagnostic. We first describe the measures used to test for concurrent validity and then present correlations between the MAP-X assessment and these measures. We then conclude with an interpretation and discussion of these results.

4.2.1. Measures

The Utrecht Work Engagement Survey-9 items (UWES-9; Schaufeli & Bakker, 2006)

The UWES-9 is a 9-item scale measuring work engagement. It is a shorter version of the original 17-item UWES that characterizes work engagement by three subscales: Vigor, Dedication, and Absorption, which can be totaled to produce a single work engagement score — representing the extent to which an individual is cognitively, emotionally, and physically engaged with, and motivated by, their work. Participants respond to each item using a frequency 7-point Likert-scale (1 = Never to 7 = Always). Work engagement has been found to hold a positive relationship with a variety of organizational measures of performance (Saks, 2006).

Counter Productive Work Behaviors (Bennett & Robinson, 2000)

Counterproductive behaviors (CWBs) describe employee behavior that goes against the interests of an organization and its incumbents. This can include behaviors such as absenteeism, abuse towards others, bullying, loafing, incivility, fraud, sexual harassment, and sabotage (Spector et al., 2006). To measure CWBs we used the 18-item CWB checklist that was developed by Bennet and Robinson (2000). The checklist contains 18 specific CWBs and participants rated the frequency of which they have displayed a given behavior (0 = never, 7 = daily). The scale was found to have acceptable levels of internal consistency and has been used extensively in research contexts.

Self-Reported Job Performance
A five item, job performance, scale was created by the Deeper Signals team. Participants indicated the number of promotions they had received in the last two years, alongside the frequency to which they:

- Planned their work so that it was done on time.
- Performed their work well with minimal time and effort.
- Collaborated well with others.
- Met or exceeded what their job demands from them.

Participants rated themselves on how frequently they display the above behaviors using a 1 to 5 Likert scale, ranging between Never to Daily. A single job performance score was created from the sum of the five items. While subjective ratings of job performance can be prone to bias and are typically less accurate than supervisor or peer ratings, this data was collected to indicate the extent to which an individual believe they perform well within their role.

4.2.2. Concurrent Validity Results

Table 16 contains the correlation between the diagnostic and three measures of relevant work behaviors: CWB, work engagement, and self-reported job performance.

First, CWB was moderately and negatively correlated with the Agreeableness scale. The Conscientiousness and Emotional Stability scales were also negatively correlated, but comparatively less so. Such relationships are in line with the existing literature (Mount, Ilies, & Johnson, 2006): agreeable, empathetic, and cooperative individuals are significantly less likely to display harmful and counterproductive behaviors at work.

Second, Work Engagement was positively correlated with the Conscientiousness, Emotional Stability, Extraversion, and Openness scales. These relationships can be interpreted as organized, committed, goal-orientated individuals that are somewhat outgoing tend to hold more positive attitudes towards their work (i.e. feelings of commitment, energy and satisfaction; Schaufeli & Bakker, 2006). Again, such relationships are also in line with existing literature (Akhtar, Boustani, Tsivrikos, & Chamorro-Premuzic, 2015)

Finally, self-appraisals of job performance were significantly correlated with most scales, with the strongest being the Extraversion, Conscientiousness, and Openness scales. This indicates that proactive, hard-working, and curious individuals are more likely to complete their work on time, exceed other's expectations, and produce high quality work. While these correlations indicate a relationship between MAP-X scores and job performance, we acknowledge that the performance is self-reported and that further analyses should be conducted to test for criterion validity against measures of supervisor ratings and objective work outcomes.

Table 16: Concurrent Validity Results

	MAP-X				
	Agreeableness	Conscientious	Emotional Stability	Extraversion	Openness

CWB	-.42*	-.34*	-.34*	-.17	-.25
Engagement	.06	.23*	.17*	.40*	.22*
Job Performance	.24*	.34*	.13	.45*	.32*

Note: CWB *N* = 265; Engagement *N* = 142; Job Performance *N* = 142; *$p < .05$.

5. Group Differences & Score Normalization

This chapter reports on the extent to which different genders, ages and ethnic groups have statistically significant different scores on the MAP-X diagnostic. Understanding such differences may aid in the interpretation of feedback reports and scores. We then present the result for adverse impact simulations to demonstrate that the scales do not discriminate on the bases of age and gender. Finally, we report data on the distribution and normalization of scores.

5.1. Group Differences

Independent samples t-tests were conducted to investigate whether males and females, under/over 40-years old, and White and Non-White individuals scored significantly different across the five MAP-X scales. Cohen's d was also computed to understand to what extent are such differences practically meaningful.

Table 17 indicates there are statistically significant differences in average scores between individuals who are under and over 40 years old. The results demonstrate that individuals who are under 40 typically score lower on Agreeableness and Emotional Stability, and higher on Conscientiousness, Extraversion, and Openness. Although age groups significantly differ on these scales, Cohen's d demonstrates that such differences are not practically meaningful. Further statistically significant differences are likely the product of the large sample used in the analyses, thereby increasing the chances of Type 1 errors.

