Are the questionnaire and the psycho-lexical Big Twos the same? Towards an integration of personality structure within the Circumplex of Personality Metatraits

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The Big Two personality factors were identified independently in questionnaire (Stability and Plasticity) and in psycho-lexical studies (Social Self-Regulation and Dynamism), but despite the close correspondence between them, the existing results are inconclusive as to the degree of their similarity. The presented study involved 692 participants (55.3% females; M_{age}=31.5, SD_{age}=13.1) who completed a set of instruments measuring the most general personality dimensions to clarify the relationship between the questionnaire and the psycho-lexical Big Twos within the Circumplex of Personality Metatraits (CPM). It was shown that both Big Twos can be deemed slightly different manifestations of the personality metatraits identified within the CPM. Thus, the obtained results suggest a possibility for renewed integration of the questionnaire and the psycho-lexical traditions of research on personality structure.

Keywords: big two, two factor model, higher-order factors, circumplex of personality metatraits

The predominant model of personality trait structure, consisting of Neuroticism vs. Emotional Stability, Extraversion, Openness to experience (or Intellect), Agreeableness, and Conscientiousness, is rooted in two research traditions: the psycho-lexical approach where the model is referred to as the Big Five, and the questionnaire approach where it is referred to as the Five Factor Model (FFM) (De Raad & Perugini, 2002; Digman, 1990; John, Naumann, & Soto, 2008). The Big Five model was discovered and independently recovered in several psycho-lexical studies on the structure of personality (e.g., Goldberg, 1990), and expanded theoretically and empirically within the questionnaire approach as FFM (McCrae & Costa, 2003).

Later findings from both lines of research indicate that the Big Five/FFM model may not describe the highest level of personality trait structure. There is a considerable body of empirical evidence supporting a structure with only two factors of personality which are broader and located above the Big Five (see Cieciuch & Strus, 2017). Although these two factors were found independently in questionnaire and psycho-lexical studies, the pairs of factors seem to correspond to each other, and are sometimes labeled as the *Big Two* in both traditions (DeYoung, Peterson, & Higgins, 2002; Saucier, 2008; Saucier et al. 2014; see Cieciuch & Strus, 2017). Yet, the names of the individual factors vary across studies and the identity or precise relations between both pairs of the Big Two factors still requires theoretical consideration and empirical confirmation because the existing findings are not unambiguous (De Raad & Barelds,

2008; De Raad et al., 2010; Gorbaniuk, Budzińska, Owczarek, Bożek, & Juros, 2013; Saucier, 2008; Saucier, Georgiades, Tsaousis, & Goldberg, 2005; Saucier et al., 2014). The current paper aims to show that the relationship between the psycho-lexical and the questionnaire Big Twos can be clarified and described within the so-called Circumplex of Personality Metatraits (CPM; Strus, Cieciuch, & Rowiński, 2014; Strus & Cieciuch, 2017), which was developed as an extension of the Big Two model (Cieciuch & Strus, 2017).

The Big Two within the questionnaire approach

From the very beginning, the FFM/Big Five model has faced problems with confirming one of its key assumptions, i.e., the orthogonality of the five factors, which were found to be correlated regardless of the instrument used (e.g., Caprara, Barbaranelli, Borgogni, & Vecchione, 2007; Digman, 1997; John et al., 2008; Hendriks, Hofstee, & De Raad, 1999; McCrae & Costa, 2003), with the intercorrelations sometimes exceeding .40 or even .50. Digman (1997) was the first to note that these associations formed a pattern suggesting two higher-order factors.

Digman's (1997) finding was based on analyses of more than a dozen previously published correlation matrices involving different measures, informants (teachers' ratings, peer ratings, and self-reports), and subjects (children, adolescents, and adults). The first factor, named *Alpha*, is responsible for the covariance of Emotional stability (vs. Neuroticism), Conscientiousness, and Agreeableness, while the other one, termed *Beta*, is related to the shared variance of Extraversion and Intellect/Openness to experience. Digman (1997) interpreted Alpha as a socialization factor and Beta as a personal growth factor; they were subsequently reconceptualized respectively as *Stability* and *Plasticity* by

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DeYoung et al. (2002). These two higher-order factors of the Big Five were replicated in later studies (e.g., Anusic, Schimmack, Pinkus, & Lockwood, 2009; Chang, Connelly, & Geeza, 2012; DeYoung, 2006; Simsek, Koydemir, & Schütz, 2012; Strus & Cieciuch, 2017; Vecchione & Alessandri, 2013), and now are sometimes called metatraits (Cieciuch & Strus, 2017; DeYoung, 2015; Hirsh, DeYoung, & Peterson, 2009). Moreover, there is some evidence that these metatraits are also the higher-order factors of the HEXACO model – a theoretically expanded questionnaire equivalent of the psycho-lexical Big Six (Saucier, 2008; Strus & Cieciuch, 2019; see Saucier & Srivastava, 2015).

The Big Two in the psycho-lexical approach

The original lexical studies that led to the discovery of the Big Five were conducted in the English language (Goldberg, 1990), and subsequently replicated reasonably well in German and in Dutch (Hofstee, Kiers, De Raad, Goldberg, & Ostendorf, 1997). However, when research was extended to non-Germanic languages, the replication of the Big Five structure met serious problems (e.g., De Raad et al., 2010; De Raad, Perugini, Hřebíčková, & Szarota, 1998). Some psycho-lexical studies indicated the possibility of a sixth factor, replicating the Big Six (or HEXACO) model with Honesty/Propriety (or Honesty-Humility), Resiliency (vs. Emotionality), Extraversion, Agreeableness, Conscientiousness, and Originality (or Openness to experience; Ashton et al., 2004; Lee & Ashton, 2008; Saucier, 2008; Saucier & Srivastava, 2015; Thalmayer & Saucier, 2014). At the same time, the latest lexical analyses carried out on data collected from the lexicons of many different languages show that the number of factors must be reduced if the criteria of replicability are to be met. The majority of these studies indicated that no more than three broad factors are replicable (see De Raad et al., 2010), of which at least two appear to be fully ubiquitous among cultures, irrespective of variable (word) selection strategies and analytical procedures (De Raad et al., 2018; Saucier, 2008; Saucier & Srivastava, 2015; Saucier et al., 2014; Saucier, Thalmayer, & Bel-Bahar, 2014a; see Saucier & Goldberg, 2001). The first of those Big Two related factors have been variously labeled as *Virtue* (De Raad, 2009; De Raad & Barelds, 2008), *Morality*, *Social Propriety* (Saucier, 2008; Saucier & Goldberg, 2001; Saucier et al., 2005), and *Social Self-Regulation* (S factor; Saucier et al., 2014). The other factor has been invariably termed *Dynamism* (D factor).

It should be underlined that the psycho-lexical Big Two were not derived as higher-order factors from the Big Five or Big Six factors or scales, but they emerged by extracting two factors from the "first-order" level on the basis of hundreds of natural language trait descriptors (mostly adjectives; Ashton, Lee, & Boies, 2015; Saucier & Srivastava, 2015; Saucier et al., 2014). An exception to this rule is the recent study by De Raad and colleagues (2018), who verified the Big Two in a multi-language psycho-lexical study using both methods. At any rate, the psycho-lexical Big Two has been found to reveal a generally consistent pattern of relationships with the Big Five/FFM (quite similar to the two higher-order factors from questionnaire studies; De Raad et al., 2018; Saucier, 2008; Saucier et al., 2014) and with the Big Six/HEXACO, where Social Self-Regulation

is related to Honesty/Humility, Agreeableness, and Conscientiousness, and where Dynamism is related to Extraversion, Originality/Openness, and Resiliency (vs. Emotionality; Saucier et al. 2014; Thalmayer & Saucier, 2014; see Ashton et al., 2015; De Raad et al., 2010; Strus & Cieciuch, 2019). What is more, the psycho-lexical Big Two seem to be more cohesively related to the Big Six/HEXACO (than to the Big Five/FFM; see Saucier et al., 2014; Strus & Cieciuch, 2019), and it has even been suggested that the former constitute the higher-level structure of the latter (see Ashton et al., 2015; Saucier & Srivastava, 2015; Saucier et al., 2014; Strus & Cieciuch, 2019; Thalmayer & Saucier, 2014).

The relationship between the questionnaire and the psycho-lexical Big Two factors

The Big Two personality factors have gained strong empirical support both within psycho-lexical and questionnaire approaches (e.g., DeYoung, 2006; DeYoung et al., 2002; Saucier & Srivastava, 2015; Saucier et al., 2014), and currently they are sometimes referred to as the Two Factor Model of personality (Cieciuch & Strus, 2017). It has been proved that the Big Two are not artifacts resulting from, e.g., evaluative bias, but that they are substantive constructs with predictive power and possible biological underpinnings (see e.g., Anusic et al., 2009; Chang et al., 2012; DeYoung, 2006; Jang et al., 2006; McCrae et al., 2008; Saucier & Srivastava, 2015; Saucier et al., 2014; Vecchione & Alessandri, 2013). Moreover, their discovery is of crucial importance as they have a rich theoretical potential (e.g., affinity with exploratory/mechanistic constructs; Digman, 1997; DeYoung, 2010; DeYoung, 2015; Saucier, 2008; Saucier & Srivastava, 2015; Saucier et al., 2014; Strus & Cieciuch, 2017; Strus et al., 2014). However, the important question arises whether the two general factors that emerged independently in questionnaire and psycho-lexical approaches can be treated as indeed the same, and – if not – what are the precise relations between the two sets of factors?

