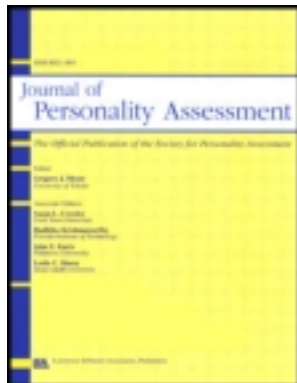


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## Evaluating the Interpersonal Content of the MMPI–2–RF Interpersonal Scales

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Convergence between the MMPI–2 Restructured Form (MMPI–2–RF; Ben-Porath & Tellegen, 2008) interpersonal scales and 2 interpersonal circumplex (IPC) measures was examined. University students ( $N = 405$ ) completed the MMPI–2 and 2 IPC measures, the Interpersonal Adjectives Scales Revised Big Five Version (IASR–B5; Trapnell & Wiggins, 1990) and the Inventory of Interpersonal Problems Circumplex (IIP–C; Horowitz, Alden, Wiggins, & Pincus, 2000). Internal consistency was adequate for 3 of the 6 scales investigated. The majority of scales were located in their hypothesized locations, although magnitude of correlations was somewhat weaker than anticipated, partly owing to restricted range from using a healthy sample. The expected pattern of correlations that defines a circular matrix was demonstrated, lending support for the convergent and discriminant validity of the MMPI–2–RF interpersonal scales with respect to the assessment of interpersonal traits and problems.

Interpersonal functioning has implications for social functioning, symptom presentation, course, and treatment, and is therefore important to assess when conducting a comprehensive assessment of personality and psychopathology. The Minnesota Multiphasic Personality Inventory (MMPI; Hathaway & McKinley, 1943) and its successor, the MMPI–2 (Butcher et al., 2001), have long-standing histories of measuring interpersonal functioning (e.g., Ben-Porath, Hostetler, Butcher, & Graham, 1989; Drake, 1946; Ward & Perry, 1998). However, until recently, the test has lacked a coherent set of scales designed specifically to measure interpersonal tendencies. The recently released Minnesota Multiphasic Personality Inventory–2 Restructured Form (MMPI–2–RF; Ben-Porath & Tellegen, 2008) has remedied this limitation by including a set of five interpersonal scales designed specifically to measure variations of interpersonal problems. In so doing, the MMPI–2–RF is in step with proposed changes to the fifth edition of the *Diagnostic and Statistical Manual of Mental Disorders (DSM–5; www.dsm5.org)*, which emphasizes the important role of interpersonal functioning in the assessment of mental illness. This is particularly evident in recent proposed changes to Axis II in *DSM–5*, where problems in interpersonal functioning represent one of two primary features in the proposed revised definition of personality disorder. Accordingly, providing a basis for direct assessment of interpersonal problems within an already popular omnibus measure of personality and psychopathology has much clinical and research appeal. However, to date, no independent research has explored the validity of this set of scales. The purpose of this study was to evaluate the validity of the MMPI–2–RF interpersonal scales using two established and well-validated measures of interpersonal style and functioning, providing researchers and clinicians with additional reliability and validity evidence for these scales outside of the technical manual.

### THE MMPI–2–RF INTERPERSONAL SCALES

Located in the bottom tier of the three-tiered hierarchical structure of the MMPI–2–RF, the interpersonal scales are part of the 25 lower order scales that represent narrow-band measures associated with or complementing the Restructured Clinical (RC) scales. The five interpersonal scales have been labeled Family Problems, Interpersonal Passivity, Social Avoidance, Shyness, and Disaffiliativeness. The Family Problems scale consists of 10 items describing negative family experiences including quarrels, disliking of family members, feeling unappreciated by family members, and feeling that family members cannot be counted on for support in times of need (Ben-Porath & Tellegen, 2008). A low score on this scale indicates a relatively conflict-free family environment, whereas a high score suggests conflictual family relationships, where the respondent blames family for his or her difficulties. The Interpersonal Passivity scale also consists of 10 items, but the focus of this scale is on unassertive, submissive behavior, including failure to stand up for oneself, not having strong opinions, and not liking to be in charge. Low scores suggest the respondent views himself or herself as having leadership abilities, however, he or she is likely seen by others as domineering, self-centered, and possibly grandiose. High scores indicate a submissive, passive, and behaviorally overcontrolled individual. The Shyness scale consists of seven items that describe manifestations of social anxiety, including feeling embarrassed and feeling uncomfortable around others. Low scores on this scale suggest the relative absence of social anxiety, whereas high scores are indicative of social introversion and inhibition and feeling anxious in social situations. The Social Avoidance scale consists of 10 items describing a disliking of social events and avoidance of social situations. Low scores suggest a gregarious individual who enjoys social situations, whereas high scores suggest a socially introverted, emotionally restricted individual who has difficulties forming close relationships. Generally, if Social Avoidance is elevated but Shyness is not, it indicates that the social avoidance being experienced is not so much linked to social anxiety, but a more general dislike of social stimulation, or an avoidant

