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The Five-Factor Model and the Dark Tetrad of Personality: Psychometric Properties of Brief Instruments in Youth

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This dissertation has been accepted by the co-authors of the publications listed above that have waived the right to present them as a part of another PhD dissertation.

It is personalities, not principles, that move the age.

-Oscar Wilde, The Picture of Dorian Gray

A simple analogy here will help. The psychopath is like a color-blind person who sees the world in shades of gray but who has learned how to function in a colored world.

-Robert D. Hare, Without Conscience: The Disturbing World of the Psychopaths Among Us

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Abstract

Time constraints, ambitious research aims, and administrations of large instrument batteries, particularly among youths, demand the validation of brief measures to reliably and validly assess psychological traits. Within the fields of normal and "dark" personality psychology, such short instruments are constructed and employed more and more to study the outcomes associated with broad dispositional traits in general, and antagonistic features in particular. Notwithstanding, in some populations where it may be needed most (e.g., adolescents), short questionnaires assessing personality are lacking, especially in line with up-to-date frameworks within the so-called "dark side" of human nature (such as the Dark Tetrad of personality, comprising the subclinical, aversive traits of Machiavellianism, narcissism, psychopathy, and sadism).

Thus, the present doctoral dissertation aimed at conducting research to cover the need for psychometrically sound, brief tools to assess Five-Factor Model (FFM) and "dark" personality traits in Spanish adolescents. To this end, four studies were carried out: Study 1 aimed at constructing an abridged form of an FFM questionnaire specifically directed at adolescents (the 150-item JS NEO-S), reducing item length by 60% and emphasizing fidelity, or maximum facet representation, ending up with the 60-item JS NEO-A60. Study 2 aimed at validating a second, even more abridged form of the JS NEO-S with a higher focus on construct bandwidth, or having adequate coverage of the core elements in each broad domain, ending up with an instrument reduced by two-thirds from its parent measure, the 50-item JS NEO-A50. Studies 1 and 2 provided psychometric evidence (i.e., in terms of structural, convergent, and criterion validity; and test-retest and internal consistency reliability) that the 60- and 50-item personality measures

covered FFM personality content as intended, highly representing the lower-order facets in the JS NEO-A60 despite its brevity, and a proper assessment of each broad domain by the JS NEO-A50 with just 10 items per scale. Studies 3 and 4 were consecutive steps directed at validating the Short Dark Tetrad (SD4), a very brief, 28-item measure of "dark" personality traits within a highly backed, four-factor framework of antagonistic personality, for Spanish-speaking adolescents. The measure had proper psychometric performance in community adults (Study 3), in line with the scale's intended population, and subsequently showed adequate validity and reliability evidence in community adolescents (Study 4). Important psychometric evidence, replicating and extending previous work with the SD4, included establishing gender invariance within each study, finding evidence of age invariance between both study samples (i.e., adults vs. adolescents), and ascertaining the instrument's nomological network, including hypothesized associations with normal personality employing the JS NEO-A50.

In sum, the combined results of the four studies that make up this doctoral dissertation underscore the utility of brief personality measures and provide short, comprehensive instruments validated for their use in Spanish-speaking community adolescents. With a total of just 78 items, researchers can benefit from adding the JS NEO-A50 and the SD4 to their toolkit, particularly when FFM and Dark Tetrad personality traits wish to be explored in conjunction with other relevant psychological variables in large test batteries.

Resum

Limitacions de temps, objectius d'investigació ambiciosos i l'administració de bateries d'instruments extenses, especialment en joves, requereixen la validació de mesures breus per tal d'avaluar de manera fiable i vàlida els trets psicològics. En els àmbits de la psicologia de la personalitat normal i "fosca", aquests instruments curts es desenvolupen i usen cada vegada més per a estudiar les conseqüències associades amb les dimensions en general, i els aspectes antagonistes en particular. Malgrat tot, en algunes poblacions on es poden necessitar més (p. ex., adolescents), els qüestionaris curts d'avaluació de la personalitat són escassos, especialment els lligats als marcs teòrics més actuals dins l'anomenat "part fosca" de la natura humana (tals com la Tètrada Fosca de personalitat, incloent els trets subclínics problemàtics de Maquiavel·lisme, narcisisme, psicopatia i sadisme).

Per tant, l'objectiu d'investigació d'aquesta tesi doctoral és cobrir la necessitat de disposar de ferramentes en castellà psicomètricament adequades i breus que avaluen el Model de Cinc Factors (FFM), així com trets de personalitat "fosca" en adolescents. Amb aquesta finalitat, s'han portat a terme quatre estudis: l'Estudi 1 tenia com a objectiu la construcció d'una forma abreujada d'un qüestionari del FFM per adolescents (el JS NEO-S de 150 ítems), reduint en un 60% la seua llargària i fent èmfasi en la fidelitat, o la màxima representació de les facetes, disposant finalment del JS NEO-A60 de 60 ítems. L'Estudi 2 tenia com a objectiu la validació d'una segona forma, encara més breu, del JS NEO-S fent més atenció a l'amplada del constructe, és a dir, disposar d'una cobertura adient dels elements centrals de cada dimensió. El resultat fou un instrument reduït en dos terços de la mesura original, el JS NEO-A50 de 50 ítems. Els estudis 1 i 2 han

proporcionat evidència psicomètrica (en termes de validesa estructural, convergent i de criteri; i de fiabilitat test-retest i de consistència interna) de les mesures de 60 i 50 ítems. Aquestes escales cobrien el contingut de personalitat segons el FFM, tal com es pretenia, representant àmpliament les facetes o trets en el JS NEO-A60, tot i la seua brevetat, i una avaluació adient de cada dimensió mitjançant el JS NEO-A50 amb tan sols 10 ítems per escala. Els estudis 3 i 4 foren passos consecutius dirigits a la validació de l'escala curta de la tètrada fosca (Short Dark Tetrad - SD4), una mesura molt breu, de 28 ítems, dels trets "foscos" de personalitat en el marc teòric àmpliament recolzat dels quatre factors de la personalitat antagonista en adolescents espanyols. La mesura, psicomèticament, funcionava de manera adequada en una mostra de població adulta general (Estudi 3), població en la que s'havia desenvolupat l'escala original, i posteriorment va mostrar evidència satisfactòria de validesa i fiabilitat en una mostra d'adolescents de la població general (Estudi 4). Els resultats aporten evidència psicomètrica que replica i amplia en treballs previs amb l'SD4, incloent la invariància de gènere en els dos estudis, la invariància d'edat entre les mostres d'ambdues investigacions (adults vs. adolescents), i s'examina la xarxa nomològica de l'instrument, incloent les associacions hipotetitzades amb la personalitat normal usant el JS NEO-A50.

En definitiva, la combinació dels resultats dels quatre estudis que conformen aquesta tesi doctoral subratlla la utilitat de les mesures breus de personalitat i aporta instruments curts i exhaustius en castellà validats per al seu ús en adolescents. Només amb 78 ítems, els investigadors i les investigadores poden treure'n profit a l'incorporar el JS NEO-A50 i l'SD4 a les seues ferramentes, en particular quan es vol explorar conjuntament els trets de personalitat de l'FFM i la Tètrada Fosca juntament amb altres variables psicològiques rellevants en bateries amples de tests.

Introduction

Personality traits

Conceptualization: Biodispositional paradigm

The history of personality psychology can be summarized in six broad conceptual framings: phenomenological, psychodynamic, dispositional, biological, learning, and cognitive (Carver & Scheier, 2012). These perspectives have given rise to the two main contemporary theories in personality: social-cognitive (e.g., Mischel & Shoda, 1995) and biodispositional (e.g., Eysenck & Eysenck, 1985; McCrae & Costa, 2008b). The latter, the biodispositional theory, has gained widespread consensus, emerging as the basis for the most employed taxonomies on which assessment of personality traits rests (Boyle et al., 2008). A review of the extensive influences on the biodispositional theory exceeds the scope of the present dissertation, however this model is built upon the scientific evidence pertaining to the genetic influences on individual differences in personality (Kandler et al., 2021).

One of the most influential figures in the study of the inheritance of psychological traits, a central piece of the biodispositional theory, was Sir Francis Galton (1822-1911). To name just one of his many important contributions to the field of psychology, he is attributed with the first twin studies, in the context of which he coined the phrase "nature-nurture" (Galton, 1875/2019), describing the heredity of human abilities. Galton's contributions paved the way for the modern science of behavioral genetics (Plomin, 2023). Such studies shed light on the proportion of variance within individual differences which is attributable to genetic influence, which averages around 50% for human traits in general (Polderman et al., 2015) and personality traits in particular

(Kandler et al., 2021). The concept of correlation can also be ascribed to Galton (1889), however developed in greater depth by Pearson (1901) and Spearman (1904). This mathematical concept has proved to be of the utmost importance in psychological science, and was instrumental in the development of factor analysis, one of the main statistical techniques for the mathematical study of latent constructs of personality and intelligence in the 20th century (Williams et al., 2003). One of the first researchers that applied factor analysis to different psychological traits, including personality variables, was L. L. Thurstone. His work "vectors of the mind" (Thurstone, 1934), in fact revealed a four-factor solution composed of personality dimensions with a clear correspondence to more contemporary perspectives: conscientiousness, emotional stability, extraversion and a similar factor to what R. B. Cattell later termed "Independence". Despite important insights on the biological underpinnings of personality in the early 20th century, such as the constitutional (Kretschmer, 1888-1964; Sheldon, 1898-1977) and reflexological theories (Pavlov, 1849-1936), these perspectives were merely speculative by today's standards, in the same vein as Hipocrates' four temperaments, themselves purported to be linked to biological entities, or "humors".

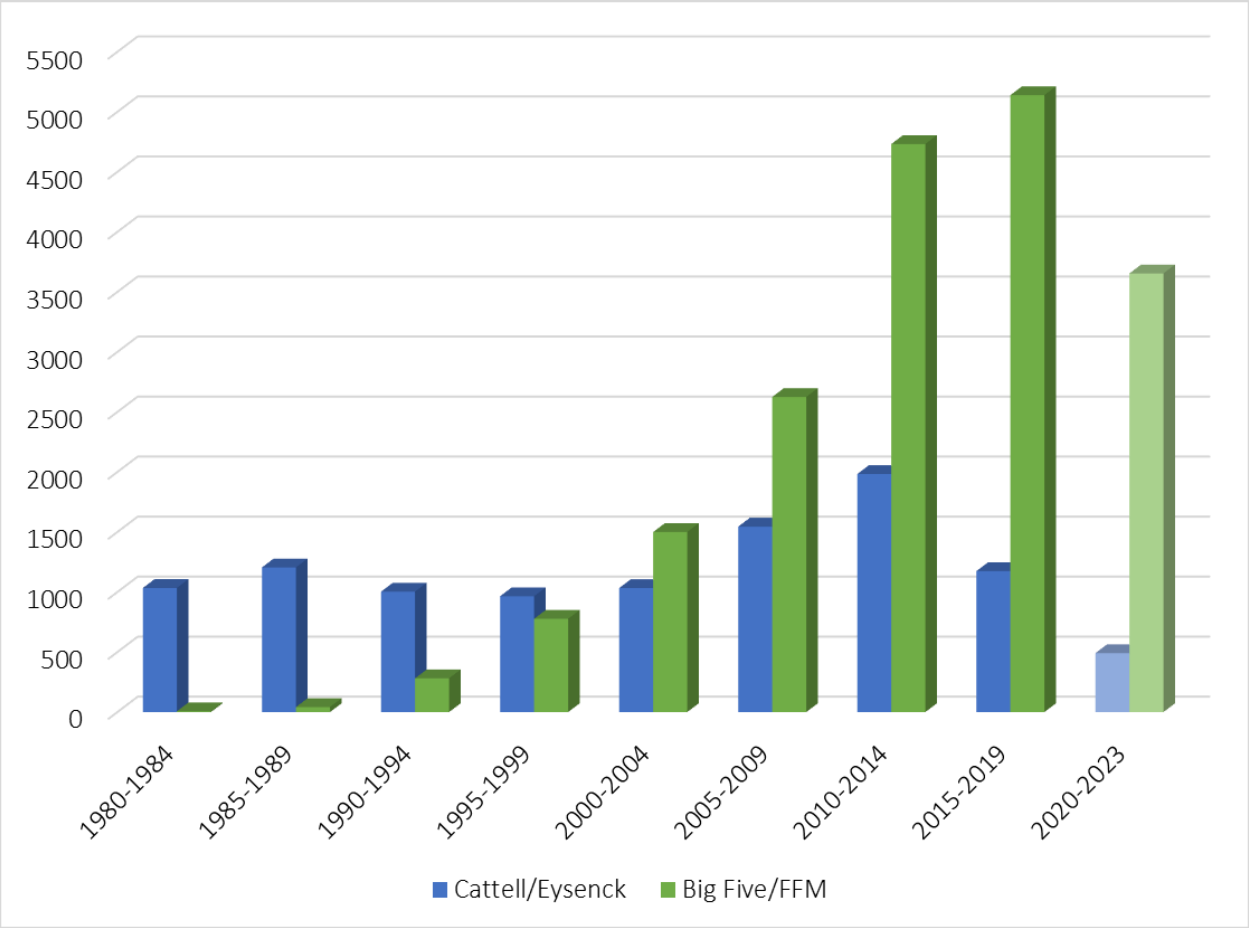
It was not until Gordon Allport's contributions in the 1930's that the theoretical framework for the scientific study of personality took off, by introducing the dispositional perspective. Allport (1927) held traits as the basic elements of human personality. The conceptual framework provided by Allport, along with the systematic use of factor analysis to study the structure and taxonomy of human personality, kept the dispositional model as the dominating personality theory throughout the mid- and late-20th century. The most influential of its proponents were authors like J. P. Guilford, Raymond B. Cattell, and Hans J. Eysenck. Cattell employed factor analysis to narrow in on 16 traits, grouped

into 6 second-order factors upon which his 16-PF measure (Cattell, 1970) is grounded. Eysenck, on his part, highlighted two main personality domains: neuroticism and extraversion (Eysenck, 1947), to which a third domain, psychoticism, was subsequently added (Eysenck & Eysenck, 1985). Eysenck employed his model to develop the EPQ, and later EPQ-R instruments, and proposed a continuum from normal personality to psychopathology according to scores on these basic traits.

Finally, the 1990s arrived with a personality taxonomy which would come to be the contemporary consensus on personality theory: The Five-Factor Model (FFM; McCrae & Costa, 2010), a.k.a. Big Five (BF, Goldberg, 1990). With a careful and rigorous study of natural language, served with more sophisticated statistical tools than its predecessors, this personality model dominated the field by the turn of the century, already surpassing the number of publications awarded to Cattell's or Eysenck's frameworks (see Figure 1). Nevertheless, models such as Eysenck's, and others like Gray's (Corr, 2004), Cloninger's (Švrakić et al., 1996), or Tellegen's (Church, 1994) are all grounded in the biodispositional theory, considering traits (i.e., behavioral, affective, and cognitive tendencies), as the basic building blocks of personality common to all human beings, with important genetic and biological influences. Some models put the focus on personality structure (e.g., Tellegen's model) or on the different causes of personality manifestation (e.g., Cloninger and Gray's models), while still sharing an overarching biodispositional approach.

Figure 1

Number of Publications Related to Either the Big Five Personality Traits or the Influential Models Developed Earlier by Cattell and Eysenck, Identified in Keyword Searches of the PsycNET Database



Note. Adapted from John (2021) and expanded to include the 2020-2023 range of years (more lightly shaded bars, given its shorter span compared with the previous five-year blocks).

Thus, the biodispositional theory, where the FFM is embedded, is considered the most backed model of personality, in both research and applied settings (John, 2021). This model (see Figure 2), currently goes beyond simply being one of many theoretical viewpoints of personality, but is rather a paradigm whose conceptual framework is overwhelmingly supported by most scholars in the field. The core features of the biodispositional paradigm are the following:

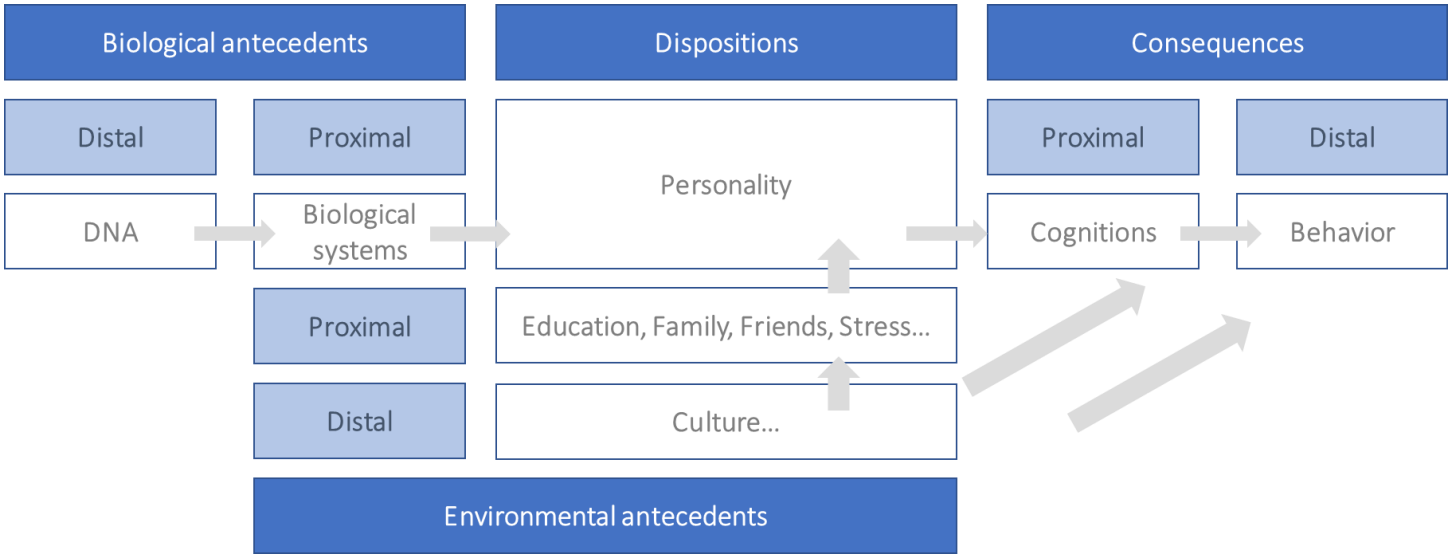
1. Relative stability of personality across the lifespan, which can be summarized in a limited number of broad personality traits (Bleidorn et al., 2021; Damian et al., 2019; Denissen et al., 2013; Costa et al., 2019; Roberts et al., 2006).
2. Relative consistency of personality traits in different situations, permeating many different aspects of everyday life (Ozer & Benet-Martínez, 2006; Soto, 2019; 2021; Soto & Tacket, 2015).
3. Biological underpinnings of personality. Personality traits are partly biological in origin, as demonstrated by several studies on behavioral genetics (de Moor, 2012; Flint et al., 2020; Plomin, 2023). Thereby, and in line with an etic (i.e., cross-cultural) view of personality, these traits are identifiable to a lesser or greater degree among people worldwide (Hendricks et al., 2003; Oishi et al., 2021; Schmitt et al., 2007).
4. Interaction with the environment, whereby personality traits are a result of reciprocal gene-environment interactions. Particular situations give rise to the manifestation of personality traits which, in turn, are responsible for selecting different environments and interpreting situations. The environment has a crucial role in shaping the development and expression of our personality (Kandler et al., 2021).
5. Hierarchical structure of personality, where the covariance of habitual behaviors is grouped into higher-order traits. These traits, in turn, covary among each other and are organized into the broad personality dimensions that are at the highest level of the hierarchy (McCrae & Costa, 2010). The nature and number of the basic dimensions is an interesting, classical

debate which continues to this day (Ashton & Lee, 2020; Costa y McCrae, 2010; Digman, 1997; Eysenck, 1991; Musek, 2007).

6. Dimensionality of personality traits, which involves personality features being continuous rather than categorial (i.e., people's levels of personality traits are considered higher or lower with regard to the rest of the population, rather than possessing a particular trait or not; McCrae & Costa, 2008b).

Figure 2

Biodispositional Paradigm



Note. Adapted from Ortet & Sanchis (1999).

Five-Factor Model - FFM (a.k.a. Big Five)

The FFM (McCrae & Costa, 2010) or Big Five (Goldberg, 1990) is, as highlighted above, the most employed taxonomy for the study of human personality (John, 2021). Its dimensions, themselves partitioned into lower-order facets or traits (which vary depending on the particular model), are the following:

1. Neuroticism: This dimension refers to the tendency toward negative emotional experiences, such as anxiety and depression. Its opposite pole, emotional stability, entails a resistance toward such negative states, with a higher threshold for emotion-control under pressure.
2. Extraversion: A highly extraverted person is enthusiastic, sociable, and optimistic. This dimension is characterized by stimulation-seeking and craving social connections. Conversely, low extraversion (or introversion) involves a preference for solitude and unstimulating environments, and being reserved in the company of other people.
3. Openness: This personality trait reflects curiosity, aesthetic appreciation, and receptivity towards unconventional ideas. People lower on this dimension are rather closed-minded, traditional, and pragmatic, and less interested in intellectual pursuits.
4. Agreeableness: People who are more agreeable value social harmony over conflict, and are more collaborative than competitive. They are helpful and empathetic toward others. In its negative pole, labeled antagonism, individuals are more cynical, value competition, and are more self-centered.
5. Conscientiousness: This personality dimension is linked to orderliness, dependability, and dutifulness, particularly in academic and workplace

settings. Conscientious people also tend to be highly disciplined in their personal life. By contrast, low levels on conscientiousness are associated with less rigidity or planning in the pursuit of goals, and a greater likelihood to show impulsive behavior and value short-term gratification.

The main contemporary FFM taxonomies divide the five domains into between two (e.g., aspects in the BFAS; DeYoung et al., 2007) and six (e.g., facets in the NEO-PI-3; McCrae & Costa, 2010) lower-order, specific traits per domain. The BFAS actually places personality aspects as an intermediate level of personality structure between domains and facets, which entails that, theoretically, the NEO and BFAS approaches can be integrated. Further, a more recent proposal of personality structure includes so-called nuances (Mõttus et al., 2017; Seeboth & Mõttus, 2018), purported to be the at the bottom of the personality hierarchy, in essence item-level descriptions that capture unique variance. Regardless of the different approaches to divide the five major dimensions, the FFM has shown strong links to consequential outcomes throughout the lifespan (Costa et al., 2019; Ozer & Benet-Martínez, 2006; Soto, 2021). An overview of important life outcomes is shown in Table 1. Replication rates of such personality-outcome effects are substantial, and are plotted in Figure 3, based on 78 published trait-outcome associations.

Table 1

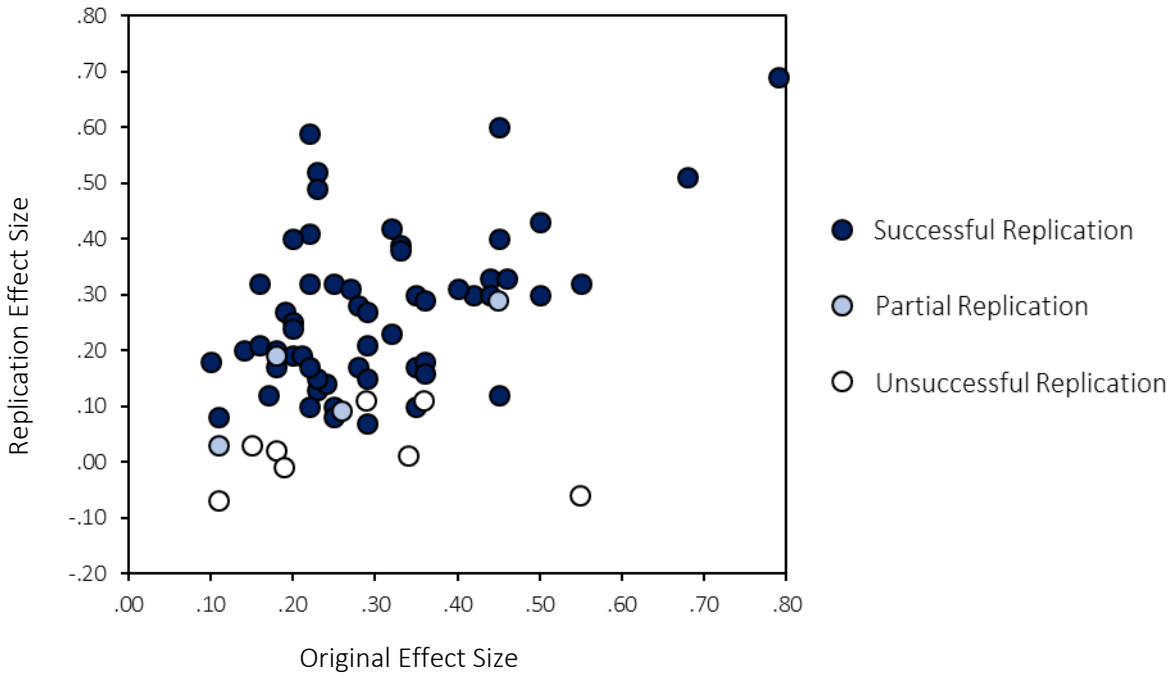
Summary of the Relation Between Personality Traits and Consequential Outcomes

	Individual outcomes	Interpersonal outcomes	Social institutional outcomes
Extraversion	Happiness: subjective well-being Spirituality & virtues: existential well-being, gratitude, inspiration Health: longevity, coping, resilience Psychopathology: (–) depression, (–/+) personality disorders Identity: majority culture identification (for minorities)	Peer & family relations: peers' acceptance and friendship (children and adults); dating variety, attractiveness, status (adults) Romantic relations: satisfaction	Occupational choice & performance: social and enterprising interests, satisfaction, commitment, involvement Community involvement: volunteerism, leadership
Agreeableness	Spirituality & virtues: religious beliefs and behavior, gratitude, forgiveness, humor Health: longevity; (–) heart disease Psychopathology: (–/+) personality disorders Identity: ethnic culture identification (for minorities)	Peer & family relations: peers' acceptance and friendship (children) Romantic relations: satisfaction (dating couples only)	Occupational choice & performance: social interests, job attainment, (–) extrinsic success Community involvement: volunteerism, leadership Criminality: (–) criminal behavior
Conscientiousness	Spirituality & virtues: religious beliefs and behavior Health: longevity, (–) risky behavior Psychopathology: (–) substance abuse, (–/+) personality disorders Identity: achievement, ethnic culture identification (for minorities)	Peer & family relations: family satisfaction Romantic relations: satisfaction (dating couples only)	Occupational choice & performance: performance, success Political attitudes & values: conservativism Criminality: (–) antisocial and criminal behavior
Neuroticism	Happiness: (–) subjective well-being Spirituality & virtues: (–) existential well-being, (–) humor Health: (–) coping Psychopathology: anxiety, depression, (+/–) personality disorders Identity: (–) identity integration/consolidation	Peer & family relations: (–) family satisfaction, (–) status (males only) Romantic relations: dissatisfaction, conflict, abuse, dissolution	Occupational choice & performance: (–) satisfaction, (–) commitment, (–) financial security, (–) success Criminality: antisocial behavior
Openness	Spirituality & virtues: existential/phenomenological concerns, forgiveness, inspiration Psychopathology: substance abuse Identity: (–) foreclosure, identity integration/consolidation, majority culture identification (for minorities)		Occupational choice & performance: investigative and artistic interests, success Political attitudes & values: (–) right-wing authoritarianism, liberalism

Note. (–) indicates a negative relation between the trait and outcome (adapted from Ozer & Benet-Martínez, 2006).

Figure 3

Scatterplot Showing the Association Between the Z-transformed Original and (Observed) Replication Effect Sizes, by Success of the Replication Attempt



Note. Adapted from Soto (2019).

Assessment of Five-Factor Model personality traits in children and adolescents

Already in the 1960's, John Digman (1963), showed personality traits in youth could be retrieved with teacher ratings employing the Q-sort. In subsequent work with teacher ratings of children employing the same technique, Digman & Inouye (1986) narrowed Digman's original 11 traits to seven factors, five of which corresponded clearly with the FFM broad domains. More recently, personality assessment in children and adolescents has followed either a top-down or a bottom-up approach. The former has entailed the use of measures originally developed for adults (often with slight modifications in wording), to study personality features in youth. This research allowed very important

findings such as FFM structure emerging by age 10 (Soto et al., 2008). Barbaranelli et al. (2003) developed the Big Five Questionnaire for Children (BFQ-C) adapting their adult version of the scale (BFQ; Caprara et al., 1993), retrieving four of the Big Five across informant scores. John et al. (1994) coined the "Little Five", obtaining markers of the FFM traits from the California Child Q-set (CCQ; Block & Block, 1980).

The latter approach to personality assessment in youth, so-called bottom-up, has entailed the development of inventories specifically tailored to children and adolescents. This perspective aimed at accomplishing the most useful description of personality in a non-aprioristic fashion, based upon parent's personality descriptions of their children. The Hierarchical Personality Inventory for Children (HiPIC; Mervielde & De Fruyt, 2002) and the Inventory for Children's Individual Differences (ICID; Halverson et al., 2003) were developed, within an FFM structure and also in line with research on temperament (the dominating model of dispositions in infancy and childhood; Rothbart et al., 2000; Thomas & Chess, 1977). De Fruyt and Karevold (2021) outlined a clear correspondence of lower order facets within the HiPIC and ICID, matched to Soto and John's BFI-2 (2017), detailed in Table 2.

Table 2

Broad and Mid-Level Constructs of Childhood and Adolescent Personality

HiPIC	ICID	BFI-2
Neuroticism	**Neuroticism**	**Neuroticism**
Anxiety	Fearful/insecure	Anxiety
Self-confidence	Negative emotionality	
	Shy	Volatility
Extraversion	**Extraversion**	**Extraversion**
Energy	Activity level	Energy
Expressiveness	Positive emotionality	Sociability
Optimism	Considerate/Sociable	Assertiveness
Shyness	Openness	
Imagination	**Openness**	**Openness**
Creativity	Intellect	Creative imagination
Intellect		Intellectual curiosity
Curiosity		Aesthetic sensitivity
Benevolence	**Agreeableness**	**Agreeableness**
Altruism	Strong willed	Compassion
Dominance	Antagonism	Trust/forgiveness
Egocentrism		Respect
Compliance		
Irritability		
Conscientiousness	**Conscientiousness**	**Conscientiousness**
Concentration	Distractible	Productivity
Persistence	Organized	Organization
Orderliness	Achievement orientation	Reliability
Achievement		

Note. Broad domains are in bold. HiPIC: Hierarchical Personality Inventory for Children (Mervielde & De Fruyt, 1999); ICID: Inventory of Child Individual Differences (Halverson et al., 2003); BFI-2: Big Five Inventory-2 (Soto & John, 2017) (adapted from De Fruyt & Karevold, 2021).

Soto et al.'s (2011) study of over a million participants in English-speaking countries, further supported by subsequent research on personality across the lifespan (e.g., De Bolle et al., 2015), shows the development of personality in the direction of greater maturity. That is, in the transition into adulthood, children and adolescents experience mean-level increases in emotional stability, extraversion, openness, agreeableness, and

conscientiousness, with prior drops in these scores between the childhood and adolescent phases. There are some caveats regarding sex differences, such as opposing neuroticism patterns for boys (i.e., decreasing scores) and girls (i.e., increasing) across adolescence (see Soto et al., 2011, for a more detailed account).

Short measures of personality traits

Several considerations have motivated the development of brief personality assessment tools. Despite the popularity and utility of the NEO-PI-3 as a comprehensive and up-to-date FFM instrument (McCrae & Costa, 2010), it is a 240-item questionnaire that requires a 40-minute administration session. In research and applied settings, such a long assessment is far from ideal, as it may conflict with time constraints in clinical or educational contexts, as well as preventing researchers from administering additional, relevant measures when there is a tight schedule to adhere to.

Thus, an important research area involves constructing abridged measures, ensuring that construct breadth (or bandwidth), fidelity (capturing narrower traits), and predictive power are conserved (Soto & John, 2017). To this end, the NEO-PI-3 has a short, 60-item form assessing the Big Five domains (NEO-FFI-3; McCrae & Costa, 2010) which, as its longer counterpart, is also suitable for youths aged 12 and up. Another instrument purporting to assess 15 lower-order facets (three per domain) is the BFI-2 (Soto & John, 2017), which is also composed of 60 items. The Big Five Aspect Scales (BFAS; DeYoung et al., 2007), also assess lower order traits, the mid-level "aspects" (2 per domain), with a slightly longer 100-item instrument, albeit significantly shorter than the full NEO-PI-3.

Finally, even more abridged personality instruments exist, most notably the Ten Item Personality Inventory (TIPI; Gosling et al., 2003), although a two item per broad domain scale undoubtedly sacrifices fidelity to a great extent. Instruments such as the TIPI may be highly time-efficient (just around a minute to complete) snapshots of the Big Five, but are not well-suited to provide nuanced, comprehensive pictures of personality. Furthermore, internal consistency is an important descriptive statistic to ensure precision of any test, and the TIPI domains' alpha coefficients were far from acceptable in a Spanish adaptation administered to a large sample (ranging from just .38 to .59; Romero et al., 2012). Thereby, abridged instruments are encouraged to tackle the demands mentioned above, provided the scales meet minimum reliability and validity requirements.

Following the rationale with which FFM instruments originally designed for adults are employed to study personality in children and adolescents, short questionnaires such as those mentioned above have also been employed in youth and, sometimes with slight wording modifications, show appropriate psychometric properties. Given that issues such as lack of focus, tediousness, and biased response styles (e.g., acquiescence or random responding) may appear more often in long administration sessions with adolescents as compared to adults (Ziegler et al., 2014), short personality questionnaires suitable for the adolescent population have been developed or adapted. These include, among others in the Spanish sociocultural context, the 50-item Overall Personality Assessment Scale (OPERAS; Vigil-Colet et al., 2013, which is aimed at a wide age range from 13 years on), and the 150-item short Junior Spanish version of the NEO-PI-R (JS NEO-S; Ortet et al., 2010), more tailored to adolescents aged 12 to 17.

Although the JS NEO-S constitutes a notably reduced version with regard to its 240-item parent measure (i.e., the JS NEO; Ortet et al., 2012), it still requires a reasonably lengthy administration session, which may not be practical with adolescents. Along with the aforementioned response bias issues, school timetables and research aims that involve administering large batteries of questionnaires put time efficiency at a premium. Thus, there is an important gap to be filled with psychometrically sound, brief personality instruments mainly directed at adolescents, the wording of which properly reflects the characteristic FFM manifestations of this life period. An exception would be the 50-item Big Five Personality Trait Short Questionnaire (BFPTSQ; Ortet et al., 2022) that can be used from age 12 and up, suitable for adolescents and adults).

Dark personality traits

In their seminal article, Paulhus and Williams (2002) laid out the personality configurations linked to antagonistic interpersonal behaviors which, in their view, had the most conceptual, historical, and clinical significance. Namely, this set was dubbed the Dark Triad of personality. Its members were psychopathy, narcissism, and Machiavellianism. Despite several other features falling under the "dark traits" umbrella (e.g., contempt, spitefulness, greediness; Marcus & Zeigler-Hill, 2015), the introduction of the Dark Triad has been responsible for the explosion of research on antagonistic personality and remains the set of traits most relevant to contemporary scholars (Jones & Paulhus 2023). Outlined below are the summarized history and main features of each of the Triad traits:

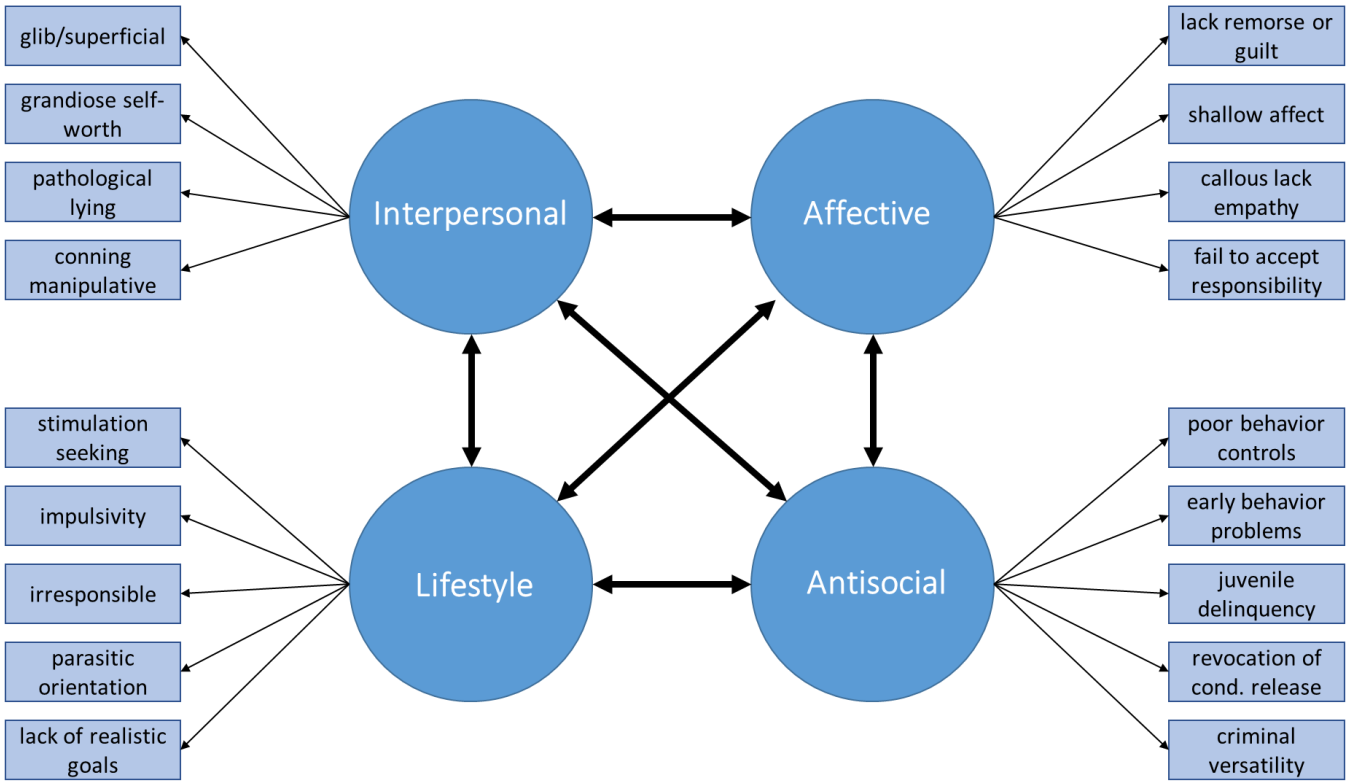
Psychopathy

The first uses of the term as a distinctive mental disorder linked to criminality, can be attributed to psychiatrists such as Julius Koch (1841-1908; Gutmann, 2007) and Emil Kraepelin (1856-1926; Millon, 2002). However, until the publication of *The Mask of Sanity* by Hervey Cleckley (1941/1976), there was no agreed-upon conceptualization of psychopathy. Cleckley described 16 characteristics based on case-studies of his patients with the "mask" in the title of his work referring to the veneer of normality with which psychopathic individuals would conceal their callousness and amorality.

The operationalization and proper clinical appraisal of psychopathy was subsequently built on by Robert Hare with his Psychopathy Checklist (PCL; Hare, 1980) and later Psychopathy Checklist-Revised (PCL-R; Hare, 2003). This instrument is considered the "gold standard" diagnostic tool for psychopathy in forensic settings. The 20-item, semistructured interview distinguishes four underlying factors at the core of the psychopathy disorder: interpersonal (grandiosity and manipulativeness), affective (lack of remorse and empathy), lifestyle (impulsive tendencies), and antisocial (violent and criminal outcomes). Figure 4 illustrates the PCL-R model obtained from psychopathy assessments around the globe (Hare & Neumann, 2008).

Figure 4

Four-Factor PCL-R Item-Based Model of Psychopathy



Note. Adapted from Hare and Neumann (2008).