At first glance, Stability strongly corresponds to Social Self-Regulation (S) in terms of content, as does Plasticity to Dynamism (D). According to DeYoung et al. (2002), the questionnaire Alpha is associated with *stability* in the emotional domain (Emotional stability), the motivational domain (Conscientiousness), and the social domain (Agreeableness). It is understood to be responsible for maintaining the stability of psychosocial functioning, being also interpreted as a general socialization tendency (Digman, 1997; see Becker, 1999). The psycho-lexical S factor includes attributes linked to *social self-regulation*, socialization, solidarity, communion, cohesion, and adherence to socio-moral rules. Thus, it concerns morality, social propriety, respect for others and for authority, and it is related to using social norms as standards for regulating one's behavior. The questionnaire Beta reflects behavioral (Extraversion) and cognitive (Intellect/Openness) *plasticity*, which is revealed in the tendency to explore and voluntarily engage (behaviorally and cognitively) in new experiences (DeYoung et al., 2002). It is responsible for exploration and adaptation to novelty and change, being also interpreted as an orientation towards personal growth (Digman, 1997; see Becker, 1999). The psycho-lexical dimension D includes attributes connected

with *dynamism*, positively valued active qualities, and individual ascendancy. Consequently, it is associated with liveliness, self-expression, self-confidence, and skills for dealing with social situations, and it is possibly related to the activation-inhibition ratio and reward-punishment sensitivity.

The factors comprising both Big Twos seem to be inversely related to externalizing and internalizing tendencies (Stability and Social-Self-Regulation to externalizing problems, e.g., impulsiveness, aggression; Plasticity and Dynamism to internalizing ones, e.g., depression, anxiety; DeYoung, 2006; Saucier, 2008; Saucier et al., 2014), and they are aligned with broad dual personological concepts (Digman, 1997; Saucier & Srivastava, 2015; Saucier et al., 2014), such as Agency (associated with Plasticity and Dynamism) and Communion (linked to Stability and Social Self-Regulation), concepts stemming from Bakan's (1966; Abele & Wojciszke, 2014) theory.

The suggested correspondence between the questionnaire and psycho-lexical Big Twos is, however, far from evident in light of both theoretical meaning and empirical findings. Basically, it would not be obvious to expect in advance a second-order factor analysis of questionnaire scales, developed to measure the Big Five, to yield a solution similar to a first-order factor analysis of the universe of adjectives in cross-cultural psycho-lexical studies (especially in light of limited replicability of the Big Five outside the Germanic languages; but see De Raad et al., 2018). The similarity between the Big Twos may therefore require a theoretical interpretation and empirical confirmation, which turn out to be inconclusive. For example, Stability and Plasticity were found to be genetically determined (Jang et al., 2006; McCrae et al., 2008). Moreover, they are both assumed to have a neurobiological foundation – Stability is supposed to be related to the serotonergic system and Plasticity to the dopaminergic system (DeYoung, 2006; DeYoung et al., 2002). However, while Dynamism shows an association with biological-process-model variables, revealing its temperamental core (the approach-avoidance system, activation-inhibition, reward-punishment sensitivity), Social Self-Regulation does not exhibit such a relationship (Saucier et al., 2014). This could – together with its socialization and moral-ethical meaning – suggest that the S factor is related to the internalization of social and cultural norms (Thalmayer & Saucier, 2014), being mainly a dimension of character (its alternatively used labels, i.e., Morality, Social Propriety, and Virtue are perplexing in themselves; De Raad, 2009).

The main differences in meaning between Stability and Social Self-Regulation seem to be an emphasis on the socio-ethical content of the latter and the emotional stability content (lack of Neuroticism) of the former (see DeYoung, 2015). The meanings of Plasticity and Dynamism seem to differ mainly in the more pronounced cognitive-intellectual content and cognitive-behavioral openness to novelty and change of the former, as well as in the presence of social competence and resiliency (vs. internalizing negative emotionality) in the latter (Saucier et al. 2014; Thalmayer & Saucier, 2014).

Although in some studies the pattern of correlations between the psycho-lexical Big Two and the Big Five factors

is nearly identical to the pattern of relationships between Stability and Plasticity and the Big Five (De Raad et al., 2018; Saucier, 2008), in other studies these patterns appear to diverge to a lesser or greater degree (De Raad et al., 2010; De Raad et al., 2018; Saucier, 2008; Saucier et al. 2014). Conducted by Saucier et al. (2014), a direct empirical comparison of the psycho-lexical and the questionnaire Big Twos does not bring unequivocal results either. A problem seems to concern the factor of Neuroticism/Emotional stability, which constitutes a crucial element of Stability in the questionnaire approach, but which is often associated (particularly in its Big Six/HEXACO variant, i.e., Emotionality vs. Resiliency) with Dynamism, or both Big Two factors in the psycho-lexical approach (e.g., De Raad et al., 2010; Saucier & Srivastava, 2015; Saucier et al., 2014). Moreover, there is some evidence suggesting that the questionnaire Big Two is more consistently related to the Big Five/FFM, while the psycho-lexical Big Two is more coherently associated with the Big Six/HEXACO (see Strus & Cieciuch, 2019).

For an evaluation of the above results one should also take into account some measurement aspects. Namely, correlation analyses of the psycho-lexical Big Two and the Big Five and Big Six factors made use of different variants of the five-factor or six-factor models (obtained in those lexical studies), and sometimes also of the various measures of the FFM. But, most of all, Big Two measurements are imperfect in general because in the questionnaire approach the Big Two are usually derived from different Big Five/FFM measures (through factor analysis), and in the psycho-lexical approach the exact content of the S and D factors depends on the language of a given study and on the employed procedure of variable selection. For that reason, the words loading the Big Two in different psycho-lexical studies are not semantically identical, which is illustrated by the diversity of names of factor S (see De Raad et al., 2018).

In summary, the existing studies are inconclusive – they do not allow for an unambiguous conclusion about either a far reaching similarity between the two higher-order questionnaire factors and two broad psycho-lexical factors, nor about a substantial difference between them both in terms of content and in theoretical meaning. Therefore, more conclusive empirical evidence is required to determine whether the questionnaire and psycho-lexical Big Two factors are in fact the same (De Raad, 2009; DeYoung, 2006; Saucier, 2008) or how they are related to each other. When an analysis of relationships between constructs from the same level of organization or abstraction is of interest, it is a good idea to change the perspective from vertical/hierarchical to horizontal/circumplexical (Goldberg, 1993). This change is particularly justified when we take into account the fact that differences between the content of factors from different data or solutions may well be of a rotational nature (see e.g., differences between the psycho-lexical Big Five, questionnaire FFM, and HEXACO model in regard to Agreeableness and Emotional stability factors; Ashton & Lee, 2007; Goldberg, 1990; McCrae & Costa, 2003). The recently proposed CPM model (Strus et al., 2014; Strus & Cieciuch, 2017) is a circumplex extension of the Big Two that addresses the issue of rotational differences between the higher-order factors (or metatraits), and therefore we used it as a clarification framework.

The Circumplex of Personality Metatraits

The CPM is a proposition that continues the line of thinking in terms of broad personality dimensions, or higher-order factors of personality, and, at the same time, it may help resolve some of the problems that have arisen in the literature concerning these metatraits (Strus et al., 2014, Strus & Cieciuch, 2017). The CPM is based on the idea of organizing the metatraits in a circumplex structure. The model consists of four bipolar metatraits located on a circumplex – two basic orthogonal dimensions of Alpha/Stability and Beta/Plasticity (Anusic et al., 2009; Chang et al., 2012; DeYoung, 2006; McCrae et al., 2008; Simsek et al., 2012), originally taken from the questionnaire approach, are complemented by *Gamma/Integration* and *Delta/Self-Restraint* (see Figure 1). The opposite poles of each metatrait exhibit some psychological meaning that goes beyond simple opposition, and for this reason the CPM defines the positive and negative poles of each metatrait separately. As a result, the CPM assumes an octant structure of personality metatraits consisting of four bipolar metatraits or eight unipolar ones. Each of the eight metatraits represents a certain configuration of the Big Five traits that is however not reducible to a simple sum of these trait meanings.
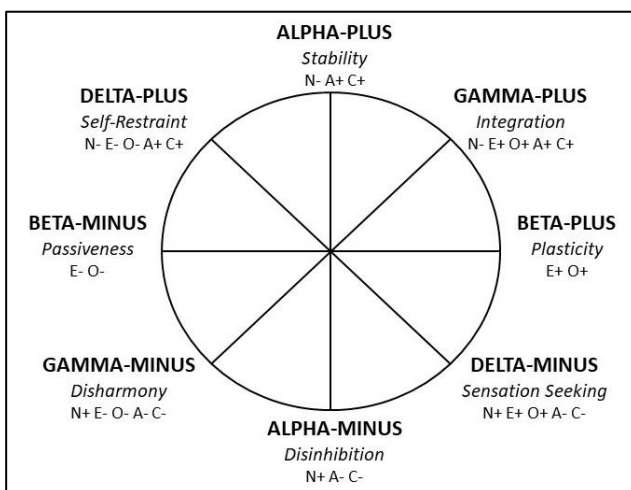

Figure 1. The Circumplex of Personality Metatraits (Strus et al., 2014); N = Neuroticism; E = Extraversion; O = Openness to Experience; A = Agreeableness; C = Conscientiousness; + denotes the positive pole of a trait; – denotes the negative pole of a trait.

