# Digital Phenotyping of Smartphone Data Successfully Predicts a Broad Range of Personality Constructs

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## GENERAL REVIEW OF QUESTIONNAIRES

### USED IN THE REPORTED DIGITAL PHENOTYPING PERSONALITY RESEACH (NOVMBER, 2022)

| Questionnaire Name and rational | Source | Version (short/long) | Number of Items and measurement range | Sample questions | Reliability | Comments |
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| 30 Facet Scales of Costa and McCrae's NEO Personality Inventory (NEO-PI-R) by the IPIP Scales Measuring Similar Constructs. ("Questionnaire 300") (https://ipip.ori.org/newNEO_FacetsTable.htm) | ● Goldberg, L. R. (1992). The development of markers for the big-five factor structure. Psychological Assessment, 4, 26-42. <br><br> ● Goldberg, L. R. (1999). A broad-bandwidth, public | Long | 300 items (including breakdown to 30 specific personality facets). | I see myself as someone who… <br><br> ● Often feel blue. <br><br> ● Dislike myself. <br><br> ● Am often down in the dumps. | 0.73 | Similar to the popular NEO-PI-R. See: Costa, P. T., Jr., & McCrae, R. R. (1992). Revised NEO Personality Inventory (Neo-PI-R) and NEO Five-Factor Inventory (NEO-FFI): Professional manual. Odessa, FL: Psychological Assessment Resources. |

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| In brief:<br><br>The Big Five personality traits, also known as the five factor model (FFM), is a taxonomy for personality traits. It is based on common language descriptors. When factor analysis (a statistical technique) is applied to personality survey data, some words used to describe aspects of personality are often applied to the same person. The five factors have been defined as <u>openness to experience</u>, <u>conscientiousness</u>, <u>extraversion</u>, <u>agreeableness</u>, and <u>neuroticism</u> (OCEAN). Beneath each proposed global factor, there are a number of correlated and more specific primary facets. | domain, personality inventory measuring the lower-level facets of several five-factor models. In I. Mervielde, I. Deary, F. De Fruyt, & F. Ostendorf (Eds.), Personality Psychology in Europe, Vol. 7 (pp. 7-28). Tilburg, The Netherlands: Tilburg University Press.<br><br>● Goldberg, L. R., Johnson, J. A., Eber, H. W., Hogan, R., Ashton, M. C., Cloninger, C. R., & Gough, H. C. (2006). The International Personality Item Pool and the future of public-domain personality measures. Journal of Research in Personality, 40, 84-96.<br><br>● International Personality Item Pool: A Scientific Collaboratory for the Development of Advanced Measures of Personality Traits and Other Individual Differences (http://ipip.ori.org/). Internet Web Site. | | | ● Have a low opinion of myself.<br><br>● Have frequent mood swings.<br><br>● Feel desperate.<br><br>● Feel that my life lacks direction. | | ------------------<br><br>Goldberg, L. R., Johnson, J. A., Eber, H. W., Hogan, R., Ashton, M. C., Cloninger, C. R., & Gough, H. G. (2006). The international personality item pool and the future of public-domain personality measures. Journal of Research in personality, 40(1), 84-96. |

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| The Big5 short inventory.<br><br>*A short version of the Costa and McCrae's NEO Personality Inventory (NEO-PI-R).<br><br>In brief:<br><br>See previous item. | Rammstedt, B., & John, O. P. (2007). Measuring personality in one minute or less: A 10-item short version of the Big Five Inventory in English and German. *Journal of research in Personality*, *41*(1), 203-212. | Short | 10-Items | I see myself as someone who…<br><br>● Is reserved<br><br>● Is generally trusting | .79 | A highly used new measure adapted to online personality Surveys. |
| Locus of Control<br><br><br>In brief:<br><br>The degree to which people believe that they have control\power over events in their lives. Studies show that individuals with higher values in Internal Locus of Control seem to perform better as leaders, managers, and officers. | ● Specht, J., Egloff, B., & Schmukle, S. C. (2013). Everything under control? The effects of age, gender, and education on trajectories of perceived control in a nationally representative German sample. Developmental psychology, 49(2), 353.<br><br>● Originally developed by:<br><br>er, J. B. (1966). Generalized expectancies for internal versus external control of reinforcement. Psychological | Short | 7-Items | ● How my life goes depends on myself<br><br>● Compared to others, I haven't achieved what I deserved<br><br>● What one achieves in life is mainly a question of luck or fate<br><br>● I often have the experience that others make decisions regarding my life<br><br>● When I encounter difficulties, I have doubts about my abilities | .69 | |