Despite some debate regarding the antisocial domain of psychopathy (namely whether this is a core feature or, rather, a proximal outcome of this particular personality configuration; e.g., Cooke & Miche, 2001), research conducted with the PCL-R has paved the way for a substantial agreement on the conceptualization of the psychopathic personality. Thus, psychopathy can be defined as a personality disorder, whose manifestation entails a syndrome of which callous lack of empathy and guilt, self-centeredness, manipulation, and impulsive short-term gratification are the main features (De Brito et al., 2021). Some researchers, however, have argued strongly in favor of the role of fearless dominance (or boldness) as a core psychopathic trait (Lilienfeld et al., 2012).

Notwithstanding, and as posited by the Dark Triad framework, psychopathic traits are also distributed on a continuum in the general population, therefore exhibiting subclinical manifestations (Edens et al., 2006; Guay et al., 2007). Outcomes of psychopathic traits are not only linked to dangerous and criminal outcomes (Gillespie et al., 2022), but may also lead to success in some noninstitutional settings (Hall & Benning, 2006), which make community studies highly valuable for preventive efforts of the large-scale pernicious effects that may be perpetrated by these "successful" psychopathic individuals (Garofalo et al., 2022; Lilienfeld et al., 2015). Assessment instruments developed for non-diagnostic use (with slightly different conceptualizations regarding the inclusion of boldness/fearless dominance as a core feature) include the Triarchic Psychopathy Measure (TriPM; Patrick et al., 2010), the Self-Report Psychopathy Scale (SRP 4; Paulhus et al., 2017), and the Levenson Self-Report Psychopathy Scale (LSRP; Levenson et al., 1995).

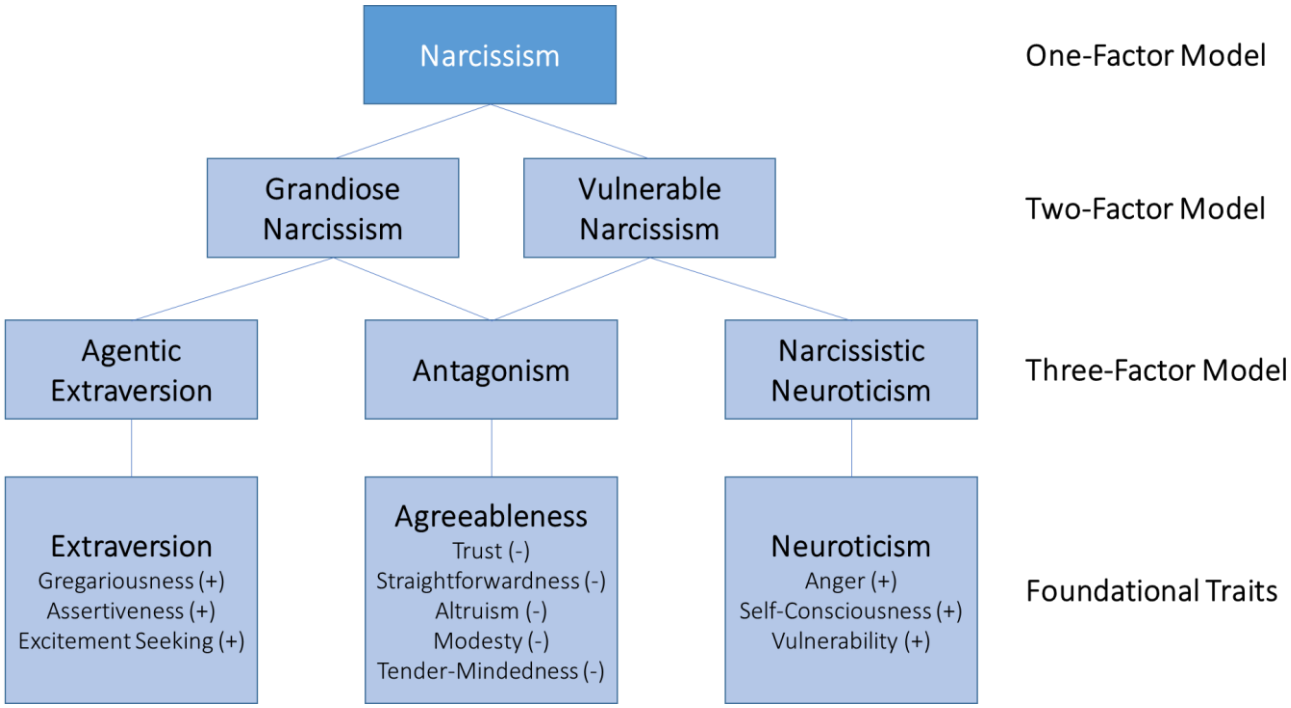
Narcissism

Coined in the 19th century to describe excessive self-love by poets such as Lord Byron (1788-1824) and Charles Baudelaire (1821-1867), the term originates in the Greek Mythology of Narcissus, a story involving a young man who falls in love with his reflection in a pool of water. A focus of psychoanalysts, Sigmund Freud (1856-1939) linked narcissism to the development of the ego in infancy (Freud, 1913; 1914) and distinguished primary narcissism (linked to self-preservation and common to all human beings) from secondary narcissism (pathological, associated with schizophrenia and megalomania). Kernberg (1975) argued grandiose narcissism to be the product of an improperly integrated self, whereby healthy, infantile narcissism fails to regulate self-esteem into a mature, adult form.

In its current pathological conceptualization, narcissistic personality disorder in the DSM-5-TR (NPD; American Psychiatric Association, 2022) involves a set of nine diagnostic criteria, out of which five must be present for formal diagnosis. Narcissism is in fact the only feature out of the Triad that has a corresponding, diagnosable condition in the DSM-5-TR. The current state-of-the art in narcissism research (Miller et al., 2021) outlines a hierarchical structure where two main variants (i.e., grandiose and vulnerable) stem from the combination of normal personality domains and narrow facets (see Figure 5).

Figure 5

Hierarchical Structure of Narcissism. The Bottom Row Shows Foundational Traits Associated Positively (+) and Negatively (–) With the Components of the Three-Factor Model



Note. Adapted from Miller et al. (2021).

One of the most widely used measures to assess narcissism across a wide range of contexts is the Narcissistic Personality Inventory (NPI; Raskin & Hall, 1979; Raskin & Terry, 1988). The scale was originally intended to tap into the criteria for DSM-III NPD (American Psychiatric Association, 1980). The 40-item version of the scale most commonly used today (Raskin & Terry, 1988) contains seven underlying factors (labeled by the authors): authority, self-sufficiency, superiority, vanity, exhibitionism, entitlement, and exploitativeness. Regrettably, this factor structure has been difficult to replicate in subsequent studies on the NPI, with some studies yielding a more limited number of factors (Ackerman et al., 2011; Brown et al., 2009; Svindseth et al., 2009). Within the contemporary conceptualization of the trait, the NPI assesses the grandiose variant of narcissism, but fails to capture variance associated with vulnerable narcissism). This is important to highlight given initial developments of the NPI aimed at a broad, multidimensional assessment of narcissism, whereas only its grandiose manifestations are captured. In any case, despite its limitations, it has proven to be an efficient measure of a core narcissism component to this day (Foster & Raley, 2023).

More recent instruments have been developed to differentiate more clearly among the different narcissism variants, including the Narcissistic Grandiosity Scale (NGS; Crowe et al., 2016), the Narcissistic Vulnerability Scale (NVS; Crowe, Edershile, et al., 2018), and the Five-Factor Narcissism Scale (FFNI; Glover et al., 2012).

Machiavellianism

Stemming from their interest in the writings of Niccolò Machiavelli (most notably his political treatise *The Prince*; Machiavelli, 1532/1935), Christie and Geis (1970) coined the term Machiavellianism to refer to the personality profile combining ambition,

cynicism, deceptiveness, strategic manipulation, and exploitative and duplicitous behavioral tendencies. The famous consequentialist slogan "The end justifies the means" is paraphrased from Machiavelli's writings, and is often used as a way to encapsulate the moral compass of Machiavellians. More recently, Jones and Paulhus (2009) integrated the precepts from Machiavelli with those of *The art of war* (5th century B. C./1998), written by Military strategist and philosopher Sun Tzu (544 B.C.-496 or 470 B.C.), whose emphasis on alliance-building and maintaining a positive reputation were thought to complete the definition of Machiavellian personality, also distinguishing it more clearly from psychopathy (Hare & Neumann, 2008). As opposed to psychopathy and narcissism, this feature is not classified as a disorder in its extreme manifestations, nor is there a diagnostic tool for any "Machiavellian personality disorder". Rather, the construct has remained within the realm of individual differences in the general population, separate from clinical nosology.

The most popular assessment tool to gauge Machiavellian personality, which has generated the most research on the trait, is the Mach-IV (Christie & Geis, 1970). The questionnaire employs excerpts directly form Machiavelli's writings, specifically from *The Discourses* and *The Prince*. The Mach-IV's items assess the degree to which respondents agree with strategies to secure power in interpersonal contexts. The large empirical overlap among this instrument (and others assessing Machiavellianism), with independent measures of psychopathy, has led to serious concerns on the construct validity of measures of the former trait (J. D. Miller et al., 2017; 2019). This issue will be explored in greater detail later in this dissertation (see section: Assessment of the dark personality traits and associations with the Five-Factor Model).

Importantly, Paulhus and Williams (2002) emphasized the subclinical nature of the profiles mentioned above. That is, they are each a combination of traits found to varying degrees in the general population, and not just their clinical manifestations (e.g., complying with DSM-5 criteria for Narcissistic Personality Disorder). Thereby, dark personality traits are important to study in a wide range of contexts, to properly understand which environments can favor, and which interventions may prevent or limit, the harm caused by such individuals (Jonason et al., 2014; LeBreton et al., 2018; Smith & Lilienfeld, 2013).

The Dark Tetrad: Inclusion of sadism

More recently, support has been offered to the inclusion of a fourth antagonistic profile: subclinical, or *everyday* sadism (Buckels et al.; 2013;2014). The term "sadism" was coined in the 1800s by Richard von Krafft-Ebing. He defined this feature as pleasure derived from the pain and suffering of others in his work *Psychopathia Sexualis* (1886/2011). The word sadism itself derives from the Marquis de Sade (1740-1814), a French aristocrat whose work was notorious for its explicit erotic content, emphasizing sexual violence (notably, *The 120 Days of Sodom*; De Sade, 1785/2016). The use of sadism to describe a personality feature was introduced by Chabrol et al. (2009), and since then caught much scientific attention (Paulhus, 2014; Paulhus & Dutton, 2016).

Its conceptual distinctiveness and separate empirical profile from the Dark Tetrad traits (e.g., particular associations with internet trolling behavior or willingness to work for the opportunity to cause suffering; Buckels et al., 2013; 2014), have pushed the field of personality research to adopt a new taxonomy: The Dark Tetrad, by incorporating sadism as a fourth member in this set of malicious traits (Paulhus, 2014). Problematic

interpersonal outcomes such as dominance via threat, animal abuse, and intimate partner abuse are other important correlates that have been reported for everyday sadism (Paulhus et al., 2011).

The stand-alone measures developed for everyday sadism include the Short Sadistic Impulse Scale (SSIS; O'Meara et al., 2011), the Varieties of Sadistic Tendencies (VAST; Paulhus & Jones, 2015), the Comprehensive Assessment of Sadistic Tendencies (CAST; Buckels & Paulhus, 2013), and the Assessment of Sadistic Personality (ASP; Plouffe et al., 2017). A very high overlap has been observed between these instruments and psychopathy subscales from the SD3 (e.g., Plouffe et al., 2019), and the DD (Pineda et al., 2021), an issue that motivated the validation of a scale able to distinguish between and capture the core components among all four tetrad features: the Short Dark Tetrad (SD4; Paulhus, Buckels, et al., 2021), which will be discussed at the end of the following section.

Assessment of the dark personality traits and associations with the Five-Factor Model

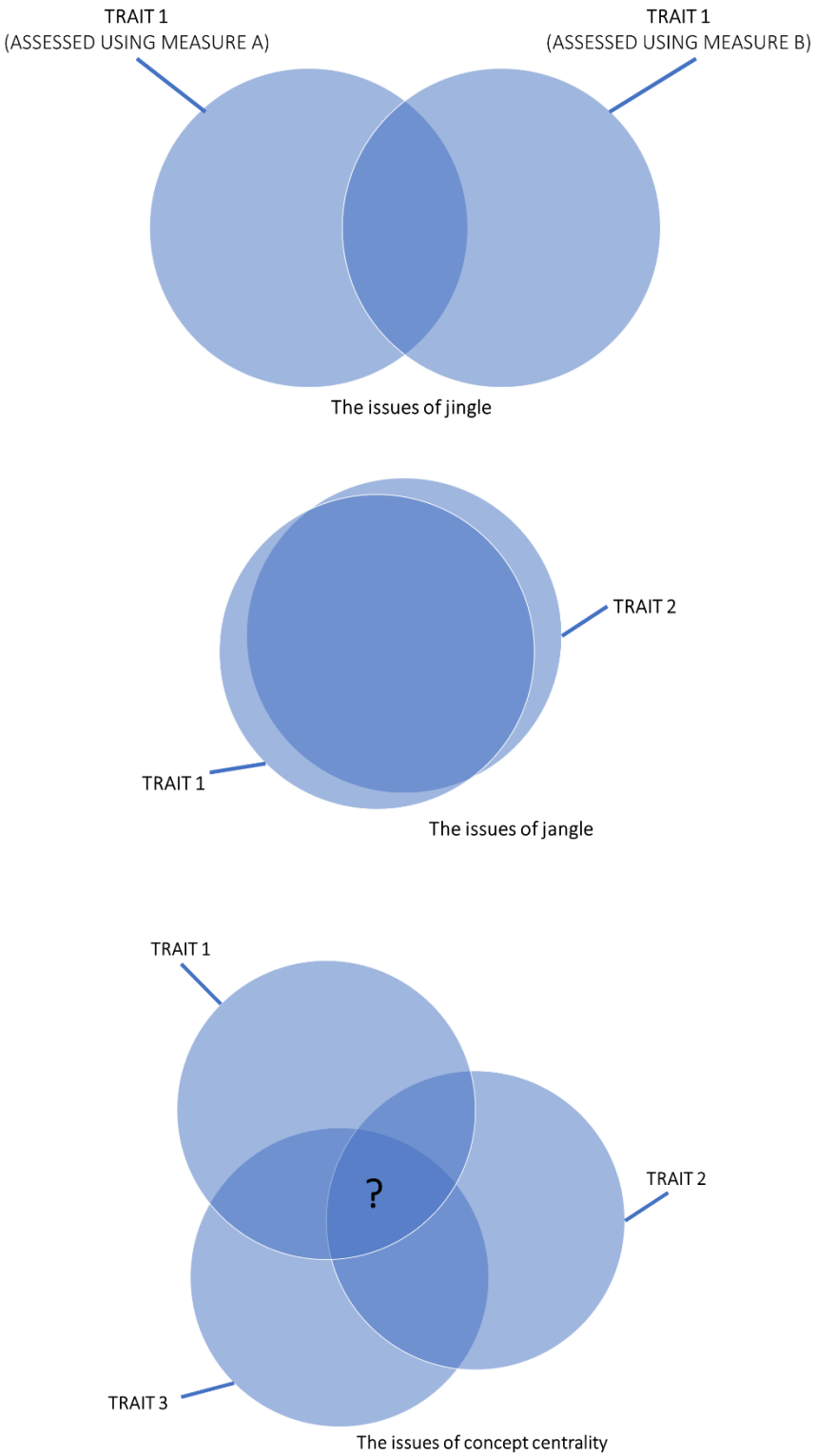
Having introduced the Dark Tetrad, a framework which is growing in popularity in personality research, along with some of the main assessment instruments of each trait, this section will dive into dark trait measurement in more detail.

An important issue with Dark Triad and Tetrad measurement, given the conceptual features that unite their members, is ensuring that each profile can be validly captured. In a review inspecting the elements making up different assessment instruments of the Dark Triad traits, Kay and Arrow (2022) examined these issues from the point of view of the *jingle* fallacy, the *jangle* fallacy, and concept centrality. Namely, the *jingle* fallacy pertains to instances where instruments purporting to measure the same construct actually assess different variables (Thorndike, 1913), whereas the *jangle fallacy* refers to

supposedly different concepts turning out to converge empirically as a single construct (Kelley, 1927). Issues of concept centrality involve establishing the true variance which is shared among distinct but related constructs. A depiction of these three important problems in aversive traits research is illustrated in figure 6.

Figure 6

Three Issues That Afflict the Study of Aversive Personality Traits

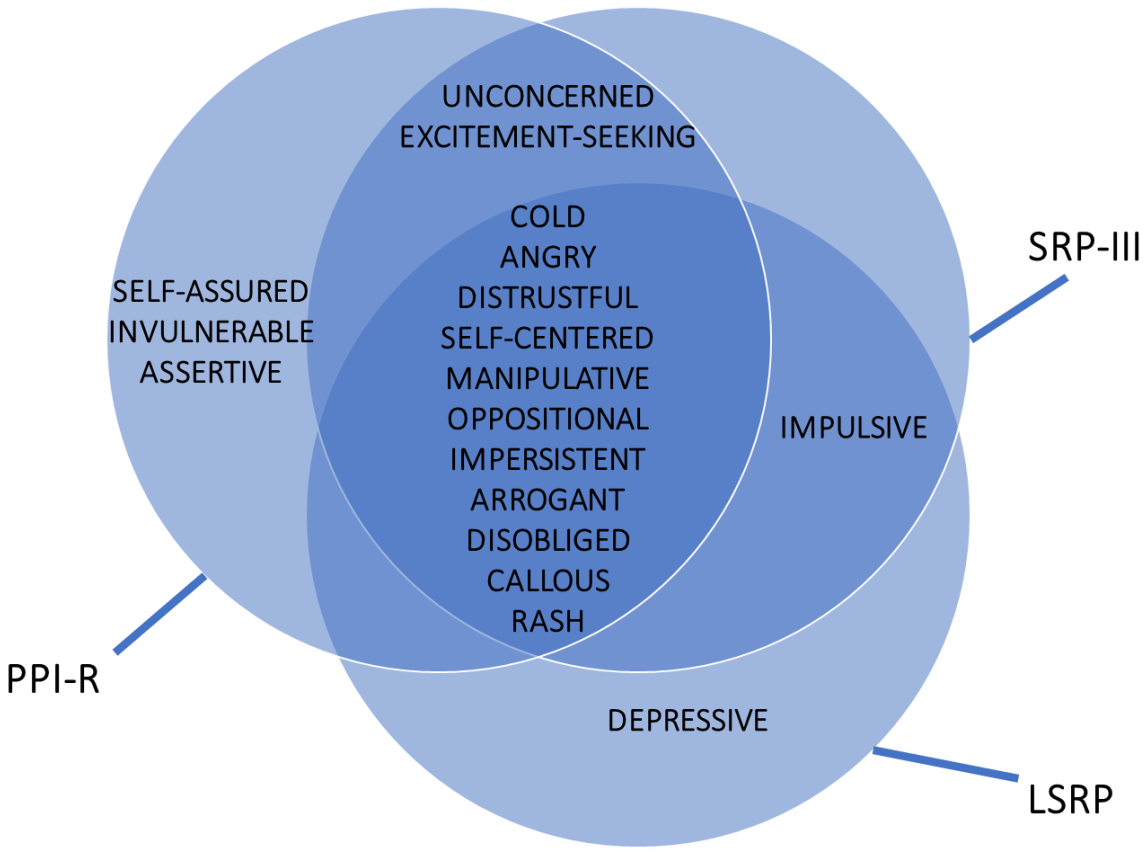


Note. Adapted from Kay and Arrow (2022).

Psychopathy can be pointed to as, likely, the main "victim" of the jingle fallacy in dark trait research. Disagreements on its core components (e.g., whether or not boldness/fearless-dominance are central features; Cooke & Michie, 2001; Lilienfeld & Andrews, 1996; Patrick, 2010; Patrick et al., 2009) has led to the development of measures all purporting to be assessing psychopathy, albeit made up by somewhat different elements (see Figure 7 for an overview).

Figure 7

An Elemental Approach to Psychopathy Using the Correlations Between the Five-Factor Model and the SRP-III, LSRP, and PPI-R

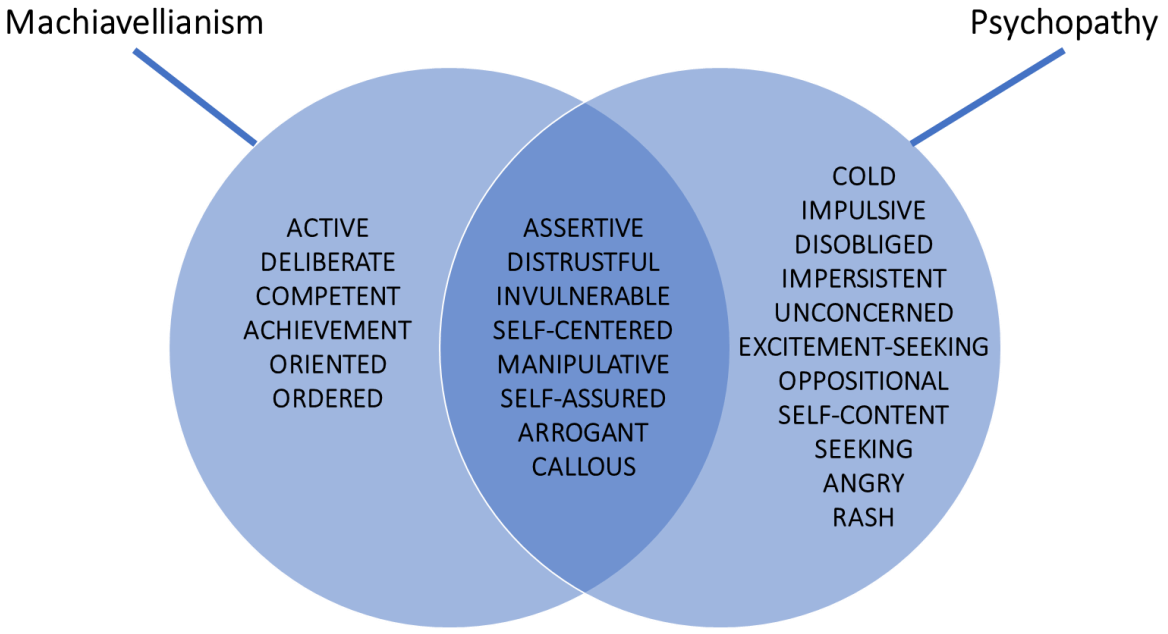


Note. Adapted from Kay and Arrow (2022).

Machiavellianism instruments, on their part, have shown to suffer from the *jangle* fallacy. Namely, whereas Machiavellianism and psychopathy measures purport to be measuring distinct theoretical constructs, their empirical profiles turn out to be highly similar (J. D. Miller et al., 2017; 2019). Also, meta-analytic research has shown that psychopathy explains even more variation in Machiavellianism scores (Muris et al., 2017) than even the amount of overlap *among* psychopathy measures (Miller & Lynam, 2012). It should be noted that some of the core features of psychopathy (i.e., impulsivity and recklessness) and Machiavellianism (i.e., strategic planning and calculated manipulation) are almost conceptual *opposites*, making their empirical overlap especially problematic. The conceptual differences and commonalities among these traits are summarized in Figure 8.

Figure 8

Traits Unique to and Common Among Machiavellianism and Psychopathy



Note. Adapted from Kay and Arrow (2022).

Everyday sadism is beginning to raise some doubts on its distinctiveness with psychopathy (e.g., Blötner & Mokros, 2023; Bonfá-Araujo et al., 2023), although the main conceptual features that distinguish sadism from psychopathy do seem to support differentiated empirical profiles (e.g., Buckels et al., 2013; 2014; Paulhus & Dutton, 2016; Paulhus, Buckels et al., 2021). More research is yet to be conducted on everyday sadism and its position within the constellation of dark personality traits.

On the question of construct centrality, there have been several proposals for the variance shared between the Triad and Tetrad traits. Namely, from an evolutionary point of view: an exploitative life history strategy (Jonason et al., 2010); from an affective standpoint: callousness (Paulhus, 2014); and from a basic trait perspective: low honesty-humility (Lee & Ashton, 2014) and low agreeableness/antagonism (Vize et al., 2019; 2020). The latter proposal is the only perspective which has been systematically employed to examine dark traits from their normal personality building blocks, and its reliance on the FFM as the contemporary paradigm of personality psychology strengthens this viewpoint. A "Dark Factor" (or *d*; Moshagen et al., 2018), in the same vein as the general intelligence factor (or *g*; Jensen, 2011), has been proposed as the core feature of all dark personality traits. This *d* factor is conceptualized as a tendency to maximize utility for oneself while causing disutility, or negative consequences, for others (Moshagen et al., 2018). It is worth noting that this proposal has been met with studies finding an almost perfect convergence with FFM low agreeableness/antagonism, both conceptually (Crowe, Lynam & Miller, 2018) and empirically (Vize et al., 2020).

Building on the FFM as the framework of reference for the elemental components of subclinical dark personality traits, Rose et al. (2023) developed the Five-Factor Model

Antagonistic Triad Measure (FFM ATM). This instrument is composed of the brief questionnaires designed to assess psychopathy, narcissism, and Machiavellianism. These are, namely: the Super-Short Form of the Elemental Psychopathy Assessment (EPA-SSF; Collison et al., 2016), the Super-Short Form of the Five-Factor Narcissism Inventory (FFNI-SSF; Packer West et al., 2021), and the Super-Short Form of the Five-Factor Machiavellianism Inventory (FFMI-SSF; Du et al., 2021). The FFM ATM is a commendable attempt at multidimensional assessments of each Dark Triad component, integrated with the dominating theory of normal personality in the FFM. However, several psychometric issues have arisen. Most notably, some of the FFM ATM scales are composed of items capturing *opposing* personality traits (e.g., items of high and also low neuroticism making up the total narcissism score, an integration of the grandiose and vulnerable variants resulting in a highly questionable alpha value of .55 in the instrument's validation study; Rose et al., 2023). Furthermore, there is the problem of *construct creep* (Paulhus, 2014), whereby an effort to subdivide constructs into lower-order facets to capture their multidimensionality, leads to an eventual excessive overlap with other, related constructs.

Thus, Paulhus, Buckels, et al. (2021) developed the SD4 to validate a single brief instrument with which to assess all four traits, as well as addressing some of the psychometric issues of dark trait research that have been discussed up to this point: tempering the overlap among Machiavellianism and psychopathy, preventing *construct creep*, and providing an assessment of the central features of each Tetrad profile (Paulhus, 2014; 2023). The SD4 has demonstrated, across different validation studies (Paulhus, Buckels, et al., 2021; Neumann et al., 2022) and adaptations to different languages (Blötner et al., 2021; 2022; Gajda et al., 2022; Meng et al., 2021; Qaderi

Bagajan et al., 2023; Pechorro et al., 2023), that the scale is a step forward in solving many of the dark personality research controversies. Namely, this brief questionnaire accomplishes a clearer distinction between psychopathy and Machiavellianism, showing a more theoretically sound nomological network of the latter (a problem that has plagued the literature; J. D. Miller et al., 2017; 2019). Moreover, the inclusion of sadism fits neatly within a four-factor structure, demonstrating adequate structural validity of the Tetrad model (Blötner et al., 2022; Neumann et al., 2022), and complies with expectations on gender differences (i.e., higher scores by men especially in psychopathy and sadism; Jonason et al., 2010; Paulhus, Buckels, et al. 2021; Paulhus, Gupta & Jones, 2021; Pechorro et al., 2022) together with strong invariance across gender and age, suggesting the instrument assesses the latent Tetrad traits similarly across these groups (Vandenberg & Lance, 2000).

The validity of instruments must be revised and, if necessary, updated (Messick, 1995). As such, despite the popularity of some instruments (e.g., Machiavellianism scales such as the Mach-IV or the DD Mach subscale), new and improved scales must be put forward and prioritized if serious psychometric issues, like construct overlap (J. D. Miller et al., 2017; 2019), arise. Furthermore, outdated language is another issue that can affect assessment, and is yet another hinderance of the Mach-IV (B. K. Miller et al., 2019) in terms of archaic references (e.g., *"Barnum was very wrong when he said there's a sucker born every minute"*) or gender bias (e.g., *"Most men are brave"*). The SD4 Machiavellianism subscale has tempered the overlap with psychopathy regarding impulsiveness (Neumann et al., 2022). In this respect, it has also been an improvement over its SD3 predecessor, with both subscales containing adequately worded items using more contemporary language.

Dark traits and their assessment in youth

In line with FFM personality, dark personality traits have also found to be identifiable in children and adolescents (Frick & Kemp, 2021), and are stable and predictive of future maladaptive and antisocial outcomes (Lynam et al., 2007; Salekin, 2017). The nomological networks of Dark Triad and Tetrad traits in youth are largely in line with problematic adult behaviors (Muris et al., 2013; 2017), but have their particular correlates which are especially harmful at young ages. Namely: important dark personality links to problematic social media use (especially narcissism; Hawk et al., 2019), bullying and cyberbullying (especially psychopathy; Despoti et al., 2020; López-Larrañaga & Orue, 2019), and victimization (Hayes et al., 2021; Pineda et al., 2022).

From a person-centered approach, Robins et al. (1996) outlined three major personality types in youth, which have also been subsequently identified in European countries (Asendorpf & van Aken, 1999; De Fruyt et al., 2002; Van Leeuwen et al., 2004): so-called resilient, overcontrolled, and undercontrolled. Regarding the latter, individuals with the undercontrolled trait profile are characterized by low agreeableness and low conscientiousness, along with higher risk of externalizing problems, conduct disorders, and antisocial outcomes. This is precisely the overwhelmingly pervasive FFM profile that subsumes dark triad features in youth and adults, particularly psychopathy (Paulhus et al., 2014; Lynam & Miller, 2015). Correlational (e.g., Salekin et al., 2010) and person-centered studies (e.g., Robins et al., 1996; Chabrol et al., 2015) between dark traits and FFM personality in youth highlight the building blocks of antagonistic personality and allow such profiles to be understood as variations in normal personality. Furthermore, they have underscored the high convergence between youth personality configurations

with adult profiles associated with criminality and other interpersonal maladaptive outcomes (Lynam, 1996; Lynam et al., 2007).

Some brief instruments have been developed specifically to assess dark personality traits in children and adolescents, mainly to capture the factors and overall scores on psychopathic personality. They include: The Antisocial Process Screening Device (APSD; Frick & Hare, 2001), the Psychopathy Checklist-Youth version (PCL-YV; Kosson et al., 2013), the Psychopathy Screening Device (PSD; Frick et al., 2000), The Youth Psychopathic Traits Inventory —along with its short and child versions (YPI; Andershed et al., 2002; YPI-S and YPI-CV; van Baardewijk et al., 2010), and the Inventory of Callous-Unemotional traits (ICU; Frick, 2004).

However, Dark Triad and Tetrad traits have been reliably studied in adolescent populations, typically employing time-efficient measures originally developed for adults, such as the SD3 and DD for the triad, and the SSIS, ASP, VAST, or CAST for sadism (Chabrol et al., 2015; Pineda et al., 2021). Stand-alone measures of other Triad members are rarer, although the Kiddie Mach scale (Christie & Geis, 1970) is an instrument that stands out as a Machiavellianism questionnaire for youth. Addressing dark personality traits early in the lifespan is associated with positive intervention results (Colins & Andershed, 2018; Ribeiro da Silva et al., 2020), and it is therefore vital to conduct research on these features in childhood and adolescence. Although most studies on youth antagonistic personalities have been conducted with a focus on psychopathic traits in general (Salekin, 2017) and callous-unemotional traits in particular (Frick & White, 2008; Frick & Ray, 2015) it is vital to broaden the scope and incorporate the assessment of the other Tetrad members, so

as to properly disentangle the distinctive contributions of each trait to maladaptive outcomes (Paulhus & Williams, 2002; Paulhus, Buckels, et al., 2021).

Just as in fine-grained, comprehensive research on the influence of FFM personality facets and nuances on life outcomes (Stewart et al., 2022), more insight can be gained and proper tailored intervention efforts can be directed at youth scoring high on dark personality traits if the focus is widened to include the Dark Tetrad constellation.

Aims

Given the gaps in the literature on normal and dark personality assessment in youth, highlighted above, the aims of the present dissertation were the following:

1. Construct an abridged, psychometrically sound instrument of normal personality for adolescents, focused on a comprehensive assessment of the five broad domains within the FFM. This questionnaire should be as representative of the five-factor model as possible at the level of second-order facets, thereby emphasizing fidelity.
2. Make available a second, even more abridged questionnaire, aimed at covering the core features of the five broad domains. This questionnaire should emphasize construct breadth over fidelity (while still retaining adequate levels of the latter), in order to provide a more time-efficient measure.
3. Ensure adequate psychometric properties of both brief, normal personality questionnaires in terms of reliability (i.e., test-retest and internal consistency) and validity (i.e., structure, criterion, and convergent).
4. Adapt and validate a Spanish version of the SD4. Given its intended original population (i.e., community adults) this will be the employed sample for the

study corresponding to the present aim. Ensure adequate psychometric properties of the Spanish version of the SD4 in line with reliability and validity features mentioned in aim 3.

5. Employ a short measure of FFM personality developed for adults, similar to the brief comprehensive instrument developed to cover aim 2, in order to have a specific focus on the overlap among normal and dark personality in the adaptation of the SD4.
6. Have a specific focus on adding supporting evidence to the advances in the dark trait literature provided by the SD4: among aforementioned improvements, a more adequate depiction of Machiavellianism and empirical evidence supporting the position of sadism within the Dark Tetrad framework.
7. Validate the SD4 in a Spanish sample of community adolescents, whereby adequate assessment of the Tetrad traits is ascertained in this population, ensuring proper psychometric properties summarized above.
8. Employ the second, more time-efficient and comprehensive brief measure of FFM personality for adolescents developed in line with aim 2, in order to uncover the underlying FFM profile of the SD4 features. This last aim will provide further, cross-cutting evidence of convergent validity, both for our abridged personality measure and the Spanish version of the SD4.

Hypotheses

In line with the outlined aims, the following hypotheses are contemplated for the results obtained in the dissertation studies:

a) Both shortened FFM personality measures will yield a valid five-factor structure and show evidence of reliability and construct validity.

b) Each shortened FFM personality measure will align with its intended aim regarding item length and content (i.e., the measure emphasizing fidelity will be longer, representing all 30 facets, whereas the instrument underscoring construct breadth will be shorter and cover the core features of each domain).

c) The SD4 adaptation for adults will show adequate reliability and validity indices, proving to be a sound measure for the assessment of the Dark Tetrad in the Spanish-speaking adult population.

d) The SD4 will be validated for its use with adolescents, including evidence of age invariance against the adult sample employed to adapt the SD4.

e) Both studies on the SD4 will show expected patterns of correlations with FFM personality traits: agreeableness will be negatively associated with the four dark traits, extraversion will correlate positively with narcissism, and conscientiousness will be related negatively to psychopathy and negligibly or slightly positively to Machiavellianism.

Study 1. JS NEO-A60

Ortet-Walker, J.[1], Mezquita, L.[1,2], Vidal-Arenas, V[1]., Ortet, G.[1,2], & Ibáñez, M. I[1,2]. (2022). **Validation of an abridged, 60-item form, of the Junior Spanish NEO inventory (JS NEO-A60)**. *Current Psychology, 41*(9), 6620-6630. https://doi.org/10.1007/s12144-020-01135-y

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Abstract

The aim of this study was to develop a 60-item, abridged form of the Junior Spanish version of the NEO-PI-R (JS NEO-A60), consisting of 12 items per dimension. A sample of 399 high school students completed two personality scales to examine the factor structure (Exploratory Structural Equation Model), reliability and convergent validity of the JS NEO-A60. Our sample also completed several consequential life outcome measures in order to examine criterion validity. The five-factor structure, along with representation of the majority of lower-order facets, was satisfactorily covered by the JS NEO-A60. Sources of reliability (internal consistency and test-retest) and validity (convergent) were adequate. The life outcome variables revealed links to personality traits in the expected direction. Namely, internalizing emotional symptoms (anxiety and depression) were mainly predicted by emotional instability. Symptoms of behavioral problems (aggression and antisocial behavior) were predicted by low scores in both agreeableness and conscientiousness. Life satisfaction was significantly predicted by emotional stability. Last, academic performance via students' grades was predicted by conscientiousness and openness. We conclude that the JS NEO-A60 is a sound inventory to assess the five broad personality domains in Spanish-speaking adolescents.

Keywords: Personality assessment, Validation, Adolescents, Abridged, JS NEO-A60.

Introduction

The construct of personality has been widely studied and shown to be highly pervasive in many areas of one's life, including consequential outcomes (Soto, 2019) as well as mental disorders (Kotov et al., 2010). When considering psychopathology, studies have shown the important predictive power of personality traits on the general (or p) factor of psychopathology (Caspi et al., 2014; Etkin et al., 2020), and also its internalizing and externalizing spectrums (Mezquita et al., 2015; Oltmanns et al., 2018). In fact, in recent years, a new taxonomy of psychopathology has arisen, the HiTOP model (Kotov et al., 2017; Widiger et al., 2019), which accounts for broad personality traits as core features of mental disorders from a dimensional standpoint. As for the structure of personality, the Five-Factor models, aka Big Five, (FFM; McCrae & Costa, 2010) account for the current scientific consensus as the main personality taxonomy frameworks (John et al., 2008).

The most employed FFM assessment instruments are the NEO Personality inventories (NEO-PI-R and NEO-PI-3; McCrae & Costa, 2010). This framework is composed of five basic personality traits: neuroticism, extraversion, openness, agreeableness and conscientiousness, which are a) relatively stable across time in the whole life span (Ibáñez et al., 2016; Damian et al., 2019), b) fairly consistent across situations (Lensvelt-Mulders & Hettema, 2001), and c) genetically rooted in part (Kandler & Papendick, 2017). Broadly, the characteristics of each trait as covered by McCrae and Costa (2010) highlight the following features: neuroticism encompasses individual differences in the propensity toward negative emotions like anxiety and depression. Extraversion refers to the

variability in the tendency toward feeling positive emotions such as enthusiasm, as well as socializing with others and engaging in thrilling activities. Openness to experience is characterized by the individual differences in curiosity, holding unconventional ideas and aesthetic appreciation. Agreeableness corresponds with the different levels of empathy, kindness and consideration toward others. Finally, conscientiousness refers to the variability in the propensity toward persistence in tasks, engaging in goal-oriented behavior and impulse control (Morizot, 2014).

The five personality factors commonly identified in adults can also be extracted in youth assessments (at least from early adolescence on; Soto et al., 2008; Soto & Tackett, 2015). The FFM has also been found to overlap and correspond with temperament traits, studied in greater depth in child and adolescent populations (De Pauw, 2016). The presence of FFM personality structure in populations as young as 12-13, coupled with the influence of these traits in an array of life outcomes for adolescents, like happiness (Suldo et al., 2015), psychopathology (Brandes et al., 2019), antisocial behavior (Mann et al., 2016) or substance use (Stautz & Cooper, 2013; Ibáñez et al., 2015), make it imperative to develop psychometrically sound FFM assessment instruments for this population segment.

There are three major strategies that researchers have used in their effort to assess FFM personality in youth populations (each with their advantages and drawbacks). Namely, the first strategy would involve assessing adolescents with unmodified adult versions of questionnaires (e.g. Brandt et al., 2020). This procedure would be extremely beneficial to longitudinal studies or for the comparison of adults and adolescents, as identical instruments would be administered. The main limitation to this strategy is the

level of difficulty in the items themselves (especially for the youngest participants). Furthermore, certain items may not be appropriate for adolescents due to the wording and/or maturity-based content (Ortet et al., 2012; Rogers & Glendon, 2018).

The second strategy consists of the development of original, customized questionnaires for adolescents. Some examples include the Adolescent Personality Style Inventory (APSI; Lounsbury et al., 2003), or the Hierarchical Personality Inventory for Children (HiPIC; Mervielde & De Fruyt, 1999). The advantage to the second strategy is in the nature of the tests being specifically customized for youth, with appropriate item content, but an important drawback is the inadequacy of their use in longitudinal or adult-adolescent comparative studies, as the inventories employed would be distinct.