Within the CPM model, Alpha/Stability and Beta/Plasticity are defined in accordance with the existing literature concerning higher-order factors of the FFM/Big Five (DeYoung, 2006; DeYoung, 2015; DeYoung et al., 2002; Digman, 1997; see Becker, 1999), the difference being that the CPM also defines their negative poles: *Disinhibition* (Alpha-Minus) and *Passiveness* (Beta-Minus). The dimensions of Gamma and Delta are seen as derivatives of a combination of Alpha and Beta, located orthogonally to each other and at 45° rotation to the latter. Gamma can be seen as a CPM reinterpretation of the General Factor of Personality (Musek, 2007; Rushton & Irwing, 2011); the positive pole (i.e., Gamma-Plus) is termed *Integration*, because it brings

together all socially and individually desirable qualities of personality (including high Stability and high Plasticity or – on the Big Five level – Emotional stability, Extraversion, Openness, Agreeableness, and Conscientiousness); accordingly, the negative pole (i.e., Gamma-Minus) is labeled *Disharmony,* as it represents the most undesirable configuration of personality traits (see Figure 1). In turn, Delta results both from the logic of the circumplex structure incorporating Alpha, Beta, and Gamma (Revelle & Wilt, 2013), as well as from research indicating different-sign correlations of Alpha/Stability and Beta/Plasticity with other variables (e.g., DeYoung et al., 2002; DeYoung et al., 2008; see Becker, 1999). The positive pole of Delta (i.e., Delta-Plus) is termed *Self-Restraint*, as its psychological meaning results from a combination of high Stability and low Plasticity or (on the Big Five level) Emotional stability (N-), high Agreeableness (A+), high Conscientiousness (C+), introversion (E-), and low Openness (O-). The metatrait Delta-Minus is termed *Sensation Seeking*, related to an inverse configuration of personality traits (i.e., low Stability, high Plasticity, and N+, E+, O+, A-, C-; see Figure 1).

According to a suggestion of Strus et al. (2014), which has already gained some evidence (Strus & Cieciuch, 2017), the main advantage of the CPM model is that it can provide foundations for a comprehensive, wide-ranging theoretical integration (see Rogoza, Cieciuch, Strus, & Baran, 2019; Topolewska & Cieciuch, 2017). Although the CPM was directly developed within the questionnaire approach of the FFM/Big Five research (and it originally adopted the questionnaire Big Two), Strus et al. (2014) claim that it is capable of integrating the psycho-lexical and questionnaire Big Twos, enabling renewed integration of both traditions of study on basic personality factors. This integration can be termed "renewed" as the first wave of integration took place in the late 1980s and 1990s with a general consensus as to the Big Five (see De Raad & Perugini, 2002; Digman, 1990; John et al., 2008). It is worth noting that a circular representation of personality variables arranged by the Big Two factors has also been provided within the psycho-lexical studies (see De Raad, 2009; De Raad et al., 2018). Nevertheless, in the context of clarifying the relationships between both Big Twos, the CPM offers not just a circular, two-dimensional arrangement, but with its octants placed at 45 degrees it can serve as point of reference providing precise coordinates of meaning space.

Current study

The goals of the present study are to test the relationship between the questionnaire and the psycho-lexical Big Twos and to explain these relations within the CPM framework. In connection with the issues presented above and the problems discussed in the literature, two main expectations are formulated: (1) there are moderate to strong correlations of Stability with Social Self-Regulation and of Plasticity with Dynamism, but not strong enough to indicate an identity between those pairs of personality factors, and (2) the CPM model clarifies and systemizes relationships between the questionnaire and psycho-lexical Big Twos. This second expectation is more complex, and so it is illustrated in Figure 2, and specified below.
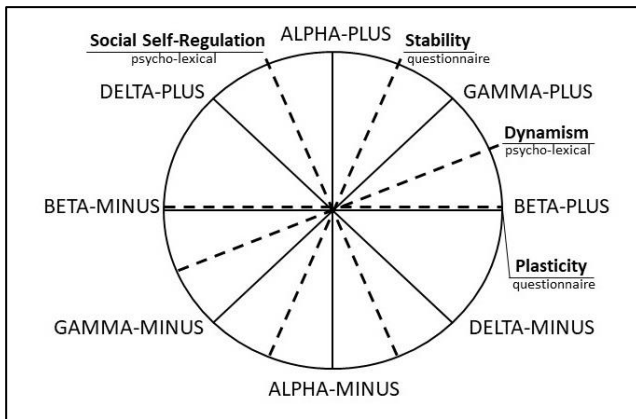
Figure 2. The hypothesized relationships between the questionnaire and psycho-lexical Big Twos within the Circumplex of Personality Metatraits.

Stability and Social Self-Regulation

Questionnaire Stability and psycho-lexical Social Self-Regulation are expected to be positioned near the Alpha-Plus metatrait, however, with Social Self-Regulation on the Delta-Plus side and Stability on the Gamma-Plus side. Alpha-Plus is defined as stability in emotional, motivational, and social functioning, expressed as a general tendency for social adaptation, and with an ethical attitude towards the world. These characteristics stand in contrast with anti-social tendencies underpinned by unrestraint and low frustration tolerance and by aggression and antagonism towards people, norms, and obligations (definition of Alpha-Minus). Due to the fact that factor S would encompass such qualities as adhering to social norms and using them as standards for regulating one's behavior, social propriety, and respect for authority, it also shows some similarity with Delta-Plus (Self-Restraint), which includes high behavior control, a tendency to adjust oneself, conformism, and conventionality (vs. impulsiveness, stimulation-seeking, provocativeness, and expansiveness in interpersonal relations, characteristic of Delta-Minus; Strus et al., 2014; Strus & Cieciuch, 2017). For this reason, Social Self-Regulation is expected to be located halfway between Alpha-Plus and Delta-Plus.

In turn, Stability extracted from the Big Five questionnaires quite often shows correlations with Extraversion (e.g., DeYoung et al., 2002; Strus & Cieciuch, 2017) and it exhibits a content expressing (a lack of) internalizing, rather than externalizing, tendencies (DeYoung, 2010). These unexpected findings may result from imperfect measurements of the questionnaire Stability based on factor analysis of scales designed to measure the Big Five, not the Big Two. In terms of the CPM, one can argue that Stability based on factor analysis of the Big Five scales may encompass accidental content related to the CPM Gamma, i.e., well-being, a warm attitude towards people, both intra- and interpersonal harmony (Gamma-Plus) vs. inaccessibility in interpersonal relationships, depressiveness, pessimism, and proneness to suffer from psychological problems (Gamma-Minus; Strus et al., 2014; Strus & Cieciuch, 2017). Also the unambiguous position of the factor Neuroticism/Emotional stability could shift Stability to the Gamma-Plus direction. Emotional stability usually strongly saturates questionnaire Stability (e.g., DeYoung, 2006; DeYoung et al., 2002), but

some studies suggest that it is related to both Big Two factors (Strus & Cieciuch, 2017; see Becker, 1999; De Raad et al., 2018; Saucier et al. 2014). For these reasons, the questionnaire Stability is expected to be located halfway between Alpha-Plus and Gamma-Plus.

Plasticity and Dynamism

Dynamism encompasses not only activity, liveliness, and individual ascendancy, but also self-expression and social competencies. For this reason, factor D would be related primarily to Beta-Plus, defined as cognitive and behavioral engagement in new experiences, initiative, and invention in social relations, as well as orientation towards personal growth vs. apathy, submissiveness in interpersonal relations, inhibition, and stagnation (Beta-Minus). However, Dynamism is expected to be positioned halfway between Beta-Plus and Gamma-Plus (with its well-being, intra- and interpersonal harmony, and effectiveness in attaining important goals vs. pessimism, coldness, and distance in interpersonal relationships). The main reason underlying this expectation is that Dynamism seems to reveal a consistent relationship with Emotional stability (or Resiliency; De Raad, 2009; De Raad et al., 2010; Saucier & Srivastava, 2015; Saucier et al., 2014), which is absent from the content of Beta, but which is one of the elements of Gamma.

In turn, the questionnaire Plasticity was expected to be positioned in the immediate proximity of the CPM Beta-Plus. In contrast to Stability, measurement imperfection does not seem to substantially affect the validity of Plasticity indicators extracted from the Big Five scales, although they are sometimes unexpectedly correlated with Emotional stability or even Agreeableness (Strus & Cieciuch, 2017).

METHOD

Measures

The study employed diverse sets of reliable and empirically well-grounded indicators for the questionnaire and psycho-lexical Big Two.

Two kinds of measures were used for the questionnaire Big Two. The first one (BFI$_{EFA}$) is derived from the Big Five Inventory (John et al., 2008) on the basis of exploratory factor analysis (EFA), as the most natural procedure (DeYoung et al., 2002; Digman, 1997). The second one (IPIP-SPS) is a direct measure, which consists of items from the International Personality Item Pool (IPIP; Goldberg, 1999; Goldberg et al., 2006).