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| | monographs: General and applied, 80(1), 1. | | | | | |
| Self-efficacy<br><br>In brief:<br><br>Self-efficacy is confidence in one's own ability to achieve intended results. Also referred to as personal efficacy. | Gough, H. G. (1996). CPI Manual: Third Edition. Palo Alto, CA: Consulting Psychologists Press. | Short | 10-Items | ● Can handle complex problems.<br><br>● Think quickly.<br><br>● Formulate ideas clearly.<br><br>● Have excellent ideas. | .81 | CPI = California Psychological Inventory (Gough, 1996). |
| Risk Taking Behavior<br><br>In brief:<br><br>Risk taking behavior refers to the tendency to engage in activities that have the potential to be harmful or dangerous. | Calvert, G. (1993). Highwire management: Risk-taking tactics for leaders, innovators, and trailblazers. Jossey-Bass. | Standard | 15-Items | ● Taking management risks makes good sense only in the absence of acceptable alternatives.<br><br>● I generally prefer stimulation over security.<br><br>● I have confidence in my ability to recover from my mistakes, no matter how big.<br><br>● Anything worth doing is worth doing less than perfectly. | .57 | Moderate levels of risk taking behavior potentially predict successful leadership and management outcomes. |

| Distress Tolerance | Simons, J. S., & Gaher, R. M. (2005). The Distress Tolerance Scale: Development and validation of a self-report measure. Motivation and Emotion, 29(2), 83-102. | Standard | 15-Items | • Perceived ability to tolerate emotional distress (e.g., I can't handle feeling distressed or upset), <br><br> • Subjective appraisal of distress (e.g., My feelings of distress or being upset are not acceptable), <br><br> • Attention being absorbed by negative emotions (e.g., When I feel distressed or upset, I cannot help but concentrate on how bad the distress actually feels) <br><br> • Regulation efforts to alleviate distress (e.g., When I feel distressed or upset I must do something about it immediately). | • Tolerance (.72) <br><br> • Appraisal (.82) <br><br> • Absorption (.78) <br><br> • Regulation (.70) | **Comprises four dimensions:** <br><br> Tolerance - individuals with low distress tolerance are expected to report distress as being unbearable and that they cannot handle being distressed or upset. <br><br> Appraisal - individual appraisal of being distressed is expected to reflect a lack of acceptance of distress, being ashamed of being distressed, and perceiving one's coping abilities as inferior to others. <br><br> Regulation - emotional regulation of individuals with low distress tolerance is expected to be characterized by great efforts to avoid negative emotions and utilizing rapid means of alleviating the negative emotions they do experience <br><br> Absorption - if unable to alleviate negative emotions, individuals with low distress tolerance are expected to report being relatively consumed by the experience, indicating that their attention is absorbed by the presence of distressing emotions and that their functioning is significantly disrupted by the experience of negative emotions |
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**In brief:**

Distress: extreme anxiety, sorrow, or pain.
Distress Tolerance - Ability of the individual to effectively cope with such difficulties.

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| Tolerance for Ambiguity (MSTAT-II)<br><br>In brief:<br><br>Measure an individual's tolerance for situations that are unfamiliar, insoluble, or complex. | McLain, D. L. (2009). Evidence of the Properties of an Ambiguity Tolerance Measure: The Multiple Stimulus Types Ambiguity Tolerance Scale–II (MSTAT–II). Psychological reports, 105(3), 975-988.<br><br>Budner, J. (1962) Tolerance of ambiguity as a personality variable. Journal of Personality, 30, 29-40. | Standard | 13-Items | • I don't tolerate ambiguous situations well. (G)<br><br>• I avoid situations that are too complicated for me to easily understand (C)<br><br>• I would rather avoid solving a problem that must be viewed from several different perspectives. (I)<br><br>• I try to avoid situations that are ambiguous. (G)<br><br>• I prefer familiar situations to new ones (N) | | The MSTAT-II measures the participants' degree of ambiguity tolerance based on **five stimulus types:**<br><br>1. Ambiguous stimuli in general  (G)<br><br>2. Complex stimuli (C)<br><br>3. Uncertain stimuli (U)<br><br>4. New / unfamiliar / novel stimuli (N)<br><br>5. Insoluble / illogical / internally inconsistent stimuli (e.g., "I try to avoid situations that are ambiguous" and "I prefer familiar situations to new ones"). (I)<br><br>(Note: Higher score means better ability to handle ambiguous situations). |
| Improvisation Capacity<br><br>In brief:<br><br>Improvisation providing a framework for explaining how individuals deviate from both strategic plans and cognitive biases and heuristics in order to exploit opportunities in the moment, as they arise. | Hmieleski, K. M., & Corbett, A. C. (2006). Proclivity for improvisation as a predictor of entrepreneurial intentions. Journal of Small Business Management, 44(1), 45-63. | Long | 27-Items | • I am inventive.<br><br>• I serve as a good role model for creativity.<br><br>• I demonstrate originality in my work. | • Creativity and bricolage (alpha = 0.89)<br><br>• Ability to function and excel under pressure-filled and stressful | **Comprises three dimensions:**<br><br>• <u>Creativity and bricolage</u> represents the extent to which individuals are able to produce novel solutions under constrained conditions by recombining available resources.<br><br>• <u>Ability to function and excel under pressure-filled and stressful environments</u>. This dimension |