Finally, the third strategy involves the adaptation of adult versions of questionnaires, modifying only some of the more problematic items to make them more easily relatable, understandable, and age-appropriate in general. An example of this type of scale is the NEO-PI-3 (McCrae & Costa, 2010). Importantly, this instrument (a slightly modified version of the NEO-PI-R; Costa & McCrae, 1992) specifies its use for individuals as young as 12, while NEO-PI-3 adaptations to other cultures (e.g. Dutch version; Hoekstra & De Fruyt, 2014) recommend a starting point of 16 years. Another instrument that fits into this third category is the JS NEO (Ortet et al., 2012), an adapted form of the NEO-PI-R for Spanish adolescents. This inventory was constructed by adapting half of the NEO-PI-R items, in order to be made suitable for adolescents from 12 to 17 years of age in the Spanish general population (Ortet et al., 2012). While the third strategy wouldn't necessarily allow for administration of identical measures in longitudinal research or adult-adolescent comparative studies, it likely entails the best balance between sound

psychometric qualities in adolescent assessment, and fidelity with corresponding adult scales.

To the best of our knowledge, the JS NEO, mentioned above, is the only NEO-based personality inventory developed within the third strategy in the Spanish language. There are two versions of this questionnaire, a 240-item long form (Ortet et al., 2012), and a 150-item short form (JS NEO-S; Ortet et al., 2010), both suitable for Spanish adolescents between the ages of 12 and 17. They have both shown reliable and valid properties regarding the five basic traits and respective lower order facets (6 per domain). Notwithstanding, even the short version is quite lengthy, and time can be an important issue in contexts where school timetables allow for limited administration times, or research projects require administering large batteries of tests. Consequently, abridged FFM instruments (usually 50-60 items or shorter), most of them in English, are used more and more to tackle these constraints. They typically perform adequately, with acceptable balance between their psychometric properties and conciseness (e.g. BFI-2, Soto & John, 2017; HiPIC-30, Vollrath et al., 2016; NEO-FFI-3, McCrae & Costa, 2007; IPIP-50, Goldberg, 1992; BFPTSQ, Morizot, 2014; FFM-APQ; Rogers & Glendon, 2018).

Given the current scarcity of FFM personality questionnaires within the NEO model for Spanish adolescents (particularly brief measures), the aim of this study was to develop such an instrument consisting of 60 items, the JS NEO-A60. We specifically aimed at attempting to preserve indices of validity and reliability, balanced out with a reduced length toward saving time and resources for assessment purposes. The current study explored the factor structure of the JS NEO-A60, along with the reliability and validity of its scales in a non-clinical sample. We followed recommendations for the development

of short versions (Marsh et al., 2010), employing a strong instrument (the JS NEO-S) and aimed at preserving the content of both the five broad domains and the second-order facets. We then explored the same factor structure at the domain level as the original form, as well as examining reliability and validity indices.

Our main hypotheses were the following: each of the five personality dimensions in the FFM would be satisfactorily assessed by the JS NEO-A60 (hypothesis 1). Bandwidth would be preserved (i.e. items corresponding with the NEO facets would be adequately represented) (hypothesis 2). The JS NEO-A60 scales would have significant correlations with equivalent domain scales from a different FFM personality measure (the BFPTSQ), ascertaining convergent validity (hypothesis 3). Internalizing symptoms (anxiety and depression) would be mainly related to neuroticism (Kotov et al., 2010) (hypothesis 4). Externalizing problems (antisocial and aggressive behaviors) would mainly be associated with (low) agreeableness and (low) conscientiousness (Jones et al., 2011) (hypothesis 5). A measure of life satisfaction would be particularly associated with (low) neuroticism and extraversion (Steel et al., 2019) (hypothesis 6). Last, academic achievement would be related mainly to conscientiousness and openness (Poropat, 2014) (hypothesis 7).

Method

Participants and Procedure

We recruited a sample from a high school of convenience in a city in eastern Spain. All students from first year to fourth year of compulsory secondary education were invited to participate, and 405 of them returned signed written parental consent forms and responded to the questionnaires. However, six of these participants did not complete all of the scales, yielding a final sample of 399 students between 12 and 17 years of age

(Mean age = 14.32 years; *SD* = 1.57; 50.9% males, 49.1% females). We readministered the JS NEO A-60 one month later to a sub-sample of 226 students between the ages of 13 and 17 (Mean age = 15.15; *SD* = 0.99; 47.3% males, 52.7% females).

This study was part of a broader research aimed at ascertaining psychosocial risk and protective factors pertaining to mental health (see Moya-Higueras et al., 2020 for more details). Written consent forms were handed out to parents or legal guardians and returned, and trained research assistants administered the battery of tests. Three 1-hour sessions were required. The present study was approved by the ethical committee from the authors' university.

Measures

A sociodemographic survey was completed by all participants. Information requested included the students' age, gender, current academic year, whether they had repeated courses, nationality, parents' occupation and parents' level of education.

The Short form of the Junior Spanish version of the NEO-PI-R (JS NEO-S; Ortet et al., 2010). This scale is a 150-item adaptation of the NEO-PI-R personality questionnaire for Spanish adolescents (JS NEO), tailored for assessment of youth aged 12 to 17. It consists of statements answered on a 5-point Likert-type scale (0 = *Strongly disagree*; 4 = *Strongly agree*). The questionnaire allows for the assessment of the five broad FFM domains, and also their respective six lower-order facets. Internal consistency reliabilities for each domain ranged between α = .71 and .93.

Big Five Personality Trait Short Questionnaire (BFPTSQ; Morizot, 2014), Spanish version (Ortet et al., 2017). This is a short personality questionnaire for both adolescents and adults consisting of 50 items, assessing the broad dimensions in the FFM. The scale

contains statements answered on a 5-point Likert-type scale (0 = *Disagree strongly*; 4 = *Agree strongly*). Internal consistency reliabilities found in the present sample were: .80 for emotional stability (low neuroticism), .77 for extraversion, .80 for openness, .74 for agreeableness, and .74 for conscientiousness.

The Assessment System for Children and Adolescents (SENA; Sánchez-Sánchez et al., 2016). This inventory assesses many common behavioral and emotional problems in the child and adolescent population. The sub-scales selected for the present study were two from the externalizing spectrum (antisocial behavior and aggression), and two from the internalizing spectrum (depression and anxiety). Internal consistency reliabilities in the present study were .81 for antisocial behavior, .74 for aggression problems, .91 for depressive symptoms and .89 for anxiety symptoms.

The Student's Life Satisfaction Scale (SLSS; Huebner et al., 1998), Spanish version (Galindez & Casas, 2010). This is a short, 7-item inventory that assesses self-reported life satisfaction among youth between the ages of 8 and 18. It consists of 5 subscales regarding satisfaction in different areas: Family, Friends, School, Living Environment, and Self. Internal consistency reliability of the SLSS in the present study was .79.

A Single item assessing academic performance: 'What grades did you obtain last school year?', with a 5-point scale response format ranging from 0 = Normally failed, to 4 = Normally outstanding.

Data Analyses

We used the JS NEO-S to extract the 60 items corresponding to the JS NEO-A60. To this end, a balance between representation of FFM lower-order facets and adequate structure and reliability was carefully studied. Following a recommended strategy (Marsh et al., 2010), items were iteratively selected and replaced in several Exploratory Factor Analyses (EFA, Varimax rotation). We aimed at achieving: a) adequate bandwidth, selecting items from all facets if possible; b) adequate factor structure, containing items with the highest loadings on their respective domains and low loadings on all others; and c) adequate internal consistency reliability. Once the previous requirements were met, an ESEM model was performed. This factor model was estimated using 16 a priori correlated uniquenesses (CUs), which are employed in studies of FFM structure due to items relating to the same domain, or sharing similar content. We employed the robust maximum likelihood estimator (MLR), providing adjusted standard errors and statistical fit tests that are robust to nonnormality in the data. We also calculated and reported confidence intervals (99%), and studied several goodness-of-fit indices, namely: chi-square, comparative fit index (CFI), Tucker-Lewis index (TLI), root mean square error of approximation (RMSEA), and standardized root mean square residual (SRMR) (see Morizot, 2014 for a similar procedure).

Temporal stability was explored by assessing participants in a one-month retest. Convergent validity indices were obtained by means of the BFPTSQ scale. Finally, criterion validity was obtained through stepwise multiple linear regression analyses, predicting externalizing behaviors, internalizing symptoms, life satisfaction and school grades. Age and gender were controlled for in these regressions. Reliability and validity analyses were

conducted employing SPSS software, version 26. ESEM was performed employing Mplus software, version 8 (Muthén & Muthén, 2017).

Results

Sample Characteristics

Descriptive statistics (frequency and percentage) of several sociodemographic characteristics are presented in Table 3. The most common (Spanish) and second most frequent (Romanian) nationalities are provided, with an additional "Other" category. Most of the participants from countries other than Spain or Romania were from several other European countries. Parents' professions were grouped into categories (e.g. construction workers and factory workers were labeled as "laborers") (see Table 3).

ESEM

Goodness-of-fit values obtained from ESEM analysis were acceptable (χ^2/df = 1.42). However, the chi-square test did not acquire non-significance and the TLI value was slightly lower than recommended for acceptable fit (≥ .90). The chi-square result was expected due to its sensitivity to sample size. (see Table 4).

All target loadings were statistically significant. Notwithstanding, two of the 60 items (item 121 from the openness domain and item 30 from the conscientiousness domain) had loadings slightly lower than .30. Two cross-loadings higher than .30 appeared on the neuroticism domain (conscientiousness item 102) and on the agreeableness domain (conscientiousness item 108). These cross-loadings were not higher than any of the dimension's target loadings. All but one of the thirty NEO facets

contained at least one item each (the facet *Actions*, from the openness domain, could not be adequately represented) (see Table 5).

Convergent-Discriminant Validity

Correlations among analogous BFPTSQ and JS NEO-A60 traits were satisfactory: Neuroticism -.56 (BFPTSQ emotional stability), extraversion .57, openness .58, agreeableness .54, conscientiousness .67. These indices were only slightly lower than the correlations among BFPTSQ domains and the 150-item JS NEO-S (-.62, .61, .59, .62, and .72, respectively). Non-equivalent traits, such as JS NEO-A60 extraversion and BFPTSQ conscientiousness, had much weaker links, ascertaining discriminant validity (see Table 6). Furthermore, correlations between JS NEO-A60 domains and respective JS NEO-S facets were high (see Table 1 in Electronic Supplementary Material).

Reliability

Table 6 also presents the Cronbach's alpha indices for each of the five JS NEO-A60 domains, along with temporal stability indices. All internal consistency coefficients were satisfactory, ranging from .75 to .84. 1-month retest correlations were also adequate, ranging from .75 to .83.

Criterion Validity

Male gender was significantly related only to aggression, whereas females showed higher links to both internalizing measures and academic achievement. Mainly antagonism (low agreeableness) and (low) conscientiousness predicted higher scores in both antisocial and aggression scales, with higher scores in extraversion contributing to aggressive behaviors. Anxiety and depression were mainly linked to neuroticism, with

(low) extraversion contributing to the prediction of depressive symptoms. Life satisfaction was predicted by emotional stability (low neuroticism) and extraversion. Finally, higher school grades were linked to conscientiousness and openness (see Table 7).

Discussion

Within the personality psychology framework with the most backing, the FFM (Soto, 2019), the NEO inventories are some of the most employed instruments. In our sociocultural context, as far as we know, questionnaires that fully capture the NEO facets are lacking. Thereby, we developed the abridged JS NEO-A60. The scale showed adequate psychometric properties despite the inventory's brevity. The ESEM analysis revealed that the scale covered the FFM broad domains adequately, with adequate target loadings of items and acceptable goodness-of-fit indices. FFM bandwidth was reasonably adequate, whereby 29 of the 30 facets were covered by at least one item. *Actions*, from the openness dimension was not properly represented. Previous studies have posited that this domain would cover the facets most bound by psychological maturity in youth (Mervielde et al., 1995; Soto et al., 2008). Therefore, openness may not fully emerge until late adolescence, with its manifestations growing more and more sophisticated as children age (Allik et al., 2004; Tackett et al., 2012).

As for our reliability and validity hypotheses, the results were mainly consistent with our initial predictions. The moderate to high internal consistencies and temporal stabilities of the JS NEO-A60 traits were adequate and comparable to those of other abridged questionnaires (McCrae & Costa, 2010; Morizot, 2014; Soto & John, 2017). In line with other studies (Ortet et al., 2012; Morizot, 2014), correlations with respective JS

NEO-S facet scales were all statistically significant and moderate-to-high, including the association with the *Actions* facet, which could not be adequately covered in the JS NEO-A60.

After controlling for age and gender, criterion validity indices were mostly in the expected direction. Consistent with previous studies in adults (Kotov et al., 2010), internalizing symptoms (depression and anxiety symptoms) were scored highest by the more neurotic adolescents. Also, depressive symptoms were more common in introverts, supporting the theoretical premise that (low) positive emotionality (highly related to introversion) would be a personality-related vulnerability toward the development of depression (Khazanov & Ruscio, 2016). As for externalizing problems, the more antagonistic and unconscientious adolescents scored higher on the antisocial and aggressive behavior scales, consistent with previous research (Jones et al., 2011; Kotov et al., 2010).

As expected, scores on life satisfaction were linked with the more emotionally stable and extraverted youngsters, which is consistent with results from the adult literature (Steel et al., 2019) and also in previous studies with adolescents (Suldo et al., 2015; Weber & Huebner, 2015). Finally, academic achievement was strongly associated with adolescents scoring high on conscientiousness and, to a lesser extent, being more open to experience. These traits have shown to be the most relevant personality factors at all levels of education, from primary to tertiary (Poropat, 2014; Richardson et al., 2012; Vedel, 2014).

The main limitation of the present study was employing a convenience sample that may have constrained the generalization of our findings. Also, wider and more

representative samples of adolescents for replication studies would be highly desirable to tackle these obstacles in future research efforts. Despite these limitations, the psychometric properties evinced in the present study would regard the JS NEO-A60 as a useful tool for the assessment of the FFM domains in the Spanish-speaking adolescent population. This consideration would be especially apt when having to concurrently administer a large number of other questionnaires. The JS NEO-A60 can be especially useful in future studies on the association between personality traits and other relevant, problematic issues in adolescence, such as gambling, videogame abuse, and alcohol and other drug use.

Declarations

Availability of Data and Material

Data are openly available in https://osf.io/safn4/

Code Availability

Code with ESEM analysis is openly available in https://osf.io/g6r2s/

Table 3

Sample Characteristics

Characteristic		*n* (%)	Characteristic		Father; *n* (%)	Mother; *n* (%)
Age (years)	12	61 (15.3)	Occupation			
	13	79 (19.8)		Liberal professions	77 (19.3)	59 (14.8)
	14	79 (19.8)		Businessman/woman	20 (5)	7 (1.8)
	15	69 (17.3)		Clerical staff	69 (17.3)	73 (18.3)
	16	74 (18.5)		Civil servants	59 (14.8)	60 (15)
	17	37 (9.3)		Laborers	63 (15.7)	4 (1)
Gender	Males	203 (50.9)		Housewives	0 (0)	122 (30.5)
	Females	196 (49.1)		Students	1 (0.3)	2 (0.5)
Current academic year	First year	97 (24.3)		Unemployed	17 (4.7)	29 (7.3)
	Second year	80 (20.1)		Retired	7 (1.8)	1 (0.3)
	Third year	86 (21.6)		Others	52 (12.5)	28 (7)
	Fourth year	133 (33.3)		Not indicated	34 (8.6)	14 (3.5)
	Not indicated	3 (0.7)	Level of education			
Repeated courses	No	279 (69.9)		No studies	6 (1.5)	9 (2.3)
	One year	81 (20.3)				
	Two years	33 (8.3)				
	Three years	3 (0.7)		Primary	37 (9.3)	39 (9.8)
Nationality	Spanish	260 (65.2)		Secondary	205 (51.4)	218 (54.6)
	Romanian	23 (6.6)		University	129 (32.3)	125 (31.3)
	Other	83 (19.9)				
	Not indicated	33 (8.3)		Not indicated	22 (5.5)	8 (2)

Table 4

Goodness-Of-Fit Statistics From the Exploratory Structural Equation Model

Model	χ^2 *(df)*	*CFI*	*TLI*	*RMSEA*	*90% CI*	*SRMR*
JS NEO-A60 ESEM	2075.372* (1464)	.90	.88	.03	[.029, .035]	.04

Note. ESEM = exploratory structural equation modeling; χ^2 = chi square; df = degrees of freedom, CFI = comparative fit index; TLI = Tucker-Lewis index, RMSEA = root mean square error of approximation 90% CI = 90% confidence interval of the RMSEA; SRMR = standardized root mean square residual.

*$p < .001$

Table 5

Standardized Factor Loadings From the Exploratory Structural Equation Model of the JS NEO-S Items Selected for the JS NEO-A60

	Neuroticism		*Extraversion*		*Openness*		*Agreeableness*		*Conscientiousness*	
JS NEO-S items (facets)	λ	99% CI	λ	99% CI	λ	99% CI	λ	99% CI	λ	99% CI
16 (Self con)	**.433*****	[.266, .600]	-.130*	[-.278, .018]	.088	[-.084, .259]	.043	[-.125, .211]	.054	[-.127, .235]
26 (Vuln)	**.465*****	[.281, .649]	-.063	[-.209, .082]	.003	[-.166, .171]	-.041	[-.216, .133]	.002	[-.170, .175]
47 (Self con)	**.571*****	[.421, .721]	-.179***	[-.296, .062]	.070	[-.075, .216]	.043	[-.108, .194]	.068	[-.092, .228]
62 (Anxiety)	**.417*****	[.231, .602]	.039	[-.095, .173]	-.036	[-.227, .155]	-.104	[-.297, .089]	.000	[-.189, .188]
88 (Vuln)	**.736*****	[.608, .863]	.029	[-.087, .145]	.005	[-.139, .148]	.179**	[.031, .327]	.042	[-.130, .214]
98 (Ang host)	**.454*****	[.298, .610]	.027	[-.105, .158]	-.105	[-.251, .041]	-.227***	[-.389, -.066]	.019	[-.148, .186]
103 (Dep)	**.626*****	[.487, .766]	.068	[-.185, .049]	-.015	[-.159, .130]	-.054	[-.208, .100]	.042	[-.104, .188]
109 (Self con)	**.700*****	[.571, .829]	-.139**	[-.258, -.020]	-.037	[-.172, .097]	.201***	[.069, .334]	.096	[-.056, .247]
114 (Impul)	**.424*****	[.262, .586]	.236***	[.103, .368]	-.007	[-.174, .160]	-.109	[-.293, .076]	-.005	[-.193, .184]
124 (Anxiety)	**.512*****	[.364, .659]	.059	[-.061, .180]	.125*	[-.031, .281]	-.110	[-.260, .040]	.034	[-.117, .186]
129 (Ang host)	**.525*****	[.377, .673]	-.026	[-.148, .096]	.055	[-.101, .281]	-.135*	[-.281, .012]	.151**	[.010, .293]
134 (Dep)	**.700*****	[.564, .836]	-.008	[-.121, .106]	.019	[-.125, .162]	.052	[-.096, .201]	.012	[-.158, .183]
7r (Gregari)	-.182**	[-.346, -.018]	**.497*****	[.363, .632]	-.074	[-.236, .089]	.031	[-.148, .210]	-.028	[-.207, .151]
17 (Activity)	-.102	[-.266, .062]	**.468*****	[.328, .607]	.005	[-.179, .189]	-.041	[-.224, .142]	.017	[-.161, .195]
38 (Gregari)	-.027	[-.165, .111]	**.551*****	[.404, .698]	-.111	[-.261, .038]	-.024	[-.180, .131]	.059	[-.109, .227]
58 (Pos em)	-.035	[-.193, .123]	**.488*****	[.358, .617]	.140*	[-.024, .305]	-.037	[-.226, .151]	-.052	[-.206, .103]
63 (Warmth)	-.011	[-.136, .114]	**.674*****	[.569, .779]	.089	[-.039, .217]	.059	[-.088, .207]	-.036	[-.179, .108]
79 (Activity)	-.048	[-.170, .075]	**.645****	[.533, .756]	.090	[-.044, .225]	.018	[-.120, .156]	-.106	[-.259, .046]
84 (Exc)	.128	[-.026, .282]	**.397*****	[.249, .545]	-.123	[-.309, .063]	-.212**	[-.390, -.035]	-.158*	[-.353, .037]
94 (Warmth)	-.023	[-.192, .145]	**.458*****	[.307, .608]	-.055	[-.228, .119]	.196**	[.008, .384]	-.062	[-.238, .114]
120 (Pos em)	-.091	[-.255, .044]	**.609*****	[.486, .732]	-.091	[-.224, .041]	.123*	[-.022, .268]	.060	[-.085, .204]
130 (Gregari)	-.004	[-.139, .131]	**.642*****	[.532, .752]	-.182**	[-.334, -.030]	.011	[-.141, .163]	-.051	[-.223, .121]
135 (Asserti)	.149*	[-.009, .308]	**.465*****	[.340, .590]	.107	[-.057, .271]	-.162*	[-.324, .000]	-.103	[-.271, .066]
151 (Pos em)	.030	[-.116, .176]	**.514*****	[.378, .650]	.097	[-.068, .262]	.042	[-.117, .200]	-.068	[-.244, .107]
8r (Aesth)	.044	[-.124, .212]	.018	[-.128, .164]	**.415*****	[.227, .604]	.030	[-.164, .225]	-.023	[-.206, .160]
23 (Ideas)	-.018	[-.185, .149]	-.150**	[-.294, -.005]	**.362*****	[.181, .544]	.041	[-.137, .220]	-.002	[-.181, .176]
33 (Fantasy)	.204**	[.041, .366]	-.039	[-.181, .103]	**.379****	[.196, .563]	-.131*	[-.285, .022]	-.246***	[-.423, -.069]
39r (Aesth)	.046	[-.113, .206]	.092	[-.034, .219]	**.464****	[.315, .614]	.080	[-.075, .234]	-.115	[-.285, .055]
54r (Ideas)	-.228**	[-.408, -.048]	-.070	[-.206, .066]	**.418*****	[.241, .595]	.150*	[-.020, .320]	-.210**	[-.410, -.011]

69 (Aesth)	.021	[-.126, .168]	-.084	[-.198, .030]	**.690*** **	[.546, .834]	-.013	[-.144, .118]	-.069	[-.218, .079]
85 (Ideas)	-.049	[-.184, .086]	-.162**	[-.288, -.036]	**.481*** **	[.314, .649]	-.020	[-.169, .128]	-.025	[-.191, .141]
95 (Fantasy)	.215**	[.044, .386]	.109	[-.045, .263]	**.313*** **	[.114, .513]	.049	[-.113, .210]	-.206**	[-.398, -.014]
121 (Values)	-.107	[-.291, .077]	-.138*	[-.287, .011]	**.265****	[.068, .462]	.170*	[-.026, .365]	-.203**	[-.389, -.018]
131 (Aesth)	-.080	[-.237, .076]	.006	[-.111, .122]	**.715*** **	[.555, .875]	-.138*	[-.310, .034]	-.041	[-.210, .127]
136 (Feelings)	.191**	[.046, .336]	.231***	[.103, .359]	**.436*** **	[.280, .592]	-.130*	[-.290, .029]	-.078	[-.270, .113]
147 (Ideas)	.006	[-.153, .166]	.059	[-.073, .190]	**.496*** **	[.345, .647]	-.148*	[-.307, .011]	.077	[-.101, .255]
9r (Straight)	.041	[-.083, .165]	.059	[-.056, .175]	-.098	[-.227, .031]	**.688*** **	[.552, .824]	-.076	[-.216, .065]
14r (Altruism)	-.040	[-.189, .109]	.035	[-.097, .167]	.145*	[-.018, .307]	**.533*** **	[.377, .688]	-.075	[-.249, .100]
19r (Compli)	-.030	[-.207, .147]	-.037	[-.185, .111]	-.041	[-.212, .131]	**.448*** **	[.284, .612]	.008	[-.184, .200]
29 (Tender)	.198***	[.054, .342]	.183***	[.051, .314]	-.034	[-.185, .116]	**.481*** **	[.301, .660]	-.016	[-.180, .147]
45r (Altruism)	-.106	[-.255, .044]	.023	[-.105, .151]	-.059	[-.206, .088]	**.620*** **	[.467, .774]	-.014	[-.184, .156]
65r (Trust)	-.253***	[-.434, -.073]	.129*	[-.016, .274]	-.014	[-.195, .167]	**.373*** **	[.175, .571]	-.137	[-.335, .060]
76r (Altruism)	-.111	[-.267, .044]	-.019	[-.138, .100]	-.066	[-.204, .072]	**.693*** **	[.568, .817]	-.052	[-.219, .115]
86r (Modesty)	.101	[-.052, .255]	-.002	[-.146, .141]	.045	[-.116, .205]	**.463*** **	[.287, .640]	-.125	[-.294, .045]
101r (Straight)	-.087	[-.217, .043]	-.017	[-.127, .093]	-.033	[-.169, .102]	**.634****	[.489, .779]	.020	[-.106, .145]
132r (Straight)	-.081	[-.228, .066]	-.103*	[-.218, .012]	-.012	[-.156, .131]	**.631*** **	[.482, .781]	-.057	[-.200, .085]
148r (Modesty)	.168*	[-.005, .341]	-.076	[-.212, .060]	.086	[-.093, .265]	**.424*** **	[.217, .631]	-.154*	[-.351, .044]
153r (Tender)	.095	[-.059, .248]	-.002	[-.140, .136]	.134*	[-.032, .300]	**.505*** **	[.335, .675]	-.205**	[-.392, -.019]
10 (Order)	-.082	[-.246, .083]	.107	[-.033, .246]	-.008	[-.179, .163]	.125*	[-.038, .289]	**.455*** **	[.288, .622]
15 (Duti)	.001	[-.164, .166]	-.002	[-.146, .143]	.007	[-.159, .174]	.205**	[.040, .369]	**.458*** **	[.313, .602]
25 (Self dis)	-.095	[-.253, .063]	.121*	[-.015, .257]	.120*	[-.035, .274]	.072	[-.102, .247]	**.518*** **	[.366, .669]
30 (Deli)	-.056	[-.242, .131]	-.048	[-.205, .110]	.123	[-.081, .328]	.213**	[.032, .395]	**.255****	[.040, .470]
36r (Compet)	-.067	[-.235, .101]	.040	[-.105, .186]	.236**	[.057, .414]	.194**	[.005, .384]	**.310*** **	[.113, .507]
66 (Compet)	-.050	[-.232, .133]	.058	[-.091, .207]	.0151*	[-.032, .333]	.000	[-.177, .178]	**.449*** **	[.277, .622]
82 (Achieve)	.052	[-.103, .208]	.157**	[.021, .294]	.204**	[.037, .371]	.239**	[.049, .429]	**.406*** **	[.229, .583]
87 (Self dis)	.032	[-.140, .205]	.090	[-.065, .244]	.155*	[-.014, .325]	.272***	[.083, .461]	**.336*** **	[.131, .541]
92 (Deli)	.049	[-.129, .227]	.030	[-.123, .182]	.104	[-.073, .281]	.158*	[-.032, .347]	**.374*** **	[.196, .552]
102r (Order)	.316***	[-.468, -.164]	.008	[-.129, .144]	.058	[-.105, .220]	.055	[-.101, .212]	**.459*** **	[.287, .632]
108 (Duti)	-.028	[-.173, .117]	.067	[-.057, .191]	.223***	[.075, .372]	.306***	[.152, .459]	**.398*** **	[.246, .551]
113 (Achieve)	-.137*	[-.299, .025]	.176**	[.033, .320]	.187**	[.030, .343]	-.032	[-.201, .138]	**.459*** **	[.309, .609]

Note. Ang host = Angry hostility; Dep = Depression; Self con = Self-consciousness; Impul = Impulsiveness; Vuln = Vulnerability; Gregari = Gregariousness; Asserti = Assertiveness; Exc = Excitement seeking; Pos em = Positive emotions; Aesth = Aesthetics; Straight = Straightforwardness; Compli = Compliance; Tender = Tender-mindedness; Compet = Competence; Duti = Dutifulness; Achieve = Achievement striving; Self dis =

Self-discipline; Deli = Deliberation. Shaded entries are the target loading items. Target loadings are shown in bold. Item numbers with an r are reverse scored. λ = factor loadings, 99% CI = 99% confidence interval.

*$p < .05$. **$p < .01$. *** $p < .001$.

Table 6

Correlations Between JS NEO-A60 and JS NEO-S Traits, With BFPTSQ Domains, Internal Consistency and Test-Retest Indices

	JS NEO-S/ A60 N	JS NEO-S/ A60 E	JS NEO-S/ A60 O	JS NEO-S/ A60 A	JS NEO-S/ A60 C	*Cronbach's α value JS NEO-S/ A60*	*Test-Retest*
BFPTSQ Em St	-.62***/ **-.56*** **	.12*/ .03	-.16**/ -.20***	.19***/ .16**	.22***/ .13*	.83/ **.84**	**.75*** **
BFPTSQ E	-.23***/ -.21***	61***/ **.57*** **	.15**/ .04	-.01/ .01	.15**/ .12*	.83/ **.82**	**.81*** **
BFPTSQ O	.10/ .11*	.13**/ .15**	.59***/ **.58*** **	.04/ -.02	.09/ .10*	.78/ **.75**	**.77*** **
BFPTSQ A	-.30***/ -.26***	.24***/ .20***	.19***/ .13*	.62***/ **.55*** **	.40***/ .37***	.84/ **.83**	**.77*** **
BFPTSQ C	-.31***/ -.30***	.17**/ .07	.13**/ .12*	.34***/ .32***	.72***/ **.67*** **	.90/ **.84**	**.83*** **

Note. N = Neuroticism; Em St = Emotional Stability; E = Extraversion; O = Openness; A = Agreeableness; C = Conscientiousness. Correlations between analogous JS NEO-A60 traits and BFPTSQ domains, along with JS NEO-A60 internal consistency and test-retest indices, are shown in bold.

*p < .05. **p < .01. *** p < .001.

Table 7

Criterion Validity Values, Represented by Multiple Linear Regressions Predicting Different Measures

		Agr (ext)		Ant (ext)		Anx (int)		Dep (int)		Life satisfaction		Grades	
Step	Variable	ΔR^2	β	ΔR^2	β	ΔR^2	β	ΔR^2	β	ΔR^2	β	ΔR^2	β
1		.03		.08		.12		.05		.07		.08	
	Age		.11		.26**		.15*		.13*		-.26**		-.24**
	Gender		-.15*		-.12		.31**		.19**		-.07		.16*
2		.26		.20		.34		.39		.17		.16	
	N		.11		.08		.55**		.53**		-.30**		-.04
	E		.15*		.20***		.10		-.11*		.17**		-.10
	O		-.13*		-.07		.13*		.09		.02		.20**
	A		-.37**		-.27**		.07		-.02		.07		-.01
	C		-.14*		-.22**		-.12*		-.12*		.07		.33**

Note. Agr = Aggression; Ant = Antisocial; Anx = Anxiety; Dep = Depression; Grades = Academic performance, int = internalizing, ext = externalizing. N = Neuroticism; E = Extraversion; O = Openness; A = Agreeableness; C = Conscientiousness.

*p < .01. ** p < .001.

Supplementary Table 1

Correlations Among JS NEO-S Facets and JS NEO-A60 Dimensions

JS NEO-S Facets	JS NEO-A60 dimensions				
	N	E	O	A	C
N1 *Anxiety*	**.59*** **	-.03	.20***	-.05	-.05
N2 *Angry Hostility*	**.51*** **	-.02	.03	-.32***	-.28***
N3 *Depression*	**.79*** **	-.20***	.17**	-.19***	-.23***
N4 *Self-Consciousness*	**.75*** **	-.24***	.21***	-.03	-.02
N5 *Impulsiveness*	**.35*** **	.06	-.03	-.25***	-.29***
N6 *Vulnerability*	**.66*** **	-.30***	15**	-.07	-.21***
E1 *Warmth*	-.22***	**.67*** **	.02	.30***	.25***
E2 *Gregariousness*	-.28***	**.75*** **	-.16**	.07	.13*
E3 *Assertiveness*	-.37***	**.48*** **	.10*	.02	.26***
E4 *Activity*	-.23***	**.60*** **	-.04	.04	.10*
E5 *Excitement Seeking*	.11*	**.35*** **	.04	-.23***	-.12*
E6 *Positive Emotions*	-.27***	**.75*** **	.04	-19***	.28***
O1 *Fantasy*	.14**	-.06	**.42*** **	-.03	-.18***
O2 *Aesthetics*	.08	.01	**.80*** **	.15**	.26***
O3 *Feelings*	.13**	.37***	**.38*** **	.11*	.20***
O4 *Actions*	.00	.45***	**.33*** **	.13**	.26***
O5 *Ideas*	.02	-.07	**.70*** **	.16**	.20***
O6 *Values*	-.08	-.11*	**.35*** **	.30***	.08
A1 *Trust*	-.23***	.32***	.08	**.39*** **	.30***
A2 *Straightforwardness*	-.26***	.00	.08	**.78*** **	.36***
A3 *Altruism*	-.24***	.13*	.18***	**.79*** **	.41***
A4 *Compliance*	-.31***	-.08	.16**	**.55*** **	.34***
A5 *Modesty*	.14**	-.24***	.18***	**.44*** **	-.01
A6 *Tender-Mindedness*	.16**	.19***	.28***	**.51*** **	.28***

C1 *Competence*	-.28***	.23***	.16**	.28***	**.80*** **
C2 *Order*	-.29***	.15**	-.05	.25***	**.71*** **
C3 *Dutifulness*	-.12*	.20***	.19***	.39***	**.73*** **
C4 *Achievement Striving*	-.18***	.28***	.19***	.26***	**.78*** **
C5 *Self-discipline*	-.28***	.10	.19***	.32***	**.78*** **
C6 *Deliberation*	-.24***	-.15**	.13*	.33***	**.55*** **

Note. *$p < .05$. **$p < .01$. *** $p < .001$.

Supplementary Table 2

Correlations Between JS NEO-S and JS NEO-A60 Traits, With Criterion Validity Measures

	Agr (ext)	Ant (ext)	Anx (int)	Dep (int)	Life satisfaction	Grades
JS NEO-S/ A60 N	.18**/ .19***	.12**/ .16**	.61**/ .59***	.65**/ .62***	-.40**/ -.38***	-.04/ -.06
JS NEO-S/ A60 E	.06/ .09	.07/ .13**	-.10/ -.01	-.29**/ -.21***	.30**/ .24***	.03/ -.04
JS NEO-S/ A60 O	-.19**/ -.21***	-.13/ -.16**	.28**/ .28***	.16*/ .20***	.02/ -.03	.25**/ .29***
JS NEO-S/ A60 A	-.53**/ -.48***	-.42**/ -.41***	-.06/ .07	-.21**/ -.20***	.26**/ .21***	.22**/ .20***
JS NEO-S/ A60 C	-.32**/ -.32***	-.37**/ -.36***	-.21**/ -.16**	-.30**/ -.23***	-.27**/ .22***	.41**/ .40***

Note. Agr = Aggression; Ant = Antisocial; Anx = Anxiety; Dep = Depression; Grades = Academic performance, int = internalizing, ext = externalizing. N = Neuroticism; E = Extraversion; O = Openness; A = Agreeableness; C = Conscientiousness.

*p < .01. ** p < .001.

Supplementary Table 3

Gender Differences Among JS NEO-A60 Traits

	Full sample (*n* = 399)		Males (*n* =203)		Females (*n* = 196)		*t-test*	
	M	*SD*	*M*	*SD*	*M*	*SD*	*p*	*d*
N	22.66	9.06	21.70	8.80	23.66	9.24	<.05	.22
E	33.05	7.73	32.44	7.50	33.68	7.94	ns	.16
O	24.54	8.302	22.02	7.78	27.16	8.03	<.001	.65
A	34.68	8.09	33.02	8.49	36.41	7.28	<.001	.43
C	30.95	8.41	29.43	8.23	32.54	8.33	<.001	.38

Note. N = Neuroticism; Em. St. = Emotional Stability; E = Extraversion; O = Openness; A = Agreeableness; C = Conscientiousness; M = Mean; SD = Standard Deviation. *d* = Cohen's d scores in absolute values. Scores of .20, .50 and .80 correspond to small, medium and large effect sizes respectively (Cohen, 1992).

ns = non-significant.

Study 2. JS NEO-A50

Ortet-Walker, J.[1], Mezquita, L.[1,2], Vidal-Arenas, V[1]., Ortet, G.[1,2], & Ibáñez, M. I[1,2]. (2021). **Development of a 50-item abridged form of the Junior Spanish version of the NEO questionnaire (JS NEO-A50)**. *European Journal of Psychological Assessment, 38*(2), 101-112. https://doi.org/10.1027/1015-5759/a000648

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Abstract

The aim of this psychometric study was to construct an abridged 50-item form, 10 for each of the five factors of personality, of the Junior Spanish version of the NEO-PI-R (JS NEO-A50). Two separate studies were conducted. In study 1, 400 high school students completed two personality scales to examine the factor structure (Exploratory Factor Analysis), convergent validity and reliability of the JS NEO-A50. In study 2, an independent sample of 385 adolescents completed the JS NEO-A50 and several outcome measures to replicate the factor structure (Exploratory Structural Equation Model) and examine criterion validity, respectively. The five-factor structure found in study 1 was satisfactorily replicated in the second, independent sample. Sources of reliability (internal consistency and test-retest) and validity (convergent) were adequate. Also, the outcome measures assessed in study 2 were related to personality traits in the expected direction. Life satisfaction was significantly predicted by emotional stability; symptoms of behavioral problems were predicted by low scores in both agreeableness and conscientiousness, while internalizing emotional symptoms were mainly predicted by emotional instability; finally, academic performance was mainly predicted by

conscientiousness. We conclude that the JS NEO-A50 is a sound inventory to measure the five broad personality domains in Spanish-speaking adolescents.

Keywords: Personality assessment, Adolescents, Abridged, Psychometric study, JS NEO-A50.

Introduction

Personality constitutes an important and core construct in people's lives. Evidence has shown robust associations between personality and a wide array of life outcomes, such as interpersonal relationships, political and religious beliefs, occupational performance, happiness or longevity (Ozer & Benet-Martínez, 2006; Soto, 2019). The role of personality is also important in common mental disorders (Jeronimus et al., 2016; Kotov et al., 2010), particularly when considering internalizing, externalizing and the general (aka p) factors of psychopathology (Caspi et al., 2014; Mezquita et al., 2015). Similarly, personality traits have also shown great relevance in adolescents' important life areas, such as academic achievement (Poropat, 2009), resilience and coping behaviors (Oshio et al., 2018) or happiness (Gale et al., 2013; Suldo et al., 2015); and also more negative outcomes such as antisocial behavior (Durán-Bonavila et al., 2017; Mann et al., 2016), substance use (Stautz & Cooper, 2013; Ibáñez et al., 2015) or psychopathology (Castellanos-Ryan et al., 2016; De Bolle et al., 2012; Etkin et al., 2020). Thus, it is crucial to have psychometrically sound instruments available for the assessment of personality traits in this key period in the life span.

Nowadays, there is a wide consensus in considering the broad domains of personality proposed by the Big Five (BF; Goldberg, 1992) and Five-Factor models (FFM; McCrae & Costa, 2008b) as the main framework of personality taxonomy (John et al.,

2008). As for personality assessment instruments, the NEO Personality inventories (McCrae & Costa, 2010) are the most used questionnaires for assessing the FFM.

Although there are short Big Five questionnaires that can be applied to adolescents in our sociocultural context (BFQ-C; Barbaranelli et al., 2003; BFPTSQ, Ortet et al., 2017; OPERAS; Vigil-Colet et al., 2013), their coverage of the NEO facets is limited. Thus, there is no brief tool available specifically for Spanish adolescents that presents an adequate FFM bandwidth, a key validity issue (Soto & John, 2017).