For the psycho-lexical Big Two, we used three kinds of indicators because it is harder to measure the psycho-lexical Big Two without conducting an extensive psycho-lexical study. The first of these three (B2AL) is an adjectival measure, most naturally related to the origins of the psycho-lexical Big Two. The second one (IPIP-SDS) is sentence-based and consists of items from the IPIP (Goldberg, 1999; Goldberg et al., 2006); the third one (QB6$_{EFA}$) is based on EFA run on six scales of the Questionnaire Big Six (Thalmayer & Saucier, 2014).

Additionally, the Circumplex of Personality Metatraits Questionnaire (CPM-Q) was used to measure the metatraits identified within the CPM model.

The Big Five Inventory (BFI_EFA)

The BFI (John et al., 2008) is one of the most commonly used instruments to measure the Big Five/FFM, provided with demonstrated cross-cultural reliability and validity in 29 languages in 56 nations (Schmitt, Allik, McCrae, & Benet-Martinez, 2007; see also Simsek et al., 2012). It has also shown convergence with the NEO-FFI (McCrae & Costa, 2003) measure of the FFM (John et al., 2008), and it has been utilized for obtaining higher-order factors of the Big Five (e.g., DeYoung, 2006; Simsek et al., 2012). The BFI consists of 44 short phrases, based on trait adjectives, serving as the item core to which elaborative or contextual information is added. Each Big Five trait is assessed by 8 (Extraversion and Neuroticism) to 10 items (Openness), which are rated on a 5-point scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). The Polish version of the measure was prepared by the authors of this paper. Cronbach's alphas for the BFI scales in the current study ranged between .74 and .82 ($M = .79$; see Table A in the Appendix). Stability and Plasticity indicators were obtained as factor scores calculated by the regression method on the basis of EFA, which is an established procedure in the literature (DeYoung et al., 2002; Digman, 1997). Principal axis factoring (PAF) with two iterations followed by a varimax rotation was run on the five BFI scales resulting in two higher-order factors extracted with eigenvalues greater than one (the other factors had eigenvalues lower than one) and accounting for 59% of the variance.

The International Personality Item Pool – Stability and Plasticity Scales (IPIP-SPS)

The IPIP-SPS consists of the 40 strongest IPIP markers of Stability and Plasticity, identified by DeYoung (2010) out of more than 2,500 IPIP items through a correlation based procedure. These 40 IPIP items were translated into Polish. In the current study, Cronbach's alpha coefficient (given on the diagonal of Table 1) for the Stability scale (20 items, of which 18 were negatively scored) was .89, and that for the Plasticity scales (20 items, 4 negatively scored) it was .93. Participants indicated their answers on a 5-point Likert scale (from 1 – *very inaccurately describes me* to 5 – *very accurately describes me*).

The Big Two Adjective List (B2AL)

The B2AL was developed on the basis of a set of 53 adjectives taken from two psycho-lexical studies. A set of 17 adjectives was derived from a cross-cultural study by Saucier et al. (2014) on the lexicons of nine European, Asian, and African languages of diverse provenance (Chinese, Korean, Filipino, Turkish, Greek, Polish, Hungarian, Maasai, and Senoufo), with 10 markers for the Social Self-Regulation factor and 7 for the Dynamism factor, which appeared to be the most salient, recurrent markers in five of nine languages, capturing the core of the Big Two lexical content. However, while those markers do capture the core of the Big Two, they do not cover the full breadth of the two factors. For this reason, the list used in the current study was supplemented with 40 adjectives loading most heavily on two factors (20 adjectives per factor) in the two-factor solution obtained in a large-scale Polish psycho-lexical study by Gorbaniuk et al

(2013). Four of these adjectives were shared with the solutions of Saucier et al. (2014), thus resulting in a final version of the B2AL with 53 items.

These 53 items were grouped into two sets of two scales. One set (B2AL-CROSS) comprised cross-cultural markers of factor S (10 items of which 2 negatively scored) and cross-cultural markers of factor D (7 items, 3 negatively scored). The other set (B2AL-POL) comprised Polish markers of factor S (20 items, 5 negatively scored) and Polish markers of factor D (20 items, 9 negatively scored). These two sets of scales would represent the cross-cultural –universal– aspect (*etic*) as well as any possible Polish specificity (*emic*) of the psycho-lexical Big Two content. The reliabilities of these scales as measured by Cronbach's alpha coefficients in the current study are given in Table 1 (on the diagonal) and range between .77 and .92 ($M = .84$). Participants were asked to assess how accurately a given trait describes themselves, indicating their answers on a 5-point Likert scale (from 1 – *inaccurately* to 5 – *accurately*). The list of B2AL adjectives is available from the first author upon request.

The International Personality Item Pool – Social Self-Regulation and Dynamism Scales (IPIP-SDS)

The IPIP-SDS consists of 40 items that were identified by Saucier et al. (2014) as the strongest IPIP correlates of the psycho-lexical Big Two out of a total of 2,400 items. These 40 items (20 per factor) were translated into Polish. In the current study, Cronbach's alpha coefficients (Table 1, diagonal) for the Social Self-Regulation scale (out of 20 items 11 are negatively scored) was .90, and that for the Dynamism scale (out of 20 items 13 negatively scored) was .94. Answers were given on a 5-point Likert scale (from 1 – *very inaccurately describes me* to 5 – *very accurately describes me*).

The Questionnaire Big Six (QB6_EFA)

Although, the QB6 was designed to measure the psycho-lexical Big Six factors (roughly similar to the HEXACO factors), it was also used for obtaining indicators of the psycho-lexical Big Two (Saucier et al., 2014; Thalmayer & Saucier, 2014). The latter is justified by evidence supporting the position of the psycho-lexical Big Two as the higher-order factors of the Big Six/HEXACO (see Strus & Cieciuch, 2019).

The QB6 derived its items from the IPIP pool (Goldberg et al., 2006), and it was recently cross-culturally tested in samples from 26 nations (Thalmayer & Saucier, 2014). In the current study, Cronbach's alpha coefficients for the Big Six scales (each consisted of five items) ranged from .66 to .77 ($M = .71$; see Table A in the Appendix). Answers were given on a 5-point Likert scale (from 1 – *very inaccurately describes me* to 5 – *very accurately describes me*). The Social Self-Regulation and Dynamism scores were obtained using an EFA procedure that was analogous to that employed for the higher-order factors of the Big Five and they have previously been utilized by Saucier et al. (2014) and Strus and Cieciuch (2019). PAF with two iterations followed by a varimax rotation was run on the six QB6 scales resulting in two higher-order factors extracted with eigenvalues greater than one (the eigenvalues of the other factors

Table 1. Descriptive statistics and correlations between the questionnaire and psycho-lexical Big Two indicators

| | | Questionnaire Big Two | | | | Psycho-lexical Big Two | | | | | | | |
| | | BFI_EFA | | IPIP-SPS | | QB6_EFA | | IPIP-SDS | | B2AL-CROSS | | B2AL-POL | |
		Stab.	Plast.	Stab.	Plast.	S	D	S	D	S	D	S	D
BFI_EFA	Stability	-											
	Plasticity	.28	-										
IPIP-SPS	Stability	.58	.17	.89									
	Plasticity	.22	.67	.33	.93								
QB6_EFA	Social Self-Regulation	.56	-.08	.55	-.02	-							
	Dynamism	.45	.55	.55	.74	.19	-						
IPIP-SDS	Social Self-Regulation	.46	-.01	.64	.12	.72	.26	.90					
	Dynamism	.39	.57	.56	.78	.14	.78	.29	.94				
B2AL-CROSS	Social Self-Regulation	.44	.05	.40	.08	.62	.17	.70	.18	.77			
	Dynamism	.29	.57	.32	.74	.00	.71	.06	.78	.07	.78		
B2AL-POL	Social Self-Regulation	.53	-.14	.45	-.11	.70	.09	.66	.04	.71	-.12	.90	
	Dynamism	.38	.59	.43	.76	.09	.78	.12	.81	.12	.90	-.04	.92
	Mean	.00	.00	3.59	3.46	.00	.00	3.87	3.65	3.94	3.58	3.65	3.62
	Standard Deviation	.70	.65	.56	.63	.74	.73	.51	.70	.47	.67	.54	.64

Notes: EFA = indicators extracted in exploratory factor analysis; BFI = Big Five Inventory (John et al., 2008); IPIP-SPS = International Personality Item Pool Stability and Plasticity Scales (DeYoung, 2010); QB6 = Questionnaire Big Six (Thalmayer & Saucier, 2014); IPIP-SDS Social Self-Regulation and Dynamism Scales (Saucier et al., 2014); B2AL-CROSS = the Big Two Adjective List – cross-cultural Big Two markers by Saucier et al. (2014); B2AL-POL = The Big Two Adjective List – Polish Big Two markers by Gorbaniuk et al. (2013). Correlations greater than |.06| are significant at p < .05 (one-tailed). Cronbach's alphas are indicated on the diagonal. $N = 500$ for the BFI, and $N = 692$ for the other measures.

were clearly lower and below one) and accounting for 54% of the variance. These factors were then saved as regression-based factor scores.