Table 18 demonstrates that there are statistically significant differences between females and males. On average, females score higher on Agreeableness, Conscientiousness, Extraversion, and Openness, and lower on Emotional Stability. Like the age differences, these differences are not practically meaningful as evidenced by the small Cohen's d estimates.

Finally, Table 19 demonstrates that there are statistically significant differences between non-white and white individuals. On average white individuals score higher on Agreeableness, Conscientiousness, and Emotional Stability, and lower on Extraversion and Openness. While statistically significant, Cohen's d estimates indicate that these differences are not practically meaningful.

To summarize, although there are statistically significant differences in MAP-X scores between different demographic groups, such differences are small and unlikely to be practically meaningful.

Table 17: Age Differences

	Under 40 Mean	Over 40 Mean	*t*	*df*	*d*
Agreeableness	42.50	43.02	-27.50*	135,410	-.12
Conscientious	28.15	27.53	51.34*	133,460	.22
Emotionality Stability	19.82	20.42	-54.33**	143,400	-.23
Extraversion	29.55	28.55	71.68*	133,290	.31
Openness	41.59	39.05	138.73*	138,190	.59

Note: Under 40 *N* = 182,493; Over 40 *N* = 72, 323. *t* = *t* value, *df* = degrees of freedom, * *p* < .05, *d* = Cohen's d effect size (.00 - .19 = negligible; .20 - .49 = small; .50 - .79 = moderate; .80 <= large).

Table 18: Gender Differences

	Female Mean	Male Mean	*t*	*df*	*d*
Agreeableness	43.35	41.89	85.10*	246,670	.34
Conscientious	28.07	27.88	17.71*	249,480	.07
Emotionality Stability	19.77	20.23	-43.34*	251,960	-.17
Extraversion	29.61	28.91	54.33*	247,220	.22
Openness	41.14	40.58	32.60*	251,130	.13

Note: Female *N* = 132,994; Male *N* = 121,793. *t* = *t* value, *df* = degrees of freedom, * *p* < .05, *d* = Cohen's d effect size (.00 - .19 = negligible; .20 - .49 = small; .50 - .79 = moderate; .80 <= large).

Table 19: Ethnic Differences

	Non-White Mean	White Mean	*t*	*df*	*d*
Agreeableness	35.62	37.17	-3.87*	515	-.30
Conscientious	22.83	23.65	-3.31*	586	-.24
Emotionality Stability	14.77	15.63	-3.39*	563	-.25
Extraversion	25.09	22.53	3.96*	152	.58
Openness	39.33	38.95	.38	102	.07

Note: Non-White *N* = 262; Male *N* = 512. *t* = *t* value, *df* = degrees of freedom, * *p* < .05, *d* = Cohen's d effect size (.00 - .19 = negligible; .20 - .49 = small; .50 - .79 = moderate; .80 <= large).

5.2. Adverse Impact Simulations

Adverse Impact (AI) can be defined as "a substantially different rate of selection in hiring, promotion, or other employment decisions which works to the disadvantage of members of a race, sex or ethnic group" (see section 1607.16 of the *Uniform Guidelines on Employee Selection Procedures,* Equal Employment Opportunity Commission, 1978). The "Four-Fifths rule" can be used to determine whether an assessment has AI. Specifically, when the "selection rate for any race, sex or ethnic group which is less than four-fifths (4/5) (or eighty percent) of the rate for the group with the highest rate will generally be regarded by the

Federal enforcement agencies as evidence of adverse impact." (see section 1607.4 D; Equal Employment Opportunity Commission, 1978). Furthermore, given the Age Discrimination in Employment Act (ADEA, 1967) states that individuals over 45 years old need protection, assessments should not adversely impact younger or older individuals.

While the previous analyses demonstrated statistically significant, although not practically meaningful, group differences, AI simulations of the 4/5ths rule were conducted to further demonstrate that the five scales do not adversely impact protected groups. To test for AI, we compared the selection rate of protected groups (females & over 40-year olds) against the selection rate of non-protected groups (males & under 40-year olds). Ratios greater than or equal to .80 indicate that the assessment has no AI. AI simulations were not computed for ethnicity because of insufficient data. Ongoing research and development efforts are being made to address this.

Although organizations do not need to conduct validity studies for selection tools that do not adversely impact protected groups, it is best practice that organizations do continually test for AI and continue to build evidence of criterion validity. As such, Deeper Signals recommends that organizations who use the MAP-X assessment pilot the tool and collect such evidence before using the diagnostic to inform their employee selection and development practices.