As far as we know, there is only one questionnaire based on the NEO personality inventories developed for Spanish adolescents, the JS NEO (Ortet et al., 2012). The JS NEO consisted in an adaptation to Spanish adolescents of the NEO-PI-R adult version (McCrae & Costa, 2010) by using an easy-to-understand language and age-appropriate content. For the development of the JS NEO, half of the NEO-PI-R items had to be modified to be suitable for Spanish adolescents between 12 and 17 years of age (Ortet et al., 2012). The JS NEO has a complete form of 240 items (Ortet et al., 2012) and a short version of 150 items (JS NEO-S; Ortet et al., 2010). Both versions allow to obtain reliable and valid scores for the five broad dimensions and their corresponding 6 facets proposed in the NEO-PI-R in Spanish adolescents aged between 12 and 17 years.

However, questionnaire length may be a relevant issue in certain circumstances, especially in research contexts where a wide battery of questionnaires has to be administered, and schools represent time-limited settings which lower the available administration time. For these reasons, the main aim of this study was to develop an abridged 50-item questionnaire, the JS NEO-A50, in order to save time and resources for the assessment of the NEO personality traits in Spanish adolescents. This goal was set

trying to preserve adequate bandwidth and reliability and validity indices of the new instrument. To this end, two studies were conducted with non-clinical samples to explore the factor structure of the JS NEO-A50, and the reliability and validity of the scores obtained. Specifically, and following recommendations for the development of short versions (Widaman et al., 2011) we: a) began with a strong instrument, the JS NEO-S; b) attempted to preserve the content of the five domains and their facets; c) retained the same factor structure as the original form; and d) examined reliability and validity indices in an independent sample.

We report how we obtained our samples, all data exclusions, all measures in the study, and all analyses including all tested models. Data inclusion/exclusion criteria were not necessary. For our inferential tests, we report p values, effect sizes (in the Electronic Supplementary Material), and 99% confidence intervals. All data, materials, and Supplementary Material are accessible at https://osf.io/yrhc9/.

Study 1

Method

Participants and Procedure

All the students from first year to fourth year of a high school of convenience in a city in eastern Spain, were invited to participate. Four hundred and twenty-eight students returned signed written parental consent forms and responded to the questionnaires, but 28 of them did not complete all of the scales. Thus, the final sample consisted of 400 students between the ages of 12 and 17 (Mean age = 14.31 years; *SD* = 1.57; 51% males, 49% females). To study retest reliability, the JS NEO A-50 was readministered one month later to a sub-sample of 227 students, belonging to 10 classes selected at convenience

from second to fourth grade, between the ages of 13 and 17 (Mean age = 15.16 years; *SD* = 1.00; 47.1% males, 52.9% females). There were no significant differences between the full sample and the subsample in terms of gender frequency: $\chi^2(1) = .87$, $p > .05$. The subsample had a significantly higher mean age, albeit by less than a year: $t(625) = 8.24$, $p < .001$.

This study was part of broader research into psychosocial risk and protective factors affecting mental health (see Moya-Higueras et al., 2020 for more details). After giving detailed information about the research and handing out the consent documents to teachers and parents or legal guardians, trained research assistants administered the battery of questionnaires to each of the classes in two 1-hour tutorial sessions from each class, separated by 1 week. A sub-sample of convenience completed a third session one month later, in order to explore test-retest reliability. The questionnaires were voluntarily completed by those students authorized by their parents or legal guardians, and merchandising items from our university, such as notebooks and pens, were given to the adolescents that completed all the questionnaires in order to incentivize participation. Participants took around one hour to complete the questionnaires.

Ethics

This research was approved by the ethical committee from the authors' university, and authorized by the high schools' boards as well as by the regional education authorities. The parents or legal guardians of the participants gave written informed consent in accordance with the Declaration of Helsinki and the European Parliament General Data Protection Regulation (GDPR; European Parliament 2016/679) guidelines,

emphasizing that all personal details including identification data would be completely confidential.

Measures

Short form of the Junior Spanish version of the NEO-PI-R (JS NEO-S; Ortet et al., 2010). This 150-item scale is the short form of the Spanish adaptation of the NEO-PI-R personality questionnaire for adolescents (JS NEO) between the ages of 12 and 17 (Ortet et al, 2012). It consists of statements answered on a 5-point Likert-type scale (0 = *Strongly disagree*; 4 = *Strongly agree*) in order to assess the five higher-order dimensions in the FFM (neuroticism, extraversion, openness, agreeableness and conscientiousness), as well as the 30 lower-order facets corresponding to them (6 facets per dimension and 5 items per facet). Reliability estimates for domains in the present sample ranged between .78 (openness) and .90 (conscientiousness) (see Table 8). Facet reliabilities in the present sample ranged between α = .50 and .77 for all but three of the 30 scales: *Anxiety* (.40) and *Impulsiveness* (.33) from the neuroticism domain, and *Feelings* (.48) from the openness domain. These lower reliabilities were expected due to the reduced number of items, and had similar values to those of the original validation article (Ortet et al., 2010) and subsequent studies employing the JS NEO-S (e.g., Romero & Alonso, 2017).

Big Five Personality Trait Short Questionnaire (BFPTSQ; Morizot, 2014), Spanish version (Ortet et al., 2017). It is a short, 50-item personality questionnaire designed to assess the broad dimensions in the FFM, specifically designed for both the adolescent and adult populations. It is answered on a 5-point Likert-type scale (0 = *Disagree strongly*; 4 = *Agree strongly*). The alpha reliabilities of the BFPTSQ in the present sample were:

openness .80, extraversion .77, agreeableness .74, conscientiousness .77 and emotional stability (low neuroticism) .80.

Data Analyses

The JS NEO-S was used to extract the 50 items for the JS NEO-A50. In order to select the 10 items per scale, we attempted to ensure a proper balance between a maximization of facet representation with an adequate structure and reliability of the new 50-item scale. Specifically, and following a recommended strategy for constructing short forms (Widaman et al., 2011), items were selected and replaced iteratively in different Exploratory Factor Analyses (EFA; Principal Axis factoring and Varimax rotation) attempting to: a) maintain an adequate bandwidth, i.e. including items of all facets if possible; b) maintain an adequate factor structure, i.e. selecting those items with the highest loadings on their respective dimensions and low loadings on the others; and c) ensure proper internal consistency by means of Cronbach's alpha coefficients. Iterative item selection of the 50 items for the JS NEO-A50 was performed in the following sequence: 1) EFA of all 150 JS NEO-S items, and extraction of 50 items with highest loadings on their respective domains and low cross-loadings, belonging to as many of the lower-order facets that reasonably yielded at least 1 item; 2) EFA of 50 selected items; 3) Inspection of internal consistency of the 10-item domains; 4) Repeat previous steps replacing items that present difficulties at certain points of the sequence, until accomplishing the best performing items across all criteria (facet bandwidth, EFA loadings, and domain alpha indices).

Reliability was further investigated with McDonald’s Omega, and temporal stability was calculated by means of data from a one-month retest. Finally, convergent

validity was obtained by correlating JS NEO-A50 dimensions with BFPTSQ traits. Additionally, JS NEO-A50 traits were correlated with JS NEO-S domains, JS NEO-S ad-hoc domains without common items (excluding those selected for the JS NEO-A50), and JS NEO-S facets.

JS NEO-A50 domain Omegas were computed employing Mplus software, version 8.4 (Muthén & Muthén, 2017). All other statistical analyses were conducted employing SPSS software, version 26.

Results

Descriptives

Student's t-test for independent samples revealed that females scored higher on all FFM domains (only non-significantly for extraversion) (see Supplementary Table 4).

EFA

The EFA for the entire scale yielded adequate loadings (≥ .30) for the items selected in each of their respective dimensions (see Table 8). 26 out of the 30 facets from the JS NEO-S had at least one item representing each of them in the JS NEO-A50, whereas only four facets were not represented due to their items achieving insufficient psychometric fitness: *Impulsiveness*, from the neuroticism domain; *Actions* and *Values*, from the openness domain; and *Trust,* from the agreeableness domain. The amount of total variance explained by the five factors was 34.2%.

Reliability

Internal consistency reliabilities were adequate for the five JS NEO-A50 scales, with Cronbach alpha indices ranging from .73 to .83 and Omega indices ranging from .74

to .83. The alpha values were very similar to those calculated and reported for the JS NEO-S for this study. In addition, temporal stability reliability was also satisfactory, with 1-month test-retest correlations ranging from .74 to .81 (see Table 8).

Convergent Validity

Equivalent personality factors presented high to very high correlations, in the range from .55 to .69 between JS NEO-A50 and BFPTSQ traits (see Table 9). The abridged instrument's domains were highly associated with respective JS NEO-S domains, although these correlations could be overestimated due to common items. Thus, we mainly relied on the associations with JS NEO-S ad-hoc domains as an additional source of convergent validity. In this case, correlations were large to very large (from.63 to .83) and slightly lower for openness (.48) (see Table 9). At the facet level, JS NEO-A50 traits even showed small to moderate correlations among those facets not represented by items in the abbreviated questionnaire (in the range from .20 to .34) (see Supplementary Table 5).

Study 2

Method

Participants and Procedure

Following the same protocol as described in study 1, we obtained data from another high school of convenience, located in the same city in eastern Spain. Four hundred and one students returned signed written parental consent forms and responded to the questionnaires, but 16 of them did not complete all the questionnaires. Thus, a final sample of 385 high school students between the ages of 12 and 17 (Mean

age = 14.29, *SD* = 1.49; 47.5% males, 52.5% females) was obtained for study 2. Participants took around one hour to complete the questionnaires.

Measures

JS NEO-A50. In this study, the 50 items from study 1 were used to conduct an Exploratory Structural Equation Model (ESEM) for further validation of the abridged scale's structure (see item content in Supplementary Table 6).

Assessment System for Children and Adolescents (SENA; Sánchez-Sánchez et al., 2016). The SENA is a questionnaire that assesses a wide range of common emotional and behavioral problems in children and adolescents. Two externalizing (aggression-7 items, and antisocial behavior-8 items) and two internalizing (anxiety-10 items, and depression-14 items) scales were selected. The internal consistencies for each of the subscales in the present study were .77 for aggression, .67 for antisocial, .89 for anxiety, and .90 for depression.

Student's Life Satisfaction Scale (SLSS; Huebner et al., 1998), Spanish version (Galindez & Casas, 2010). The SLSS is a brief 7-item questionnaire that assesses self-reported life satisfaction for youngsters between the ages of 8 and 18 (Huebner et al., 1998). The internal consistency for the scale in the present study was .73.

Single item assessing academic performance. The item requested 'What grades did you obtain last school year?' The response format was a 5-point scale ranging from 0 = Normally failed to 4 = Normally outstanding. Note that grades in the Spanish educational system are given in the following range from 0 to 10 points (0-4 = Fail; 5 = Sufficient pass; 6 = Pass; 7-8 = Mention; 9-10 = Outstanding/Honors).

Data Analyses

In order to investigate internal consistency reliability in the present sample, Alphas and Omegas were calculated for the JS NEO-A50 domains.

We employed ESEM to confirm the factor structure described in study 1. ESEM has shown to reflect personality structure more adequately than other procedures (e.g. Confirmatory Factor Analysis; Guo et al., 2019; Marsh et al., 2019). The analysis was conducted using the weighted least square mean and variance adjusted (WLSMV) estimator, appropriate for ordinal indicators (i.e., items). Adjusted standard errors and statistical fit tests that are robust to nonnormality in the data are provided. Assessment of ESEM model fit was based on several indices (West et al. 2012). A nonsignificant chi-square suggests a good fitting model. However, because this test is known to be overly sensitive to increasing sample size, to minor departure from multivariate normality and to minor (substantively irrelevant) model misspecifications, additional fit indices were considered (Bentler, 1990). Thus, an acceptable model fit is suggested when a value of .90 or above is obtained for the comparative fit index (CFI) and Tucker-Lewis index (TLI), of .08 or below for the root mean square error of approximation (RMSEA), and of .10 or below for the standard root mean square residual (SRMR). A chi-square/degrees of freedom ratio of 2 or below is also an index of acceptable model fit (Bentler, 1990; Marsh et al., 2004; Jöreskog, 1969). For the RMSEA 90% CI, values below .05 and below .08 for the lower and upper bounds, respectively, suggest acceptable fit (MacCallum et al., 1996). Confidence intervals (99%) were calculated and reported. The ESEM was employed using target loading rotation. A factor model was estimated using 3 a priori correlated uniquenesses (CUs; see Supplementary Figure 1). CUs are employed in FFM to

reflect the fact that some items share similar content, a common word, or relate to the same domain (see Morizot, 2014 for a similar procedure). In the present study, our a priori CUs were conducted strictly for those items sharing a common word and also belonging to the same original facet, whose content was considered very similar (e.g., items 101r and 132r both refer to manipulation tactics to "get them [others] to do what I want").

A single covariate Multiple Indicator Multiple Causes (MIMIC) model within ESEM was performed in order to explore differential item functioning (DIF; Jones, 2006) across gender and age separately. DIF analysis was chosen as it is adequate for ordinal indicators, and is appropriate for use within the ESEM strategy (Marsh et al., 2014). For age comparison, the sample was divided into two groups of equal ranges (Group 1: 12-14 years, n = 213; Group 2: 15-17 years, n = 172). The stepwise procedure for both age and gender DIF involved (1) testing the model without any direct effects, (2) inspecting whether the modification indices showed a significant direct effect from the covariate (age or gender) on any of the items, and 3) performing a subsequent DIF test if significant direct effects were found, ascertaining improvement in model fit. Both ESEM and DIF analyses, along with JS NEO-A50 domain Omegas, were computed employing Mplus software, version 8.4 (Muthén & Muthén, 2017).

Last, and for criterion validity, we performed stepwise multiple linear regression analyses to predict antisocial behavior, aggression, anxiety problems, depressive symptoms, life satisfaction and academic performance. We controlled for age and gender in a first step (males were coded as "1" and females as "2"), whereas the JS NEO-A50

traits acted as predictors in a second step. Reliability and validity indices, as well as gender differences were calculated employing SPSS software, version 26.

Results

Correlations among all study 2 variables can be found in Supplementary Table 7.

Descriptives

Gender differences in mean domain scores were very similar to those in study 1, where females scored higher on all FFM traits (see Supplementary Table 8).

ESEM

The indices obtained by means of the ESEM showed acceptable goodness-of-fit values (χ^2/df = 1.53), although the chi-square test did not acquire non-significance. This result from the chi-square test was expected due to the index's sensitivity to sample size. Nonetheless, only one index, TLI, had a slightly lower value than recommended for acceptable fit (≥ .90). DIF analysis for gender revealed no direct effects, except for one on openness item 8r. Model fit was unchanged when this direct effect was accounted for. DIF for age yielded no direct effects (see Table 10).

All target loadings were statistically significant and above .30, with reversed-scored items loading negatively onto their respective domains (except for agreeableness, due to all its items being reversed-scored). (see Table 11).

Reliability

Internal consistency reliabilities for domains in the present study were acceptable, ranging between .70 and .81 for alphas, and between .71 and .82 for Omegas (see Table 11), and very similar to those reported in study 1.

Criterion Validity

In the first step of the regression, boys reported more externalizing behaviors and higher life satisfaction, whereas girls scored higher on internalizing symptoms and reported slightly higher grades. In the second step of the regression, the externalizing scales of aggressive and antisocial behaviors were predicted by (low) agreeableness and (low) conscientiousness traits. Anxious symptoms were positively and significantly linked to neuroticism, while depressive symptoms were predicted by both neuroticism, introversion and (low) conscientiousness traits. Life satisfaction was significantly associated with emotional stability, extraversion and, to a lesser extent, with conscientiousness. Finally, academic performance was positively and significantly associated with conscientiousness and openness. An unexpected but small association was also found between aggressive behavior and (low) openness (see Table 12).

Discussion

Nowadays, the most accepted and useful framework in personality psychology is the FFM (John et al., 2008; Soto, 2019), with the NEO inventories being the most used questionnaires. Thus, the main aim of the present two-study research was to develop a 50-item version the JS NEO-S (JS NEO-A50). Our main results revealed the adequate psychometric properties of the JS NEO-A50 despite its brevity. Specifically, the EFA conducted in study 1 showed that the abridged 50-item form adequately covered most

facets embraced by the FFM. This structure was also replicated in an independent sample, as reflected in the ESEM performed in study 2, with items showing adequate loadings on their respective domains and acceptable goodness-of-fit indices. Thus, the questionnaire had a reasonably adequate FFM bandwidth, with 26 of the 30 facets covered by at least one item. Only four facets, *Impulsiveness,* from neuroticism, *Trust,* from agreeableness and *Actions* and *Values,* from openness were not properly represented. *Impulsiveness* and *Trust* usually present important secondary loadings in other dimensions (McCrae et al., 2010; Ortet et al., 2012), suggesting that these facets would result from a combination of two or more dimensions, and thus not being core traits of neuroticism and agreeableness, respectively. DIF analysis revealed that there were no differences in item functioning for the JS NEO-A50 across age and gender, with only one direct effect on a single item out of 50 for the latter.

The openness domain was the most problematic to fit correctly in the abridged scale, in line with previous research (Mervielde et al., 1995; Soto et al., 2008; Soto & Tackett, 2015). It has been argued that openness embraces the most maturity-based facets, with more sophisticated manifestations arising as children age (Tackett et al., 2012). Thereby, this dimension may not fully emerge until late adolescence (Allik et al., 2004; Tackett et al., 2012).

Regarding reliability and validity indices of the JS NEO-A50, our findings were mostly in line with the expected results. The moderate to high reliability indices, i.e., internal consistency and temporal stability, found in both studies were satisfactory and comparable to what is found in the scale's longer counterparts, i.e., the JS NEO and JS NEO-S (Ortet et al., 2012; Ortet et al., 2010), and in other short questionnaires (McCrae

& Costa, 2010; Morizot, 2014; Soto & John, 2017). The analysis conducted to assess convergent validity in study 1 yielded adequate correlations among analogous FFM personality traits, with similar magnitudes as those found in other studies (Ortet et al., 2012; Morizot, 2014).

The measures of criterion validity in study 2 showed most of the expected results, after controlling for age and gender. In line with previous studies in adults (Jones et al., 2011; Kotov et al., 2010), our second study showed that those more disagreeable and unconscientious individuals scored higher on the externalizing behavior scales: antisocial and aggressive behavior. An unexpected finding was neuroticism being unrelated to aggression, contrary to what is typically found (Jones et al., 2011). Perhaps impulsiveness not being represented in neuroticism may partially explain this, as impulsiveness is a relevant trait, especially for reactive aggression (Miller & Lynam, 2006). We also did not anticipate (low) openness linking significantly to aggressive behavior, although previous studies have reported similar small associations (Jones et al., 2011).

The internalizing scales (depressive and anxious behavior) were associated especially with highly neurotic youngsters, in line with previous research in adults (Jeronimus et al., 2016; Kotov et al., 2010). We also found that introverts tended to show depressive symptoms, supporting the theoretical notion that low positive emotionality (closely associated with introversion) constitutes a personality-related vulnerability toward depression (Khazanov & Ruscio, 2016). Also, in line with previous research (Kotov et al., 2010), depressive symptoms were associated with low conscientiousness, probably reflecting the role of impulsivity and disinhibition in depression (Berg et al., 2015).

Life satisfaction, as expected, showed that emotionally stable and extraverted individuals were the happiest, in a similar vein than what is found for adults (Steel et al., 2019) and in other studies in adolescents (Suldo et al., 2015; Weber & Huebner, 2015). Last, academic performance was strongly predicted by conscientiousness and, to a lesser degree, openness, the two most relevant personality dimensions for academic performance at all levels of education, from primary to tertiary education (Poropat, 2009; Richardson et al., 2012; Vedel, 2014).

One of the main limitations of this study was the sample sizes, which were clearly lower compared to other similar studies (e.g., Ortet et al., 2012). Also, use of convenience samples may constrain the generalization of the results. Further, method variance may have been an issue, as only self-reported instruments were employed. For instance, the overlap among internalizing symptoms and emotional stability may have been slightly overestimated. Thereby, replication efforts of these findings in wider and more representative samples of the adolescent population, employing parent and/or teacher reports additionally, would be desirable. It would also be helpful to employ clinical samples in future studies to tackle possible construct overlap among personality and self-reported internalizing/externalizing problems. Last, although most domains yielded adequate bandwidths, the absence of those facets not represented could affect the prediction of certain outcomes. Despite these limitations, all psychometric evidence considered, the abridged questionnaire JS NEO-A50 should be regarded as an adequate tool for the measurement of the FFM broad domains in the Spanish-speaking adolescent population, especially when administering a number of other questionnaires simultaneously.

Open Science

Open Data: We confirm that there is sufficient information for an independent researcher to reproduce all of the reported results (Ortet-Walker, 2021).

Open Materials: We confirm that there is sufficient information for an independent researcher to reproduce all of the reported methodology (Ortet-Walker, 2021).

Preregistration of Studies and Analysis Plans: This study was not preregistered.

Tables and Figures

Table 8

Exploratory Factor Analysis of the 50 Items Selected from the JS NEO-S[a], JS NEO Reliabilities of Internal Consistency[a], and JS NEO-A50 Test-Retest Reliability Indices[b] in Study 1

JS NEO-S items (facets)	*Dimensions*				
	N	E	O	A	C
88 (Vulnerability)	**.71**	.01	.03	.05	.01
134 (Depression)	**.69**	.02	.05	.05	.08
109 (Self-Consciousness)	**.67**	.20	.01	.08	.02
103 (Depression)	**.61**	.11	.01	.13	.09
47 (Self-Consciousness)	**.57**	.17	.13	.03	.04
129 (Angry Hostility)	**.52**	.03	.09	.17	.00
124 (Anxiety)	**.52**	.06	.15	.14	.05
98 (Angry Hostility)	**.46**	.01	.09	.29	.17
26 (Vulnerability)	**.46**	.06	.05	.11	.10
16 (Self-Consciousness)	**.42**	.11	.16	.03	.06
79 (Activity)	.12	**.75**	.05	.03	.05

120 (Positive Emotions)	.18	**.69**	.10	.11	.17
63 (Warmth)	.09	**.61**	.07	.04	.15
58 (Positive Emotions)	.05	**.59**	.14	.02	.04
151 (Positive Emotions)	.00	**.52**	.04	.05	.07
94 (Warmth)	.09	**.48**	.06	.17	.05
38 (Gregariousness)	.10	**.48**	.09	.07	.12
17 (Activity)	.15	**.45**	.05	.04	.13
135 (Assertiveness)	.14	**.43**	.05	.17	.03
84 (Excitement Seeking)	.09	**.32**	.12	.26	.19
69 (Aesthetics)	.12	.02	**.63**	.10	.12
131 (Aesthetics)	.04	.04	**.62**	.00	.16
85 (Ideas)	.04	.11	**.52**	.06	.11
33 (Fantasy)	.28	.05	**.47**	.06	.25
23 (Ideas)	.03	.11	**.44**	.08	.11
147 (Ideas)	.10	.11	**.42**	.07	.20
95 (Fantasy)	.22	.17	**.40**	.08	.15
8r (Aesthetics)	.09	.03	**.37**	.08	.15
136 (Feelings)	.27	.28	**.34**	.10	.03
100r (Aesthetics)	.08	.03	**.30**	.04	.10
101r (Straightforwardness)	.18	.01	.01	**.66**	.22
9r (Straightforwardness)	.10	.07	.04	**.64**	.12
132r (Straightforwardness)	.16	.10	.01	**.62**	.15
76r (Altruism)	.22	.02	.01	**.60**	.20
45r (Altruism)	.21	.02	.02	**.56**	.20
86r (Modesty)	.06	.00	.07	**.52**	.01
14r (Altruism)	.09	.05	.12	**.51**	.19
153r (Tender-Mindedness)	.06	.05	.12	**.48**	.00
148r (Modesty)	.13	.05	.11	**.48**	.06
19r (Compliance)	.09	.01	.00	**.40**	.13
25 (Self-discipline)	.10	.09	.08	.03	**.65**
108 (Dutifulness)	.03	.06	.19	.29	**.62**
102r (Order)	.29	.01	.03	.07	**.59**
82 (Achievement striving)	.04	.14	.17	.23	**.58**

113 (Achievement striving)	.10	.17	.09	.00	**.55**
66 (Competence)	.04	.08	.11	.01	**.52**
10 (Order)	.11	.09	.07	.10	**.50**
36 (Order)	.05	.04	.16	.21	**.48**
87 (Self-discipline)	.01	.09	.14	.25	**.48**
92 (Deliberation)	.05	.01	.09	.12	**.44**
Test-retest JS NEO-A50	.74***	.78***	.77***	.78***	.81***
Alpha JS NEO-S/A-50	.83/ .83	.83/ .79	.78/ .73	.84/ .82	.90/ .83
Omega JS NEO-A50	.83***	.79***	.74***	.82***	.83***
[99% CI]	[.79, .86]	[.74, .83]	[.64, .78]	[.78, .86]	[.79, .86]

Note. Five factor extraction with Varimax rotation of the 50 items selected (10 per dimension) from the JS NEO-S. All loadings are provided in absolute values. Item numbers correspond with the JS NEO-S. Item numbers with an r are reverse scored. Shaded entries are the item loadings on their respective domains. Loadings ≥ .30 are shown in bold. N = Neuroticism; E = Extraversion; O = Openness; A = Agreeableness; C = Conscientiousness. 99% CI = 99% confidence interval. [a] n = 400; [b] n = 227.

Table 9

Convergent Validity Indices Represented by Correlations Among JS NEO A-50 Dimensions, JS NEO-S Dimensions and Ad-Hoc Scales, and BFPTSQ Dimensions in Study 1

		JS NEO-A50				
		N	E	O	A	C
N/Em.St.	*JS NEO-S*	**.89*** **	-.15**	.21***	-.19***	-.25***
	Ad-hoc	**.63*** **	-.11*	.15**	-.11*	-.25***
	BFPTSQ (r)	**-.57*** **	.01	-.20***	.15**	.12*
E	*JS NEO-S*	-.35***	**.88*** **	-.02	.04	.24***
	Ad-hoc	-.42***	**.69*** **	-.06	.07	.25***
	BFPTSQ	-.26***	**.58*** **	.02	-.01	.15**
O	*JS NEO-S*	.09	.17**	**.84*** **	.23***	.23***
	Ad-hoc	.06	.25***	**.48*** **	.29***	.20***
	BFPTSQ	-.11*	.19***	**.61*** **	-.02	.12*
A	*JS NEO-S*	-.17**	.08	.18***	**.88*** **	.41***
	Ad-hoc	-.09	.14**	.22***	**.63*** **	.37***
	BFPTSQ	-.26***	.20***	.11*	**.55*** **	.38***
C	*JS NEO-S*	-.28***	.15**	.14**	.37***	**.94*** **
	Ad-hoc	-.33***	.14**	.10*	.37***	**.83*** **
	BFPTSQ	-.29***	.07	.09	.33***	**.69*** **

Note. Ad-hoc = JS NEO-S dimensions computed excluding common items in the JS NEO-A50; N = Neuroticism; Em.St. = Emotional Stability; E = Extraversion; O = Openness; A = Agreeableness; C = Conscientiousness. BFPTSQ (r) is the reverse scored emotional stability dimension. Correlations among analogous personality dimensions in JS NEO-A50, JS NEO-S scales and BFPTSQ are shown in bold. n = 400.

*p < .05. **p < .01. *** p < .001.

Table 10

Goodness-Of-Fit Statistics From the Exploratory Structural Equation Model, and From DIF Analyses across Age and Gender in Study 2

Model	χ^2 *(df)*	*CFI*	*TLI*	*RMSEA*	*90% CI*	*SRMR*
Main ESEM	1498.120* (982)	.91	.89	.04	[.033, .040]	.05
DIF for age	1548.692* (1027)	.91	.89	.04	[.033, .040]	.05
DIF for gender	1572.348* (1027)	.91	.89	.04	[.033, .041]	.05
DIF for gender with direct effects	1560.462* (1026)	.91	.89	.04	[.033, .040]	.05

Note. ESEM = exploratory structural equation modeling; DIF = Differential Item Functioning; χ^2 = chi square; df = degrees of freedom; CFI = comparative fit index; TLI = Tucker-Lewis index; RMSEA = root mean square error of approximation; 90% CI = 90% confidence interval of the RMSEA; SRMR = standardized root mean square residual. n = 385.

*$p < .001$.

Table 11

Standardized Factor Loadings From the Exploratory Structural Equation Model of the JS NEO-S Items Selected for the Abridged 50-Item Version, and Internal Consistency Indices for the Dimensions in Study 2

	Neuroticism		*Extraversion*		*Openness*		*Agreeableness*		*Conscientiousness*	
JS NEO-S items	λ	99% CI	λ	99% CI	λ	99% CI	λ	99% CI	λ	99% CI
88	**.744*****	[.671, .817]	.044	[-.052, .140]	.090*	[-.002, .181]	-.086*	[-.174, .002]	.062	[-.031, .156]
134	**.688*****	[.600, .777]	.004	[-.099, .108]	-.104*	[-.212, .003]	-.102**	[-.201, -.003]	-.028	[-.124, .069]
47	**.636*****	[.547, .726]	-.047	[-.151, .057]	.144**	[.031, .258]	-.013	[-.118, .093]	.056	[-.050, .163]
109	**.627*****	[.544, .711]	-.193***	[-.295, -.090]	-.016	[-.118, .085]	-.094*	[-.199, .010]	.013	[-.093, .119]
103	**.587*****	[.496, .679]	-.130**	[-.239, -.022]	-.044	[-.146, .058]	.006	[-.102, .114]	-.083*	[-.183, .017]
124	**.537*****	[.432, .642]	.139**	[.019, .259]	-.038	[-.157, .081]	.051	[-.055, .158]	-.149**	[-.269, -.029]
16	**.532*****	[.428, .636]	-.025	[-.140, .90]	.115*	[-.004, .234]	-.040	[-.158, .078]	.073	[-.050, .195]
26	**.462*****	[.354, .570]	-.147**	[-.261, -.034]	.117*	[-.008, .242]	.266***	[.157, .376]	.108*	[-.020, .236]
129	**.432*****	[.321, .542]	-.064	[-.179, .052]	.020	[-.100, .141]	.185***	[.070, .300]	-.016	[-.130, .098]
98	**.422*****	[.310, .534]	.064	[-.058, .186]	-.038	[-.165, .090]	.096*	[-.020, .211]	-.098*	[-.221, .024]
120	-.226***	[-.319, -.132]	**.692*****	[.612, .771]	.020	[-.071, .111]	-.091**	[-.178, -.004]	.103**	[.011, .194]
79	-.125***	[-.210, -.041]	**.674*****	[.582, .767]	.051	[-.045, .148]	.049	[-.046, .145]	.123**	[.022, .225]
63	.039	[-.061, .139]	**.616*****	[.522, .709]	.037	[-.070, .143]	-.135**	[-.239, -.032]	.002	[-.103, .108]
17	-.093*	[-.204, .017]	**.588*****	[.491, .684]	-.098*	[-.218, .022]	.034	[-.081, .149]	-.099*	[-.216, .019]
151	.159***	[.047, .272]	**.583*****	[.465, .701]	-.016	[-.131, .099]	-.142**	[-.252, -.033]	.021	[-.093, .136]
94	.034	[-.072, .140]	**.575*****	[.472, .677]	-.073	[-.200, .054]	-.118**	[-.226, -.009]	.154**	[.039, .268]
58	-.119**	[-.216, -.022]	**.525*****	[.429, .622]	.187***	[.081, .293]	.042	[-.063, .147]	.132**	[.028, .236]
38	-.023	[-.137, .091]	**.516*****	[.404, .628]	.055	[-.062, .171]	.121**	[.011, .231]	-.056	[-.176, .064]
135	.135**	[.029, .242]	**.513*****	[.412, .614]	.079	[-.040, .198]	.016	[-.096, .128]	-.068	[-.179, .042]
84	-.013	[-.135, .109]	**.326*****	[.209, .443]	-.080	[-.217, .058]	**.326*****	[.207, .444]	-.038	[-.165, .090]
131	-.052	[-.145, .042]	-.081$^{•}$	[-.184, .021]	**.737*****	[.635, .840]	-.007	[-.111, .096]	-.029	[-.133, .076]
69	.009	[-.088, .106]	.057	[-.050, .164]	**.677*****	[.577, .777]	.017	[-.087, .121]	.001	[-.099, .100]
147	.089$^{•}$	[-.010, .187]	.012	[-.097, .121]	**.560*****	[.460, .661]	.168***	[.074, .263]	.216***	[.119, .313]
85	.046	[-.065, .156]	-.125$^{••}$	[-.249, -.001]	**.429*****	[.304, .554]	-.001	[-.122, .120]	.089	[-.037, .215]
33	.066	[-.048, .181]	.144$^{••}$	[.030, .258]	**.390*****	[.264, .515]	.061	[-.048, .170]	**-.309*****	[-.430, -.188]
95	.100$^{•}$	[-.012, .212]	.177***	[.062, .292]	**.389*****	[.260, .518]	.001	[-.107, .109]	-.075	[-.199, .050]
23	.054	[-.071, .178]	-.029	[-.160, .102]	**.386*****	[.256, .516]	-.055	[-.185, .075]	.136$^{•}$	[.000, .272]
8r	.091	[-.042, .225]	.041	[-.088, .171]	**-.354*****	[-.487, -.221]	.202***	[.074, .330]	.190***	[.062, .318]
136	.234***	[.123, .346]	**.303*****	[.189, .417]	**.307*****	[.171, .443]	.055	[-.061, .171]	-.011	[-.128, .106]

100r	.180***	[.052, .308]	.112*	[-.015, .238]	**-.301*** **	[-.442, -.160]	.192***	[.074, .311]	.204***	[.075, .332]
86r	-.247***	[-.346, -.149]	.014	[-.085, .112]	.281***	[.177, .385]	**.729*** **	[.635, .824]	.109**	[.004, .213]
9r	.025	[-.087, .137]	-.096*	[-.212, .020]	.004	[-.109, .117]	**.700*** **	[.599, .802]	-.150***	[-.259, -.040]
148r	-.288***	[-.382, -.193]	.073	[-.036, .182]	.138**	[.035, .241]	**.692*** **	[.590, .795]	.141**	[.035, .248]
132r	.082*	[-.018, .182]	.023	[-.078, .124]	-.112**	[-.219, -.006]	**.641*** **	[.548, .735]	-.078	[-.184, .028]
101r	.092*	[-.005, .189]	.060	[-.037, .157]	-.010	[-.116, .095]	**.624*** **	[.527, .722]	-.138**	[-.243, -.033]
45r	.177***	[.077, .277]	-.045	[-.148, .058]	-.101*	[-.214, .012]	**.612*** **	[.514, .710]	-.030	[-.135, .075]
76r	.199***	[.096, .301]	-.056	[-.163, .050]	-.069	[-.184, .046]	**.603*** **	[.503, .702]	-.026	[-.128, .076]
14r	.036	[-.079, .152]	-.102*	[-.225, .022]	-.044	[-.165, .077]	**.528*** **	[.416, .641]	.047	[-.079, .173]
153r	-.065	[-.189, .059]	-.101*	[-.227, .025]	-.033	[-.163, .098]	**.429*** **	[.299, .560]	.037	[-.107, .181]
19r	.098*	[-.021, .217]	.161***	[.047, .276]	-.206***	[-.330, -.081]	**.427*** **	[.310, .543]	-.154**	[-.273, -.035]
87	.118**	[.025, .211]	-.034	[-.137, .070]	.080*	[-.023, .182]	-.007	[-.105, .090]	**.695*** **	[.599, .791]
82	.140***	[.039, .242]	.066	[-.036, .167]	-.051	[-.168, .066]	.026	[-.090, .142]	**.641*** **	[.540, .741]
25	-.103**	[-.196, -.010]	.057	[-.049, .164]	-.026	[-.140, .088]	.085*	[-.017, .187]	**.630*** **	[.525, .736]
36r	.119**	[.020, .217]	.145**	[.036, .255]	.152**	[.032, .272]	.146***	[.042, .250]	**-.566*** **	[-.668, -.464]
108	.033	[-.074, .139]	.128**	[.021, .234]	.003	[-.108, .115]	-.056	[-.158, .045]	**.566*** **	[.461, .671]
113	.179***	[.074, .284]	.247***	[.141, .354]	.040	[-.065, .145]	-.045	[-.146, .056]	**.548*** **	[.444, .652]
102r	**.346*** **	[.257, .436]	-.064	[-.168, .040]	.139**	[.034, .245]	.078*	[-.020, .176]	**-.516*** **	[-.616, -.415]
66	.125**	[.014, .236]	-.016	[-.129, .097]	.030	[-.089, .148]	-.020	[-.132, .093]	**.493*** **	[.377, .609]
10	-.161***	[-.273, -.049]	.077	[-.038, .192]	-.043	[-.168, .082]	.040	[-.080, .161]	**.438*** **	[.321, .555]
92	.139**	[.030, .249]	-.109*	[-.226, .008]	.162**	[.037, .286]	-.049	[-.168, .070]	**.400*** **	[.280, .520]
Alpha	.81		.79		.70		.80		.78	
Omega [99% CI]	.82 [.77, .86]		.80 [.74, .84]		.71 [.57, .77]		.81 [.75, .85]		.80 [.75, .84]	

Note. Shaded entries are the target loading items. Item numbers with an r are reverse scored. Loadings > .30 are shown in bold. λ = factor loadings, 99% CI = 99% confidence interval. n = 385.

*p < .05. **p < .01. *** p < .001.

Table 12

Criterion Validity Values for the JS NEO-A50, Represented by Multiple Linear Regressions Predicting Different Measures in Study 2

		Agr (ext)		Ant (ext)		Anx (int)		Dep (int)		Life satisfaction		Grades	
Step	Variable	ΔR^2	β	ΔR^2	β	ΔR^2	β	ΔR^2	β	ΔR^2	β	ΔR^2	β
1		.02		.03		.16		.07		.04		.02	
	Age		.03		.09		.15*		.06		-.06		-.10
	Gender		-.13		-.15*		.37**		.25**		-.19**		.10
2		.22		.17		.30		.34		.25		.21	
	N		.05		-.01		.56**		.44**		-.33**		.11
	E		.10		.09		-.03		-.22**		.21**		.07
	O		-.15*		.02		-.01		.06		.08		.13*
	A		-.41**		-.37**		.01		-.09		-.02		.09
	C		-.14*		-.16*		.03		-.15**		.18**		.40**

Note. Agr = Aggression; Ant = Antisocial; Anx = Anxiety; Dep = Depression; Grades = Academic performance, int = internalizing, ext = externalizing. N = Neuroticism; E = Extraversion; O = Openness; A = Agreeableness; C = Conscientiousness. n = 385.

*p < .01. ** p < .001.

Supplementary Table 4

Gender Differences Among JS NEO-A50 Dimensions in Study 1

	Full sample (*n* = 400)		Males (*n* =204)		Females (*n* = 196)		*t-test*	
	M	*SD*	*M*	*SD*	*M*	*SD*	*p*	*d*
N	17.94	7.99	17.02	7.63	18.90	8.27	< .05	.24
E	27.75	6.38	27.29	6.20	28.23	6.54	ns	.15
O	19.72	7.22	18.00	6.96	21.51	7.06	< .001	.50
A	28.37	7.23	26.82	7.60	29.99	6.45	< .001	.45
C	25.61	7.43	24.23	7.24	27.05	7.36	< .001	.39

Note. N = Neuroticism; Em. St. = Emotional Stability; E = Extraversion; O = Openness; A = Agreeableness; C = Conscientiousness; M = Mean; SD = Standard Deviation.

d = Cohen's d scores in absolute values. Scores of .20, .50 and .80 correspond to small, medium and large effect sizes respectively (Cohen, 1992).

ns = non-significant.