The Circumplex of Personality Metatraits - Questionnaire (CPM-Q)

The CPM-Q was developed in order to operationalize the CPM model (Strus & Cieciuch, 2017). It assesses each of the 8 unipolar metatraits with 25 items and responses could be given on a 5-point Likert scale (from 1 – *completely disagree* to 5 – *completely agree*). The reliability as well as structural and theoretical validity of the measure was confirmed in Strus and Cieciuch (2017). Cronbach's alpha reliabilities of the eight CPM-Q scales in the present study ranged between .88 and .93 ($M = 90$; see Table 2, last column). As the CPM-Q does not have any negatively keyed items, its scores were centered (see DeYoung et al., 2013; Strus & Cieciuch, 2017) to correct for idiosyncrasies in the use of the response scale (e.g., acquiescence bias). For that purpose, each subject's mean score for all responses was subtracted from each scale score.

Participants and procedure

The sample consisted of 692 Polish participants (55.3% females) aged 16 to 75 years ($M_{age} = 31.5$, $SD_{age} = 13.1$). All respondents completed each measure with the exception of the BFI, which was completed by a subsample of 500 subjects (72% of the whole sample, 56.6% females; $M_{age} = 31.7$, $SD_{age} = 13.9$). The study was conducted using a self-report paper-and-pencil method in 3 sessions approximately 2 weeks apart. The CPM-Q was administrated in one session, and the B2AL, QB6, IPIP-SDS, and IPIP-SPS in the other one. The BFI was completed by a subsample of respondents during a separate session. Participation in the study was voluntary. Appropriately trained students of psychology assisted in conducting the study; each of them administered the measures to approximately 6–10 subjects. The data-set is open and available from the public repository on the authors institutional website.

Analyses

In order to verify the adopted expectations about the pattern of relationships between the Big Twos and the CPM metatraits depicted in Figure 2, the method outlined by Terracciano, McCrae, Hagemann, and Costa (2003), DeYoung et al. (2013), and Strus and Cieciuch (2017) was employed. This procedure allows to compare an empirically observed factor matrix with a theoretically predicted structure (target). The comparison employs congruence coefficients, which quantify the fit of the target (theoretically predicted) and comparison (empirically obtained) loading matrices for overall solution congruence, for the axes (by column), and for each variable (by row).

The target matrix represents the circumplex structure of the CPM and the predicted locations of the Big Two dimensions within the CPM space as presented in Figure 2. It was obtained by assigning an angle to each CPM octant (which is the typical specification of locations within circumplex

models, see DeYoung et al., 2013; Wiggins, 1995) and each Big Two dimension, followed by calculating loadings on two factors based on a given angle. These latter two factors represent two major axes of the CPM space (i.e., two bipolar metatraits: Alpha and Beta), with loadings being the sines and cosines of particular angles. The angular locations (Θ) and the corresponding loadings are specified in the *target matrix* column of Table 3. This specification started from Beta-Plus and Plasticity, which have an angle of 0°, and loadings resulting from this angle: .00 on the first factor (Alpha) and 1.00 on the second one (Beta). Then, the procedure was continued counterclockwise for the other seven CPM metatraits and the remaining Big Two dimensions (see also Figure 2).

The comparison matrix was obtained in two EFA steps which were performed on eight CPM metatraits and/or Big Two scores. In the first step, EFA with PAF was conducted in order to generate two factors – the basic dimensions (axes) of a circular model (see DeYoung et al., 2013; McCrae, Zonderman, Bond, Costa, & Paunonen, 1996; Wiggins, 1995). In the second step, Procrustes rotation was used (Barrett, 2013; Schönemann, 1966), rotating the empirically obtained results to the theoretically expected ones, practically without changing them. It aligned the comparison matrix with the target one by an orthogonal rotation of the first against the second (so as to minimize the sum of squared deviations between the comparison matrix and the target matrix values), providing a common orientation for the empirical solutions and the target matrix without affecting the relative positions of the variables on a two-dimensional plane.

The comparison matrix obtained in this way was then compared with the target matrix in order to analyze the degree of their congruence – overall, for the axes (by column), and for each variable (by row). Axis congruence coefficients is the most common as it is analogous to the familiar factor congruence coefficients. Variable congruence coefficients are computed with the same formula as the factor congruence coefficients, but utilized across the rows rather than along the columns of the factor matrix. The overall solution congruence is the mean of the variable (row) congruence coefficients calculated across all (both) factors/axes (Barrett, 2013; McCrae et al., 1996). Congruence coefficients range from -1 to 1, analogously to correlation coefficients. Congruence coefficients higher than .85 are typically considered evidence of similarity or acceptable match, and those higher than .95 indicate very good fit (see Barrett, 2013; DeYoung et al., 2013; McCrae et al., 1996; Terracciano et al., 2003). Additionally, the explained variance coefficients (R^2) were computed for each indicator of a personality variable to assess the communality of the variables in the joint two-factor (CPM) space.

The above procedure was run three times, i.e., on three sets of variables: on all indicators of the Big Two (Analysis 1), on the CPM metatraits and all indicators of the Big Two (Analysis 2), and on the CPM metatraits and four Big Two composite scores (Analysis 3). The composite scores were calculated by averaging the standardized scores of all indicators of the same dimension – in this way, individual scores were obtained for Stability, Plasticity, Social Self-Regulation, and Dynamism. This three-stage plan of analyses was designed to test whether the Big Two indicators reveal the

Table 2. Descriptive statistics and correlations of the CPM metatraits with the questionnaire and psycholexical Big Two indicators

CPM metatraits	Questionnaire Big Two						Psycho-lexical Big Two												M	SD	Alpha
	BFI$_{EFA}$		IPIP-SPS		Composites		QB6$_{EFA}$		IPIP-SDS		B2AL-CROSS		B2AL-POL		Composites				
	Stab.	Plast.	Stab.	Plast.	Stab.	Plast.	S	D	S	D	S	D	S	D	S	D			
Delta-Plus	.51	-.27	.40	-.24	.53	-.25	.60	-.01	.49	-.04	.37	-.19	.62	-.12	.60	-.10	.22	.49	.88
Alpha-Plus	.67	.07	.57	.06	.69	.07	.65	.27	.62	.26	.58	.10	.59	.16	.70	.21	.70	.44	.89
Gamma-Plus	.62	.40	.62	.38	.69	.41	.40	.53	.46	.52	.40	.37	.34	.42	.46	.50	.64	.42	.88
Beta-Plus	.22	.73	.22	.75	.24	.80	-.11	.60	-.03	.58	-.04	.62	-.15	.61	-.09	.65	.43	.51	.93
Delta-Minus	-.37	.38	-.28	.39	-.40	.40	-.57	.18	-.48	.19	-.39	.34	-.56	.29	-.58	.27	-.24	.52	.91
Alpha-Minus	-.60	.00	-.50	.02	-.62	.02	-.64	-.14	-.60	-.11	-.54	.06	-.66	.01	-.70	-.05	-.62	.51	.91
Gamma-Minus	-.67	-.44	-.64	-.49	-.73	-.50	-.32	-.66	-.32	-.63	-.23	-.52	-.24	-.61	-.32	-.66	-.57	.55	.92
Beta-Minus	-.07	-.68	-.12	-.69	-.08	-.74	.19	-.54	.07	-.54	.04	-.59	.23	-.57	.15	-.61	-.56	.57	.90

Note: See the notes under Table 1.

Table 3. Target and obtained factor matrices with corresponding CPM angles, explained variances, and congruence coefficients for comparing target and obtained factor loadings of the CPM metatraits, Big Two indicators, and their composites in three analyses (N = 500)