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| | | | | • I perform better under time pressure.<br><br>• I need pressure in order to focus.<br><br>• I am not easily distracted.<br><br>• I am a persistent person.<br><br>• I don't let past failures hinder future performance. | environments (alpha = 0.83)<br><br>• Spontaneity & persistence (alpha = 0.70). | represents the ability of individuals to excel in uncertain and rapidly changing environments.<br><br>• <u>Spontaneity and persistence</u>. This dimension represents the action orientation and determination of individuals toward achieving goals and solving problems in the moment. |
| Emotional and Social Intelligence (ESI)<br><br><u>In brief</u>:<br><br>Social skills involve showing desirable emotions to others. Thus, emotional intelligence reflects the extent to which a person attends to, processes and acts upon information of an emotional nature: intrapersonally and interpersonally. High level of emotional intelligence (by using Goleman's framework of emotional intelligence) skills such as self-confidence, trustworthiness, achievement orientations, service orientation, change catalyst, teamwork and collaboration. | Wong, C. S., & Law, K. S. (2002). The effects of leader and follower emotional intelligence on performance and attitude: An exploratory study. The leadership quarterly, 13(3), 243-274. | Standard | 16-Items | • I have a good sense of why I have certain feelings most of the time.<br><br>• I have good understanding of my own emotions.<br><br>• I always know my friends' emotions from their behavior.<br><br>• I am a good observer of others' emotions. | • Self-emotion appraisal (SEA) = .86<br><br>• Others' emotion appraisal (UEA) = .85<br><br>• Regulation of emotion (ROE) = .79<br><br>• Use of emotion (UOE) = .82 | **Comprises four dimensions:**<br><br>1. **SEA**: Relates to the individual's ability to understand their deep emotions and be able to express these emotions naturally.<br><br>2. **OEA**: Relates to peoples' ability to perceive and understand the emotions of those people around them.<br><br>3. **ROE**: Relates to the ability of people to regulate their emotions, which will enable a more rapid recovery from psychological distress.<br><br>4. **UOE:** Relates to the ability of individuals to make use of their motions by directing them towards |

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| | | | | ● I always tell myself I am a competent person. <br><br> ● I am a self-motivated person. | | constructive activities and personal performance. |
| Social Desirability (MCSD-SF) <br><br> <u>In brief</u>: <br><br> Social desirability bias is a social science research term that describes a type of response bias that is the tendency of survey respondents to answer questions in a manner that will be viewed favorably by others. <u>It is used here to assess the reliability of the answers provided by the survey respondents.</u> | Vésteinsdóttir, V., Reips, U. D., Joinson, A., & Thorsdottir, F. (2017). An item level evaluation of the Marlowe-Crowne Social Desirability Scale using item response theory on Icelandic Internet panel data and cognitive interviews. Personality and Individual Differences, 107, 164-173. | Short | 10-Items | ● I sometimes feel resentful when I don't get my way <br><br> ● No matter who I'm talking to, I'm always a good listener <br><br> ● There have been occasions when I took advantage of someone <br><br> ● I'm always willing to admit it when I make a mistake <br><br> ● I sometimes try to get even, rather than forgive and forget <br><br> ● There have been occasions when I felt like smashing things | .83 | In general, this set of questions is meant to identify respondents who tend to be biased towards social desirability, that is to try the guess the correct answers. The closer the number is to 0 the better off is the person from our perspective and the more reliable and trustworthy are his answers. |