Supplementary Table 5

Correlations Among JS NEO-S Facets and JS NEO-A50 Dimensions

JS NEO-S Scales	JS NEO-A50 dimensions				
	N	E	O	A	C
N1 *Anxiety*	**.55*****	-.00	.21***	-.04	-.05
N2 *Angry Hostility*	**.47*****	.00	.04	-.30***	-.25***
N3 *Depression*	**.81*****	-.19***	.19***	-.17**	-.22***
N4 *Self-Consciousness*	**.78*****	-.21***	.23***	-.01	-.04
N5 *Impulsiveness*	**.29*****	.08	.00	-.25***	-.27***
N6 *Vulnerability*	**.69*****	-.26***	.15**	-.04	-.21***
E1 *Warmth*	-.24***	**.68*****	.02	.27***	.25***
E2 *Gregariousness*	-.30***	**.64*****	-.20***	.03	.14**
E3 *Assertiveness*	-.38***	**.48*****	.09	-.01	.28***
E4 *Activity*	-.29***	**.60*****	-.08	.01	.13*

E5 *Excitement Seeking*	.09	**.33*****	.06	-.24***	-.11*
E6 *Positive Emotions*	-.29***	**.78*****	.03	.15**	.28***
O1 *Fantasy*	.15**	.03	**.44*****	-.04	-.16*
O2 *Aesthetics*	.09	.03	**.81*****	.17**	.26***
O3 *Feelings*	.12*	.42***	**.37*****	.09	.19***
O4 *Actions*	-.03	.45***	**.34*****	.11*	.26***
O5 *Ideas*	.05	-.03	**.66*****	.15**	.20***
O6 *Values*	-.08	-.11*	**.20*****	.29***	.07
A1 *Trust*	-.22***	.33***	.08	**.33*****	.28***
A2 *Straightforwardness*	-.25***	-.00	.04	**.79*****	.34***
A3 *Altruism*	.23***	.12*	.12*	**.78*****	.39***
A4 *Compliance*	-.26***	-.07	.13*	**.55*****	.33***
A5 *Modesty*	.15**	-.24***	.13*	**.48*****	-.02
A6 *Tender-Mindedness*	.16**	.21***	.23***	**.49*****	.27***
C1 *Competence*	-.28***	.24***	.16**	.28***	**.82*****
C2 *Order*	-.27***	.13*	-.05	.25***	**.71*****
C3 *Dutifulness*	-.12*	.20***	.18***	.38***	**.71*****
C4 *Achievement Striving*	-.18***	.28***	.19***	.24***	**.80*****
C5 *Self-discipline*	-.26***	.08	.16**	.32***	**.79*****
C6 *Deliberation*	-.17**	-.16**	.10*	.32***	**.49*****

Note. *p < .05. **p < .01. *** p < .001. N = Neuroticism; E = Extraversion; O = Openness; A = Agreeableness; C = Conscientiousness.

Correlations among scales and their respective JS NEO-A50 domains are shown in bold. JS NEO-S facets are in italics.

Supplementary Table 6

Original (Spanish) and Translated Items in English Selected From the JS NEO-S to Construct the JS NEO-A50

Item (JS NEO-A50 order)	*Item (JS NEO-S)*	Item in Spanish	*Translated item in English*	NEO-PI-R item
1	*31*	A veces me vienen a la cabeza pensamientos aterradores.	*Sometimes, terrifying thoughts come into my head.*	
2	*63*	-	-	40
3	*33*	-	-	63
4	*9*	-	-	39
5	*36*	No me tomo muy en serio mis obligaciones en clase.	*I don't take my school assignments too seriously.*	
6	*98*	A veces me he sentido amargado/a, resentido/a y con ganas de tomarme la revancha.	*Sometimes I've felt bitter, resentful, and wanting to get back at people.*	
7	*38*	-	-	37
8	*8*	Tengo poco interés por el arte y la belleza artística.	*I have little interest in art and artistic beauty.*	
9	*14*	Nunca hago nada si a cambio no recibo un beneficio.	*I never do anything unless I get something in return.*	
10	*10*	-	-	40
11	*103*	A veces las cosas me parecen demasiado tristes y sin esperanza	*Sometimes things feel too sad and hopeless.*	
12	*135*	En las conversaciones tiendo a ser el/la que más habla.	*In conversations, I tend to be the one who talks the most.*	
13	*136*	Cosas raras o especiales (como ciertos olores o fotos de lugares lejanos) pueden despertar en mí emociones intensas.	*Strange or special things (such as certain smells or pictures of faraway places) can evoke intense emotions in me.*	
14	*19*	Puedo ser malo/a y duro/a con mis compañeros/as si es necesario.	*I can be tough and hard on my classmates if need be.*	
15	*108*	Trato de hacer mis deberes o trabajos escolares con cuidado, para no tener que repetirlos.	*I try to do my homework or school assignments carefully, in order to not have to repeat them.*	
16	*16*	Al tratar con los demás siempre temo meter la pata.	*I'm always scared I'll mess up when interacting with others.*	
17	*17*	Soy una persona muy activa.	*I'm a very active person.*	
18	*23*	Disfruto resolviendo problemas o puzles.	*I enjoy solving problems or jigsaw puzzles.*	

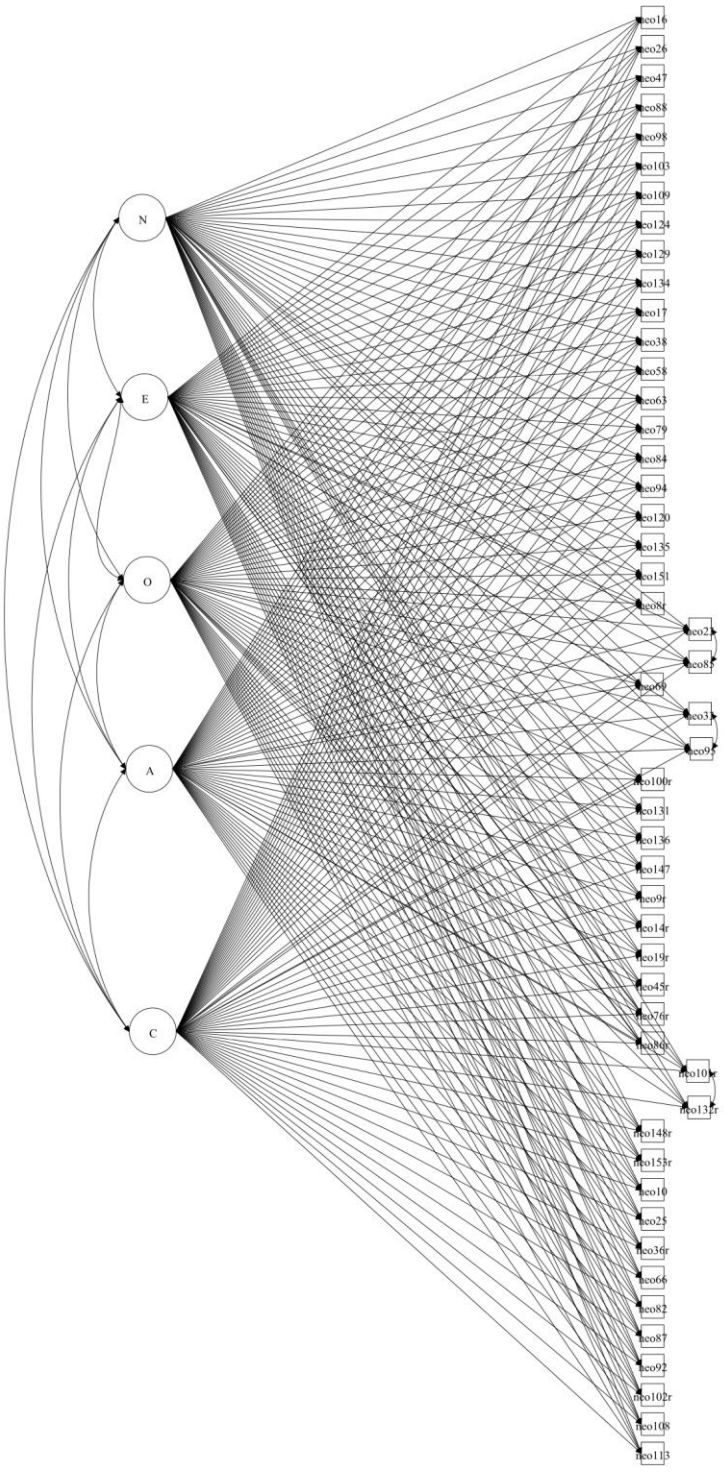
19	*86*	Soy mejor que la mayoría de la gente, y yo lo sé.	*I'm better than most people, and I know it.*	
20	*82*	Hago todo lo que puedo para sacar las mejores notas.	*I do everything I can to get the best grades.*	
21	*26*	Con frecuencia me siento indefenso/a y quiero que otro/a resuelva mis problemas	*I frequently feel helpless and want others to solve my problems.*	
22	*84*	-	-	142
23	*95*	Disfruto y paso muchos ratos dejando libre mi imaginación y fantasía.	*I enjoy fantasizing and spend a lot of time setting free my imagination.*	
24	*153*	Muchos mendigos son pobres porque se lo merecen.	*Many beggars are poor because they deserve it.*	
25	*25*	Soy bastante bueno/a en organizarme para terminar las cosas a tiempo.	*I'm pretty organized when it comes to finishing things in time.*	
26	*129*	Hasta las mínimas molestias me pueden resultar frustrantes (tremendamente fastidiosas).	*Even the slightest nuisance can be frustrating to me (incredibly annoying).*	
27	*58*	-	-	117
28	*69*	Las formas y figuras que aparecen en el arte y la naturaleza despiertan mi curiosidad.	*My curiosity is aroused by the shapes and figures that appear in art and nature.*	
29	*101*	A veces consigo engañar a mis compañeros/as o familiares para que hagan lo que yo quiero.	*Sometimes I can to trick my classmates or family members into doing what I want.*	
30	*92*	Antes de hacer algo, siempre considero sus consecuencias.	*Before doing anything, I always consider the consequences.*	
31	*134*	Con demasiada frecuencia, cuando las cosas van mal, me siento desanimado/a y a punto de tirar la toalla.	*Too often, when things are going wrong, I feel down and ready to throw in the towel.*	
32	*94*	Me siento muy unido/a a mis amigos/as.	*I feel very close to my friends.*	
33	*85*	Me gusta hacer puzles o juegos de los que me hacen estrujar el cerebro.	*I like to do jigsaw puzzles or play games that make me rack my brains.*	
34	*45*	A veces hago cosas sin tener en cuenta a los demás (o sin importarme cómo afecta a los demás) para obtener lo que quiero.	*I occasionally do things without thinking about others (or how it will make them feel) to get what I want.*	
35	*66*	Muchas veces preparo con antelación lo que tengo que hacer.	*I often prepare what I have to do in advance.*	

36	*47*	En ocasiones he estado tan avergonzado/a que he querido esconderme.	*There have been times I've been so ashamed that I've just wanted to hide away.*	
37	*79*	Soy una persona animada y con mucha vitalidad.	*I'm a very lively, energetic person.*	
38	*100*	-	-	128
39	*148*	-	-	234
40	*102*	-	-	130
41	*88*	Ante situaciones de mucha tensión, a veces pienso que me voy a hundir.	*When faced with very stressful situations, I sometimes feel like I'm sinking.*	
42	*120*	Soy una persona alegre y animada.	*I'm a happy and cheerful person.*	
43	*147*	Tengo mucha curiosidad intelectual.	*I have a lot of intellectual curiosity.*	
44	*132*	Según convenga, amenazo o "hago la pelota" a los demás para que hagan lo que yo quiera.	*Depending on the situation, I'll threaten or flatter other people to get them to do what I want.*	
45	*113*	Me esfuerzo para que todo lo que hago sea lo más perfecto posible.	*I work hard so that everything I do turns out as perfectly as possible.*	
46	*109*	-	-	136
47	*151*	-	-	237
48	*131*	A veces, cunado leo poesía o contemplo una obra de arte (un cuadro, una escultura, …), siento una profunda emoción o sensación.	*Sometimes I feel a deep emotion when I'm reading poetry or contemplating a piece of artwork (a painting, a sculpture, …).*	
49	*76*	A veces actúo de forma egoísta y pensando sólo en mí.	*Sometimes I act selfishly and only think about myself.*	
50	*87*	Si puedo, prefiero acabar las actividades de la escuela antes que dejarlas a medias.	*If I can, I prefer to finish my schoolwork instead of leaving it half done.*	

Note. Translated item content and JS NEO-S item numbers are in italics.

Supplementary Figure 1

Illustration of the Underlying Factor Model From ESEM



Note. N = Neuroticism; E = Extraversion; O = Openness; A = Agreeableness; C = Conscientiousness.

Supplementary Table 7

Correlations Among Variables Assessed in Study 2

	JS NEO-A50 N	JS NEO-A50 E	JS NEO-A50 O	JS NEO-A50 A	JS NEO-A50 C	Agr (ext)	Ant (ext)	Ans (int)	Dep (int)	Life satisfaction	Grades
JS NEO-A50 N	-										
JS NEO-A50 E	-.16**	-									
JS NEO-A50 O	.12*	.13*	-								
JS NEO-A50 A	-.17**	-.02	-.02	-							
JS NEO-A50 C	-.16**	.24***	.08	.18***	-						
Agr (ext)	.10	.05	-.13*	-.44***	-.21***	-					
Ant (ext)	.06	.06	.02	-.41***	-.21***	.60***	-				
Ans (int)	.61***	-.08	.08	-.02	-.04	.23***	.12*	-			
Dep (int)	.54***	-.28***	.09	-.12*	-.24***	.23***	.21***	.70***	-		
Life Satisfaction	-.40***	.29***	.07	-.04	.27***	-.14**	-.06	-.41***	-.57***	-	
Grades	.03	.16**	.18***	.14**	.43***	-.16**	-.19***	.14**	.00	.13*	-

Note. Agr = Aggression; Ant = Antisocial; Ans = Anxiety; Dep = Depression; Grades = Academic performance, int = internalizing, ext = externalizing.

N = Neuroticism; E = Extraversion; O = Openness; A = Agreeableness; C = Conscientiousness.

*p < .05. **p < .01. *** p < .001.

Supplementary Table 8

Gender Differences Among JS NEO-A50 Dimensions in Study 2

	Full sample (*n*=385)		Males (*n*=183)		Females (*n*=202)		*t-test*	
	M	*SD*	*M*	*SD*	*M*	*SD*	*p*	*d*
N	18.45	7.51	17.02	6.72	19.75	7.96	< .001	.37
E	25.76	6.52	25.26	6.25	26.21	6.74	ns	.15
O	19.94	6.74	19.28	6.35	20.53	7.03	ns	.19
A	28.39	6.84	26.60	6.73	30.01	6.55	< .001	.51
C	23.96	7.00	22.91	6.28	24.91	7.29	< .01	.29

Note. N = Neuroticism; Em. St. = Emotional Stability; E = Extraversion; O = Openness; A = Agreeableness; C = Conscientiousness; M = Mean; SD = Standard Deviation.

d = Cohen's d scores in absolute values. Scores of .20, .50 and .80 correspond to small, medium and large effect sizes respectively (Cohen, 1992).

ns = non-significant.

Study 3. The Spanish Short Dark Tetrad (SD4)

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Abstract

Background: The Short Dark Tetrad (SD4) is a recently developed instrument to assess the "dark" personality traits of psychopathy, narcissism, Machiavellianism, and sadism. We aimed to elaborate on the SD4's psychometric properties by adapting the instrument into Spanish and examine its structure, gender invariance, reliability, concurrent validity, and nomological network. **Method:** A sample of 668 adults (M_{age} = 26.36, SD = 10.64, 69.2% females) completed the SD4 and other self-report questionnaires. **Results:** Results showed sound reliability and concurrent validity indices, an adequate four-factor structure, and supported strong gender invariance. Furthermore, most findings about the instrument's nomological network were in line with registered hypotheses: All four SD4 scales were associated with low levels of agreeableness and antagonism; psychopathy was also related to low conscientiousness, disinhibition and impulse-control problems; narcissism was associated positively with extraversion and negatively with internalizing symptoms; Machiavellianism was uncorrelated with impulsivity-related

problems, hence showing a distinction with psychopathy's profile; finally, sadism showed a similar pattern of associations to psychopathy, albeit less strongly linked to impulsivity problems and externalizing behavior. Conclusions: Overall, the SD4 presents sound psychometric properties, although the overlap between psychopathy and sadism warrants some caution.

Keywords: SD4, Dark Tetrad, Spanish version, Five Factor Model, psychological problems

Resumen

Antecedentes: El Short Dark Tetrad (SD4) es un instrumento recientemente desarrollado para evaluar los rasgos "oscuros" de personalidad de psicopatía, narcisismo, maquiavelismo y sadismo. Nuestro objetivo fue profundizar en las propiedades psicométricas del SD4 adaptando el instrumento al español, y examinar su estructura, invariancia de género, fiabilidad, validez concurrente y red nomológica. Método: Una muestra de 668 adultos (M_{edad} = 26,36, SD = 10,64, 69,2% mujeres) completaron el SD4 y otros cuestionarios. Resultados: Encontramos índices apropiados de fiabilidad y validez concurrente, una estructura de cuatro factores, y un apoyo a la invariancia de género. Además, los hallazgos sobre la red nomológica estuvieron mayoritariamente en línea con las hipótesis prerregistradas: las cuatro escalas del SD4 se asociaron con baja amabilidad y antagonismo; la psicopatía se relacionó con baja responsabilidad, desinhibición y problemas de impulsividad; el narcisismo se asoció con extraversión y negativamente con síntomas de interiorización; el maquiavelismo no correlacionó con problemas de impulsividad, por lo que mostró un perfil diferenciado al de psicopatía; el sadismo mostró un patrón de asociaciones similar a psicopatía, aunque menos fuertemente vinculado a problemas de impulsividad y comportamientos externalizantes. Conclusiones: En general,

el SD4 presenta buenas propiedades psicométricas, aunque el solapamiento entre psicopatía y sadismo justifica cierta precaución.

Palabras clave: SD4, Tétrada Oscura, versión española, Modelo de Cinco Factores, problemas psicológicos

Introduction

Since the introduction of the term Dark Triad two decades ago (Paulhus & Williams, 2002), one of the most fruitful topics of research in the field of personality has been the study of socially aversive personality characteristics (Dinic & Jevremov, 2021). The Dark Triad comprises the joint study of subclinical psychopathy (involving a callous lack of empathy, along with sensation-seeking and impulsive behavior; Hare & Neumann, 2008; Skeem et al., 2011), subclinical narcissism (entailing self-centeredness and admiration-seeking behavior; Back et al., 2013; Raskin & Hall, 1979), and Machiavellianism (characterized by a cynical worldview, strategic planning, interpersonal exploitation, and personal ambition; Christie & Geis, 1970; Jones & Paulhus, 2009). The combined study of these "dark" traits has allowed to obtain a more accurate link between particular Triad members and external correlates, and has contributed to increase our knowledge about these antagonistic traits (Furnham et al., 2013; Jonason, 2023; Muris et al., 2017). However, some controversies and criticism have also emerged, particularly the difficulties to properly distinguish Machiavellianism from subclinical psychopathy (J. D. Miller et al., 2017) or establishing the number and nature of "dark traits" (e.g., Marcus & Ziegler-Hill, 2015; Moshagen et al., 2018).

Among the proposed additional traits, everyday sadism has achieved the broadest consensus (e.g., Buckels et al., 2013; Plouffe et al., 2017; Paulhus, 2014), thus a so-called

Dark Tetrad has been proposed (Chabrol et al., 2009). *Everyday sadism* refers to non-sexual, non-criminal forms of sadistic behavior that occur in daily life and that involve intrinsic pleasure arising from the physical or psychological suffering of others (Paulhus, 2014). Initial attempts to jointly study Dark Tetrad traits usually employed the Dirty Dozen (DD; Jonason & Webster, 2010) or the Short Dark Triad (SD3; Jones & Paulhus, 2014) questionnaires, together with stand-alone scales assessing sadism, such as the Assessment of Sadistic Personality (ASP; Plouffe et al., 2017), the Short Sadistic Impulse Scale (SSIS; O'Meara et al., 2011), the Comprehensive Assessment of Sadistic Tendencies (CAST; Buckels et al., 2013), or the Varieties of Sadistic Tendencies (VAST; Paulhus & Jones, 2015). Recently, the Short Dark Tetrad (SD4; Paulhus, Buckels, et al., 2021) has been developed to improve the SD3 by: a) replacing items of the Machiavellianism scale, reflecting less aggressive content with a greater focus on controlled manipulation, thereby differentiating better with the psychopathy scale; and b) adding sadism items that have shown to be structurally distinctive from the other dark factors.

As a recently developed instrument, the SD4 requires multiple sources of reliability and validity evidence, and initial studies point to promising psychometric properties. Thus, different modeling approaches have supported an adequate four-factor structure subsuming the SD4 (Blötner et al., 2022; Neumann et al., 2022; Paulhus, Buckels, et al., 2021). The SD4 has also shown sound concurrent validity with homologous scales (Blötner et al., 2021). In addition, the SD4 has yielded distinctive links of each dark trait to particular outcomes, despite the apparent similarities between the profiles of subclinical psychopathy and everyday sadism (Blötner & Mokros, 2023; Bonfá-Araujo et al., 2022). Namely, these links include associations of narcissism with interpersonal adjustment (Paulhus, Buckels, et al., 2021) and transformational leadership (Schreyer et

al., 2023); associations of Machiavellianism with cynicism and mistrust (Blötner et al., 2021); correlations of psychopathy with impulsivity-related behaviors (Blötner et al., 2021); and sadism predicting behavioral and self-report aggression (Paulhus, Gupta & Jones, 2021) or cyberbullying behavior (Gajda et al., 2022). Last, a coherent association of SD4 scales with the personality domains of the Five-Factor Model (FFM) has also been reported (Paulhus, Buckels et al., 2021; Blötner et al., 2022). Thus, all four features were linked to (low) agreeableness, mainly psychopathy and sadism, supporting the proposal of a shared "dark core" for dark traits (Moshagen et al., 2018) that would reflect the opposite pole of the normal personality dimension of agreeableness (i.e., "antagonism"; Vize et al., 2020). Furthermore, narcissism correlated with extraversion; psychopathy and sadism with low conscientiousness; whereas Machiavellianism presented inverse but small (Paulhus, Buckels et al., 2021) or non-significant correlations (Blötner et al., 2022) with conscientiousness. Overall, SD4 narcissism, Machiavellianism, and psychopathy reflect different personality and criteria profiles, although the distinctiveness between psychopathy and sadism requires further scrutiny (Blötner & Mokros, 2023; Bonfá-Araujo et al., 2022).

To date, the original SD4, developed in English, has been adapted to the German (Blötner et al., 2022; 2021), Portuguese (Pechorro et al., 2022), Polish (Gajda et al., 2022), Farsi (Qaderi Bagajan et al., 2023), and Chinese languages (Liu et al., 2023). To expand knowledge in this area, we aimed to adapt the SD4 into the Spanish language and test the psychometric properties of the scale in a community sample of adults living in Spain, bearing in mind the International Test Commission guidelines for translating and adapting tests (Muñiz et al., 2013). Specifically, we sought to replicate its factor structure and find evidence of multiple group invariance across gender. Furthermore, we aimed to examine

internal consistency reliability and concurrent associations with corresponding scales. Finally, to provide incremental knowledge beyond the current state-of-the-art, we aimed to expand the evidence of the nomological network of the SD4 by investigating links to normal and maladaptive personality traits and to broad psychopathology domains. Thus, the present study can be useful to address some criticisms of the constructs of Machiavellianism (J. D. Miller et al., 2017) and sadism (Blötner & Mokros, 2023), therefore expanding upon the empirical structure and conceptual utility of these traits.

Our main hypotheses were that (see registration of present study): a) The four-factor structure of the SD4 would be adequately replicated in our Spanish adaptation, employing Exploratory Structural Equation Modeling; b) the SD4 would show evidence of strong measurement invariance across gender; c) mean scores on each of the Tetrad traits would be significantly higher in men than women, especially for psychopathy and sadism; d) reliability sources of evidence would show adequate indices; e) each of the SD4 traits would yield evidence of concurrent validity, showing highest correlations with corresponding measures; and f) the SD4 features would show evidence of criterion validity, in terms of correlations with normal and maladaptive personality traits, and psychological problems. Thus, we anticipated that all four traits (especially psychopathy and sadism) would have significant associations with antagonism/low agreeableness and externalizing problems; differential correlations would include psychopathy being associated with disinhibition/impulsivity, whereas Machiavellianism would show non-significant or even positive associations with measures of impulse-control; narcissism would be associated positively with extraversion and negatively with detachment; finally, sadism would show a similar pattern of correlations to psychopathy, although less strongly related to impulse-control and externalizing problems.

Method

The registration for the present study, databases, analyses scripts, and supplementary material can be found in the Open Science Framework through the following link: https://osf.io/hqs9t/?view_only=c941a00bf8644ef992e2bda6cb553901

Participants

A core set of questionnaires was completed by all participants, whereas a subset of them (subsamples 1 and 2, see description in Supplementary Material-SM) completed additional measures. The full sample consisted of 668 adults (age range 18 to 76; *M*age = 26.36, *SD* = 10.64; 69.2% women, 1 participant identified as non-binary, so this participant was excluded from gender invariance and difference in means analyses). Their maximum level of education was requested, where 14 had completed up to Primary School, 31 Compulsory High school, 300 Baccalaureate (post-16 stage of education), 105 Apprenticeships, 157 Bachelor's degree, 60 Master's degree, and 1 PhD. All participants resided in the Valencian region of eastern Spain and were fluent Spanish speakers.

Instruments

A detailed description of the questionnaires is included in SM Instruments, and an overview of descriptive statistics for all measures (mean scores, standard deviations, and internal consistency indices) are shown in SM Table 9.

Dark Tetrad. The Short Dark Tetrad (SD4; Paulhus, Buckels et al., 2021). This 28-item self-report measure assesses Machiavellianism, everyday sadism and the subclinical traits of psychopathy and narcissism, and its Spanish adaptation is the focus of the present study. The measure is responded on a 5-point scale, indicating the degree to

which statements apply to the respondent (1 = Not at all, 5 = Very much). Original and translated items are available in Table 10 of the SM.

Dark Triad. A Spanish adaptation (Ortet-Walker et al., 2021) of the Five-Factor Model Antagonistic Triad Measure (FFM ATM; Rose et al., 2022). This questionnaire assesses psychopathy, narcissism, and Machiavellianism, along with specific subscales per trait. In the present study, we used the grandiose narcissism subscale, as in the original validation of the FFM ATM (see Rose et al., 2022), and a composite measure of antagonism plus planfulness for Machiavellianism, according to the theoretical core components of this dark trait (J. D. Miller et al., 2017; Jones & Paulhus, 2009). Alphas ranged from .41 to .63 (see Table 16), similar to those reported in the original validation (see Rose et al., 2022).

Psychopathy. Triarchic Model. A Spanish adaptation (Tomás-Portalés et al., 2021a) of the Triarchic Psychopathy Measure, 15-item version (TriPM-Short; Mededovic & Damjanovic, 2018). This is a short version of the TriPM (Patrick, 2010), assessing *boldness*, *meanness*, and *disinhibition*, along with a total composite psychopathy score. Alphas ranged from .71 to .74 (see Table 16).

Psychopathy. Four-Factor Model. A Spanish adaptation (Tomás-Portalés et al., 2021b) of the Self-Report Psychopathy Scale, Short Form (SRP SF; Paulhus et al., 2017). This 28-item questionnaire assesses the four factors (interpersonal, affective, lifestyle, and antisocial) of psychopathy (Hare, 2003). For the present study, item 22 from the antisocial scale was removed given its contribution to an extremely low internal consistency (Alpha with item = .29; alpha without item = .56, see Table 16). This last

Cronbach's Alpha value is in line with other studies in subclinical samples (Gordts et al., 2017), and the remaining alpha values were acceptable to good (see Table 16).

Sadism. Spanish adaptations (Ortet-Walker et al., 2019) of the Short Sadistic Impulse Scale (SSIS; O'Meara et al., 2011) and the Assessment of Sadistic Personality (ASP; Plouffe et al., 2017). Acceptable alphas for both scales were found (see Table 16).

Five-Factor Model Personality. The NEO-FFI, Spanish version is the short form of the NEO-PI-R (McCrae & Costa, 2008). This scale assesses the 5 broad domains of FFM personality: neuroticism, extraversion, openness, agreeableness, and conscientiousness. Alphas ranged from .70 to .87 (see Table 16).

Psychopathology. Personality Disorder Traits. The Personality Inventory for DSM-5-Brief Form, Spanish version (PID-5-BF; Romero & Alonso, 2019). The PID-5-BF assesses five personality disorder domains: negative affect, detachment, antagonism, disinhibition, and psychoticism. Alphas ranged from .66 to .76 (see Table 16).

Psychopathology. Internalizing, Externalizing, and Attention Problems. The authorized Spanish self-report version of the Brief Problem Monitor (BPM; Achenbach & Ivanova, 2018). The BPM is a self-report measure assessing problems in three domains: Internalizing, externalizing, and attention. Alphas ranged from .75 to .83 (see Table 16).

Procedure

Two of the authors of the present study, both experts in psychological assessment and fluent in both Spanish and English languages, translated and adapted the original English SD4 items into Spanish. Afterwards, an experienced translator unfamiliar with the

questionnaire back-translated them into English. One of the authors of the SD4 analyzed the back translation and ensured that the items were adjusted to their original meaning.

A convenience sample was recruited by five trained graduate students. A core set of questionnaires were completed by the full sample, and the remaining questionnaires were distributed among two subsamples (see SM Table 9 for specific questionnaires completed by each sample). Participants were community-dwelling adults who were friends, family members, or acquaintances of the recruiters, and were contacted via email or posting announcements on social media. All questionnaires were completed through the Google Forms platform in a forced response format, thus yielding no missing data. Participation was voluntary, there was no incentive to participate, and the data were ensured to be completely confidential. The present research was approved by the ethical review board of the first author's university and was conducted in accordance with the Declaration of Helsinki and the European Parliament Data Protection Regulation (GDPR; European Parliament, 2016/679) guidelines.

Data Analysis

Exploratory Structural Equation Modeling (ESEM) was conducted using the Weighted Least Square Mean and Variance adjusted estimator (WLSMV). The standard cut-off criteria for assessing model fit were considered (West et al., 2012). The χ^2 index was also inspected, although given its high sensitivity to sample size, its non-significance was not relied upon to establish adequate model fit (see a detailed description of the ESEM in SM Data analysis). Results of a Confirmatory Factor Analysis (CFA) can be found in Supplementary Tables 12 and 13, which are provided to illustrate ESEM's improved fit to the data.

Using an ESEM framework, we performed a multiple-group invariance test between men and women (see a detailed description in SM Data Analysis). In line with Neumann et al. (2022) and Sass (2011), configural and scalar models were performed incrementally to test for invariance. Cheung and Rensvold's (2002) criteria of ≤ .01 CFI change (ΔCFI) and ≤ .015 ΔRMSEA were employed, where a decrease in CFI and an increase in RMSEA above these values for the nested model are indicative of non-invariance. SRMR value change was de-emphasized given its lack of sensitivity to detect non-invariance (Chen, 2007). The ESEM procedures were undertaken using Mplus software, v.8 (Muthén & Muthén, 2017).

We performed Student's t-tests and computed the effect size in order to study gender differences in SD4 scales. Alpha (α) and Omega (ω) coefficients were computed to evaluate internal consistency reliability. Last, Pearson correlations were computed to inspect concurrent and criterion validity indices, employing SPSS v29. Significance was established at $p < .01$ to control for family-wise Type I error rate (see registration of present study).

Results

Intercorrelations

Zero-order correlations between all variables employed in the present study are shown in SM Table 11.

Exploratory Structural Equation Modeling and Reliability

Adequate fit indices were found for the ESEM model (except for the significant χ^2 result). Furthermore, we found evidence of strong invariance across gender. The ESEM

procedure retained adequate fit indices in the separate subsamples of men and women. In addition, in each invariance step, change in CFI and RMSEA fit indices were trivial and within the cut-off criteria (see Table 13).

The standardized loadings of the items were statistically significant and above .30 on their respective factors (except sadism item 27 “Just for kicks, I’ve said mean things on social media”, with a higher cross-loading on the psychopathy factor). The only other cross-loading higher than .30 was sadism item 22 “Watching fist fights excites me” on the psychopathy factor, albeit with a much higher target loading.

Internal consistency indices ranged between $\alpha = .69$ and .78 and between $\omega = .68$ and .79, in line with Paulhus, Buckels et al. (2021). Table 14 shows the latent factor correlations among the SD4 traits, which ranged between .21 and .48, highest between psychopathy and sadism (Pearson correlations were between .25 and .54; see SM Table 11).

Gender Differences

Having established strong measurement invariance across gender, mean differences among these groups could be inspected. Men scored significantly higher on all traits (with medium effect sizes), especially sadism, the difference of which was close to a large effect size (see Table 15).

Concurrent Validity

Table 16 shows the zero-order correlations between the SD4 traits and corresponding scales. Total scale scores of narcissism and sadism correlated highest with their respective SD4 trait and were large in magnitude. The FFM ATM Machiavellianism

composite of antagonism plus planfulness had the highest, medium correlation with its respective SD4 scale. Regarding SD4 psychopathy, the FFM ATM psychopathy scale together with the TriPM total, meanness and disinhibition, and SRP lifestyle scales showed the highest concurrent associations, all large. However, the SRP interpersonal and affective subscales, along with the total scale score, were more strongly linked to sadism. TriPM boldness showed the highest correlation with SD4 narcissism.

Nomological Network

The SD4 factors' correlations with FFM and maladaptive personality and psychopathological problems can be found in SM Table 11. The four Tetrad factors had significant, negative correlations with FFM agreeableness, particularly psychopathy and sadism. Both of the latter traits were associated with (low) conscientiousness, especially psychopathy. Low neuroticism and especially high extraversion were distinctly linked to narcissism. A small, positive association was additionally found between openness and narcissism. Machiavellianism also positively correlated with neuroticism.

As for maladaptive personality correlates, all four Tetrad traits were positively associated with antagonism. Detachment and psychoticism were significantly positively associated with Machiavellianism, psychopathy, and sadism. Both psychopathy and sadism also correlated positively with disinhibition, a feature more strongly related to the psychopathy factor. Negative affect showed a small, positive correlation with psychopathy.

In terms of psychopathological problems, Machiavellianism was characterized by small, positive associations with both internalizing and externalizing problems. Narcissism showed a medium, negative link to internalizing distress. Psychopathy was significantly

positively associated with all three psychopathological problems, with medium-to-large effect sizes with inattention and externalizing behavior. Finally, sadism had small-to-medium sized significant positive associations with inattention and externalizing, although with lower correlations than psychopathy.

Discussion

In the present study, we aimed to elaborate on the factor structure, gender invariance, and construct validity of the SD4, while making the instrument available for the Spanish-speaking, adult general population. Regarding factor structure, we found adequate fit indices and item factor loadings for the main ESEM model. Only two cross-loadings above the standard .30 threshold were found, both corresponding to the sadism scale and loading onto psychopathy. However, only one of them (item 27 "Just for kicks, I've said mean things on social media") had a higher cross-loading than target loading value. This is consistent with the SD4 original study (Paulhus, Buckels et al., 2021) and other studies (Blötner et al., 2022; Neumann et al., 2022). Perhaps a rewording of item 27 could be considered for a better differentiation between psychopathy and sadism. Regarding reliability, the SD4 scales presented acceptable to good internal consistency indices, similar to those reported in the original study (Paulhus, Buckels et al., 2021) and in other adaptations (Blötner et al., 2022; 2021; Gajda et al., 2022; Liu et al., 202; Pechorro et al., 2022).

Multiple-group analysis was performed and yielded strong measurement invariance across gender, in line with Neumann et al. (2022), Blötner et al. (2022), and Pechorro et al. (2022). Thus, the present Spanish version of the SD4 would reflect true differences in mean Dark Tetrad scale scores when testing for statistical differences

between genders. Thus, men showed higher scores on all four Tetrad traits, particularly sadism, in line with previous studies (Hartung et al., 2022; Neumann et al., 2022; Paulhus, Buckels et al., 2021; Paulhus, Gupta & Jones, 2021; Pechorro et al., 2022).

Regarding concurrent validity, the SD4 scales generally showed expected associations with other, corresponding dark trait scales. Namely, SD4 sadism presented the highest correlations with the other two sadism scales (SISS and ASP), and psychopathy and narcissism SD4 scales associated highest with their analogous FFM ATM counterparts. SD4 Machiavellianism showed a moderate correlation with the composite score of antagonism plus planfulness of FFM ATM Machiavellianism, the theoretical core components of this dark trait (J. D. Miller et al., 2017; Jones & Paulhus, 2009), although lower than desired for concurrent associations. This result is not entirely unexpected, given the very different approaches in developing SD4 and FFM ATM Machiavellianism scales (see Paulhus, Buckels et al., 2021 for SD4; see Du et al., 2021; Rose et al., 2022 for FFM ATM), and some psychometric issues that this last scale has presented (such as poor internal consistency and low concurrent indices with other Machiavellianism scales; Du et al., 2021; Rose et al., 2022).

Regarding the association of the SD4 scales with Hare's (SRP SF; Paulhus et al., 2017) and Patrick's (TriPM; Patrick, 2010) psychopathy measures, we generally found the expected associations. SD4 psychopathy showed a high association with SRP and TriPM total psychopathy scores, and particularly with the SRP lifestyle subscale, which is characterized by impulsive, erratic, and disorganized behavior, and the TriPM disinhibition scale, in accordance with the impulsive, reckless, and aggressive content of the SD4 scale. SD4 sadism was also highly associated with the SRP SF, indeed showing

higher correlations with the affective, interpersonal, and total scores than SD4 psychopathy. Unexpectedly, SD4 sadism was more largely associated with disinhibition than meanness, the latter correlation being significant but lower than predicted. SD4 narcissism was mainly associated with TriPM boldness, likely because both constructs are strongly related to extraversion (Muris et al., 2017; Poy et al., 2014). Last, SD4 Machiavellianism showed moderate to low associations with TriPM and SRP scales, supporting the differentiation between Machiavellianism and psychopathy, with the noteworthy exception of the high association with the interpersonal facet of the SRP, probably reflecting the common manipulative characteristics of both Machiavellian and psychopathic traits (Paulhus, 2014).

Taken together, the pattern of relationships showed adequate concurrent validity findings for SD4 psychopathy and narcissism, partially for SD4 sadism, whereas the SD4 Machiavellianism and FFM ATM Machiavellianism scales displayed moderate concurrent associations. Despite this, SD4 Machiavellianism presented a distinctive profile from psychopathy, showing a high relationship with the interpersonal manipulative aspects of psychopathy, but low to moderate associations with other psychopathy components. Last, SD4 sadism showed strong concurrent associations with other sadism scales, but also presented high to very high associations with SRP SF affective, interpersonal, and total scales. Thus, present results raise questions about the sadism scale's true distinctiveness from the psychopathy scale, maybe suggesting that the sadism scale could be reflecting the affective component of the broader construct of psychopathy, whereas the SD4 psychopathy scale would be reflecting the impulsive and disinhibited content of the construct (Hare & Neumann, 2008).