| | Target matrix | | | Obtained matrix | | | | | | | | | | | | | | | |
| | | | | Analysis 1 | | | | | Analysis 2 | | | | | Analysis 3 | | | | |
	Θ	F1	F2	F1	F2	R^2	Congr.	Θ	F1	F2	R^2	Congr.	Θ	F1	F2	R^2	Congr.	Θ
CPM Delta-Plus	135	.71	-.71						.72	-.39	.67	.96	118.63	.75	-.40	.72	.96	118.51
CPM Alpha-Plus	90	1.00	.00						.85	-.03	.72	1.00	92.00	.88	.03	.78	1.00	88.18
CPM Gamma-Plus	45	.71	.71						.68	.40	.62	.97	60.12	.72	.46	.73	.98	57.26
CPM Beta-Plus	0	.00	1.00						.07	.83	.69	1.00	5.26	.07	.89	.80	1.00	4.72
CPM Delta-Minus	315	-.71	.71						-.65	.56	.74	1.00	311.25	-.68	.58	.80	1.00	310.36
CPM Alpha-Minus	270	-1.00	.00						-.82	.19	.71	.97	283.17	-.85	.12	.74	.99	278.36
CPM Gamma-Minus	225	-.71	-.71						-.64	-.53	.69	1.00	230.36	-.67	-.55	.75	1.00	230.55
CPM Beta-Minus	180	.00	-1.00						.09	-.82	.68	.99	174.21	.11	-.90	.82	.99	173.23
Quest. COMPOSITE Stability	67.5	.92	.38											.83	.25	.75	1.00	73.14
Quest. COMPOSITE Plasticity	0	.00	1.00											.10	.86	.75	.99	6.74
Lex. COMPOSITE Soc. Self-Reg.	112.5	.92	-.38											.75	-.13	.58	.98	100.03
Lex. COMPOSITE Dynamism	22.5	.38	.92											.29	.74	.63	1.00	21.24
Quest. BFI Stability	67.5	.92	.38	.67	.17	.48	.99	75.42	.75	.19	.60	.99	76.04					
Quest. BFI Plasticity	0	.00	1.00	.11	.68	.47	.99	8.66	.09	.76	.59	.99	6.79					
Quest. IPIP Stability	67.5	.92	.38	.72	.24	.58	1.00	71.28	.74	.25	.61	1.00	71.80					
Quest. IPIP Plasticity	0	.00	1.00	.22	.84	.75	.97	14.81	.17	.85	.75	.98	11.15					
Lex. QB6 Soc. Self-Reg.	112.5	.92	-.38	.82	-.20	.71	.99	103.62	.78	-.18	.64	.99	103.22					
Lex. QB6 Dynamism	22.5	.38	.92	.44	.75	.76	.99	30.50	.41	.73	.70	.99	29.42					
Lex. IPIP Soc. Self-Reg.	112.5	.92	-.38	.84	-.10	.72	.96	96.74	.77	-.07	.60	.95	95.07					
Lex. IPIP Dynamism	22.5	.38	.92	.42	.80	.82	1.00	27.19	.39	.76	.73	1.00	27.15					
Lex. B2AL-CROSS Soc. Self-Reg.	112.5	.92	-.38	.76	-.14	.60	.98	100.11	.66	-.08	.44	.96	96.94					
Lex. B2AL-CROSS Dynamism	22.5	.38	.92	.23	.85	.78	.99	15.01	.19	.81	.69	.99	13.47					
Lex. B2AL-POL Soc. Self-Reg.	112.5	.92	-.38	.81	-.32	.76	1.00	111.37	.76	-.27	.65	1.00	109.56					
Lex. B2AL-POL Dynamism	22.5	.38	.92	.32	.87	.86	1.00	20.18	.28	.82	.75	1.00	19.06					

Note. The target matrix is based on the hypothesized circumplex structure shown in Figure 2. Θ = angles in degrees, F1 and F2 = factors/axes, Congr. = Congruence coefficients between target and obtained factor matrices.

relationships predicted using the CPM model with (Analysis 2) and even without the CPM metatrait scores (Analysis 1). In order to obtain the most reliable and synthetic picture of the relationships (eliminating the redundancy caused by the different scores of the same Big Two variables), which correspond strictly to the expectation depicted in Figure 2, Analysis 3 included the CPM metatraits and composite scores for the questionnaire and for the psycho-lexical Big Two dimensions.

RESULTS AND DISCUSSION

The relationship between the questionnaire and the psycho-lexical Big Twos

Table 1 presents the correlation coefficients among two sets of the questionnaire and four sets of the psycho-lexical Big Twos indictors. All Big Two indicators revealed good convergent and discriminant validity within the questionnaire and the psycho-lexical sets separately, although the latter exhibited a markedly better pattern of relationships (i.e., higher correlations between the same factor scores and lower between different ones). The pattern of correlations between the questionnaire and the psycho-lexical Big Two indicators was less clear. While Plasticity revealed a strong association with Dynamism (particularly for the IPIP indicator of Plasticity) and a lack of (or very low) association with Social Self-Regulation, Stability was found to be associated with both Social Self-Regulation and Dynamism (in some cases the correlations were equal or nearly so). This latter finding was, however, not limited to the questionnaire Stability: the psycho-lexical Dynamism exhibited associations with both Plasticity and Stability. Therefore only the questionnaire Plasticity and the psycho-lexical Social Self-Regulation revealed a clear (not cross-related) pattern of relationships. It is worth noting that the obtained overall pattern of results corresponds to that reported by Saucier et al. (2014), indicating that the questionnaire and the psycho-lexical Big Twos are related, yet not sufficiently in order to be considered identical, in accordance with the adopted hypothesis.

The somewhat confusing pattern of relationships between the questionnaire and the psycho-lexical Big Twos reflects, however, the hypothesized positions of both Big Two factors within the CPM space. Taking into account the relations of the Big Two dimensions depicted in Figure 2, the pattern presented in Table 1 becomes clear as Plasticity and Dynamism are located closer to each other than Stability and Social Self-Regulation. Moreover, Dynamism is not orthogonal in relation to Stability, and the latter is located at the same distance from Dynamism as from Social-Self-Regulation.

Relationship between the questionnaire and the psycho-lexical Big Twos within the CPM model

The correlation pattern between the Big Two indicators and the CPM metatraits presented in Table 2 is also almost fully consistent with expectations (for intercorrelations of the CPM metatraits see Table B in the Appendix). In both measurements, Stability was related to the CPM Alpha-Plus (vs.

Alpha-Minus) as well as Gamma-Plus (vs. Gamma-Minus), and Plasticity exhibited its precise relation with the CPM Beta (albeit the obtained pattern is slightly clearer for the positive poles of the CPM metatraits than for the negative ones). In turn, three out of four Dynamism scores conclusively indicated that it was positioned between Beta and Gamma, and two out of four Social Self-Regulation scores unambiguously revealed its location between Alpha and Delta. Only the cross-cultural indicator of Dynamism as well as the cross-cultural and IPIP indicators of Social Self-Regulation suggested their exact relationship to the CPM Beta and Alpha, respectively. But the latter was strictly true only for the positive poles of the CPM metatraits as the negative ones revealed correlations which were closer to the hypothesized ones. The composite scores of the Big Twos generally supported the above conclusions.

Procrustes-based comparative analysis was applied to directly test the hypothesis concerning the location of the questionnaire and the psycho-lexical Big Twos within the CPM. PAF led to the extraction of two factors with eigenvalues greater than one and accounting for 73.8% (Analysis 1), 69.7% (Analysis 2), and 78.2% (Analysis 3) of the variance. The eigenvalues of the first two factors were 5.50 and 3.36 (Analysis 1), 7.90 and 6.04 (Analysis 2), and 5.22 and 4.16 (Analysis 3), while those of the other factors were lower than 1.0, except for Analysis 2, where two other factors had eigenvalues of 1.21 and 1.05, but they together explained less than 12% of the variance. Correlations between the obtained pairs of regression-based factor scores (after varimax rotation) were $r = .01$, $r = -.07$, and $r = -.03$, for the first, second, and third analysis, respectively, which justifies treating them as orthogonal axes of the circumplex space.

Table 3 shows the *target matrix* columns with the predicted angles (Θ) and the corresponding loadings (F1 and F2), and the three *obtained matrices* for analyses 1, 2, and 3, respectively. For the obtained matrices the rotated factor loadings are given (the F1 and F2 columns), the communalities (R^2 columns), the congruence coefficients (Congr. columns), and the observed angular projections for each variable included (Θ columns). The obtained factor loadings from each of the three analyses are plotted on Figure 3 for ease of visual comparison with the hypothesized circumplex structure presented in Figure 2.

The congruence coefficients obtained by comparing the observed and target matrices for the overall structure (total solution) reached .99 in all three analyses, confirming the relationship between both pairs of the Big Two factors and the CPM metatraits, as predicted by the CPM model. In each analysis congruence coefficients for two factors (i.e., Alpha and Beta axes) were .98 or larger (both .99 in Analysis 3), and almost all variable (row) congruence coefficients were .96 or higher (the only one exception was the IPIP Social Self-Regulation scale at .95 in Analysis 2), indicating a very good fit of the obtained structure to the hypothesized one. All of the applied measures of Stability, Plasticity, Social Self-Regulation, and Dynamism revealed the expected relationships within the CPM space even without CPM scores (Analysis 1). In Analysis 1, a slight deviation (15.8°) from the expected location was found only for the IPIP Social Self-Regulation scale, but its congruence coefficient was still .96. In Analysis 2, when the CPM metatraits were added to the Big Two scores through their own measurements, the
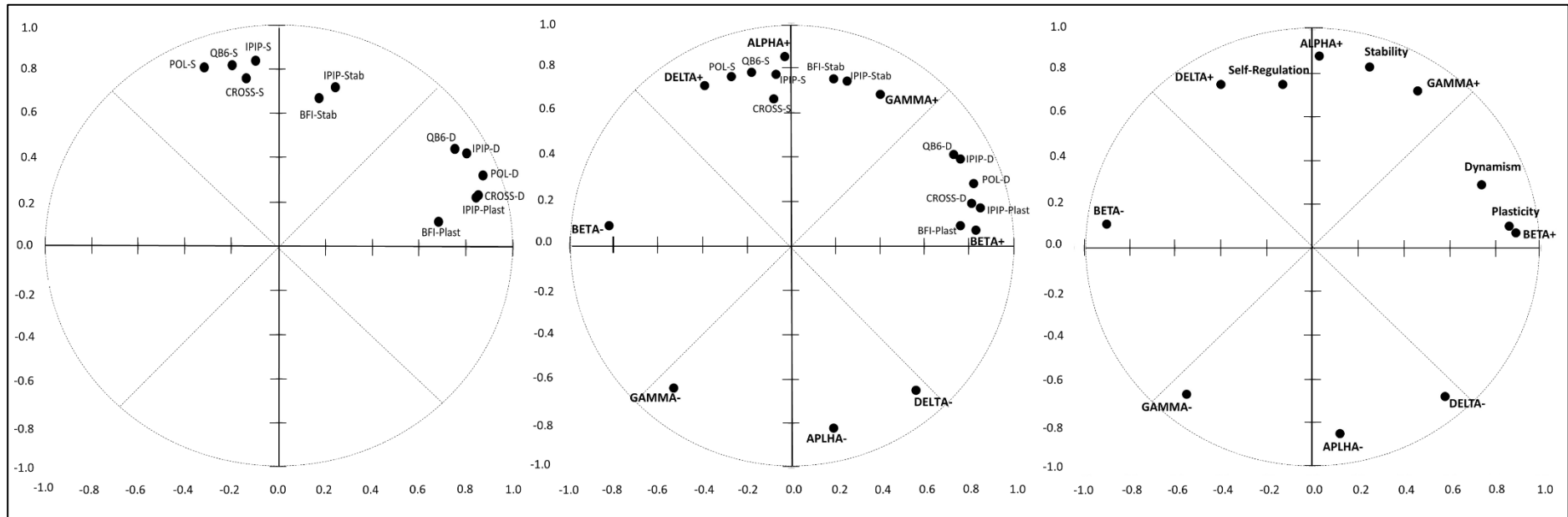
Figure 3. Plots of obtained factor loading for the Big Two indicators (from Analysis 1 – on the left side), the CPM metatraits and the Big Two indicators (from Analysis 2 – in the middle), as well as for the CPM metatraits and the Big Two composites (from Analysis 3 – on the right side). The vertical axes corresponds to factors F1 (Alpha) and horizontal axis to factors F2 (Beta). The arrangement of each plot is analogous to the visual presentation of hypotheses in Figure 2.