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personality disorder. Finally, Disaffiliativeness consists of six items describing a disliking of people and being around people. Although the previous four scales were bipolar, in that they were interpretable at both the high and low end of the scale, Disaffiliativeness only has interpretive meaning when the scale is elevated, with high scores indicating an asocial individual who prefers being alone. Highly elevated scores (e.g., T scores of 100) might be suggestive of a schizoid personality disorder. The interpersonal scales are made up of 43 items from the 338 items appearing on the inventory. Although there is no item overlap among the five scales, items on the scales are scored on other MMPI-2-RF scales. According to the technical manual, the scales yield acceptable standard errors of measurement despite somewhat lower reliability estimates for some scales (Ben-Porath & Tellegen, 2008).

In addition to the five interpersonal scales, Cynicism is recommended for inclusion in the interpretation of a given test taker's interpersonal functioning (Ben-Porath & Tellegen, 2008). Cynicism consists of 15 items reflecting a highly negative view of human nature. The item content is non-self-referential, meaning that the items do not claim that one is personally being singled out for mistreatment, but rather reflect a belief that others look out only for their own interests and are not to be trusted. A low score on Cynicism suggests naiveté and that others are seen as well-intentioned and trustworthy, whereas a high score is suggestive of cynical beliefs about the motivations of others. There are no items shared among the five interpersonal scales and Cynicism.

#### THE INTERPERSONAL CIRCUMPLEX MODEL

Two decades ago, Gurtman (1992) demonstrated the potential of the interpersonal circumplex model (ICM) as a nomological net within which the construct validity of interpersonal measures can be assessed while also establishing the construct validity of the circumplex model itself. Since then, the ICM has been viewed as the gold standard for representing constructs within the interpersonal domain. Interpersonal theory posits that all interpersonal behavior can be conceptualized in a circular ordering of variables around two underlying orthogonal axes, referred to as dominance and nurturance (Freedman, Leary, Osorio, & Coffey, 1951; LaForge, Freedman, & Wiggins, 1985; Leary, 1957; Wiggins, 1979). When these axes are plotted, they result in four quadrants that characterize four different types of interpersonal styles (warm-dominance, hostile-dominance, hostile-submissiveness, and warm-submissiveness). The mathematical properties underlying the circumplex structure are such that "*angle of separation* between interpersonal tendencies provides a direct measure of their conceptual and componential similarities" (Gurtman, 1992, p. 106, *italics in original*). The psychometric precision of the circumplex ensures that relations between variables can be largely surmised from their relative placements within circumplex space. Mathematically speaking, in a perfect two-factor circumplex, the cosine of the angle of separation between any two variables equals their correlation. Under these ideal conditions, variables that occur at right angles ( $90^\circ$ ) are unrelated ( $r = 0$ ), variables at opposite sides or ends (separated by  $180^\circ$ ) are negatively related ( $r = -1.0$ ), and variables in adjacent octants (separated by  $45^\circ$ ) are strongly related ( $r = .707$ ). In real data, it is unlikely that a perfect two-factor

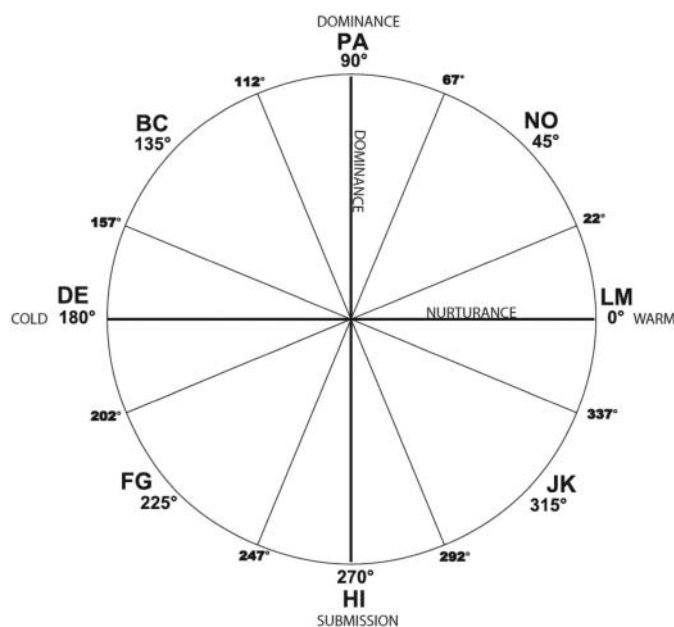


FIGURE 1.—The interpersonal circumplex.

solution is obtained. In these cases, the correlation is related to (is a function of) the angular separation between variables.