As previously argued, personality lies on a continuum whereby behavioral strengths and challenges can be found at either end (Widiger & Mullins-Sweatt, 2008). As such, the MAP-X was designed to reflect this bipolarity and has labelled each end of the five dimensions. Accordingly, we provide two sets of cutoff scores that can be used when the MAP-X is informing selection, promotion, and hiring decisions.

Table 20 contains the cutoff scores when the goal is to select out the "low" end of a scale, and Table 21 contains the cutoff scores when the goal is to select out the "high" end of each scale.

Although we supply these scores, we stress that low scores do not imply negative, unproductive, or harmful behaviors, nor do high scores imply positive, productive, or desirable behaviors. Accordingly, we recommend organizations conduct a job analysis to identify the most suitable personality profile before using the tool to make personnel decisions. Adding to this, if organizations use different cutoff scores to those listed below, it is their responsibility to evaluate the potential for AI.

Table 20: Recommended Decision Rules – Selecting Out Low Scores

Scale	Low Label	Does Not Meet Cutoff		Meets Cutoff	
		Raw Score	Percentile Score	Raw Score	Percentile Score
Agreeableness	Insensitive	< 40	< 27%	> 40	> 27%
Conscientious	Impulsive	< 27	< 36%	> 27	> 36%
Emotionality Stability	Intense	< 19	< 35%	> 19	> 35%
Extraversion	Withdrawn	< 27	< 24%	> 27	> 24%
Openness	Conformist	< 36	< 13%	> 36	> 13%

Note: *N* = 256,742.

Table 21: Recommended Decision Rules – Selecting Out High Scores

Scale	High Label	Does Not Meet Cutoff		Meets Cutoff	
		Raw Score	Percentile Score	Raw Score	Percentile Score
Agreeableness	Oversensitive	> 45	> 70%	< 45	< 70%
Conscientious	Obsessive	> 29	> 64%	< 29	< 64%
Emotionality Stability	Unemotional	> 21	> 64%	< 21	< 64%
Extraversion	Unrestrained	> 31	> 70%	< 31	< 70%
Openness	Eccentric	> 43	> 68%	< 43	< 68%

Note: *N* = 256,742.

Using the listed cutoff scores, we conducted AI simulations for two demographic dimensions: age and gender. Table 22 contains the results of both age and gender when selecting out low scores.

Table 23 contains the results of both age and gender when selecting out high scores. Given that the AI ratio was greater than .80 across each scale and demographic group, we conclude that when using the recommended cutoff scores organizations should not expect to see adverse impact or bias. AI simulations were not conducted for different ethnic groups due to insufficient data. The below tables will be updated once more data has been collected.

Table 22: Selection & Adverse Impact Ratios When Selecting Out Low Scores

Scale	Low End Scale Label	Gender			Age		
		Female SR	Male SR	AI Ratio	Under 40 SR	Over 40 SR	AI Ratio
Agreeableness	Insensitive	.76	.62	1.22	.68	.72	1.06
Conscientious	Impulsive	.61	.58	1.05	.62	.52	.84
Emotionality Stability	Intense	.57	.64	.88	.58	.66	1.15
Extraversion	Withdrawn	.75	.67	1.13	.75	.63	.85
Openness	Conformist	.86	.83	1.05	.89	.74	.84

Note: N = 256,742; SR = Selection Ratio; AI = Adverse Impact Ratio.

Table 23: Selection & Adverse Impact Ratios When Selecting Out High Scores

Scale	High End Scale Label	Gender			Age		
		Female SR	Male SR	AI Ratio	Under 40 SR	Over 40 SR	AI Ratio
Agreeableness	Oversensitive	.61	.72	.84	.67	.63	.94
Conscientious	Obsessive	.52	.54	.96	.50	.61	1.20
Emotionality Stability	Unemotional	.57	.49	1.17	.56	.47	.84
Extraversion	Unrestrained	.59	.66	.89	.59	.72	1.22
Openness	Eccentric	.63	.67	.94	.59	.81	1.37

Note: N = 256,742; SR = Selection Ratio; AI = Adverse Impact Ratio.

5.3. Normative Scoring

When reporting scores on the assessment, users may find it easier to interpret such results if they are standardized and converted into percentiles, thereby helping individuals and groups understand how they compare to the rest of the test-taker population. ***Table 24*** contains the distribution of raw scores across three interpretative groups: Low, Moderately Low, Moderately High, and High.

Table 24: Distribution of Raw Scores & Interpretative Groups

Scale	Low 0 – 25%	Moderately Low 25 – 50%	Moderately High 51 – 75%	High 76 – 100%
Agreeableness	1 – 39	40 – 43	44 – 46	47 – 56
Conscientious	1 – 26	27 – 28	29 – 30	31 – 32
Emotionality Stability	1 – 18	19 – 20	21 – 22	23 – 24
Extraversion	1 – 27	28 – 29	30 – 32	33 – 36
Openness	1 – 38	39 – 41	42 – 44	45 – 56

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