To further examine construct validity and depict the SD4's nomological network, its scales were correlated with normal and maladaptive personality domains, and with the broad psychopathological factors of internalizing, externalizing, and attention problems. Associations of the SD4 scales with FFM personality traits and PID-5 maladaptive personality confirmed registered hypotheses and previous findings (Muris et al., 2017; O'Boyle et al., 2015; Vize et al., 2018). A negative link to agreeableness and antagonism was the common pattern across all four SD4 traits, with distinguishing features in the expected direction. In addition, narcissism presented a positive association with extraversion and the small, positive link to openness shown in prior research. Psychopathy also presented consistent correlations with low conscientiousness and high disinhibition, reflecting the impulsive content of the scale (Paulhus, 2014). In contrast, Machiavellianism showed no relation with neither conscientiousness nor disinhibition, and so aligns more closely with theoretical expectations than the commonly reported negative and positive associations, respectively (J. D. Miller et al., 2017; Paulhus, 2014). This was expected given the development efforts for the SD4 to distinguish Machiavellianism from psychopathy more adequately (Paulhus, Buckels et al., 2021), and is in line with Blötner et al.'s (2021) findings. By and large, despite the moderate concurrent associations with the FFM ATM scale, the construct validity of the SD4 Machiavellianism scale was mostly supported. Sadism showed a very similar pattern of correlations with FFM traits as psychopathy, where low conscientiousness and disinhibition characterized both profiles together with disagreeableness and antagonism, in the same vein as previous findings (Paulhus, Buckels et al., 2021; Blötner et al., 2021). Partly tempering the issue of similarity between sadism and psychopathy, though, the associations between sadism and disinhibition were relatively weaker than between

disinhibition and psychopathy. A finer-grained analysis of the associations with FFM personality traits, such as links to facets, may be needed in future studies to disentangle the distinctiveness between sadism and psychopathy (Blötner & Mokros, 2023; Bonfá-Araujo et al., 2022). Finally, we did not hypothesize any of the Tetrad components to be linked to psychoticism, and for narcissism to only be slightly inversely associated with detachment. However, and in line with Blötner et al. (2021), we found high positive associations with both maladaptive personality scales, especially psychopathy and sadism. This would be indicative of a tendency for high scorers on psychopathy and sadism toward eccentric behavior and unusual beliefs about themselves, and a lower inclination to form close relationships with others (Grigoras & Wille, 2017). Similarly, other research has linked psychopathy to schizotypal and paranoid personality traits (Gillespie et al., 2021; Klipfel et al., 2017), both of which are comprised of similar content to the construct of psychoticism, at least as operationalized in the PID-5.

Regarding broad psychological problems, psychopathy exhibited the most problematic profile, revealing strong links to externalizing problems and inattention, in the same vein as Blötner et al. (2021). Of interest was also psychopathy's positive association with internalizing problems and negative affect, albeit in the small range, in line with studies linking psychopathy to emotion dysregulation (Colins et al., 2016; Garofalo et al., 2020) and negative emotions such as anger and contempt (Garofalo et al., 2019; Kosson et al., 2020). On the other hand, sadism presented a pattern of associations with psychological problems which was very similar to that of psychopathy, but they were notably attenuated, suggesting that sadism could be considered a similar construct to psychopathy with a less marked impulsivity component (Beauchaine & Sauder, 2017; Paulhus, 2014).

Taken together, these relationships with different measures revealed overall stronger associations between the SD4 features and maladaptive behavioral problems (i.e., antagonism, disinhibition, and externalizing) than to negative emotionality features (i.e., neuroticism and internalizing problems), as predicted. In addition, the patterns of associations for narcissism (extraversion, boldness, and low emotional distress), Machiavellianism (interpersonal manipulation and no impulse-control problems), and psychopathy (disinhibition, externalizing problems, and emotional dysregulation) were in line with predictions and supported their distinctiveness. Thus, SD4 Machiavellianism did not show problematic associations often reported in previous studies, at least concerning low conscientiousness and impulse-control problems. Thereby, as intended (Paulhus et al., 2022), the SD4 Machiavellianism subscale seems to constitute an improved measure compared to previous instruments and supports the differentiation between Machiavellianism and psychopathy. Last, sadism emerged as a distinguishable factor in the ESEM and showed good concurrent validity. However, its very high association with the SRP SF psychopathy scale and its pattern of associations with external correlates point to sadism's similarity with some aspects of psychopathy, suggesting that sadism may be nested within the psychopathy construct.

The present study has some limitations. On the one hand, our registration took place after data collection, although hypotheses were drafted prior to statistical analyses. On the other hand, the use of a convenience sample for the present study should be highlighted, as it is important to ensure participants are as representative of the sociocultural context as possible. Furthermore, we relied exclusively on cross-sectional data, which should be supplemented in future studies by longitudinal analyses to allow for more explanative inferences regarding the Dark Tetrad's outcomes. In addition, the

inclusion of other well-stablished stand-alone measures of narcissism and especially Machiavellianism would be highly recommended. Finally, other relevant outcomes that could better differentiate between the dark traits should be included in future studies with the Spanish SD4, such as bullying and cyberbullying, online trolling behavior, or consumption of violent media such as sports and videogames.

Despite these limitations, the present findings provide support for the reliability and validity of the SD4 for the assessment of the Dark Tetrad traits in the Spanish adult general population. It may also be a useful tool in the Latin American sociocultural context, where the wording may need to be slightly modified. In addition, this study extends the nomological network of the SD4. It appears to represent an efficient screening measure for early detection and prevention efforts toward maladaptive psychological and behavioral outcomes.

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Table 13

Goodness-Of-Fit Statistics From the Main Exploratory Structural Equation Model of the SD4 and Invariance Tests Across Gender

Model	χ^2 *(df)*	*CFI*	*TLI*	*RMSEA*	*90% CI*	*SRMR*	*ΔCFI*	*ΔRMSEA*
Model testing								
Main ESEM (n = 667)	696.776* (272)	.947	.926	.048	[.044, .053]	.037	—	—
ESEM model in men (n = 205)	405.865* (272)	.933	.906	.049	[.039, .059]	.049	—	—
ESEM model in women (n = 462)	542.368* (272)	.942	.920	.046	[.041, .052]	.042	—	—
Invariance testing								
Configural	1,046.216* (596)	.931	.912	.048	[.043, .052]	.045	—	—
Scalar	1,166.536* (721)	.931	.928	.043	[.038, .048]	.054	<.001	.005

Note. ESEM = exploratory structural equation modeling; χ^2 = chi square; df = degrees of freedom; CFI = comparative fit index; TLI = Tucker-Lewis index; RMSEA = root mean square error of approximation; 90% CI = 90% confidence interval of the RMSEA; SRMR = standardized root mean square residual.
*p < .001.

Table 14

Standardized Factor Loadings From the Main Exploratory Structural Equation Model of the SD4 Items, Latent Factor Correlations, and Internal Consistency Indices

	Machiavellianism (F1)		*Narcissism (F2)*		*Psychopathy (F3)*		*Sadism (F4)*	
SD4 items	λ	99% CI	λ	99% CI	λ	99% CI	λ	99% CI
1	**.324*****	[.199, .450]	-.006	[-.126, .113]	-.033	[-.171, .104]	.080	[-.053, .213]
2	**.530*****	[.424, .636]	.001	[-.100, .099]	.143**	[.032, .253]	-.272***	[-.386, -.158]
3	**.656*****	[.558, .754]	-.044	[-.140, .052]	.054	[-.058, .166]	-.142**	[-.255, -.028]
4	**.556*****	[.460, .651]	-.273***	[-.369, -.177]	.100*	[-.012, .213]	.079	[-.030, .188]
5	**.543*****	[.442, .645]	.150***	[.055, .246]	-.110*	[-.225, .005]	.051	[-.054, .155]
6	**.466*****	[.368, .565]	.117**	[.015, .220]	-.032	[-.150, .086]	.145**	[.028, .262]
7	**.552*****	[.460, .644]	.206***	[.117, .295]	-.153***	[-.252, -.055]	.291***	[.195, .387]
8	-.030	[-.117, .057]	**.769*****	[.693, .844]	-.118**	[-.217, -.019]	.078*	[-.016, .173]
9	.082*	[-.003, .168]	**.733*****	[.658, .809]	-.107**	[-.207, -.008]	.095**	[.002, .189]
10	.053	[-.055, .168]	**.435*****	[.333, .537]	.281***	[.166, .396]	-.099*	[-.207, .009]
11	.056	[-.039, .150]	**.610*****	[.511, .709]	.202***	[.091, .312]	-.223***	[-.334, -.112]
12	-.016	[-.111, .078]	**.634*****	[.547, .721]	-.017	[-.135, .102]	-.013	[-.131, .106]
13	-.080*	[-.184, .024]	**.591*****	[.490, .692]	.105*	[-.013, .223]	.029	[-.085, .143]
14	.070	[-.043, .184]	**.332*****	[.221, .443]	.091	[-.039, .221]	-.001	[-.130, .128]
15	.151**	[.035, .266]	.047	[-.070, .164]	**.543*****	[.419, .667]	.032	[-.092, .156]
16	.174***	[.058, .290]	.020	[-.099, .138]	**.501*****	[.376, .625]	.149**	[.026, .271]
17	.001	[-.136, .135]	.016	[-.120, .151]	**.679*****	[.548, .810]	.115*	[-.020, .251]
18	.037	[-.079, .153]	.069	[-.039, .177]	**.484*****	[.354, .615]	-.055	[-.182, .072]
19	-.162***	[-.276, -.047]	.055	[-.063, .173]	**.751*****	[.640, .863]	.110*	[-.010, .231]
20	-.102**	[-.193, -.011]	.050	[-.033, .133]	**.657*****	[.564, .749]	.235***	[.139, .332]
21	.128**	[.018, .238]	.203***	[.101, .304]	**.385*****	[.268, .503]	.173***	[.060, .285]
22	-.084*	[-.191, .024]	-.035	[-.137, .067]	**.368*****	[.253, .483]	**.621*****	[.520, .723]
23	-.076*	[-.155, .003]	-.031	[-.108, .045]	-.081*	[-.187, .025]	**.901*****	[.810, .991]
24	.242***	[.148, .336]	-.061	[-.160, .038]	.011	[-.109, .131]	**.595*****	[.481, .709]
25	-.098**	[-.181, -.015]	.023	[-.056, .102]	.028	[-.069, .125]	**.875*****	[.791, .959]

26	.223***	[.128, .338]	-.070	[-.175, .035]	.180***	[.065, .294]	**.456*** **	[.332, .580]
27	.042	[-.115, .199]	.018	[-.135, .172]	**.365*** **	[.204, .525]	.252***	[.098, .406]
28	.178***	[.076, .279]	.248***	[.146, .349]	.075	[-.037, .187]	**.391*** **	[.270, .511]
Latent correlations								
F1 (Mach)	α/ω = .69/.68		—		—		—	
F2 (Narc)	.363***		α/ω = .76/.75		—		—	
F3 (Psych)	.206***		.278***		α/ω = .74/.74		—	
F4 (Sadism)	.277***		.297***		.478***		α/ω = .78/.79	

Note. Shaded entries are the target loading items. Loadings > .30 are shown in bold, λ = factor loadings, 99% CI = 99% confidence interval. α = Cronbach's Alpha; ω = McDonald's Omega. Mach = Machiavellianism, Narc = Narcissism, Psych = Psychopathy. Internal consistency indices are shown in the diagonal over the latent factor correlations.
* $p < .05$. ** $p < .01$. *** $p < .001$.

Table 15

Mean Differences in the SD4 Traits Across Gender

	Full Sample (n = 667)	*Men (n = 205)*	*Women (n = 462)*	*t-test*	
	Mean (SD)	*Mean (SD)*	*Mean (SD)*	*p*	*d*
Machiavellianism	22.13 (5.14)	23.77 (4.72)	21.43 (5.16)	< .001	.47
Narcissism	17.87 (5.29)	19.32 (5.15)	17.24 (5.23)	< .001	.45
Psychopathy	11.74 (4.40)	13.20 (4.91)	11.09 (4.00)	< .001	.49
Sadism	13.49 (5.48)	16.52 (5.84)	12.13 (4.84)	< .001	.69

Note. SD = Standard Deviation. *d* = Cohen's d scores in absolute values. Scores of .20, .50 and .80 correspond to small, medium and large effect sizes respectively (Cohen, 1992).

Table 16

Zero-Order Correlations Among Corresponding Dark Tetrad Scales and Subscales, Normal and Maladaptive Personality Traits, and Psychopathological Problems

	SD4 Mach	SD4 Narc	SD4 Psych	SD4 Sadism
Sadism				
SSIS Sadism (.77)	.21**	.25**	.50**	**.57****
ASP Sadism (.77)	.23**	.27**	.48**	**.58****
FFM ATM				
Antagonism+Planfulness Mach (.41)	**.26****	.14**	.05	.21**
Grandiose Narc (.69)	.41**	**.60****	.45**	.50**
Total Psych (.63)	.32**	.48**	**.60****	.48**
SRP Psychopathy				
Interpersonal (.83)	.50**	.34**	.42**	.59**
Affective (.72)	.31**	.25**	.50**	.70**
Lifestyle (.79)	.20**	.32**	.66**	.51**
Antisocial (.56)	.11*	.21**	.32**	.30**
Total (.89)	.40**	.37**	**.63****	.70**
TriPM Psychopathy				
Boldness (.73)	.25**	.65**	.27**	.28**
Meanness (.75)	.21**	.12*	**.28****	**.31****
Disinhibition (.71)	.18**	.22**	**.57****	.40**
Total (.74)	.31**	.52**	**.56****	.48**
Normal personality (NEO-FFI)				
Neuroticism (.86)	.15**	-.18**	.08	.01
Extraversion (.81)	-.02	**.35****	.02	-.03
Openness (.70)	-.01	.12*	-.01	.09
Agreeableness (.72)	**-.24****	-.19**	**-.43****	**-.41****
Conscientiousness (.87)	.09	.09	**-.29****	-.21**
Maladaptive personality (PID-5)				
Negative affect (.66)	.11	-.15	.17*	.04

Detachment (.67)	.28**	.01	.37**	.35**
Antagonism (.68)	**.45****	.24**	**.41****	**.40****
Disinhibition (.70)	.01	.10	**.58****	.34**
Psychoticism (.76)	.23**	.08	.47**	.42**
BPM Psychopathological problems				
Attention (.82)	.10	-.13	**.32****	.22**
Internalizing (.83)	.18*	-.29**	.18*	.13
Externalizing (.75)	.17*	-.02	**.44****	.23**

Note. Mach = Machiavellianism, Narc = Narcissism, Psych = Psychopathy. Cronbach's Alphas of the scales are shown in brackets next to each variable. Hypothesized large associations are shown in bold (see registration).
*p < .01. **p < .001.

Electronic Supplementary Material

Subsamples

Subsample 1 consisted of 498 participants with ages between 18 and 63 (*M*age = 25.15, *SD* = 9.62; 70.7% women). The maximum education levels in this subsample were 14 up to Primary School, 28 Compulsory High School, 249 Baccalaureate, 85 Apprenticeships, 91 Bachelor's degree, and 31 Master's degree.

Subsample 2 consisted of *n* = 278 participants with ages between 18 and 76 (*M*age = 26.43, *SD* = 11.20; 71.9% women). The maximum education levels in this subsample were *n* = 3 up to Compulsory High School, *n* = 159 Baccalaureate, *n* = 20 Apprenticeships, *n* = 66 Bachelor's degree, *n* = 29 Master's degree, and *n* = 1 PhD.

The subsamples described above have 108 participants in common (i.e., those that completed all measures in the present study).

Instruments

FFF ATM. This questionnaire assesses the psychopathy (18 items), Machiavellianism (15 items), and narcissism (15 items), along with specific subscales per trait (i.e., antagonism, planfulness and agency in Machiavellianism; antagonism, disinhibition and emotional stability in psychopathy; antagonism, agentic extraversion and neuroticism, plus grandiose and vulnerable narcissism scores). In order to study convergent validity, we used the grandiose narcissism score, as in the original validation of the FFM ATM (see Rose et al., 2022), and a composite measure of antagonism plus planfulness for Machiavellianism, according to the theoretical core components of this dark trait (J. D. Miller et al., 2017; Jones & Paulhus, 2009). The questionnaire is responded on a 5-point scale from 1 (Disagree strongly) to 5 (Agree strongly). Poor to acceptable

internal consistencies were found (see Table 4), similar to those reported in the original validation (see Rose et al., 2022).

TriPM-Short. This is a short (15 item) version of the TriPM (Patrick, 2010), composed of *boldness*—reflecting the tendency to be venturesome and have low anxiety, *meanness*—characterized by callousness and cruelty, and *disinhibition*—reflecting impulsiveness and irresponsibility (5 items each), along with a total composite psychopathy score. The instrument is responded on a 4-point scale with anchors 1 (False), 2 (Somewhat false), 3 (Somewhat true), and 4 (True). Alphas ranged from .71 to .74 (see Table 16).

SRP SF. This 28-item questionnaire assesses psychopathic traits in line with the four-factor psychopathy model from the PCL-R (Hare, 2003), comprising interpersonal (manipulative tendencies), affective (unempathetic), lifestyle (disinhibited), and antisocial (rule-breaking and aggression) traits (7 items each), along with a total composite score. The scale is responded on a 5-point scale from 1 (Disagree strongly) to 5 (Agree strongly). The only reversed item from the antisocial scale, Item 22 ("I have never been involved in delinquent gang activity"), was removed given its contribution to an extremely low internal consistency, probably because most participants did not realize this item was in the opposite direction from the rest of the scale's items (Alpha with item = .29; alpha without item = .56, see Supplementary Table 9). This last Cronbach's Alpha value is in line with other studies in subclinical samples (Gordts et al., 2017), given the restriction of range in general population scores on criminal behavior. The rest of alpha were acceptable to good, ranging from .72 to .89 (see Table 16).

SSIS and ASP. These self-report scales assess subclinical sadism, consisting of 10 and nine items, respectively. The questionnaires were both responded on a 5-point scale

from 1 (Strongly disagree) to 5 (Strongly agree). Acceptable alphas of .77 for both scales were found (see Table 16).

NEO-FFI. This 60-item scale assesses the 5 broad domains of FFM personality: neuroticism, extraversion, openness, agreeableness, and conscientiousness (12 items each). The scale is responded on a 5-point scale from 0 (Disagree strongly) to 4 (Agree strongly). Alphas ranged from .70 to .87 (see Table 16).

PID-5-BF. It is a 25-item self-report measure based on the PID-5 (Krueger et al., 2012). It assesses five personality disorder domains (i.e., negative affect, detachment, antagonism, disinhibition, and psychoticism) with 5 items per domain. The five domains correspond conceptually to maladaptive variants of the FFM personality traits. The instrument is responded on a 4-point scale from 0 (Very false or often false) to 3 (Very true or often true). Alphas ranged from .66 to .76 (see Table 16).

BPM. It is an 18-item self-report measure assessing problems in three domains: Internalizing—anxious and depressive thought, externalizing—impulsive and aggressive behavior, and attention—lack of concentration and planning (6 items per scale). Responses are collected on 3-point scales with anchors 0 (Not true), 1 (Somewhat true), and 2 (Very true). Alphas ranged from .75 to .83 (see Table 16).

Data Analysis

ESEM: It has the advantage of allowing cross-loadings, which may be the modeling approach of choice for personality over the more restrictive Confirmatory Factor Analysis (CFA) (see Marsh et al., 2014). We conducted ESEM using the Weighted Least Square Mean and Variance adjusted estimator (WLSMV), appropriate for ordered categorical indicators. This model provides adjusted standard errors and statistical fit tests that are robust to nonnormality in the data. The standard cut-off criteria for assessing model fit

were considered. Namely: Comparative fit index (CFI) and Tucker-Lewis index (TLI) ≥ .90, Root Mean Square Error of Approximation (RMSEA) ≤ .08 (lower and upper 90% CI bounds ≤ .05 and ≤ .08, respectively), and standard Root Mean Square Residual (SRMR) ≤ .08 (West et al., 2012). The χ^2 index was also inspected, although given its high sensitivity to sample size, its non-significance was not relied upon to establish adequate model fit. We calculated and reported 99% confidence intervals for the standardized factor loadings.

Multiple-group invariance test: Despite our registration statement, no χ^2 difference test was done, as significant values can be obtained even with trivial discrepancies between both models. Instead, in line with Neumann et al. (2022) and Sass (2011), configural (i.e., free loadings and thresholds) and scalar (or strong; i.e., loadings and thresholds constrained) models were performed incrementally to test for invariance. Metric (or weak; i.e., constrained loadings) invariance is embedded in the scalar step and is conducted along with the scalar model because loadings and thresholds jointly define item functioning, and thus should be constrained and freed together (Sass, 2011). Cheung and Rensvold's (2002) criteria of ≤ .01 CFI change (ΔCFI) and ≤ .015 ΔRMSEA were employed, where a decrease in CFI and an increase in RMSEA above these values for the nested model are indicative of non-invariance. SRMR value change was de-emphasized given its lack of sensitivity to detect non-invariance (Chen, 2007).

Pearson correlations were computed to inspect convergent and criterion validity indices. The magnitude of associations (i.e., small, medium, or large) were interpreted based on Rosenthal's (1996) effect size benchmarks according to Pearson correlations of .10, .30, and .50, respectively. We also correlated the four SD4 scales with age (see

Supplementary Table 14). Finally, we calculated the floor and ceiling effects of the SD4 scales (see Supplementary Table 15).

Supplementary Table 9

Descriptive Statistics of All Scale and Domain Scores Employed in the Present Study

Full Sample (N = 668)		
Scale	Mean (SD)	Cronbach's alpha
SD4		
Mach	22.13 (5.14)	.69
Narc	17.87 (5.29)	.76
Psych	11.74 (4.40)	.74
Sadism	13.49 (5.48)	.78
FFM ATM		
Total Mach	35.72 (5.74)	.56
Mach Agency	19.34 (4.18)	.56
Mach Planfulness	6.90 (1.75)	.62
Mach Agency + Planfulness	16.39 (3.28)	.41
Mach Antagonism	9.49 (2.95)	.48
Total Narc	34.84 (7.01)	.64
Grandiose Narc	24.44 (6.08)	.69
Vulnerable Narc	10.40 (3.32)	.61
Narc Agentic Extraversion	11.66 (3.47)	.60
Narc Neuroticism	9.16 (3.33)	.80
Narc Antagonism	14.20 (4.40)	.67
Total Psych	39.59 (7.41)	.63
Psych Disinhibition	12.60 (3.68)	.50
Psych Emotional Stability	12.60 (3.60)	.56
Psych Antagonism	14.38 (3.85)	.60
SRP SF		

Total Psych	43.45(13.14)	.89
Interpersonal	12.76 (5.44)	.83
Affective	10.72 (3.98)	.72
Lifestyle	13.10 (5.17)	.79
Antisocial	6.86 (1.87)	.56
NEO-FFI		
Neuroticism	22.76 (9.55)	.86
Extraversion	29.79 (7.89)	.81
Openness	29.52 (6.96)	.70
Agreeableness	32.21 (6.35)	.72
Conscientiousness	31.29 (8.72)	.87
Subsample 1 (n = 498)		
Scale	Mean (SD)	Cronbach's alpha
TriPM—Short		
Total Psych	27.56 (5.83)	.74
Boldness	12.11 (3.25)	.73
Meanness	8.63 (1.60)	.75
Disinhibition	8.56 (3.00)	.71
SSIS Sadism	14.21 (4.93)	.77
ASP Sadism	12.59 (4.55)	.77
Subsample 2 (n = 278)		
Scale	Mean (SD)	Cronbach's alpha
PID-5-BF		
Negative Affect	7.64 (3.07)	.66
Detachment	3.46 (2.83)	.67
Antagonism	2.39 (2.33)	.68
Disinhibition	3.54 (2.73)	.70
Psychoticism	4.06 (3.13)	.76
BPM		

Attention	4.00 (3.19)	.82
Internalizing	3.48 (3.01)	.83
Externalizing	3.29 (2.60)	.75

Note. Mach = Machiavellianism, Narc = Narcissism, Psych = Psychopathy. SD = Standard Deviation.

Supplementary Table 10

Original SD4 (English) and Translated Items into Spanish

SD4 items	Item in English	*Translated item in Spanish*
Machiavellianism		
1	It's not wise to let people know your secrets.	*No es prudente dejar que los demás conozcan tus secretos.*
2	Whatever it takes, you must get the important people on your side.	*Cueste lo que cueste, debes tener a la gente importante de tu lado.*
3	Avoid direct conflict with others because they may be useful in the future.	*Evito el conflicto directo con otros porque me pueden ser de utilidad en el futuro.*
4	Keep a low profile if you want to get your way.	*Si quieres salirte con la tuya, es mejor pasar desapercibido.*
5	Manipulating the situation takes planning.	*Tiendo a planificar previamente para manejar las situaciones como yo quiero.*
6	Flattery is a good way to get people on your side.	*Usar halagos es una buena forma de conseguir que la gente esté de tu lado.*
7	I love it when a tricky plan succeeds.	*Me encanta cuando me funciona un plan astuto.*
Narcissism		
8	People see me as a natural leader.	*La gente me ve como un líder natural.*
9	I have a unique talent for persuading people.	*Tengo talento único para convencer a la gente.*
10	Group activities tend to be dull without me.	*Muchas actividades en grupo tienden a ser aburridas sin mí.*
11	I know that I am special because people keep telling me so.	*Sé que soy especial porque todo el mundo me lo dice una y otra vez.*
12	I have some exceptional qualities.	*Tengo algunas cualidades excepcionales.*
13	I'm likely to become a future star in some area.	*Es probable que en el futuro me convierta en una estrella en algún ámbito.*
14	I like to show off every now and then.	*Me gusta presumir de vez en cuando.*

Psychopathy		
15	People often say I'm out of control.	*La gente dice a menudo que estoy fuera de control.*
16	I tend to fight against authorities and their rules.	*Tiendo a luchar contra la autoridad y sus reglas.*
17	I've been in more fights than most people of my age and gender.	*He estado en más peleas que mucha gente de mi edad y género.*
18	I tend to dive in, then ask questions later.	*Tiendo a lanzarme primero y preguntar después.*
19	I've been in trouble with the law.	*He tenido problemas con la ley.*
20	I sometimes get into dangerous situations.	*A veces me meto en situaciones peligrosas.*
21	People who mess with me always regret it.	*La gente que se mete conmigo siempre lo lamenta.*
Sadism		
22	Watching a fist-fight excites me.	*Las peleas a puñetazo limpio me resultan excitantes.*
23	I really enjoy violent films and video games.	*Me encantan las películas y los videojuegos violentos.*
24	It's funny when idiots fall flat on their face.	*Me resulta gracioso cuando veo a un imbécil caerse y estamparse la cara contra el suelo.*
25	I enjoy watching violent sports.	*Disfruto viendo deportes violentos.*
26	Some people deserve to suffer.	*Hay algunas personas que merecen sufrir.*
27	Just for kicks, I've said mean things on social media.	*He dicho cosas ofensivas en redes sociales solo para divertirme.*
28	I know how to hurt someone with words alone.	*Sé cómo hacer daño a la gente usando sólo las palabras.*

Note. Translated item content and SD4 item numbers are in italics.

Supplementary Table 11

Zero-Order Correlations Among All Variables Employed in the Present Study

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
SD4 Mach (1)	—																						
SD4 Narc (2)	.33***	—																					
SD4 Psych (3)	.25***	.35***	—																				
SD4 Sadism (4)	.33***	.32***	.54***	—																			
FFM ATM psych antagonism (5)	.32***	.20***	.43***	.37***	—																		
FFM ATM psych Emotional Stability (6)	.11**	.54***	.21***	.22***	.06	—																	
FFM ATM Psych disinhibition (7)	.19***	.25***	.56***	.37***	.36***	.07	—																
FFM ATM Total psych (8)	.32***	.48***	.60***	.48***	.73***	.55***	.72***	—															
FFM ATM grandiose narc (9)	.41***	.60***	.45***	.50***	.47***	.51***	.40***	.69***	—														
FFM ATM vulnerable narc (10)	.29***	-.01	.13**	.09*	.39***	-.39***	.26***	.14***	0.03	—													
FFM ATM narc antagonism (11)	.44***	.37***	.47***	.45***	.73***	.21***	.48***	.72***	.75***	.45***	—												

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
FFM ATM narc neuroticism (12)	.13**	-.13***	-.09*	-.07	.08*	-.50***	.02	-.19***	-.23***	.82***	.09*	—											

FFM ATM narc agentic extraversion (13)	.34***	.61***	.29***	.39***	.21***	.43***	.26***	.45***	.83***	.04	.39***	-.09*	—									
FFM ATM Total narc (14)	.49***	.52***	.45***	.48***	.59***	.26***	.46***	.66***	.88***	.50***	.86***	.19***	.74***	—								
FFM ATM Mach antagonism (15)	.27***	.24***	.32***	.38***	.57***	.29***	.24***	.56***	.46***	.12**	.56***	-.07	.25***	.46**	—							
FFM ATM Mach agency (16)	0.02	.37***	.03	.05	-.23***	.58***	-.04	.14***	.30***	-.46***	-.05	-.49***	.34***	.04	0.05	—						
FFM ATM Mach planfulness (17)	0.03	-.14***	-.44***	-.25***	-.31***	-.04	-.58***	-.47***	-.20***	-.18***	-.27***	-.06	-.11**	-.26***	-.10*	.24***	—					
FFM ATM Total Mach (18)	.16***	.35***	.05	.16***	.03	.56***	-.08*	.25***	.39***	-.33***	.17***	-.41***	.34***	.19***	.52***	.83***	.43***	—				
FFM ATM Mach antagonism + planfulness (19)	.26***	.14***	.05	.21***	.35***	.24***	-.09*	.25***	.31***	.01	.36***	-.10*	.16***	.27***	.85***	.17***	.45***	.70***	—			
SRP SF interpersonal (20)	.50***	.34***	.42***	.59***	.58***	.19***	.35***	.56***	.60***	.27***	.65***	.06	.43***	.65***	.49***	.01	-.17***	.21***	.35***	—		
SRP SF affective (21)	.31***	.25***	.50***	.70***	.53***	.28***	.37***	.59***	.54***	.10*	.56***	-.11**	.33***	.52***	.51***	.06	-.22***	.24***	.34***	.61***	—	
SRP SF lifestyle (22)	.20***	.32***	.66***	.51***	.44***	.22***	.63***	.64***	.51***	.15***	.51***	-.05	.36***	.52***	.35***	.02	-.44***	.06	.08*	.49***	.56***	—
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
SRP SF antisocial (23)	.11**	.18***	.21***	.30***	.28***	.11**	.18***	.29***	.30***	.10**	.31***	.05	.19***	.30***	.25***	-.03	-.09*	.08*	.18**	.34***	.34***	.32***	—
SRP SF Total psych (24)	.39***	.37***	.61***	.70***	.61***	.26***	.53***	.70***	.66***	.22**	.68***	-.02	.45***	.67***	.53***	.02	-.32***	.19***	.31***	.84***	.82***	.81***	.56***
TriPM boldness (25)	.25***	.65***	.27***	.28***	.13**	.64***	.24***	.48***	.61***	-.15**	.33***	-.25***	.63***	.46***	.22***	.44***	-.04	.43***	.18***	.36***	.25***	.30***	.18***
TriPM meanness (26)	.21***	.12**	.28***	.31***	.52***	.27***	.18***	.48***	.39***	.01	.45***	-.15***	.17***	.34***	.60***	.05	-.10*	.31***	.48***	.37***	.54***	.29***	.13**
TriPM disinhibition (27)	.18***	.22***	.57***	.40***	.42***	.06	.58***	.53***	.35***	.22***	.45***	.02	.23***	.41***	.29***	-.13**	-.55***	-.12**	-.04	.44***	.40***	.66***	.22**

TriPM Total psych (28)	.31***	.52***	.56***	.48***	.49***	.49***	.50***	.73***	.68***	.03	.59***	-.19***	.54***	.60***	.51***	.19***	-.35***	.30***	.27***	.58***	.56***	.62***	.26***
SSIS sadism (29)	.21***	.25***	.50***	.57***	.47**	.12**	.33***	.46***	.44***	.22***	.50***	.04	.29***	.49***	.43***	-.010	-.17***	.16**	.29***	.55***	.54***	.42***	.33***
ASP sadism (30)	.23***	.27***	.48***	.58***	.46***	.16***	.33***	.48***	.46***	.15**	.49***	-.02	.30***	.47***	.42***	.03	-.20***	.18**	.26***	.54***	.53***	.43***	.32***
NEO-FFI neuroticism (31)	.15***	-.18***	.08*	.01	.24***	-.56***	.26***	-.02	-.11***	.61***	.20***	.55***	-.10***	.19***	-.05	-.60***	-.22***	-.53***	-.16***	.13***	-.03	.09*	.05
NEO-FFI extraversion (32)	-0.02	.35***	.02	-.03	-.22***	.53**	-.03	.12**	.24***	-.31***	-.07	-.30***	.33***	.06	-.19***	.45***	-.04	.22***	-.19***	-.02	-.09*	-.01	-.07
NEO-FFI openness (33)	-0.01	.12**	-.01	.09*	-.14**	-.01	.04	-.05	.03	.01	-.07	.06	.14***	.03	-.16***	.02	-.03	-.08*	-.17***	-.01	-.04	.12**	-.01
NEO-FFI agreeableness (34)	-.24***	-.19***	-.43***	-.41***	-.57***	-.06	-.45***	-.55***	-.39***	-.27***	-.55***	-.05	-.22***	-.47***	-.54***	.07	.24***	-.16***	-.36***	-.47***	-.47***	-.42***	-.23***
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
NEO-FFI conscientiousness (35)	.09*	.09*	-.29***	-.21***	-.34***	.18***	-.29***	-.24***	.02	-.22**	-.15***	-.19***	.08*	-.09*	-.12**	.49***	.56***	.46***	.19***	-.10**	-.19***	-.32***	-.10*
BPM attention (36)	.10	-.13*	.32***	.22***	.36***	-.40***	.31**	.15*	.03	.42***	.28***	.34***	-.03	.23***	.05	-.50***	-.41***	-.45***	-.16**	.25***	.24***	.36***	.18**
BPM internalizing (37)	.18**	-.29***	.18**	.13*	.32**	-.60***	.23***	-.01	-0.10	.59***	.24***	.54***	-.11	.21***	.07	-.60***	-.09	-.42***	.02	.23***	.15*	.21***	.14*
BPM externalizing (38)	.17**	-.02	.44***	.23**	.33***	-.27***	.62***	.36***	.19**	.37***	.39***	.20***	.11	.35***	.22***	-.23***	-.35***	-.15*	.02	.29***	.23***	.44***	.20***
PID negative affect (39)	.11	-.15*	.17**	0.04	.15*	-.54***	.27***	-.06	-.07	.55***	.20***	.49***	-.04	.21***	-.06	-.47***	-.13*	-.40***	-.12*	.18***	-.03	.11	.06
PID detachment (40)	.28***	.01	.37***	.35***	.56***	-.19**	.32***	.37***	.23**	.40***	.52***	.19**	.01	.39***	.44***	-.32***	-.18***	-.04	.31***	.44***	.44***	.40***	.27***
PID antagonism (41)	.45***	.24***	.41***	.40***	.50***	.15*	.33***	.51***	.50***	.28***	.62***	.08	.28***	.57***	.49***	-.04	-.13*	.20***	.39***	.61***	.48***	.41***	.32***
PID disinhibition (42)	.01	.09	.58***	.34***	.39***	-.09	.53***	.43***	.31***	.18**	.41***	.01	.14*	.36***	.20***	-.23***	-.66***	-.25***	-.15*	.31***	.36***	.57***	.21***

PID psychoticism (43)	.23***	.08	.47***	.42***	.44***	-.17**	.39**	.35***	.34***	.36***	.51***	.20***	.17**	.46***	.28***	-.33***	-.35***	-.19***	.08	.49***	.44***	.45***	.26***	

Supplementary Table 11 (cont.)

Zero-Order Correlations Among All Variables Employed in the Present Study

	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43
SRP SF Total psych (24)	—																			
TriPM boldness (25)	.38***	—																		
TriPM meanness (26)	.45***	.15***	—																	
TriPM disinhibition (27)	.60***	.16***	.26***	—																
TriPM Total psych (28)	.70***	.70***	.62**	.71***	—															
SSIS sadism (29)	.62***	.20***	.39***	.39***	.47***	—														
ASP sadism (30)	.61***	.25***	.35***	.34***	.45***	.78***	—													
NEO-FFI neuroticism (31)	.09*	-.21***	-.10*	.28***	-.01	.12**	.06	—												
NEO-FFI extraversion (32)	-.05	.46***	-.10*	-.10*	.17***	-.16***	-.09	-.37***	—											
NEO-FFI openness (33)	.03	.19***	-.18***	.03	.05	-.06	-.06	.09*	.12**	—										
NEO-FFI agreeableness (34)	-.53***	-.20***	-.44***	-.43***	-.51***	-.50**	-.49***	-.21***	.34***	.17***	—									
	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43
NEO-FFI conscientiousness (35)	-.24***	.11*	-.14**	-.45***	-.23***	-.26***	-.24***	-.31***	.28***	.01	.33***	—								

BPM attention (36)	.33***	-.17	.01	.42***	.12	.28**	.28**	.55***	-.30***	.14*	-.22***	-.61***	—							
BPM internalizing (37)	.23***	-.35***	-.04	.23*	-.09	.28**	.19*	.73***	-.54***	.12	-.20***	-.29***	.60***	—						
BPM externalizing (38)	.38***	-.07	.01	.52***	.23*	.31**	.19*	.50***	-.23***	-.08	-.47***	-.26***	.38***	.46***	—					
PID negative affect (39)	.11	-.30**	-.36***	.31**	-.15	.11	.05	.65***	-.27***	.03	-.20***	-.18**	.41***	.56***	.51***	—				
PID detachment (40)	.50***	-.10	.26***	.36***	.24*	.45***	.34***	.39***	-.53***	-.01	-.45***	-.31**	.44***	.45***	.32***	.25***	—			
PID antagonism (41)	.59***	.26**	.51***	.42***	.56***	.56***	.49***	.14*	-.05	.09	-.40***	-.06	.14*	.11	.25***	.19***	.38***	—		
PID disinhibition (42)	.48***	.06	.14	.60***	.40***	.35***	.24*	.30***	-.05	.06	-.33***	-.47***	.44***	.21***	.48***	.20***	.35***	.25***	—	
PID psychoticism (43)	.53***	-.02	.20*	.49***	.32***	.44***	.41***	.42***	-.27***	.19**	-.30***	-.39**	.49***	.47***	.34***	.34***	.54***	.40***	.46***	—

Note. Mach = Machiavellianism, Narc = Narcissism, Psych = Psychopathy.

* $p < .05$. ** $p < .01$. *** $p < .001$

Supplementary Table 12

Goodness-Of-Fit Statistics From the Confirmatory Factor Analysis of the SD4

Model	χ^2 *(df)*	*CFI*	*TLI*	*RMSEA*	*90% CI*	*SRMR*
CFA	1218.908* (272)	.891	.880	.062	[.058, .065]	.063

Note. CFA = Confirmatory Factor Analysis. χ^2 = chi square; df = degrees of freedom; CFI = comparative fit index; TLI = Tucker-Lewis index. RMSEA = root mean square error of approximation; 90% CI = 90% confidence interval of the RMSEA; SRMR = standardized root mean square residual.

*$p < .001$.

Supplementary Table 13

Standardized Factor Loadings From the Confirmatory Factor Analysis of the SD4 Items

SD4 items	λ
Machiavellianism	
1. It's not wise to let people know your secrets.	.328*
2. Whatever it takes, you must get the important people on your side.	.347*
3. Avoid direct conflict with others because they may be useful in the future.	.484*
4. Keep a low profile if you want to get your way.	.403*
5. Manipulating the situation takes planning.	.591*
6. Flattery is a good way to get people on your side.	.632*
7. I love it when a tricky plan succeeds.	.840*
Narcissism	
8. People see me as a natural leader.	.701*
9. I have a unique talent for persuading people.	.771*
10. Group activities tend to be dull without me.	.576*
11. I know that I am special because people keep telling me so.	.603*
12. I have some exceptional qualities	.583*
13. I'm likely to become a future star in some area.	.614*
14. I like to show off every now and then.	.430*
Psychopathy	
15. People often say I'm out of control.	.611*
16. I tend to fight against authorities and their rules.	.674*
17. I've been in more fights than most people of my age and gender.	.717*
18. I tend to dive in, then ask questions later.	.438*
19. I've been in trouble with the law.	.726*
20. I sometimes get into dangerous situations.	.772*
21. People who mess with me always regret it.	.699*
Sadism	
22. Watching a fist-fight excites me.	.813*

23. I really enjoy violent films and video games.	**.725***
24. It's funny when idiots fall flat on their face.	**.654***
25. I enjoy watching violent sports.	**.814***
26. Some people deserve to suffer.	**.647***
27. Just for kicks, I've said mean things on social media.	**.564***
28. I know how to hurt someone with words alone.	**.685***

Note. Loadings > .30 are shown in bold, λ = factor loadings.