Figure 1 displays a typical interpersonal circumplex. The two primary dimensions of the interpersonal world, dominance and nurturance, represent the primary axes of the circumplex. The vertical axis represents the dominance dimension and is marked by dominance at the top and submission at the bottom. The horizontal nurturance axis is marked by love and hate on the right and cold on the left. The eight sectors of the circle (called octants) divide the circumplex into meaningful and manageable units. The degrees indicate the boundaries of the sectors and their midpoints. The alphabetic labels (e.g., PA, BC, DE) derive from the originators of the ICM (Freedman et al., 1951), and provide a common vernacular for rapid communication across ICM measures (see Locke, 2006). Circumplex measures, when properly constructed, are psychometrically very precise, measuring the full array of the  $360^\circ$  of the circle. A number of different kinds of scores can be generated from a given individual's profile. From a research standpoint, a common use of the circumplex involves cosine curve modeling (e.g., Gurtman, 1992). In this application the extent to which a given construct is interpersonal in nature is determined by its pattern of correlations with the eight octants of the circumplex. There are three parameters in a cosine curve model, each relevant to understanding the nature of the construct in question. The *angular displacement* is the point at which a score on an outside measure has its highest positive correlation with the circumplex and represents the angular location of that scale within circumplex space. The angular location provides information about the predominant interpersonal theme of the outside variable being assessed. Interpretation of the interpersonal theme is qualified by the amplitude parameter. *Amplitude* is a measure of discriminant validity, as it indicates the degree to which the construct correlates differentially with the octants of the circumplex. A completely undifferentiated profile, resulting from a construct achieving a similar correlation with each of the octants of the

circumplex, would be characterized by a flat line, rather than the expected sinusoidal curve. High amplitude indicates a clear central tendency (theme), whereas low amplitude suggests less profile definition, and therefore, less confidence in any summary conclusion about the central theme (angular displacement). As such, amplitude can be understood as an indication of the “interpersonalness” of a construct. Finally, *elevation* is the average correlation between an outside measure and the octants of the circumplex. In a perfect two-factor circumplex, an outside measure’s elevation would be equal to zero (e.g., the decreasing positive, increasing negative, decreasing negative, and then increasing positive correlations with the octant scales around the circumplex will average out such that the overall mean correlation is zero). However, for a circumplex with a general factor, the elevation represents the correlation of the scale with the general factor and is interpreted in light of this general factor. In addition to the three parameters of the cosine function, a measure of goodness of fit ( $R^2$ ) can be calculated to determine the extent to which the profile conforms to circumplex expectations. In other words, the  $R^2$  value ascertains whether the pattern of correlations of the projected scale conforms to the expected sinusoidal curve (and thus, the interpersonal nomological net). Together, these parameters create a structural summary of the measure in relation to a particular circumplex domain.<sup>1</sup>

Multiple circumplex measures have been created to assess the different domains or levels of interpersonal functioning, including measures of traits (Wiggins, 1995), problems (Alden, Wiggins, & Pincus, 1990; Horowitz, Rosenberg, Bauer, Ureno, & Villaseñor, 1988; Soldz, Budman, Demby, & Merry, 1995), social support (Trost, 2000), values (Locke, 2000), efficacies (Locke & Sadler, 2007), and sensitivities (Hopwood et al., 2011). This study takes a comprehensive approach to construct validation by evaluating the MMPI-2-RF interpersonal scales within the context of two of these domains: interpersonal traits and interpersonal problems.

### THIS STUDY

The goal of this research was to elaborate on the construct validity of the MMPI-2-RF interpersonal scales within the nomological net provided by the interpersonal circumplex, in particular, measures of interpersonal traits and interpersonal problems. Associations with a measure of interpersonal traits will provide a means of examining the underlying interpersonal dispositions assessed by the RF interpersonal scales. This is important given recent research that links personality and psychopathology (Krueger & Tackett, 2003) and suggests that dimensions of personality represent relevant endophenotypes that give rise to and account for the presence of various forms of psychopathology (Ebstein, 2006; Gottesman & Gould, 2003; VanGestel & VanBroeckhoven, 2003). Associations with a measure of interpersonal problems will provide a direct assessment of convergent validity as both sets of scales were designed to assess problems in interpersonal functioning. Far too often, evaluation of a new measure focuses exclusively on the demonstration of convergent validity with existing measures designed to assess similar constructs. The evaluation of discriminant validity of a