largest deviation (i.e., greater than 15° from the expected location) was again revealed by the IPIP Social Self-Regulation scale (17.4°), the B2AL cross-cultural indicator of Social Self-Regulation (15.6°), as well as Delta-Plus (16.4°) and Gamma-Plus (15.1°). In Analysis 3, a slight deviation (16.5°) from the expected location was found only for Delta-Plus.

These deviations do not change the overall conclusion that the obtained results essentially confirmed our expectations. Almost all congruence coefficients were .96 or larger. The best indices were obtained for the –most synthetic– Analysis 3, in which both Big Twos were represented in the form of composite scores. The overall congruence coefficients and those for both major factors (axes), amounted to .99, indicating an excellent fit. It is worth noting that the highest indices of communality (R^2) were found in Analysis 3, while the lowest ones were found in Analysis 1 (including the Big Two scores without the CPM scores), which suggests that measurement specificity (present to the greatest degree in Analysis 1) decreases the strength of the Big Two relationships, whereas a lack of this specificity and the presence of the CPM metatrait scores makes these relationships clearer and stronger. Last but not least, the obtained results replicated the expected circumplex structure of the CPM metatraits.

GENERAL DISCUSSION

Basically, personality traits seem to be hierarchically organized. We can distinguish at least six-factor and five-factor models, theoretically elaborated and with numerous facets at the lower-order level. However, there are also models with fewer factors, such as the Big Two (or Two Factor Model), which can be useful as a description of a higher-order personality level. Those different models should not be perceived as competitors, but as partners in a dialogue promoting a better understanding of the structure of personality. While both the Big Five/FFM and Big Six/HEXACO have the advantage of being more informative (DeYoung, 2015; Saucier, 2008), the Big Two are the most general dimensions of personality which may form a truly cross-culturally universal model with unique theoretical potential (Cieciuch & Strus, 2017; DeYoung, 2015; Saucier et al., 2014; Strus & Cieciuch, 2017; Strus et al., 2014). The present study addressed the question of whether the Big Two higher-order factors identified within the questionnaire approach and the Big Two broad factors identified within the psycho-lexical approach are the same and can be treated as one and the same model. And if it would not be the case, the question was how they are related. To analyze these relationships, we changed the perspective from hierarchical to circumplexical – which is better suited for analyzing how constructs at the same level of organization are related to each other – and employed the CPM model as a point of reference and as a clarification framework. The CPM was chosen because it is a circumplex model that was originally built on the basis of the questionnaire Big Two and which included also the meaning of the psycho-lexical Big Two. Therefore, the CPM seems to cover the full theoretical space

of the highest-order, broadest personality dimensions.

The obtained results indicate that the Big Twos are not identical, but that they are closely related to each other (see Figure A in the Appendix). Some empirical differences between them could be partially explained by differences in their meaning, as well as by some methodological and contextual aspects. Due to their respective origins, the psycho-lexical Big Two emphasize the social aspects of human personality as accessible to the perceivers mind, while the diagnostic (or even clinical) roots of the questionnaire Big Two reveals an emphasis of emotional and cognitive aspects of personality (see DeYoung, 2015; Saucier et al., 2014). However, the somewhat confusing pattern of cross-relationships between the questionnaire and the psycho-lexical Big Twos (i.e., Stability vs. Dynamism and Plasticity vs. Social-Self Regulation), found to date in the literature as well as in the present study, calls for clarification and raises the question about some basic personality dimensions that underlie both the questionnaire and the psycho-lexical Big Two factors. Analyses of both Big Twos within the CPM framework shed some light on their interrelationships, as well as on the content and structure of the most general personality dimensions themselves. They also provide further corroboration of the CPM as a model capable of integrating many other personality constructs in addition to those already integrated (Strus & Cieciuch, 2017).

Within the CPM framework, the questionnaire and the psycho-lexical Big Twos can be seen as slightly different manifestations of the two CPM dimensions underlying them, i.e., the metatraits of Alpha and Beta. The differences are related to the measurement and the conceptualization diversity resulting from different methodological and theoretical contexts of questionnaire and psycho-lexical approaches. For this reason, Stability and Social Self-Regulation manifest themselves not only as the Alpha dimension, but also as mixed variants of Alpha and Gamma or Delta, respectively, and Dynamism often exhibits some content characteristic not only of Beta, but also of Gamma (see Figure A in the Appendix). On the basis of the obtained patterns of results one could argue that the CPM model (and the CPM-Q measure) accurately capture the most general personality dimensions while the psycho-lexical and the questionnaire research rather cover only their approximate or rotational variants. If so, then the set of the most cross-culturally consensual markers developed by Saucier et al. (2014) seems to form the best approximation out of all the six Big Two sets of indices applied in the present study. Moreover, there is some evidence that the fundamental, most general personality traits should be conceptualized as four bipolar dimensions (or eight unipolar octants) organized within a circumplex structure (Becker, 1999; Strus & Cieciuch, 2017; Strus et al. 2014). This also may shed new light on the claim that the Big Two model has a unique theoretical and integrative potential (apart from parsimony and cross-cultural ubiquity), but it is possibly not sufficient for personality description and prediction of outcomes (DeYoung, 2015; Saucier et al. 2014; Saucier & Srivastava, 2015). The CPM model was shown to enhance the integrative theoretical potential of the Big Two model (Cieciuch & Strus, 2017; Strus & Cieciuch, 2017), while at the same time it has been more informative due to its eight unipolar metatraits.

Summing up, in reference to the problem formulated in the title of this paper, one could argue that in light of the obtained results, the questionnaire and the psycho-lexical Big Twos are the same in substance, but slightly differing in conceptualization due to their origins and measurement contexts. However, the present study indirectly revealed one essential problem, which is probably related to the main difficulty with integrating both Big Twos and which is not fully explained by the CPM in its current form. This problem becomes visible when one considers the relationships of the questionnaire and the psycho-lexical Big Twos with the Big Five and the Big Six traits (see Table A in the Appendix). On the one hand, these relationships are generally in accordance with expectations (based on results from other studies and consistent with the roots of both Big Two models; Digman, 1997; DeYoung 2006; Saucier et al. 2014; Saucier & Srivastava, 2015). Moreover, the present results could be taken to confirm that the questionnaire Big Two is more consistently associated with the Big Five and the psycho-lexical Big Two with the Big Six. On the other hand, the whole pattern of relationships of the Big Five Neuroticism/Emotional stability and the Big Six Emotionality/Resiliency with the Big Two and the CPM metatraits is problematic, as suggested not only by the current findings, but also by many others (i.e., De Raad et al., 2010; DeYoung, 2006; Digman, 1997; Saucier et al., 2014; Strus & Cieciuch, 2017; see Saucier & Srivastava, 2015). Emotionality/Resiliency is the Big Six counterpart of the Big Five Neuroticism/Emotional stability and indeed they are quite closely related to one another. However, they are linked to different Big Two factors, that is, the former is supposed to be part of Dynamism and the latter is supposed to be part of Stability. Two fairly strongly correlated lower-level traits are highly unlikely to be constituents of different and supposedly orthogonal (see DeYoung, 2006; Saucier et al., 2014; Thalmayer & Saucier, 2014) higher-level factors. This situation could be explained in two steps.