* $p < .001$.

Supplementary Table 14

Zero-Order Correlations Among SD4 Scales and Age

SD4 scales	Age
Machiavellianism	-.05
Narcissism	-.14*
Psychopathy	-.19*
Sadism	-.27*

Note. *$p < .001$

Supplementary Table 15

Floor and Ceiling Effects of the SD4 Scales

SD4 scales	Floor effect	Ceiling effect
Machiavellianism	14.47	17.70
Narcissism	26.26	6.11
Psychopathy	62.14	2.13
Sadism	57.11	5.18

Note. Floor effect: Percentage of participants with the minimum score. Ceiling effect: Percentage of participants with the maximum score.

Study 4. The SD4 in adolescents

Ortet-Walker, J.[1,2], Mezquita, L.[1,3], Vidal-Arenas, V[1]., Ortet, G.[1,3], & Ibáñez, M. I[1,3]. (to be submitted). **Crafty, special, wild, and mean teens: Psychometric properties of the SD4 in adolescents**.

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Abstract

The Short Dark Tetrad (SD4) assesses the Dark Tetrad of personality, composed of psychopathy, narcissism, Machiavellianism, and sadism. The scale has been recently adapted to several languages/cultures. We aimed to expand the psychometric properties of the SD4 by validating the measure in community adolescents, investigating its structure, gender and age invariance, and criterion validity in Study 1. A second study was run to find evidence of convergent validity and further evidence of the SD4's nomological network, including longitudinal correlations. Study 1 comprised a sample of 356 adolescents (*M*age = 14.19, 57.8% boys, 42.2% girls), who completed the SD4 and other self-report questionnaires, including measures of personality traits, externalizing psychopathology, and wellbeing. An adequate four-factor structure was found and gender invariance was ascertained. Partial age invariance was established between adults and adolescents, and coherent links to external variables were found (e.g., low agreeableness associated with all four traits, psychopathy correlating highest with impulsivity measures, narcissism associated with subjective wellbeing). In Study 2, a sample of 248 adolescents (*M*age = 14.71, 49.1% boys, 50.9% girls) completed the SD4 and a different set of questionnaires, including equivalent scales of the Dark Tetrad traits

and antisocial behaviors. The SD4 scales generally correlated highest with their corresponding scale, and psychopathy showed the pattern most associated with maladaptive interpersonal behavior. Overall, the validation of the Spanish SD4 for adolescents presents sound psychometric properties, although the similarities between the empirical profiles of psychopathy and sadism raise some questions on their distinctiveness.

Keywords: SD4, Dark Tetrad, Spanish version, Five Factor Model, adolescents

Introduction

Research on the Dark Triad (Paulhus & Williams, 2002) has gained widespread popularity over the past two decades since its introduction to the field of personality research. The construct involves three antagonistic traits found in varying degrees among the general population. These are, namely: subclinical psychopathy (i.e., callousness, impulsivity, and irresponsibility; Hare & Neumann, 2008; Skeem et al., 2011), narcissism (i.e., grandiose sense of self-worth and attention-seeking; Back et al., 2013; Raskin & Hall, 1979), and Machiavellianism (i.e., cynicism, manipulativeness, and ambition; Christie & Geis, 1970; Jones & Paulhus, 2009). All three socially harmful traits are empirically related but conceptually distinct personality characteristics (Furnham et al., 2013; Muris et al., 2017). Thus, studying them together can be useful to establish commonalities among them, as well as drawing attention to particular correlates of each triad member (Paulhus, Buckels, et al., 2021). In terms of location on the normal personality space, all three traits are strongly associated with high antagonism (i.e., the opposite pole of agreeableness within the Five-Factor Model—FFM; McCrae & Costa, 2010) and low Honesty-Humility within the HEXACO framework (Lee & Ashton, 2014). Whereas narcissism and

psychopathy scales exhibit theoretically coherent relationships to other normal personality domains (i.e., narcissism is characterized by high extraversion and psychopathy by low conscientiousness; Muris et al., 2017; O'Boyle et al., 2015), Machiavellianism measures have drawn criticism for yielding a highly similar empirical profile to psychopathy (J. D. Miller et al., 2017).

More recently, everyday sadism (i.e., intrinsic pleasure derived from the suffering of others; Buckels et al., 2013; 2014) has achieved widespread consensus to be included within this group of dark features (Buckels et al., 2013; Paulhus, 2014), thus accounting for a new moniker, the so-called Dark Tetrad (Chabrol et al., 2009). Sadism's distinctiveness with regard to the other Tetrad traits is still an area that requires further research, as it is unclear whether sadistic personality is indeed a sufficiently separate characteristic, or rather nested within subclinical psychopathy (Blötner & Mokros, 2023; Bonfá-Araujo et al., 2022; see Study 3 of the present dissertation). Studies assessing the Dark Tetrad have typically employed brief dark triad instruments together with stand-alone sadism measures. Most commonly, the Short Dark Triad (SD3; Jones & Paulhus, 2014) or Dirty Dozen (DD; Jonason & Webster, 2010) are administered together with sadism instruments such as the Short Sadistic Impulse Scale (SSIS; O'Meara et al., 2011), the Comprehensive Assessment of Sadistic Tendencies (CAST; Buckels et al., 2013), the Varieties of Sadistic Tendencies (VAST; Paulhus & Jones, 2015), or the Assessment of Sadistic Personality (ASP; Plouffe et al., 2017).

Given the growing interest and purported conceptual utility of sadism within a Tetrad framework of antagonistic traits, the Short Dark Tetrad (SD4; Paulhus, Buckels, et al., 2021) was developed. It has shown many favorable psychometric properties both in

the original English-language version (Paulhus, Buckels et al., 2021; Paulhus, Gupta & Jones, 2021; Neumann et al., 2022) and in adaptations of the instrument to other languages, which so far include versions in Portuguese (Pechorro et al., 2022), German (Blötner et al., 2021; 2022), Chinese (Liu et al., 2023; Meng et al., 2022), Polish (Gajda et al., 2022), Farsi (Qaderi Bagajan et al., 2023), and Spanish (see Study 3 of the present dissertation). Its psychometric properties include adequate convergent validity indices (i.e., each scale correlating highest with independent measures of equivalent traits Blötner et al., 2021; see Study 3 of the present dissertation). In terms of criterion validity —investigating links to particular correlates of each Tetrad trait— findings include Machiavellianism being highly correlated with mistrust and cynicism (Blötner et al., 2021) and with victim-blaming for dissemination of sexual images (Karasavva & Forth, 2022); narcissism correlating positively with life wellbeing (Meng et al., 2022); psychopathy showing high correlations with impulse-control problems (Blötner et al., 2021; see Study 3 of the present dissertation); and sadism predicting online bullying over-and-above the other Tetrad traits (Gajda et al., 2022). Exploratory Structural Equation Modeling (ESEM), has been used in several studies to ascertain structural validity for the SD4 in the original version and across adaptations (Blötner et al., 2022; Neumann et al., 2022), with a four-factor solution showing a good fit to the data. ESEM is used more and more in normal and dark personality research (e.g., Neumann et al., 2022) and is preferred over the more restrictive Confirmatory Factor Analysis (CFA), as it allows cross-loadings which more closely reflect the slight overlaps among personality traits (see Marsh et al., 2014). Strong measurement invariance has also been reported across gender (Blötner et al., 2022; Meng et al., 2022; Neumann et al., 2022; Pechorro et al., 2022), and age (i.e., older vs younger adults Meng et al., 2022). Therefore, it is inferred that differences between these

groups (men and women or younger and older adults) on the SD4 scales indicate true differences in the manifestations of these latent traits. In this vein, men have scored consistently higher than women on the SD4 traits, especially psychopathy and sadism (Paulhus, Buckels et al., 2021; Paulhus, Gupta & Jones, 2021; Pechorro et al., 2022).

Thus, the SD4 allows for a brief, psychometrically sound screening measure of all four Tetrad traits. Importantly, its Machiavellianism scale is an improvement over previous stand-alone instruments of this trait (Paulhus, Buckels et al., 2021; Blötner et al., 2021), by accounting for more theoretically coherent links to impulse-control (i.e., not correlating with high impulsivity or low conscientiousness; J. D. Miller et al., 2017).

Dark Triad traits in adolescents (Muris et al., 2013), closely mirror the empirical relations found in adults (Muris et al., 2017), thereby constituting meaningful personality features to investigate in youth. With regard to dark personality correlates in adolescents, most of the research has focused on psychopathic and narcissistic traits. Subclinical psychopathy has been linked to greater perpetration of bullying (Despoti et al., 2020), cyberbullying (López-Larrañaga & Orue, 2019), and delinquency (Geerlings et al., 2020). Narcissism has shown to be a strong predictor of problematic social media use for popularity-seeking (Hawk et al., 2019) and aggression in response to ego-threat (Thomaes et al., 2008). Much less attention has been paid to Machiavellianism and everyday sadism in youth. The former has been associated with higher aggression (Klimstra et al., 2014), externalizing problems (Geng et al., 2016), and delinquent behavior (Muris et al., 2017). The latter, everyday sadism, has yielded the least amount of studies in youth, but has among its correlates the enjoyment of cruelty in video games (Greitmeyer et al., 2019) and online harassment for pleasure, both in adolescents (Kurek

et al., 2019) and young adults (Buckels et al., 2014). A cluster analysis of the Dark Tetrad traits in adolescents yielded a group of high scorers on all four traits, which perpetrated the most antisocial behaviors and had the highest suicidal ideation (Chabrol et al., 2015). Furthermore, a study with Spanish high school students found the Tetrad to be positively linked to bullying victimization in regression analyses, with sadism being the strongest predictor toward suffering these outcomes (Pineda et al., 2022). Findings such as these highlight the relationships of dark personality not only in terms of perpetration of antisocial and bullying behaviors (Goodboy & Martin, 2015; van Geel et al., 2017), but also with regard to emotion dysregulation (Colins et al., 2016; Garofalo et al., 2020) and victimization (Hayes et al., 2021) in adolescents and young adults. Developmental trajectories of the SD4 traits are yet to be studied, although FFM personality and psychopathic traits have shown relative rank-order stability from adolescence into adulthood (Lynam et al., 2008; Salihovic et al., 2013). However, other studies (e.g., Klimstra et al., 2009; Caspi et al., 2005) highlight mean-level increases in agreeableness throughout adolescence, which may suggest an opposing trend for dark personality traits: slightly decreasing in the transition to adulthood. Further research on the Dark Tetrad and its measurement is warranted given that early detection of antagonistic features, such as psychopathy, is linked to more favorable treatment outcomes (Colins & Andershed, 2018; Ribeiro da Silva et al., 2020).

As far as we know, the scarce literature on the Dark Tetrad in adolescents does not yet include studies employing the SD4 instrument. Thus, we sought out to examine the psychometric properties of the scale in an adolescent, community sample of high-school students. We aimed at investigating the SD4's psychometric properties to find: a) evidence of internal consistency reliability, b) evidence of structure, convergent, and

criterion validity, and c) establishing strong measurement invariance across age groups (adolescents vs adults) and across gender.

Our main hypotheses were: 1) The SD4 would show evidence of structural validity and measurement invariance across gender and age groups. 2) Boys would score higher than girls on the SD4 traits, particularly psychopathy and sadism, and adolescents would score higher than adults on the Tetrad traits. 3) All four scales would meet standard cut-off for internal consistency reliability (i.e., alpha and omega > .70). 4) The SD4 would show evidence of convergent validity by exhibiting high correlations among equivalent scales. 5) Each Tetrad trait would correlate highest with distinguishing correlates (e.g., psychopathy and impulse-control problems, narcissism and high extraversion), and all four traits would correlate strongly with antagonistic personality (i.e., low FFM agreeableness).

Study 1

Method

Procedure

Data was collected as part of a project aimed at assessing the cross-sectional and longitudinal links to normal and dark personality features.

A convenience sample was recruited from a public high-school in the Valencian region of eastern Spain. This high school agreed to allocate time for trained research assistants to administer the questionnaires in three separate 1-hour sessions, during the

students' tutorial hours[1]. Given that the whole high-school was the sampling unit, participants are considered to be generally representative of the adolescent general population.

Consent forms were handed out for parents to grant their children permission to participate in the present study. The students participated voluntarily and no material incentive was given to take part in the study. Questionnaires were completed in pencil-and-paper format. No personal information was collected, each participant was assigned an anonymous numerical code for subsequent data analysis. This study was in line with the Declaration of Helsinki and the European Parliament Data Protection Regulation (GDPR; European Parliament, 2016/679) guidelines. The ethical review board of the first author's university approved this study.

Participants

An initial sample of 436 adolescents completed the battery of instruments that were administered. Data imputation was performed to retain cases with less than 5% of missing data per scale. Eighty of these participants had to be removed due to missing data above this cut-off. Thus, a final sample of 356 high-school students between the ages of 12 and 17 (*M*age = 14.19, SD = 1.43, 57.8% boys, 42.2% girls) completed several self-report questionnaires in three sessions (see Procedure). Participants were all fluent in Spanish and resided in the Spanish Valencian region.

[1] In the Spanish educational system, this is a weekly class which is dedicated to helping students in their struggles with particular subjects or their general functioning at school.

Measures

Descriptive statistics of all scales employed in Study 1 (i.e., means, standard deviations, and Cronbach's Alpha and McDonald's Omega internal consistency indices) can be found in Table 1 of the Supplementary Material. All measures were self-reported.

Dark Tetrad

The Short Dark Tetrad (SD4; Paulhus, Buckels et al., 2021) Spanish version (see Study 3 of the present dissertation) is a 28-item questionnaire, and its validation in Spanish adolescents is the focus of the present study. It assesses four dark personality traits: subclinical psychopathy, Machiavellianism, narcissism, and everyday sadism with seven items per trait. The measure is responded on a 5-point scale, indicating the degree to which statements apply to the respondent (1 = Not at all, 5 = Very Much).

Normal Personality

The JS NEO-A50 (see Study 2 of the present dissertation) is an abridged form of the short Junior Spanish version of the NEO-PI-R (JS NEO-S; Ortet et al., 2010). It is a 50-item questionnaire assessing the five broad domains of personality within the FFM framework: neuroticism (N), extraversion (E), openness (O), agreeableness (A), and conscientiousness (C), employing 10 items per domain. The scale is responded on a 5-point scale from 0 (Disagree strongly) to 4 (Agree strongly). Internal consistencies in the present study ranged from α = .78 (O) to .86 (A) and ω = .77 to .85 (O and A, respectively).

The BUPPS-P NA (Caneto et al., 2020). This is the Spanish version of the brief UPPS-P Impulsivity Scale for children and adolescents (UPPS-P-R-C; Zapolski et al., 2010), consisting of 20 items. The scale assesses five impulsivity traits: negative urgency, positive

urgency, perseverance, sensation-seeking, and premeditation (5 items per trait). It is responded on a 4-point scale (1 = Not at all like me, 5 = Very much like me). Internal consistencies in the present study ranged from α and ω = .70 (Perseverance) to α and ω = .79 (Premeditation).

Psychopathology

The Assessment System for Children and Adolescents (SENA; Sánchez-Sánchez et al., 2016). This instrument assesses emotional and behavioral psychopathology symptoms. Five scales were employed: three externalizing (aggression—7 items, antisocial—8 items, and defiant—3 items) and two ADHD scales (attention and hyperactivity—10 items each), both yielding total scores for externalizing and ADHD symptoms. Internal consistencies in the present study ranged from α and ω = .75 (defiant) to α and ω = .91 (attention). The internal consistency indices for the total externalizing and ADHD scores were: α and ω = .93 for both.

Wellbeing

The Rosenberg self-esteem scale (Rosenberg, 1979), Spanish version (RSES; Tomás et al., 2015). This 10-item questionnaire assesses the positive attitude toward oneself, or the evaluative component of self-concept. It is responded on a 5-point scale from 0 (Completely disagree) to 4 (Completely agree). The internal consistency of this scale in the present study was: α and ω = .89.

The Subjective Happiness Scale (SHS; Lyubomirsky & Lepper, 1999), Spanish version (Extremera & Fernández-Berrocal, 2014) is a measure of subjective wellbeing. This questionnaire consists of 4 items answered on a 7-point scale. Anchors on each end of the scale are different for each item (e.g., item 2 ranges from 1 = “Less happy” to 7 =

"Happier" [compared with other people]). The internal consistency of this scale in the present study was: α and ω = .82.

Analyses

All Pearson correlations, internal consistency indices and mean difference testing were performed with SPSS, v29.

For Confirmatory Factor Analysis and ESEM, we employed MPlus, v8 (Muthén & Muthén, 2017). For both of these analyses, the Weighted Least Square Mean and Variance adjusted estimator (WLSMV) was employed, given the ordinal response scale of the SD4. ESEM provides adjusted standard errors and statistical fit tests that are robust to nonnormality in the data. Our criteria for assessing adequate model fit to the data were in line with standard considerations (West et al., 2012). Specifically: Comparative and Tucker-Lewis Fit Indices (CFI and TLI, respectively) ≥ .90, Root Mean Square Error of Approximation (RMSEA) and Standard Root Mean Square Residual (SRMR) ≤ .08, lower 90% CI RMSEA bound ≤ .05 and upper bound ≤ .08. Non-significance of the χ^2 index was de-emphasized given its high sensitivity to sample size. Factor loadings were reported, including 99% confidence intervals for the ESEM.

For invariance testing, we replicated a previous procedure with the SD4 (see Study 3 of the present dissertation), following guidelines highlighted by Sass (2011) and put in play by Neumann et al. (2022) to study gender invariance with the English-language SD4. Namely, configural invariance (i.e., free loadings and thresholds) was performed first, followed by scalar (or strong) invariance (i.e., loadings and thresholds constrained), because loadings and thresholds both define item functioning and should therefore be

constrained and freed simultaneously (Sass et al., 2011). Common criteria for establishing invariance was followed: ≤ .01 decrease in CFI and ≤ .015 increase in RMSEA.

Results

Zero-order correlations between all variables employed in Study 1 can be found in Table 17 of the Supplementary Material.

Exploratory Structural Equation Modeling, Gender Invariance, and Reliability

The CFA model showed adequate fit to the data for the full sample, whereas model fit was poorer for girls (only RMSEA was within the cut-off criteria (see Supplementary Table 18). However, as expected, ESEM yielded even better fit indices for the full sample as well as for boys and girls separately (see Table 17). Furthermore, in both CFA and ESEM models, strong gender invariance was established, finding trivial changes in CFI and RMSEA. Only ESEM retained indices above the standard-cut-off values.

The standardized factor loadings in the CFA model were adequate except for Machiavellianism items 1 and 2 (both below .30; see Supplementary Table 19). All standardized factor loadings in the ESEM were above the .30 on their corresponding factor. Only two items (psychopathy item 19 and sadism item 22) had cross-loadings on other factors. Specifically, item 19 "I've been in trouble with the law" loaded highly onto both Machiavellianism (inversely) and sadism. Both of these cross-loadings were substantially lower than the item's target loading. Item 22 cross-loaded onto psychopathy as highly as its target loading (see Table 18).

Internal consistency indices for narcissism, psychopathy, and sadism were above .70, which is the commonly employed benchmark. However, Machiavellianism had a rather low internal consistency: α and ω = .57 (see Table 18).

Gender Differences

Mean differences across boys and girls were investigated, as strong measurement invariance was established (suggesting the SD4 assesses the Tetrad traits equally well in both genders). Student's t-tests revealed significant differences in narcissism, psychopathy, and sadism (although not Machiavellianism), with boys scoring higher on all four traits. Effect sizes for the significant differences were medium for narcissism and psychopathy, and close to a high effect size for sadism (see Table 19).

Age Invariance and Age Group Differences

In order to investigate invariance across adolescents and adults, a community sample of adults, employed in a prior study to adapt the SD4 into the Spanish language (see Study 3 of the present dissertation for a description of this sample) was employed to test invariance alongside the present study sample, within an ESEM framework. Full strong invariance could not be ascertained, given a reduction in the CFI value above the .01 threshold for the scalar step. Thus, thresholds were freed iteratively according to the modification indices suggested by the model output until accomplishing a CFI change below the cut-off, leading to a total of seven (8.33% of all 84 thresholds) being freed (see Table 20). Specifically, one threshold for Machiavellianism item 1, narcissism items 13 and 21, psychopathy item 22, and sadism item 28 were released, along with two thresholds from psychopathy item 23. There is no well-established convention on the degree of non-invariance allowed to ascertain partial invariance. However, we released a

much lower proportion of parameters than described in tentative suggestions. Namely, less than 20% of the parameter estimates were noninvariant, in line with Asparouhov and Muthén (2014) and more than half of the items were invariant on each factor, in line with Vandenberg and Lance (2000). Thus, we cautiously interpret strong partial age invariance for the Spanish SD4.

Mean differences of scores on the Tetrad traits between adolescents and adults were computed. Toward this end, the adult sample scores on the SD4 were re-coded in line with the present study's item response scale (i.e., 0 to 4 instead of 1 to 5 employed in Study 3 of the present dissertation). Results showed adolescents scoring significantly higher on all Dark Tetrad traits. These mean differences were even more pronounced than the gender differences found among adolescents, where the same pattern emerged (i.e., highest differences found for psychopathy and especially sadism, with a large effect size for the latter; see Table 21).

Criterion Validity

All criterion validity indices are shown in Table 22. The zero-order correlations with normal personality revealed agreeableness as the strongest, inverse correlate for all four Tetrad traits, especially psychopathy and sadism (lower for narcissism and lowest for Machiavellianism). Psychopathy was equally strongly correlated with neuroticism and (low) conscientiousness. This pattern was similar for sadism, albeit more clearly distinguished (i.e., lower correlation coefficient with neuroticism and higher with low conscientiousness). Narcissism was highly associated with extraversion, and Machiavellianism correlated equally with neuroticism and (low) agreeableness. Machiavellianism was uncorrelated with conscientiousness. As for the impulsivity traits

as assessed by the BUPPS-P NA, psychopathy showed the highest, inverse correlations with negative and positive urgency, and premeditation. Perseverance and sensation-seeking were equally negatively related to psychopathy and sadism, the latter showing a higher association with narcissism. Narcissism was characterized by this feature and by positive urgency, whereas Machiavellianism showed low correlations across impulsivity traits, albeit positive and mostly significant, with negative urgency as its highest correlate.

As for psychopathology symptoms, sadism again mirrored psychopathy's pattern of associations with high, positive links to all externalizing outcomes (although the correlations were somewhat lower than for psychopathy). A more marked difference between sadism and psychopathy was revealed in terms of the latter's higher correlation with hyperactivity and the total ADHD score. Narcissism had moderate, positive correlations with the externalizing behaviors, and was slightly linked to hyperactivity. Finally, Machiavellianism only correlated positively with aggression and attention problems, although the magnitude of these associations was very low.

Measures of wellbeing were only highly significantly associated with narcissism, which showed a stronger link to high self-esteem than to happiness. The other three Tetrad traits had very small, negative, correlations to these features and only psychopathy correlated significantly with low happiness.

Study 2

Method

Procedure

The same procedure was followed as in Study 1 (see above) where the same high school was contacted a year later, and questionnaires were administered to a sample of adolescents in three sessions. A subset of this sample were participants from Study 1. The same protocol for approval and ethical considerations were met as described for the procedure in Study 1.

Participants

An initial sample of 277 adolescents completed the battery of instruments that were administered. Data imputation was performed to retain cases with less than 5% of missing data per scale. Twenty-nine of these participants had to be removed due to missing data above this cut-off. Thus, a final sample of 248 high-school students between the ages of 13 and 17 (*M*age = 14.71, SD = 1.23, 49.1% boys, 50.9% girls) completed several self-report questionnaires in three sessions (see Study 1 Procedure). A subsample of 168 adolescents were participants followed-up from Study 1. Their age range was 13 to 17 (*M*age = 14.62, SD = 1.20, 45.9% boys, 54.1% girls). All sample members were fluent in Spanish and resided in the Spanish Valencian region.

Measures

Descriptive statistics of all scales employed in Study 2 (i.e., means, standard deviations, and Cronbach's Alpha and McDonalds Omega internal consistency indices)

can be found in Table 20 of the Supplementary Material. All questionnaires were self-reported.

Dark Tetrad

The Short Dark Tetrad was administered (see characteristics of the scale in Study 1 Measures section). Internal consistency indices in the present study were: Machiavellianism α and ω = .73, narcissism α and ω = .82, psychopathy α and ω = .83, and sadism α and ω = .81.

Dark Triad

The Dirty Dozen (Jonason & Webster, 2010) Spanish version (Pineda et al., 2020) is a 12-item questionnaire assessing the Dark Triad traits—psychopathy, narcissism and Machiavellianism, with 4 items per trait. It was responded on a 5-point scale from 0 (completely disagree) to 4 (completely agree). Internal consistency indices in the present study ranged from α = .71 and ω = .72 for psychopathy to α = .86 and ω = .87 for Machiavellianism.

Machiavellianism

The Kiddie Mach Scale (KMS; Christie & Geis, 1970) was adapted to the Spanish language for the purposes of the present study, employing a back-translation procedure. It is a 20-item questionnaire which was responded on a 5-point scale from 0 (completely disagree) to 4 (completely agree). Its internal consistency in the present study was: α = .73 and ω = .66.

Narcissism

The N-15 (Trechera et al., 2008) is a 15-item inventory designed to assess narcissism in line with diagnostic criteria for Narcissistic Personality Disorder as outlined by the DSM-IV-TR (American Psychiatric Association, 2000). It was responded on a 5-point scale from 0 (completely disagree) to 4 (completely agree). Its internal consistency in the present study was: $\alpha = .89$ and $\omega = .91$.

Psychopathic Traits

The Youth Psychopathic Traits Inventory-Short version (van Baardewijk et al., 2010), Spanish adaptation (Orue & Andershed, 2015) was employed to assess psychopathic traits in line with the three-factor model of psychopathy (i.e., grandiose-manipulative, callous-unemotional, and impulsive-irresponsible factors). The scale also provides a total psychopathy score. The questionnaire was responded on a 4-point scale from 0 (completely disagree) to 3 (completely agree). The internal consistencies of the traits ranged from $\alpha = .69$ and $\omega = .70$ (callous-unemotional) to α and $\omega = .84$ (grandiose-manipulative). The total psychopathy score had an internal consistency of $\alpha = .87$ and $\omega = .86$.

Sadism

The Assessment of Sadistic Personality (Plouffe et al., 2017) is a 9-item, self-report scale assessing subclinical sadism. It was responded on a 5-point scale from 0 (completely disagree) to 4 (completely agree). Internal consistency in the present study was $\alpha = .80$ and $\omega = .81$.

Externalizing Behavior

Two ad-hoc questionnaires were administered to assess bullying (with a 7-item scale) and cyberbullying perpetration (with a 6-item scale). Sample items for these scales are, respectively: "*I have spread secrets, rumors, or lies about a classmate to annoy him or her*" and "*I have ignored or excluded a classmate through social media or an online chat*". Both were responded on a 5-point scale from 0 (completely disagree) to 4 (completely agree). Internal consistencies in the present study were α and ω = .91 for bullying, and α and ω = .84 for cyberbullying.

An additional ad-hoc scale, the TC-DSM-5, was employed to assess conduct disorder symptoms as outlined by the 15 categories in criterion A of the DSM-5-TR (American Psychiatric Association, 2022), except category 7: "has forced someone into sexual activity". Thus, the scale comprised 14 items, which were responded on a 5-point scale from 0 (completely disagree) to 4 (completely agree). The same 14 items were slightly modified to assess conduct disorder symptoms of the peer group. To this end, a second set of 14 re-worded TC-DSM-5 items requested the number of friends that engaged in each behavior (on a 5-point scale from 0: none to 4: all of them). Internal consistency was α and ω = .93 for participants' own symptoms and α and ω = .94 for number of friends presenting these externalizing features.

Analyses

All Pearson correlations, internal consistency indices and mean difference testing were performed with SPSS, v29.

Results

Zero-order correlations between all variables employed in Study 2 can be found in Table 21 of the Supplementary Material.

Convergent Validity

Table 23 shows all convergent validity indices. SD4 scales generally showed highest zero-order correlations with scales assessing equivalent constructs. Machiavellianism was the exception, where both the KMS and the corresponding Dirty Dozen subscale correlated higher with each of the other three Tetrad traits (highest with psychopathy). SD4 sadism was also not differentially linked more strongly to its ASP counterpart, as this measure correlated equally with SD4 psychopathy. Similarly, total psychopathy scores (i.e., YPI-S total score and Dirty Dozen psychopathy) had correlations of a similar magnitude with psychopathy and sadism from the SD4. However, importantly, the impulsive-irresponsible factor of the YPI-S did show a larger correlation with SD4 psychopathy. YPI-S grandiose-manipulative traits were most strongly linked to SD4 narcissism and YPI-S callous-unemotional traits had highest correlations with both SD4 psychopathy and sadism.

Criterion Validity

All three externalizing behaviors assessed, along with antisocial peers, followed the same pattern of associations. The strongest correlate was psychopathy (linking highest to conduct disorder symptoms), followed by sadism and narcissism (both also with highest associations to conduct disorder manifestations). Machiavellianism showed non-significant correlations with all four externalizing indicators (see Table 23).

Longitudinal Associations

Given that a subsample of participants had been assessed a year earlier in Study 1 (T1), we also computed Pearson correlations between the SD4 traits assessed at T1 and all Study 2 variables (T2). 1-year test-retest correlations ranged from r = .42 (Machiavellianism) to .59 (sadism). The pattern of longitudinal convergent and criterion validity indices was highly similar to the cross-sectional associations, albeit showing attenuated correlation coefficients (see Supplementary Table 22).

Discussion

In line with our hypotheses, the SD4 showed evidence of structural validity in Spanish adolescents as shown by the fit indices and factor loadings within an ESEM framework, as found by prior research (Neumann et al., 2022). Furthermore, strong (aka, scalar) gender invariance was replicated as in community-dwelling adults (see Study 3 of the present dissertation). Counter to our hypothesis and findings for the Chinese-language SD4 (Meng et al., 2022), full strong age invariance could not be established. However, very few parameters had to be released to reach criteria for invariance, a proportion well within the recommended cut-offs to establish partial scalar invariance.

Mean differences on the SD4 traits were higher in boys compared to girls for all four features (highest for sadism), as hypothesized and found in prior research (Paulhus, Buckels et al., 2021; Paulhus, Gupta & Jones, 2021; Pechorro et al., 2022). However, the difference for Machiavellianism was non-significant. Comparing the Study 1 adolescents with the adult sample from Study 3 of the present dissertation, mean differences were even larger than across gender in favor (or, rather, to the detriment) of adolescents. The

largest differences were in psychopathy and sadism. Previous studies have highlighted mean-level increases in normal personality traits throughout adolescence and into adulthood (Mann et al., 2020). These changes include elevations in agreeableness, corresponding to the lower scores on antagonistic personality traits (such as dark Tetrad features) among adults compared with adolescents (Borghuis et al., 2017; Roberts et al., 2006; Soto et al., 2011).

Internal consistency reliability for the SD4 traits was partially ascertained, where narcissism, psychopathy, and sadism had adequate Alpha and Omega indices. However, Machiavellianism did not reach commonly agreed upon levels of internal consistency, thus results concerning this scale in the Study 1 should be interpreted with caution. Notwithstanding, the Machiavellianism scale did reach adequate internal consistency values in Study 2, although just slightly over the .70 benchmark for both alpha and omega. Thus, wording of the Machiavellianism items may need to be slightly be modified to properly capture this dark trait in adolescents. It may be, for instance, that "*not letting people know your secrets*" and "*getting the important people by your side*" (SD4 items 1 and 2, respectively) do not have the same strategic connotations in youths as they do in adults. Both of these items, despite showing acceptable factor loadings in the ESEM, performed poorly in the CFA model, where items are restricted to load exclusively onto their corresponding factor (see Table 19 of the Supplementary Material).

In terms of criterion validity, results were largely in line with our hypotheses. The pattern of correlations with normal personality, showing agreeableness as the common, negatively related trait, has consistently been found in prior studies with the SD4 (Paulhus, Buckels et al., 2021) and meta-analytic research on dark traits and normal

personality broadly (Furnham et al., 2013; Muris et al., 2017). Extraversion's strong association with narcissism has also been found in these prior studies. Neuroticism's association with Machiavellianism, psychopathy, and sadism was larger than expected, but falls in line with prior links shown between psychopathic traits and emotional dysregulation (Colins et al., 2016; Garofalo et al., 2020). Similarly, psychopathy has shown positive associations with emotional instability (Garofalo et al., 2019; Kosson et al., 2020), a personality trait which is found at higher mean levels in adolescents than adults (De Fruyt et al., 2006; Mann et al., 2020). As designed for the SD4, and counter to other scales of the same construct, Machiavellianism was not associated highly with impulsivity problems (non-significant links in terms of FFM conscientiousness and very low associations with BUPPS-NA impulsivity scales). As found in the original SD4 study (Paulhus, Buckels et al., 2021) and Spanish adaptation (see Study 3 of the present dissertation), this entails and improvement of the Machiavellianism precursor scale from the SD3, aligning better with theoretical conceptualizations and expert ratings of this construct and distinguishing it more clearly with the psychopathic core feature of impulse-control difficulties (J. D. Miller et al., 2017; Paulhus, 2014).

Sadism was largely indistinguishable from psychopathy with respect to its association with most of the external criteria. However, attention and impulsivity, in line with the BUPPS-P NA negative and positive urgency, and lack of premeditation scales, were more strongly correlated with psychopathy than with sadism. Therefore, despite the nomological networks showing similar profiles for both traits, impulsivity features were notably attenuated for sadism, as found in other research (Blötner et al., 2021). The externalizing behavior measures employed in Study 2 closely reflected the pattern of associations in Study 1, where bullying and antisocial behaviors had psychopathy as their

strongest correlate. Participants with highest scores on psychopathic traits also had the most antisocial peers, in line with prior research showing selection effects for psychopathic traits (Kerr et al., 2012; Salekin & Lochman, 2008). In the same vein, previous studies have shown that psychopathic youths tend to have delinquent friends (Kimonis et al., 2004; Muñoz et al., 2008), with whom they engage in these antisocial acts (Muñoz et al., 2008). Finally, wellbeing measures (happiness and especially self-esteem) were only strongly related to narcissism, as expected and ascertained in the literature (Meng et al., 2022).

In terms of convergent validity investigated in Study 2, most equivalent measures correlated highest with each SD4 trait, as expected. Notwithstanding, SD4 Machiavellianism actually correlated lowest with its DD and KMS counterpart, which could be partly explained by the SD4 scale reflecting less impulsivity content. The DD and KMS Machiavellianism's highest correlations (both with SD4 psychopathy) support this contention. As reflected in the scale's nomological network, the overlap among SD4 psychopathy and sadism was again revealed in the convergent correlations with the ASP (equally strong for both traits and not larger with its corresponding feature).

The results from the present article must be viewed in light of several limitations. We employed only convenience samples and self-report instruments, which may limit the generalizability of our findings. Also, we did not administer any behavioral measures that would associate distinctly with Machiavellianism (and not with the other three Tetrad traits), so future studies should properly establish criterion validity evidence for SD4 Machiavellianism in adolescents. Furthermore, our longitudinal correlations should be supplemented by future studies investigating invariance of the SD4 across time, a

research aim not yet undertaken by any published study on this instrument. Also, the correlations between the SD4 in T1 and antisocial outcome variables in T2 did not adequately control for the perpetration of these behaviors, as the measures were exclusively employed in T2. Future studies should ascertain whether the SD4 Tetrad traits predict maladaptive behaviors across time, over-and above the initial engagement in these behaviors. Finally, the reliability indices reported for Machiavellianism were not optimal, and full age invariance could not be established. Therefore, caution is warranted when interpreting specific results for SD4 Machiavellianism and comparisons made between adolescents and adults on the Tetrad traits.

Overall, and despite these limitations, this research provides evidence of reliability and validity of the SD4 in community adolescents. This measure can be very useful to conduct studies on the influence of these traits across adolescence and throughout adulthood. The present article also contributes to expand knowledge on the nomological network of the SD4. By and by, this screening measure can be an adequate instrument to detect the maladaptive Dark Tetrad personality features in youth, toward the prevention of harmful life outcomes.

Table 17

Goodness-Of-Fit Statistics From the Main Exploratory Structural Equation Model of the SD4 and Invariance Tests Across Gender

Model	*χ^2 (df)*	*CFI*	*TLI*	*RMSEA*	*90% CI*	*SRMR*	*ΔCFI*	*ΔRMSEA*
Model testing								
Main ESEM (n = 356)	539.260* (272)	.950	.930	.053	[.046, .059]	.042	—	—
ESEM model in boys (n = 207)	383.065* (272)	.956	.938	.044	[.034, .054]	.046	—	—
ESEM model in girls (n = 149)	465.632* (272)	.905	.868	.069	[.058, .080]	.061	—	—
Invariance testing								
Configural	908.183* (596)	.931	.912	.054	[.047, .061]	.055	—	—
Scalar	1,065.280* (721)	.923	.920	.052	[.045, .058]	.068	-.008	-.002

Note. ESEM = exploratory structural equation modeling; χ^2 = chi square; df = degrees of freedom; CFI = comparative fit index; TLI = Tucker-Lewis index; RMSEA = root mean square error of approximation; 90% CI = 90% confidence interval of the RMSEA; SRMR = standardized root mean square residual.

*$p < .001$.

Table 18

Standardized Factor Loadings From the Main Exploratory Structural Equation Model of the SD4 Items

	Machiavellianism (F1)		*Narcissism (F2)*		*Psychopathy (F3)*		*Sadism (F4)*	
SD4 items	λ	99% CI	λ	99% CI	λ	99% CI	λ	99% CI
1	**.308*****	[.125, .490]	-.145*	[-.289, -.001]	.134*	[-.039, .308]	-.196**	[-.373, -.019]
2	**.347*****	[.188, .505]	.072	[-.066, .210]	.084	[-.081, .250]	-.288***	[-.459, -.116]
3	**.377*****	[.241, .514]	-.082	[-.211, .048]	.037	[-.127, .202]	.043	[-.114, .200]
4	**.524*****	[.395, .654]	-.176***	[-.300, -.052]	.050	[-.106, .205]	.234***	[.081, .387]
5	**.429*****	[.286, .573]	.135**	[.012, .259]	-.162**	[-.315, -.008]	.189**	[.043, .334]
6	**.347*****	[.202, .492]	.088	[-.050, .226]	.015	[-.155, .185]	.201**	[.038, .363]
7	**.575*****	[.449, .701]	.082	[-.034, .198]	-.116	[-.283, .051]	.188**	[.036, .340]
8	-.048	[-.162, .066]	**.669*****	[.553, .785]	-.064	[-.204, .076]	.121*	[-.016, .258]
9	.008	[-.122, .139]	**.463*****	[.337, .589]	.066	[-.095, .228]	.202**	[.047, .356]
10	-.033	[-.146, .081]	**.590*****	[.475, .706]	.008	[-.117, .133]	.187***	[.053, .320]
11	-.107*	[-.222, .009]	**.766*****	[.658, .874]	.012	[-.112, .137]	-.013	[-.139, .113]
12	.022	[-.090, .134]	**.638*****	[.526, .749]	-.035	[-.178, .108]	-.152*	[-.304, .001]
13	-.090*	[-.205, .024]	**.626*****	[.509, .743]	.121*	[-.021, .263]	-.070	[-.208, .068]
14	.222***	[-.101, .343]	**.489*****	[.348, .630]	.052	[-.093, .196]	-.056	[-.203, .090]
15	.208***	[.070, .345]	.003	[-.138, .145]	**.595*****	[.435, .755]	-.084	[-.238, .070]
16	.115*	[-.001, .231]	.199***	[.080, .317]	**.568*****	[.438, .697]	.079	[-.068, .225]
17	-.117***	[-.278, -.075]	-.024	[-.126, .079]	**.856*****	[.761, .950]	.076	[-.035, .187]
18	.101*	[-.011, .213]	.126**	[.013, .239]	**.760*****	[.631, .889]	-.268***	[-.395, -.142]
19	**-.306*****	[-.449, -.164]	-.128*	[-.279, .024]	**.568*****	[.402, .734]	**.349*****	[.184, .514]
20	-.055	[-.164, .054]	-.069	[-.168, .031]	**.702*****	[.599, .805]	.250***	[.137, .363]
21	.145**	[.017, .272]	.127**	[.004, .251]	**.490*****	[.358, .621]	.144**	[.013, .276]
22	-.026	[-.141, .090]	.083*	[-.018, .184]	**.468*****	[.349, .588]	**.467*****	[.348, .586]
23	.068	[-.057, .192]	-.064	[-.193, .066]	-.046	[-.221, .129]	**.675*****	[.521, .828]
24	.158**	[.019, .296]	.154*	[-.007, .315]	.083	[-.098, .264]	**.447*****	[.280, .615]
25	-.057	[-.178, .063]	.096*	[-.023, .214]	.059	[-.088, .206]	**.672*****	[.529, .815]

26	.264$^{\bullet\bullet\bullet}$	[.125, .403]	-.057	[-.191, .077]	.195	[.034, .357]	**.408$^{\bullet\bullet\bullet}$**	[.239, .576]
27	-.068	[-.212, .076]	.081	[-.068, .230]	.154$^{\bullet}$	[-.030, .337]	**.551$^{\bullet\bullet\bullet}$**	[.382, .720]
28	.282$^{\bullet\bullet\bullet}$	[.152, .413]	.134$^{\bullet\bullet}$	[.010, .258]	.084	[-.065, .233]	**.480$^{\bullet\bullet\bullet}$**	[.315, .645]
Latent correlations								
F1 (Mach)	α/ω = .57/.57		—		—		—	
F2 (Narc)	.262***		α/ω = .78/.78		—		—	
F3 (Psych)	.086		.377***		α/ω = .83/.84		—	
F4 (Sadism)	.148**		.245***		.542***		α/ω = .80/.79	

Note. Shaded entries are the target loading items. Loadings > .30 are shown in bold, λ = factor loadings, 99% CI = 99% confidence interval. Mach = Machiavellianism, Narc = Narcissism, Psych = Psychopathy. Internal consistency indices are shown in the diagonal over the latent factor correlations.