measure is just as important as evaluating convergent validity. A low to moderate correlation between measures designed to assess similar, but conceptually different, constructs provides evidence for the discriminant validity of the measures (Netemeyer, Bearden, & Sharma, 2003). The circular correlation matrix that gives rise to the circumplex structure allows for simultaneous evaluation of both convergent and discriminant validity. Given the newness of the RF interpersonal scales, convergence and divergence data that empirically support their construct validity are greatly needed. This study represents the first independent study of the validity of these scales and is the first to evaluate their convergence with established measures of the ICM.

Scale descriptions of each of the interpersonal scales and Cynicism, as well as initial empirical findings reported in the MMPI-2-RF technical manual (Tellegen & Ben-Porath, 2008), have established a tentative nomological network (see Cronbach & Meehl, 1955), which allowed us to make predictions about convergence with each of the interpersonal circumplex measures. Further, given the mathematical precision of the ICM, predictions could also be made about the discriminant validity of the scales, such that octants that are perpendicular to the angular location of a given MMPI-2-RF interpersonal scale should be unrelated (orthogonal). Our hypotheses were as follows:

1. Due to the quarrelsome family relations associated with high scores on the Family Problems scale (Burchett & Ben-Porath, 2010; Tellegen & Ben-Porath, 2008), we predicted that high scores on Family Problems would be associated with the cold (quarrelsome) side of the circle, and likely located in the DE (cold-hearted/cold) octant. Assuming this scale follows a cosine curve function, its correlation with PA or HI (located at 90° angles from the DE octant) should be nonsignificant.
2. Interpersonal Passivity is characterized by unassertive and submissive behavior (Forbey, Lee, & Handel, 2010; Tellegen & Ben-Porath, 2008) and should therefore be associated with the submissive hemisphere, likely located in the HI (unassertive-submissive/nonassertive) octant, and be unrelated to the perpendicular octants: DE and LM.
3. Social Avoidance was predicted to be located in the FG (aloof-introverted/socially avoidant) octant, as it is characterized as measuring a disliking of or discomfort with social situations (Forbey et al., 2010; Tellegen & Ben-Porath, 2008). Accordingly, it should be unrelated to the BC and JK octants.
4. The Shyness scale is characterized by introversion resulting from social anxiety (Burchett & Ben-Porath, 2010; Forbey et al., 2010; Tellegen & Ben-Porath, 2008), which suggests that it would also be located in the FG (aloof-introverted; socially avoidant) octant of the circle, and unrelated to the BC and JK octants.
5. Disaffiliativeness, being largely associated with a disliking of others and emotional disconnectivity (Tellegen & Ben-Porath, 2008), would be strongly associated with the cold side of the circle, and likely located within the DE (cold-hearted; cold) octant, and therefore unrelated with the PA and HI octants.
6. Cynicism is characterized by feelings of hostility, alienation from others, and beliefs that others are untrustworthy (e.g., Ingram, Kelso, & McCord, 2011; Sellbom & Ben-Porath, 2005; Sellbom, Ben-Porath, & Bagby, 2008; Tellegen & Ben-Porath, 2008). These feelings would likely result in a person

<sup>1</sup>For a more detailed description of the structural summary method and formulae for calculating the parameters, see Gurtman and Pincus (2003) and Wright, Pincus, Conroy, and Hilsenroth (2009).

acting hostile and cold in interpersonal situations, suggesting that the scale would be strongly related with content associated with the DE octant of the circle. However, lack of interpersonal trust and a cynical worldview would suggest the scale might have an equal association with the adjacent BC (arrogant-calculating; vindictive) octant of the circle. As a result, Cynicism will likely be located near the border of the DE and BC octants (approximately 157°), and have small to nonsignificant associations with the PA, NO, FG, and HI octants.

## METHOD

### Participants

The study involved 405 psychology undergraduate students from a large multicultural university in Toronto, Ontario, Canada. The sample was 75% female, with ages ranging from 18 to 53 ( $M = 20.38$ ,  $SD = 3.93$ ). Students were recruited from the Psychology Department's undergraduate research participant pool as well as from third-year psychology classes.