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| The Short dark triad (SD3)<br><br>In brief:<br><br>Machiavellianism is characterized by manipulation and exploitation of others. A cynical disregard for morality, and a focus on self-interest and deception.<br><br>Narcissism is characterized by grandiosity, pride, egotism, and a lack of empathy.<br><br>Psychopathy is characterized by continuing antisocial behavior, impulsivity, selfishness, callousness and remorselessness. | Jones, D. N., & Paulhus, D. L. (2014). Introducing the short dark triad (SD3) a brief measure of dark personality traits. Assessment, 21(1), 28-41. | | 27-Items | • It's not wise to tell your secrets.<br><br>• I like to use clever manipulation to get my way.<br><br>• .People see me as a natural leader.<br><br>• I hate being the center of attention.<br><br>• I like to get revenge on authorities.<br><br>• I avoid dangerous situations. | Alphas ranged from .68 to .74 and the inter-correlations ranged from .22 to .40 | **Machiavellianism-**<br><br>Also, Machiavellianism appear to be (a) manipulativeness, (b) callous affect, and (c) a strategic-calculating orientation.<br><br>**Psychopathy**-<br><br>In addition, two key elements of psychopathy—deficits in affect (i.e., callousness) and self-control (i.e., impulsivity).<br><br>**Narcissism**-<br><br>Here also defined by a clash between a grandiose identity and underlying insecurity. |
| Creativity (HPI: Intellectance)<br><br>Note: Adapted to IPIP – See: Multi-Construct IPIP Inventories. (2018). Ipip.ori.org. Retrieved 19 August 2018, from https://ipip.ori.org/newMultipleconstructs.htm<br><br>In brief:<br><br>The Intellectance ("Creativity") scale reflects the degree to which a person seems creative, adventurous, and analytical. | Hogan, R., & Hogan, J. (1992). Hogan Personality Inventory Manual (2nd ed.). Tulsa, OK: Hogan Assessment Systems. | Short | 10-Items | I see myself as someone who…<br><br>• Like to solve complex problems.<br><br>• Love to read challenging material.<br><br>• Love to think up new ways of doing things. | .83 | Persons scoring high on Intellectance tend to be original, imaginative, and to have many interests and hobbies. Persons scoring low on Intellectance tend to be practical, cautious, and uninterested in speculative questions. |

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| | | | | ● Have a vivid imagination.<br><br>● Know how things work. | | |
| **Self-Discipline (Law Enforcement Orientation)**<br><br>Note: Adapted to IPIP – See: Multi-Construct IPIP Inventories. (2018). Ipip.ori.org. Retrieved 19 August 2018, from https://ipip.ori.org/newMultipleconstructs.htm<br><br>In brief:<br><br>Self-discipline is the ability one has to control and motivate him/her serlf to stay on track and do what is right. (Questionnaire developed with Law Enforcement Orientation) | California Psychological Inventory (CPI); Gough, H. G. (1996). CPI Manual: Third Edition. Palo Alto, CA: Consulting Psychologists Press. | Short | 10-Items | I see myself as someone who…<br><br>● Like to organize things.<br><br>●  I am exacting in my work.<br><br>●  Get to work at once.<br><br>●  Go straight for the goal.<br><br>●  Get chores done right away | .75 | |
| **FTI - Fisher Type Indicator** | Brown, L. L., Acevedo, B., & Fisher, H. E. (2013). Neural correlates of four broad temperament dimensions: testing predictions for a novel construct of personality. *PloS one*, *8*(11), e78734. | Long | 56- items<br><br>Each question range score between 1-4.<br><br>14 questions for each type.<br><br>Each type range between 14- | ● I find unpredictabl e situations exhilarating<br>● I have a very wide range of interests.<br>● I like to avoid the nuances and | **Curious/Energ etic- 0.84**<br><br>**Cautious/Socia l Norm Compliant-** 0.87<br><br>**Analytical/Tou gh-minded-** 0.82 | |