*p < .05. **p < .01. ***p < .001.

Table 19

Mean Differences of Scores on SD4 Traits in Girls and Boys

	Full Sample (n = 356)	*Boys (n = 207)*	*Girls (n = 149)*	*t-test*	
	Mean (SD)	*Mean (SD)*	*Mean (SD)*	*p*	*d*
Machiavellianism	17.07 (3.98)	17.35 (3.73)	16.72 (4.29)	ns	.16
Narcissism	13.09 (5.12)	13.73 (4.92)	12.19 (5.292)	< .01	.30
Psychopathy	8.42 (6.03)	9.29 (6.23)	7.19 (5.54)	< .001	.35
Sadism	11.45 (6.25)	13.16 (5.84)	9.07 (6.01)	< .001	.69

Note. SD = Standard Deviation. ns = non-significant. *d* = Cohen's d scores in absolute values. Scores of .20, .50 and .80 correspond to small, medium and large effect sizes respectively (Cohen, 1992).

Table 20

Invariance Tests Across Age Groups: Adults andAadolescents

Model	*χ^2 (df)*	*CFI*	*TLI*	*RMSEA*	*90% CI*	*SRMR*	*ΔCFI*	*ΔRMSEA*
Model testing								
Main ESEM (n = 1,023)	1,061.572* (272)	.952	.934	.053	[.050, .057]	.034	—	—
ESEM model in adults (n = 667)	696.776* (272)	.947	.926	.048	[.044, .053]	.037	—	—
ESEM model in adolescents (n = 356)	539.260* (272)	.950	.930	.053	[.046, .059]	.042	—	—
Invariance testing								
Configural	1,477.105* (596)	.934	.916	.054	[.050, .057]	.042	—	—
Scalar	1,905.690* (721)	.911	.906	.057	[.054, .069]	.053	-.023	.003
Partial Scalar	1,691.910* (714)	.926	.922	.052	[.049, .055]	.050	-.008	-.002

Note. ESEM = exploratory structural equation modeling; χ^2 = chi square; df = degrees of freedom; CFI = comparative fit index; TLI = Tucker-Lewis index; RMSEA = root mean square error of approximation; 90% CI = 90% confidence interval of the RMSEA; SRMR = standardized root mean square residual.

*p < .001.

Table 21

Mean Differences of Scores on SD4 Traits in Adolescents and Adults

	Full Sample (n = 1,023)	*Adolescents (n = 356)*	*Adults (n = 668)*	*t-test*	
	Mean (SD)	*Mean (SD)*	*Mean (SD)*	*p*	*d*
Machiavellianism	15.80 (4.86)	17.07 (3.98)	15.13 (5.14)	< .001	.41
Narcissism	11.63 (5.33)	13.09 (5.12)	10.87 (5.29)	< .001	.42
Psychopathy	5.99 (5.31)	8.42 (6.03)	4.74 (4.40)	< .001	.74
Sadism	8.18 (6.21)	11.45 (6.25)	6.49 (5.48)	< .001	.86

Note. SD = Standard Deviation. *d* = Cohen's d scores in absolute values. Scores of .20, .50 and .80 correspond to small, medium and large effect sizes respectively (Cohen, 1992).

Table 22

Zero-Order Correlations Between the SD4 and Five-Factor Model Personality Traits, PsychopathologySsymptoms, and Positive Life Outcomes

	SD4			
	MACH	NARC	PSYCH	SADISM
FFM PERSONALITY				
JS NEO-A50				
Neuroticism	.21***	-.03	.25***	.20***
Extraversion	.04	**.39*** **	.13*	.02
Openness	.06	.09	-.11	-.09
Agreeableness	**-.27*** **	**-.52*** **	**-.59*** **	**-.66*** **
Conscientiousness	-.01	.08	**-.22*** **	-.29***
BUPPS-P NA				
Negative urgency	.20***	.13*	**.48*** **	.33***
Positive urgency	.15**	.30***	**.49*** **	.39***
Perseverance	.09	.15**	**-.20*** **	-.22***
Premeditation	.12*	-.01	**-.35*** **	-.29***
Sensation-seeking	.11*	.25***	**.18** **	.22***
PSYCHOPATHOLOGY: SENA				
Aggression	.12*	.33***	**.65*** **	**.60*** **
Antisocial	.01	.22***	**.61*** **	**.52*** **
Defiant	.07	.20***	**.54*** **	**.48*** **
Total Externalizing	.07	.29***	**.67*** **	**.59*** **
Attention	.12*	-.03	**.34*** **	.29***
Hyperactivity	.06	.19**	**.47*** **	.32***
Total ADHD	.10	.09	**.44*** **	.33***
WELLBEING				
RSES Self-esteem	-.05	**.36*** **	-.09	-.07
SHS Happiness	-.09	**.27*** **	-.12*	-.10

Note. Associations in bold represent hypothesized largest correlations. *$p < .05$. **$p < .01$. ***$p < .001$.

Table 23

Cross-Sectional Convergent and Criterion Validity of the Dark Tetrad in Study 2 (n = 248)

	SD4			
	MACH	NARC	PSYCH	SADISM
Machiavellianism				
KMS MACH	**.21****	.29***	.43***	.42***
Dirty Dozen MACH	**.31*****	.45***	.51***	.48***
Narcissism				
N-15 NARC	.36***	**.66*****	.50***	.55***
Dirty Dozen NARC	.36***	**.55*****	.34***	.41***
Psychopathic traits				
YPI-S Grandiose-manipulative	**.42*****	**.74*****	**.59*****	.58***
YPI-S Callous-unemotional	.32***	.38***	**.59*****	**.52*****
YPI-S Impulsive-irresponsible	.29***	.40***	**.45*****	.33***
YPI-S total psychopathy	.43***	.64***	**.67*****	.60***
Dirty Dozen psychopathy	.20**	.41***	**.47*****	.45***
Sadism				
ASP Sadism	.22***	.37***	.59***	**.58*****
Externalizing behavior				
Bullying	-.01	.34***	**.55*****	**.40*****
Cyberbullying	.10	.32***	**.55*****	**.40*****
TC-DSM5 conduct disorder	.09	.34***	**.57*****	**.42*****
TC-DSM5 Conduct disorder peers	.05	.27***	**.47*****	**.37*****

Note. Associations in bold represent hypothesized largest correlations. MACH = Machiavellianism, NARC = Narcissism, PSYCH = Psychopathy.

*$p < .05$. **$p < .01$. ***$p < .001$.

Supplementary Table 16

Descriptive Statistics of All Measures Employed in Study 1

	M (SD)	Alpha	Omega
FFM PERSONALITY			
JS NEO-A50			
Neuroticism	20.56 (7.23)	.83	.84
Extraversion	26.16 (6.47)	.83	.83
Openness	21.21 (7.20)	.78	.77
Agreeableness	25.80 (7.49)	.86	.85
Conscientiousness	25.21 (6.49)	.82	.82
BUPPS-P NA			
Negative urgency	9.02 (2.76)	.71	.72
Positive urgency	8.88 (2.92)	.78	.78
Perseverance	11.73 (2.38)	.70	.70
Premeditation	11.16 (2.77)	.79	.79
Sensation-seeking	11.19 (3.27)	.75	.76
PSYCHOPATHOLOGY: SENA			
Aggression	5.59 (5.52)	.87	.87
Antisocial	4.66 (5.44)	.85	.85
Defiant	2.67 (2.57)	.75	.75
Total Externalizing	12.91 (12.34)	.93	.93
Attention	19.32 (8.87)	.91	.91
Hyperactivity	17.17 (8.30)	.87	.87
Total ADHD	36.49 (15.92)	.93	.93
WELLBEING			
RSES Self-esteem	25.14 (8.06)	.89	.89
SHS Happiness	19.26 (5.02)	.82	.82

Note. Descriptive statistics of the SD4 are part of the focus of Study 1, thereby these values are not reiterated in this table as they can be found in the manuscript.

Supplementary Table 17

Zero-Order Correlations Among All Variables Employed in Study 1

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
SD4_MACH (1)	—													
SD4_NARC (2)	.23***	—												
SD4_PSYCH (3)	.18***	.38***	—											
SD4_SADISM (4)	.29***	.35***	.61***	—										
JS NEO A-50 Neuroticism (5)	.21***	-.03	.25***	.20***	—									
JS NEO A-50 Extraversion (6)	.04	.39***	.13*	.02	-.17**	—								
JS NEO A-50 Openness (7)	.06	.09	-.11	-.09	.19***	-.01	—							
JS NEO A-50 Agreeableness (8)	-.27***	-.52***	-.59***	-.66***	-.27***	-.09	.11*	—						
JS NEO A-50 Conscientiousness (9)	-.01	.08	-.22***	-.29***	-.11	.18***	.19***	.18***	—					
BUPPS-P NA Negative Urgency (10)	.20***	.13*	.48***	.33***	.45***	-.05	-.07	-.38***	-.25***	—				
BUPPS-P NA _Positive Urgency (11)	.15**	.30***	.49***	.39***	.25***	.24***	.06	-.39***	-.22***	.49***	—			
BUPPS-P NA Perseverance (12)	.09	.15**	-.20***	-.22***	-.17***	.19***	.13*	.15**	.64***	-.16**	-.20***	—		
BUPPS-P NA Premeditation (13)	.12*	-.01	-.35***	-.29***	-.08	-.02	.19***	.23***	.52***	-.39***	-.34***	.40***	—	
BUPPS-P NA Sensation-seeking (14)	.11*	.25***	.18***	.22***	.10	.24***	.14*	-.14**	.06	.15**	.18***	.15**	-.11*	—
SENA Agression (15)	.12*	.33***	.65***	.60***	.29***	.04	-.11*	-.71***	-.22***	.38***	.40***	-.19***	-.35***	.15**
SENA Antisocial (16)	.01	.22***	.61***	.52***	.20***	.01	-.06	-.60***	-.27***	.30***	.33***	-.24***	-.34***	.15**
SENA Defiant (17)	.07	.20***	.54***	.48***	.31***	.01	-.04	-.53***	-.37***	.41***	.38***	-.28***	-.36***	.12*
SENA Total Externalizing (18)	.07	.29***	.67***	.59***	.28***	.02	-.09	-.69***	-.29***	.39***	.40***	-.25***	-.38***	.16**
SENA Attention (19)	.12*	-.03	.34***	.29***	.50***	-.04	.03	-.24***	-.47***	.47***	.37***	-.42***	-.35***	.09
SENA Hyperactivity (20)	.06	.19***	.47***	.32***	.40***	.22***	-.01	-.34***	-.31***	.50***	.49***	-.22***	-.48***	.21***
SENA Total ADHD (21)	.10	.09	.44***	.33***	.49***	.09	.01	-.31***	-.42***	.53***	.46***	-.35***	-.45***	.16**

RSES Self-esteem (22)	-.05	.36***	-.09	-.07	-.58***	.43***	-.13*	-.05	.25***	-.36***	-.05	.27***	.18***	.03
SHS Hapiness (23)	-.09	.27***	-.12*	-.10	-.49***	.53***	-.12*	.02	.26***	-.26***	-.03	.25***	.11*	.06

Note. MACH = Machiavellianism, NARC = Narcissism, PSYCH = Psychopathy.

* $p < .05$, ** $p < .01$, *** $p < .001$,

Supplementary Table 17 (cont.)

Zero-Order Correlations Among All Variables Employed in Study 1

	15	16	17	18	19	20	21	22	23
SENA Agression (15)	—								
SENA Antisocial (16)	.77***	—							
SENA Defiant (17)	.71***	.69***	—						
SENA Total Externalizing (18)	.94***	.93***	.83***	—					
SENA Attention (19)	.41***	.35**	.47***	.44***	—				
SENA Hyperactivity (20)	.48***	.40***	.48***	.49***	.72***	—			
SENA Total ADHD (21)	.48***	.40***	.51***	.50***	.93***	.92***	—		
RSES Self-esteem (22)	-.07	-.09	-.15**	-.10	-.40***	-.17**	-.32***	—	
SHS Hapiness (23)	-.14*	-.10	-.17**	-.14*	-.30***	-.10	-.22***	.70***	—

Note. MACH = Machiavellianism, NARC = Narcissism, PSYCH = Psychopathy.

*p < .05. **p < .01. ***p < .001.

Supplementary Table 18

Goodness-Of-Fit Statistics From the Confirmatory Factor Analysis of the SD4 Performed in Study 1

Model	χ^2 *(df)*	*CFI*	*TLI*	*RMSEA*	*90% CI*	*SRMR*	*ΔCFI*	*ΔRMSEA*
Main CFA	888.255* (344)	.898	.888	.067	[.061, .072]	.071	—	—
CFA model in boys (n = 207)	605.911* (344)	.896	.885	.061	[.053, .069]	.076	—	—
CFA model in girls (n = 149)	660.282* (344)	.844	.829	.079	[.069, .088]	.100	—	—
Invariance testing								
Configural	1268.023* (688)	.871	.858	.069	[.063, .075]	.087	—	—
Scalar	1400.993* (792)	.865	.871	.066	[.060, .071]	.089	-.006	-.003

Note. CFA = Confirmatory Factor Analysis. χ^2 = chi square; df = degrees of freedom; CFI = comparative fit index; TLI = Tucker-Lewis index; RMSEA = root mean square error of approximation; 90% CI = 90% confidence interval of the RMSEA; SRMR = standardized root mean square residual.

*$p < .001$.

Supplementary Table 19

Standardized Factor Loadings From the Confirmatory Factor Analysis of the SD4 Items Performed in Study 1

SD4 items	λ
Machiavellianism	
1. It's not wise to let people know your secrets.	.051
2. Whatever it takes, you must get the important people on your side.	.096
3. Avoid direct conflict with others because they may be useful in the future.	.310*
4. Keep a low profile if you want to get your way.	.539*
5. Manipulating the situation takes planning.	.520*
6. Flattery is a good way to get people on your side.	.607*
7. I love it when a tricky plan succeeds.	.583*
Narcissism	
8. People see me as a natural leader.	.646*
9. I have a unique talent for persuading people.	.661*
10. Group activities tend to be dull without me.	.703*
11. I know that I am special because people keep telling me so.	.679*
12. I have some exceptional qualities	.470*
13. I'm likely to become a future star in some area.	.613*
14. I like to show off every now and then.	.543*
Psychopathy	
15. People often say I'm out of control.	.552*
16. I tend to fight against authorities and their rules.	.753*
17. I've been in more fights than most people of my age and gender.	.820*
18. I tend to dive in, then ask questions later.	.600*
19. I've been in trouble with the law.	.688*
20. I sometimes get into dangerous situations.	.832*
21. People who mess with me always regret it.	.704*
Sadism	
22. Watching a fist-fight excites me.	.904*

23. I really enjoy violent films and video games.	**.524***
24. It's funny when idiots fall flat on their face.	**.612***
25. I enjoy watching violent sports.	**.665***
26. Some people deserve to suffer.	**.578***
27. Just for kicks, I've said mean things on social media.	**.638***
28. I know how to hurt someone with words alone.	**.668***

Note. Loadings > .30 are shown in bold, λ = factor loadings.

* $p < .001$.

Supplementary Table 20

Descriptive Statistics of All Measures Employed in Study 2

	M (SD)	Alpha	Omega
DARK TETRAD			
SD4			
Machiavellianism	15.81 (4.97)	.73	.73
Narcissism	11.33 (5.65)	.82	.82
Psychopathy	7.16 (5.65)	.83	.83
Sadism	10.69 (6.21)	.81	.81
DARK TRIAD			
Dirty Dozen			
Machiavellianism	4.16 (3.80)	.86	.87
Psychopathy	3.83 (3.27)	.71	.72
Narcissism	5.56 (3.84)	.83	.83
KMS Machiavellianism	33.71 (8.24)	.73	.66
N-15 Narcissism	19.10 (10.93)	.89	.91
PSYCHOPATHIC TRAITS			
YPI-S			
Grandiose-manipulative	5.78 (4.19)	.84	.84
Callous-unemotional	4.82 (3.83)	.79	.79
Impulsive-irresponsible	7.30 (3.46)	.69	.70
Total psychopathy	17.94 (9.22)	.87	.86
ASP Sadism	6.23 (5.72)	.80	.81
Ad-hoc Bullying	3.45 (5.01)	.91	.91
Ad-hoc Cyberbullying	2.11 (3.45)	.84	.84
TC-DSM-5 ad-hoc conduct disorder	4.70 (7.93)	.93	.93
TC-DSM-5 Peers ad-hoc conduct disorder	8.48 (10.38)	.94	.94

Supplementary Table 21

Zero-Order Correlations Among All Variables Employed in Study 2

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
SD4 MACH (1)	—																	
SD4 NARC (2)	.40***	—																
SD4 PSYCH (3)	.27***	.53***	—															
SD4 SADISM (4)	.45***	.50***	.62***	—														
KMS MACH (5)	.20***	.29***	.43***	.42***	—													
DD MACH (6)	.30***	.45***	.51***	.48***	.58***	—												
N-15 NARC (7)	.36***	.66***	.50***	.55***	.52***	.65***	—											
DD NARC (8)	.36***	.55***	.34***	.41***	.31***	.52***	.73***	—										
YPI-S GM (9)	.42***	.74***	.59***	.58***	.50***	.63***	.70***	.50***	—									
YPI-S CU (10)	.32***	.38***	.59***	.52***	.30***	.38***	.49***	.36***	.50***	—								
YPI-S II (11)	.29***	.40***	.44***	.33***	.32***	.34***	.31***	.21***	.49***	.39***	—							
YPI-S Total PSYCH (12)	.43***	.64***	.67***	.61***	.47***	.57***	.64***	.45***	.84***	.79***	.77***	—						
DD PSYCH (13)	.20***	.41***	.47***	.45***	.41***	.57***	.56***	.49***	.44***	.49***	.29***	.50***	—					
ASP Sadism (14)	.22***	.37***	.59***	.57***	.57***	.64***	.62***	.46***	.51***	.55***	.30***	.57***	.58***	—				
Bullying (15)	-0.01	.34***	.55***	.40***	.31***	.47***	.52***	.34***	.42***	.49***	.28***	.49***	.43***	.67***	—			
Cyberbullying (16)	0.09	.32***	.55***	.40***	.26***	.37***	.43***	.25***	.50***	.56***	.28***	.56***	.32***	.54***	.70***	—		
TC-DSM5 Conduct (17)	0.09	.34***	.56***	.42***	.37***	.53***	.53***	.37***	.46***	.52***	.31***	.55***	.47***	.72***	.72***	.65***	—	
TC-DSM5 Conduct peers (18)	0.05	.27***	.46***	.37***	.30***	.42***	.39***	.24***	.38***	.47***	.21***	.44***	.37***	.55***	.72***	.59***	.75***	—

Note. MACH = Machiavellianism, NARC = Narcissism, PSYCH = Psychopathy.

*$p < .05$. **$p < .01$. ***$p < .001$.

Supplementary Table 22

Longitudinal Convergent and Criterion Validity of the Dark Tetrad From Participants in Both Study 1 and 2 (n = 168)

	SD4			
	SD4 MACH T1	SD4 NARC T1	SD4 PSYCH T1	SD4 SADISM T1
SD4				
SD4 MACH T2	**.42*** **	.13*	.17*	.23**
SD4 NARC T2	.18*	**.48*** **	.24***	.28***
SD4 PSYCH T2	.07	.23**	**.58*** **	.44***
SD4 SADISM T2	.21**	.15*	.38***	**.59*** **
Machiavellianism				
KMS MACH T2	**.16***	.09	.29***	.38***
Dirty Dozen MACH T2	**.16***	.23**	.35***	.38***
Narcissism				
N-15 NARC T2	.16*	**.41*** **	.26***	.34***
Dirty Dozen NARC T2	.20**	**.32*** **	.13	.25***
Psychopathic traits				
YPI-S Grandiose-manipulative T2	**.17***	.31***	**.32*** **	.35***
YPI-S Callous-unemotional T2	.15*	.29***	**.42*** **	.38***
YPI-S Impulsive-irresponsible T2	.07	.05	**.27*** **	.24***
YPI-S total psychopathy T2	.19*	.28***	**.42*** **	.41***
Dirty Dozen psychopathy T2	.03	.25***	**.31*** **	**.37*** **
Sadism				
ASP Sadism T2	.17*	.24***	.45***	**.52*** **
Externalizing behavior				
Bullying T2	.06	.22***	**.51*** **	**.33*** **
Cyberbullying T2	-.03	.17*	**.47*** **	**.30*** **
TC-DSM5 conduct disorder T2	.09	.14	**.42*** **	**.30*** **
TC-DSM5 Conduct disorder peers T2	.05	.13	**.39*** **	**.24*** **

Note. Associations in bold represent hypothesized largest correlations. MACH = Machiavellianism, NARC = Narcissism, PSYCH = Psychopathy.

*p < .05. **p < .01. ***p < .001.

General discussion

The present, four-study dissertation has generally found supporting evidence in line with the established aims and mostly confirmed the posited hypotheses. Dividing this work into its two main components, the contributions obtained in each of the major research streams will be detailed in the following. The intertwined implications of the present findings on normal and dark personality, along with future research directions, will serve as concluding remarks:

Abridged FFM instruments: Contributions from the JS NEO-A60 and JS NEO-A50

Aims 1 and 2 were largely accomplished, with findings much in line with our hypotheses. The JS NEO-A60 was developed with the aim of maximizing fidelity, or accomplishing the highest possible representation of the facet level within the NEO framework (McCrae & Costa, 2010). In this regard, the optimal outcome would have resulted in a balanced, two-item per facet questionnaire for a measure composed of 60 items. This was an ambitious objective, and the best psychometric solution (maximizing domain internal consistency without foregoing an adequate factor structure and vice versa), was to retain at least one item from each of the 30 FFM personality facets except one (openness to actions). Even without accomplishing the full facet representation, 15 of the 29 scales had two of their items included in the final measure. Thus, almost 52% of the questionnaire's elements had the desired balance, with the remaining 14 facets yielding: one item (seven facets, or around 24% of them), three items (five facets, or around 17% of them), or, most rarely, four items (two facets, equal to just under 7% of the full facet content). It should be mentioned that the domain that required both a four-

item facet representation, as well as the absence of items for one of its facets (i.e., Actions) was openness, found in prior research to be the most difficult factor to model generally (Soto & Tackett, 2015), and subject to maturation effects whereby the full array of manifestations is not observed until late adolescence (Allik et al., 2004).

The JS NEO-A50, on its part, focused on retaining items that would cover the most representative features of each FFM domain, or maximizing bandwidth. The procedure to do so was both conceptual (i.e., core elements across FFM approaches) and empirical, iteratively selecting the items that yielded the best factor loadings and highest internal consistency indices. Thus, twenty-six of its thirty facets had at least one of their items included, with openness (having to sacrifice the representation of two of its facets) showing again its problematic psychometric issues, although two-thirds of the openness domain's facet spectrum had its place among the JS NEO-A50 item content. Given the limited length of this instrument, accomplishing such high facet representation was a good outcome, with very little loss in internal consistency for each of the 10-item scales. Namely, following the sequence of shortened instruments: JS NEO-S→JS NEO-A60→JS NEO-A50 internal consistency values in the validation studies of each measure were the following (JS NEO-A50 Omega values are shown after the forward slash): Neuroticism: .86→.84→.83/.83; Extraversion: .83→.82→.79/.79; Openness: .79→.78→.73/.74; Agreeableness: .80→.83→.82/.82; Conscientiousness: .91→.84→.83/.83. Moreover, the JS NEO-A50 demonstrated an adequate five-factor structure and acceptable internal consistency indices in a second, independent sample, where alphas and omegas were closely matched to the first sample's values (all within .03 of each other, except the alpha value for conscientiousness, down .05 from study 1 but still at a respectable level of α = .78). One-month retest administrations of both instruments strengthened their reliability

evidence, with very solid zero-order correlations ranging between *r* = .75 to .84 for the JS NEO-A60 and between *r* = .77 and .81 for the JS NEO-A50, the lowest indices for openness and highest for conscientiousness in both instruments.

Together with the psychometric evidence outlined above to cover the reliability portion in aim 3 of the present dissertation, this aim's validity evidence was established in the forms of structure, convergent, and criterion validity. Below are the summarized findings in this regard:

Structural validity was ascertained in studies of both instruments, supporting the use of ESEM as an appropriate modeling technique for personality traits (Marsh et al., 2014), as interstitial elements among relatively independent traits are important to be accounted for (e.g., Lee & Ashton, 2006; 2018). Thus, both instruments showed proper structural fit indices, with high target loadings and cross-loadings kept low. The present research on the JS NEO-A50 once again had the added value of an independent sample, whereby an ESEM supported the appropriate item loading patterns observed in an Exploratory Factor Analysis performed with sample 1, providing improved CFI and TLI fit indices compared with the JS NEO-A60. Additional validity evidence for the JS NEO-A50 involved performing differential item functioning within the second study sample, demonstrating no age-group or gender effects on item endorsement.

Convergent validity in both studies employed the 50-item BFPTSQ, with highly aligned results showing adequate correspondence across equivalent FFM domains. For the JS NEO-A50, we provided additional convergent validity evidence by computing correlations with the JS NEO-S domains excluding common items (in the fashion of split-half reliability), obtaining higher correlation coefficients than those with the BFPTSQ

except for openness, whose index was slightly lower than *r* = .50. Finally, the same consequential outcome variables were used as criterion validity evidence for both the JS NEO-A60 and JS NEO-A50: inspecting associations with externalizing (aggressive and antisocial behaviors) and internalizing problems (anxiety and depression symptoms), wellbeing (life satisfaction), and academic performance (school grades). Linear regression models provided very similar overall results, where neuroticism was the main predictor of internalizing problems and (lower) life satisfaction, agreeableness for (lower) externalizing behaviors, and conscientiousness for school grades obtained. Importantly, and supporting the use of the JS NEO-A50 for the validity aims posed for the SD4 instrument, this measure showed stronger, negative links between its agreeableness scale and both externalizing outcomes. This would lead to the conclusion that JS NEO-A50 agreeableness scale taps more clearly into the antagonistic components that underpin violent and exploitative interpersonal behaviors, which represent the core features of dark personality traits (Vize et al., 2019; 2020). To give further support to the JS NEO-A50 in this regard, as compared to the JS NEO-A60, the former instrument's extraversion scale predicted life satisfaction (as the secondary predictor after emotional stability), more strongly. This would emphasize, albeit indirectly, the utility of the measure not only to better account for antagonism generally, but aligning closely with narcissism in particular, given extraversion's consistent link to this dark profile (Muris et al., 2017) and having subjective wellbeing and high self-esteem as some of its strongest correlates (Jonason et al., 2015).

Dark Tetrad traits in youth: Adaptation of the SD4 and validation in Spanish community adolescents

Having reached aims 1-3 and finding overall supporting evidence for hypotheses a) to c), the second research stream was conducted mainly with aim 4 in mind: accomplishing a properly adapted Short Dark Tetrad scale to the Spanish language, with subsequent aims focusing on its FFM coverage (aims 5 and 8), adding supporting evidence to the SD4 as an attempt to overcome controversies in the dark trait literature (aim 6), and the measure's age range extension to tap into adolescents' Tetrad traits (aim 7).

In both the main ESEM analyses performed in the adult and adolescent samples, fit indices were very good and, in fact, slightly *improved* in adolescents as reflected by CFI and TLI values: .947 and .926 respectively for adults, .950 and .930 for adolescents. Compelling evidence of the SD4's equal assessment of Tetrad traits across genders was obtained by establishing scalar (i.e., strong) invariance in each of the age-group samples. We also gathered fairly solid evidence of age-group scalar invariance between the adult and adolescent sample, albeit partial, suggesting some of the SD4 items in all four subscales (thresholds had to be released for at least one item per Tetrad trait) may not optimally reflect the latent characteristics in both populations. That is why caution should be at the backdrop of interpreting mean differences between the age-group samples (which we computed and showed even more pronounced differences than those between genders, in this case favoring adolescents over adults). The pattern of mean differences was similar across gender and age, with stronger effect sizes for the differences in psychopathy and sadism, consistent with prior research on the SD4 for gender differences (Paulhus et al., 2021a; 2021b; Pechorro et al., 2022) and developmental trends observed in mean-level scores on normal and dark personality

traits (Bloningen et al., 2006; Borghuis et al., 2017; Harpur & Hare, 1994; Mann et al., 2020; Roberts et al., 2006).

Similar to the ESEM loading patterns observed for the abridged JS NEO scales, the SD4 exhibited strong target loadings in adults and adolescents, with relatively low cross-loadings but reflecting some overlap between psychopathy and sadism, further demonstrated by the highest latent and zero-order correlations between these two traits. The patterns of convergent and criterion validity correlations were not able to completely dispel doubts about sadism's similarity with psychopathy, as they showed few distinctions. Some exceptions to temper this problematic result were psychopathy's stronger associations with impulsive behavior outcomes, such as with the Lifestyle SRP psychopathy scale, TriPM and PID-5 Disinhibition scales in adults, and BUPPS-P NA Urgency subscales and SENA hyperactivity in adolescents. Regrettably, sadism did not, however, show stronger correlations with an equivalent measure in adolescents (the ASP), whereas in adults this discriminant validity result was found with both the ASP and SSIS, albeit yielding only slightly higher correlations with SD4 sadism. For FFM conscientiousness, there were again mixed findings, whereby the scale had a higher negative correlation with psychopathy than sadism in adults (in line with theoretical expectations; Paulhus, Buckels et al., 2021), but the reverse was found in adolescents. All in all, as stated in both SD4 studies, the combined results found for sadism warrant some caution on this dark trait's place within a purported Tetrad framework, an issue that has raised questions elsewhere (Bonfá-Araujo et al., 2022; Blötner & Mokros, 2023).

Thus, the support for sadism outlined in aim 6 could only be partly awarded, whereas the psychometric improvement of Machiavellianism, also an objective laid out

in aim 6, had better outcomes. In both adults and adolescents, this dark trait did not correlate significantly negatively with conscientiousness and showed small or non-significant associations with PID-5 Disinhibition in adults, and small correlations with BUPPS-P NA subscales and non-significant with SENA Total ADHD symptoms. This discriminant validity evidence is a major advantage of the SD4 over previous Machiavellianism instruments (J. D. Miller et al., 2017; 2019), as it very clearly distanced itself from the high, positive associations that psychopathy had with all these impulsivity outcomes. A few caveats should be offered: on the one hand, although much lower than the corresponding convergent associations, some independent psychopathy subscales related to the trait's impulsivity factor (SRP Lifestyle and TriPM Disinhibition in adults, and YPI-S Impulsive-Irresponsibility in adolescents), still had substantial zero-order correlations with SD4 Machiavellianism (ranging from r = .18 to .29). Thus, whereas the measure is definitely a step forward, the jangle fallacy affecting Machiavellianism measures may still need some work to provide a truly theoretically consistent assessment of prototypical *calculating*, *strategizing*, and *planful* Machiavellianism. The relatively low convergent validity indices for SD4 Machiavellianism are consistent with this scale's attempt to lower impulsive content, as equivalent subscales in adolescents (KMS and Dirty Dozen) correlated substantially higher with psychopathy. FFM ATM Machiavellianism did not, but this measure's item content converges insufficiently with classical depictions of Machiavellianism (Christie & Geis, 1970), and was designed first and foremost to comply with FFM expert rating depictions of the profile (Du et al., 2021; J. D. Miller et al., 2017; Rose et al., 2023).

Employing the JS NEO-A50 to derive validity evidence of the normal personality domains associated with the SD4 traits was largely successful. Having mostly confirmed

results supporting hypotheses c) to d) on the SD4's psychometric properties (with the slight caveats outlined for Machiavellianism and sadism), we turn to the final aim (8) and corresponding hypothesis (e), where the JS NEO-A50 would show a sound pattern of correlations with the Tetrad traits. Inspecting the dark traits and their FFM convergence one by one:

- Machiavellianism: Adults' FFM personality (employing the NEO-FFI) and adolescents JS NEO-A50 profile associated with this trait was very much aligned in regard to its largest correlation with disagreeableness, positive association with neuroticism, and non-significant correlations with extraversion, openness or conscientiousness. Importantly, and contrary to many other Machiavellianism scales, finding that this dark trait did not significantly correlate with (low) conscientiousness offered discriminant validity evidence to more clearly distinguish the profile from psychopathy (J. D. Miller et al., 2017; 2019).
- Narcissism: Across age-groups, a clear pattern of correlations with high extraversion and low agreeableness emerged, in line with expectations. However, notable differences included a reversed order for the size of these correlations (i.e., extraversion was the stronger correlate in adults whereas for adolescents it was antagonism). Furthermore, although conscientiousness was non-significantly associated with this profile in both samples, emotional stability (or low neuroticism) was a clear, significant correlate in adults, as well as a small positive association with openness. Both of these traits were non-significantly related in adolescents, albeit correlated in the same direction, with the largest difference among correlations for neuroticism (r = -.18 in adults, only -.03 in adolescents). Interestingly, meta-analytic research (Muris et al., 2017) would support the

results obtained from JS NEO-A50 neuroticism, as indeed emotional stability seems to be a very small contributor to the narcissistic profile (uncorrected and corrected effect sizes of *r* = -.04 and -.05, respectively).

- Psychopathy: The expected pattern of associations with low scores on both agreeableness and conscientiousness was the common FFM profile in both age-groups. The most notable difference was in the association with neuroticism, much higher among adolescents and both in the positive direction. Although meta-analytic results suggest the opposite link to neuroticism (i.e., psychopathy characterized by slightly higher emotional stability, albeit non-significantly; Muris et al., 2017), it should be highlighted that psychopathic traits have a complex relation to neuroticism's lower-order facets. Namely, the psychopathic profile is characterized by both positive (e.g., angry hostility, impulsiveness) and negative (e.g., self-consciousness, anxiety) associations with the domain (Miller & Lynam, 2015). This picture is further complicated depending on the conceptualization of psychopathy the corresponding measure is based on. It would be, for instance, far more likely to obtain a large negative correlation with neuroticism employing measures portraying boldness/fearless dominance as a core psychopathic feature (e.g., TriPM, PPI-R) than with others that do not (e.g., SRP, SD4). Thus, we interpret FFM domain-level associations with neuroticism with caution when it comes to psychopathy, and turn to recent studies pointing to the role of emotion dysregulation in psychopathic traits (Garofalo et al., 2020; Kosson et al., 2022). Furthermore, neuroticism is a more pervasive trait influencing maladaptive outcomes in adolescents than adults, where developmental trends in personality

yield higher scores on emotional instability across this age period (De Fruyt et al., 2006; Mann et al., 2020).

- Sadism: The normal personality configuration associated with this recently popularized dark trait member offered no distinctive features compared with psychopathy. In both samples, the low agreeableness plus low conscientiousness trend was obtained. Interestingly, although not to a particularly large extent, JS NEO-A50 conscientiousness was a stronger correlate of sadism than of psychopathy. The opposite trend, more in line with expectations, was found for adults, where (low) conscientiousness elements of carelessness, impulsivity, and unreliability would seemingly be more aligned with the psychopathic profile than with the sadistic one. It should be mentioned that Paulhus, Buckels et al. (2021) obtained almost identical correlations between conscientiousness and both dark traits. Ironically, we may be facing a new jangle problem between psychopathy and sadism (Blötner & Mokros, 2023), which the present research efforts could not completely dispel. Given that research linking FFM personality to the SD4 has thus far only been conducted at the domain level, speculations could be offered in line with equifinality (Sato et al., 2016), whereby different elements of each dark trait (e.g., recklessness in psychopathy, violent thrill-seeking in sadism) may lead to virtually equal scores on the global conscientiousness trait.

Limitations and future research directions

There are some limitations to this four-study research that should be highlighted. Given the objectives of the present dissertation, our results do not by any means entail a complete picture of the nomological network of dark personality traits. The JS NEO-A50

and SD4 should be viewed as broad snapshots of normal and dark tetrad personality, respectively, albeit very useful to collect data on these dispositional variables swiftly. Furthermore, relevant variables that would have strengthened our construct validity evidence for the SD4 were lacking, such as adequate equivalent measures of the Triad traits in adults (the ASP and SSIS did serve as useful assessments of sadism), or outcome variables more distinctly tied to sadism in both SD4 studies, such as online trolling behavior (Buckels et al., 2014) or violent videogame playing (Greitmeyer et al., 2019). Furthermore, retest reliability is an important psychometric property to establish in personality research (McCrae et al., 2011), and was unfortunately not conducted within the typical 1-month period (Gnambs, 2014). Nevertheless, we were able to administer the SD4 and many of the same correlates to a substantial portion of the adolescent sample after one year, finding remarkable 1-year retest correlation coefficients ranging from r = .42 (Machiavellianism) to .59 (sadism) and psychopathy at time 1 correlating at r = .51 with bullying behaviors at time 2. Future studies should inspect longitudinal invariance for the SD4 traits and study their long-term links to maladaptive behavioral outcomes, adequately controlling for their initial perpetration levels.

Conclusions

- The JS NEO-A60 and JS NEO-A50 showed adequate psychometric properties.

- The JS NEO-A50 constituted a more time-efficient, broad appraisal of the Big Five personality domains.

- The SD4 was successfully adapted to the Spanish language and validated for its use in adults and adolescents.

- The findings on the SD4 distinguish Machiavellianism from psychopathy better than previous Machiavellianism instruments.

- The results found for sadism warrant some caution on this dark trait's place within a purported Tetrad framework.

Overall, most of the goals set out to accomplish by the present dissertation were met. Despite the limitations in the research conducted, the two FFM short personality measures and the SD4 can be viewed as useful tools to assess normal-range and dark personality traits in adolescents, particularly in time-limited settings and as part of larger test batteries. The scores obtained on these tools can inform researchers and practitioners toward designing bespoke prevention and intervention strategies for the maladaptive outcomes associated with different personality configurations.

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