The first one concerns analysis of theoretical relationships between Neuroticism/Emotional stability and Emotionality/Resiliency, based on some premises that rotational differences between the Big Five and the Big Six factors can be important for understanding the dissimilarities between the questionnaire and the psycho-lexical Big Twos. Although the Big Six model could be treated as an updated Big Five model (e.g., Saucier & Srivastava, 2015), differences between the two do not boil down to the presence of the Honesty factor, but include some other discrepancies. Here, it is of crucial importance that the Big Six Emotionality/Resiliency possesses only an internalizing aspect (anxiety, vulnerability) of the Big Five Neuroticism/Emotional stability, while the externalizing aspect (anger, hostility) of the latter is present in the negative pole of the Big Six Agreeableness.

On this basis one could consider the second step – modifying the central location of Neuroticism/Emotional stability from Alpha to Gamma within the CPM model. Then, Neuroticism/Emotional stability would be primarily related to Gamma (rather than Alpha), and secondarily to Alpha and Beta (rather than Delta; cf. Figure 1). Particularly, the internalizing-self-conscious aspect of Neuroticism (i.e., Emotionality) would be connected to Beta-Minus, while its opposite (i.e., Resiliency) would be related to Beta-Plus. In turn, the externalizing-hostile aspect of Neuroticism (or the negative pole of the Big Six Agreeableness) would be connected to Alpha-Minus, and its opposite to Alpha-Plus.

It is worth noting that this modification would imply a relatively minor reconceptualization of the CPM model (see Strus & Cieciuch, 2017), meaning, in addition, that the CPM could be deemed to describe also the highest-order level of the Big Six model and enable renewed integration of the questionnaire and psycho-lexical traditions of research on personality structure (following the wide-ranging Big Five consensus of the late 1980s and 1990s). Thus, the CPM model would encompass not only the Big Two models but also the Big Five and the Big Six.

Limitations

Our study is not free of limitations. We focused on the structural relations between the Big Twos and did not take the predictive power of them and the CPM metatraits into account. Meanwhile, predictive power can be considered as another source of information while analyzing the differences between the Big Twos and integrating them into one model. This issue can be addressed by further research building on the results of the current study. The one-nation origin of the sample limits the generalizability of our findings and further research should verify these results in other populations, countries, and cultures. Moreover, all measures used were self-reported, and future studies could apply a multi-informant framework to further test the generalizability of our findings.

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APPENDIX

Table A. Descriptive statistics and correlations of the Big Twos with the Big Five and the Big Six

	Questionnaire Big Two				Psycho-lexical Big Two								M	SD	Alpha
	BFI$_{EFA}$		IPIP-SPS		QB6$_{EFA}$		IPIP-SDS		B2AL-CROSS		B2AL-POL				
	Stab.	Plast.	Stab.	Plast.	S	D	S	D	S	D	S	D			
BFI Neuroticism	-.74	-.32	-.50	-.29	-.27	-.48	-.16	-.39	-.08	-.34	-.28	-.44	2.94	.74	.82
BFI Agreeableness	.68	.17	.32	-.02	.42	.11	.42	.17	.50	-.02	.51	.01	3.67	.57	.74
BFI Conscientiousness	.74	.09	.43	.15	.55	.33	.45	.22	.42	.22	.42	.28	3.75	.61	.82
BFI Extraversion	.33	.86	.17	.57	-.05	.52	.00	.62	.05	.60	-.17	.61	3.26	.68	.78
BFI Openness	.07	.76	.06	.51	-.07	.32	.01	.25	.07	.29	-.05	.31	3.62	.63	.80
QB6 Honesty	.26	-.08	.33	-.05	.81	-.01	.62	.04	.56	-.06	.49	-.03	3.81	.66	.70
QB6 Agreeableness	.48	-.08	.45	-.09	.69	.13	.42	.04	.35	-.12	.62	-.03	2.90	.73	.72
QB6 Conscientiousness	.55	.08	.50	.21	.70	.46	.56	.35	.48	.29	.45	.37	3.63	.69	.66
QB6 Resiliency	.37	.24	.50	.42	.16	.69	.09	.55	-.04	.51	.07	.57	2.92	.77	.77
QB6 Extraversion	.23	.56	.35	.57	.05	.67	.24	.71	.24	.57	.02	.57	3.79	.68	.70
QB6 Originality	.25	.42	.31	.62	.13	.75	.19	.44	.14	.44	.05	.49	3.50	.61	.71

Note: EFA = indicators extracted in exploratory factor analysis; BFI = Big Five Inventory (John et al., 2008); IPIP-SPS = International Personality Item Pool Stability and Plasticity Scales (DeYoung, 2010); QB6 = Questionnaire Big Six (Thalmayer & Saucier, 2014); IPIP-SDS Social Self-Regulation and Dynamism Scales (Saucier et al., 2014); B2AL-CROSS = the Big Two Adjective List – cross-cultural Big Two markers by Saucier et al. (2014); B2AL-POL = The Big Two Adjective List – Polish Big Two markers by Gorbaniuk et al. (2013).Correlations greater than |.07| are significant at p < .05 (one-tailed). *N* = 500 for the BFI, and *N* = 692 for the other measures.

Table B. Intercorrelations of the Circumplex of Personality Metatraits – Questionnaire scales (N = 692)

	Delta-Plus	Alpha-Plus	Gamma-Plus	Beta-Plus	Delta-Minus	Alpha-Minus	Gamma-Minus	Beta-Minus
Delta-Plus		.60	.27	-.18	-.52	-.41	-.20	.45
Alpha-Plus	.58		.73	.23	-.29	-.53	-.48	-.08
Gamma-Plus	.22	.71		.58	.06	-.34	-.62	-.45
Beta-Plus	-.35	.10	.49		.60	.18	-.32	-.75
Delta-Minus	-.82	-.57	-.18	.47		.70	.21	-.46
Alpha-Minus	-.66	-.82	-.63	-.05	.60		.53	-.05
Gamma-Minus	-.30	-.61	-.79	-.56	.03	.43		.44
Beta-Minus	.47	-.04	-.42	-.87	-.62	-.15	.44	

Note: Correlations between centered scores are shown below the diagonal, correlations between raw scores are above the diagonal. Correlations greater than |.06| are significant at p < .05 (one-tailed).
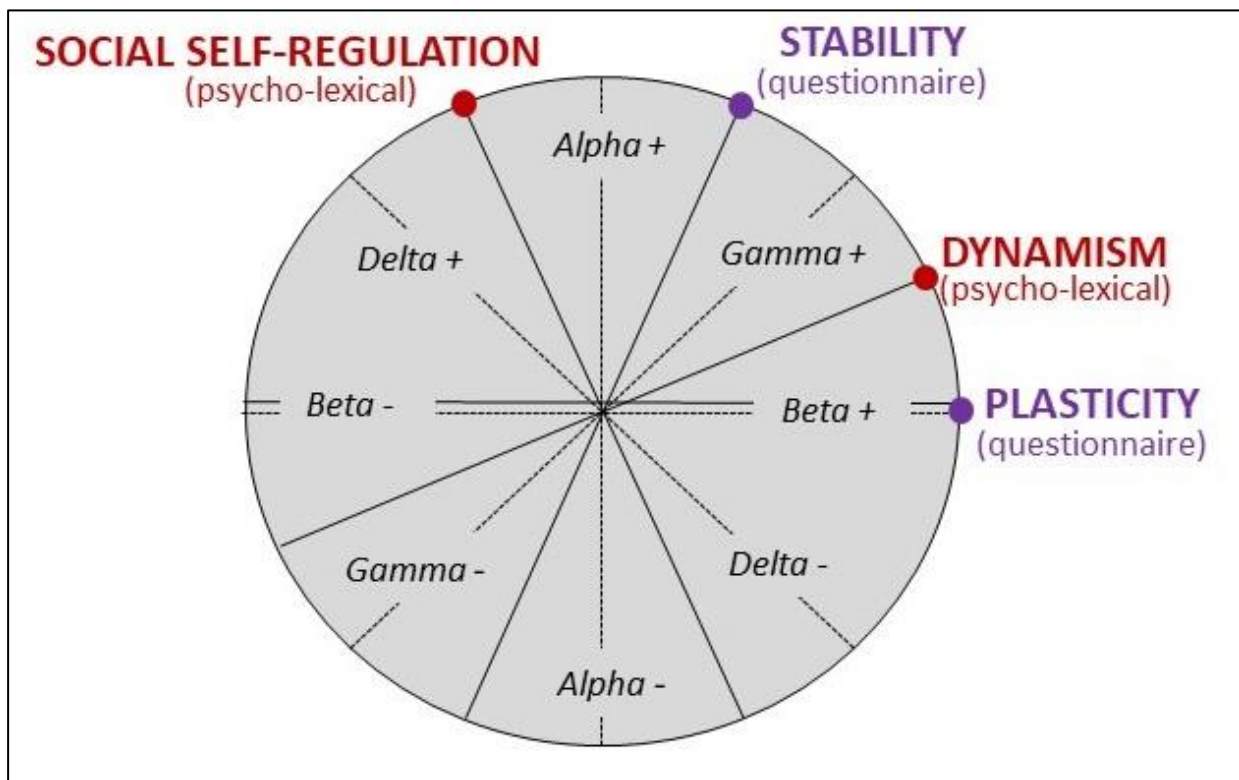

Figure A. The relationships between the questionnaire and the psycho-lexical Big Twos within the Circumplex of Personality Metatraits – the graphical abstract