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| | | | 56. | say exactly what I mean. | **Prosocial/Emp athetic-** 0.83 | |
| **Adult attachment**<br><br>(Also we now have the Brief ECR to be discussed separately )<br><br>A model of attachment styles in adulthood.<br><br>https://psycnet.apa.org/fulltext/1991-33075-001.html | Bartholomew, K. & Horowitz, L. M. (1991). Attachment styles among young adults: A test of a four-<br><br>category model. Journal of Personality and Social Psychology, 61, 226-244. | Short | 4- items. | For example, description of type A: "It is easy for me to become emotionally close to others. I am comfortable depending on them and having them depend on me. I don't worry about being alone or having others not accept me." | **0.87 – 0.895 see on pages 228-229** | Secure<br>preoccupied<br>fearful<br><br>dismissing |
| **Big Five Aspects Scales**<br><br>DeYoung Big 5 – 100, Aspects Hierarchical  model of the FFM covering Meta-traits (Dopamine + Serotonin) and Aspects (below traits above facets)<br><br>https://ipip.ori.org/BFASKeys.htm<br><br>https://ipip.ori.org/BFASTable.htm | DeYoung, C. G., Quilty, L. C., & Peterson, J. B. (2007). Between facets and domains: 10 aspects of the Big Five. *Journal of Personality and Social Psychology*, 93, 880-896. | Long | 100 items | • I get angry easily.<br>• I get upset easily.<br>• I rarely feel depressed.<br>• I am not embarrassed easily. | Neuroticism: Combined Volatility and Withdrawal 20-item scale (Alpha = .89)<br><br>Agreeableness: Combined Compassion and Politeness 20-item scale (Alpha = .84)<br><br>Conscientiousnes s: Combined Industriousness and Orderliness | • Neuroticism (Volatility, Withdrawal)<br>• Agreeableness (Compassion, Politeness)<br>• Conscientiousness (Industriousness, Orderliness)<br>• Extraversion (Enthusiasm, Assertiveness)<br>• Openness/Intellect (Intellect, Openness) |

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| | | | | | | 20-item scale (Alpha = .84)<br><br>Extraversion: Combined Enthusiasm and Assertiveness 20-item scale (Alpha = .85)<br><br>Openness/Intellect: Combined Intellect and Openness 20-item scale (Alpha = .85) |
| Dark triad – Short version<br><br>(see above - longer version. This one is 12 questions). | Jonason, P. K., & Webster, G. D. (2010). The dirty dozen: A concise measure of the dark triad. Psychological assessment, 22(2), 420. | | | | | (see above - longer version. This one is 12 questions). |
| Structure of Temperament Questionnaire (STQ)<br>STQ77- temperament- Trifomova<br><br><u>In brief</u>:<br><br>A test to measure 12 biologically and neurochemically based individual differences. | | Long | 77- items<br><br>Each question range score: 1-4<br><br>Each dimension range between 6-24 | • I can easily handle rapid conversations.<br>• I don't like risky activities.<br>• I get impatient easily when | | **ERM-** Physical Endurance<br>**TMM-** Physical Tempo<br>**SS-** Risk Seeking<br>**ERS-** Social Endurance<br>**TMS-** Social Tempo<br>**EMP-** Empathy<br>**ERI-** Intellectual Endurance<br>**PL-** Plasticity<br>**PRO-** Probab thinking<br>**SLF-** Self-confidence<br>**IMP-** Impulsivity |

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| | | | CNTL range 5-20 | something takes longer than I expected | | **NEU**- Neuroticism<br><br>**CNTL**- Validity Index |
| PVQ-RR-  The Refined Theory Of Basic Values<br><br>A measure Universal Values that are recognized throughout all major cultures | Schwartz S.H. (2017) The Refined Theory of Basic Values. In: Roccas S., Sagiv L. (eds) Values and Behavior. Springer, Cham. https://doi.org/10.1007/978-3-319-56352-7_3 | Long | 57 items | • It is important to him to form his views independently.<br>• It is important to him to obey all the laws.<br>• It is important to him to accept people even when he disagrees with them. | | **Self-direction–** thought Freedom to cultivate one's own ideas and abilities<br><br>**Self-direction–** action Freedom to determine one's own actions<br><br>**Stimulation**- Excitement, novelty, and change<br><br>**Hedonism**- Pleasure and sensuous gratification<br><br>**Achievement**- Success according to social standards<br><br>**Power– dominance**- Power through exercising control over people<br><br>**Power– resources**- Power through control of material and social resources<br><br>**Face**- Security and power through maintaining one's public image and avoiding humiliation<br><br>**Security– personal**- Safety in one's immediate environment<br><br>**Security– societal**- Safety and stability in the wider society |

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| | | | | | | **Tradition**- Maintaining and preserving cultural, family, or religious traditions<br><br>**Conformity– rules**- Compliance with rules, laws, and formal obligations<br><br>**Conformity–interpersonal**- Avoidance of upsetting or harming other people<br><br>**Humility**- Recognizing one's insignificance in the larger scheme of things<br><br>**Benevolence–dependability**- Being a reliable and trustworthy member of the ingroup<br><br>**Benevolence–caring**- Devotion to the welfare of ingroup members<br><br>**Universalism–concern**- Commitment to equality, justice, and protection for all people<br><br>**Universalism–nature**- Preservation of the natural environment<br><br>**Universalism–tolerance**- Acceptance and understanding of those who are different from oneself |
| Brief ECR (Adult Attachment) (not being used in the Seminar of 2022 but collected data for 490 people approx.). | | | | ● | | |