### Measures

**Minnesota Multiphasic Personality Inventory–2.** The MMPI–2 (Butcher et al., 2001) consists of 567 items that participants rate as either true or false. The entire MMPI–2–RF item pool (338 items) can be derived from the original MMPI–2 and the same normative sample is used with a few modifications (Ben-Porath & Tellegen, 2008). The MMPI–2–RF Technical Manual provides extensive reliability and validity data for the instrument (Tellegen & Ben-Porath, 2008). In addition, Tellegen and Ben-Porath (2008) presented data indicating that the MMPI–2–RF scale scores derived from administration of the 567-item MMPI–2 booklet are interchangeable with results obtained from administration of the 338-item MMPI–2–RF booklet, which included virtually identical mean scale elevations and correlations with external criteria. In this study, we used Cynicism, Family Problems, Interpersonal Passivity, Social Avoidance, Shyness, and Disaffiliativeness, which were described in detail earlier.

**Interpersonal Adjective Scales Revised–Big 5 Version.** The Interpersonal Adjective Scales Revised–Big 5 Version (IASR–B5; Trapnell & Wiggins, 1990) is a measure of interpersonal traits that includes 124 adjectives that are rated by participants for self-descriptiveness on an 8-point Likert scale. The first 64 items make up the IAS circumplex (Wiggins, 1995) and the remaining 60 items assess the additional three dimensions of the Five-factor model of personality<sup>2</sup> (FFM; Neuroticism, Conscientiousness, and Openness to Experience). The IASR–B5 has demonstrated excellent structure at the item level, internally consistent scales, and excellent convergent and discriminant validity in comparison with other FFM inventories (Trapnell & Wiggins, 1990). Internal consistency for the octants in this sample were all acceptable (coefficient alpha ranged from .73–.86). Internal consistency for the remaining dimensions of the FFM

TABLE 1.—Means, standard deviations, and range of the interpersonal scales and Cynicism.

Scale	<i>M</i>	<i>SD</i>	Variance	Minimum	Maximum	Skew	Kurtosis
Family Problems	57.13	10.74	115.30	37.15	88.87	.30	–.32
Interpersonal	48.07	8.89	78.96	33.78	79.95	.95	1.39
Passivity							
Social	46.62	9.38	87.96	36.56	79.72	1.16	1.60
Avoidance							
Shyness	50.26	9.63	92.80	37.12	73.94	.65	.14
Disaffiliativeness	52.27	8.86	78.47	45.70	90.48	1.24	1.10
Cynicism	56.60	9.61	92.26	33.81	82.39	.47	–.18

were also acceptable (Neuroticism,  $\alpha = .92$ ; Openness to Experience,  $\alpha = .86$ ; Conscientiousness,  $\alpha = .91$ ).

**Inventory of Interpersonal Problems–Circumplex.** The Inventory of Interpersonal Problems–Circumplex (IIP–C; Horowitz, Alden, Wiggins, & Pincus, 2000) is a 64 item self-report inventory designed to measure problems an individual might have within interpersonal interactions. Participants are required to indicate on a 5-point Likert scale the extent to which their behavior in each domain is excessive or inhibited. The IIP–C has been extensively applied in clinical assessment and treatment research as well as within normal populations, and it has demonstrated excellent psychometric properties across settings and samples (e.g., Gurtman, 1996; Horowitz, Rosenberg, & Bartholomew, 1993; Pincus & Wiggins, 1990). Internal consistency for the octants in this sample were all acceptable (coefficient alpha ranged from .69–.85).

### Procedure

Participants were given questionnaire packets in class to take home and they returned completed questionnaires the following week. All participants completed the IASR–B5 first, followed by the IIP–C and the MMPI–2. Students received course credit in exchange for their participation. Informed consent was established via an informed consent form that students were asked to read and sign. In accordance with ethical guidelines and standards set out by both the University's committee for Ethical Research using Human Participants and the American Psychological Association, these forms were removed from the completed questionnaires at the time that they were returned to the researcher to maintain the participant's anonymity.

## RESULTS

The mean and standard deviation of each of the interpersonal scales and Cynicism are presented in Table 1. Internal consistency reliability estimates (coefficient alpha and the average interitem correlation) are presented in Table 2. Alpha coefficients for the interpersonal scales ranged from .38 (Disaffiliativeness) to .78 (Social Avoidance) and were comparable to what has been reported in the manual with the normative sample (Tellegen & Ben-Porath, 2008), with the exception of Cynicism and Disaffiliativeness (see Table 2). Average interitem correlations ranged from .11 (Disaffiliativeness) to .30 (Shyness). Similar to the pattern of association among the scales presented in the technical manual using the normative sample, the intercorrelation matrix (see Table 3) reveals that the associations among scales are only small to moderate, supporting the distinctiveness of the scales.

<sup>2</sup>We say "the additional three dimensions of the FFM" because Extraversion and Agreeableness from the FFM have been shown to be isomorphic rotations of dominance and nurturance, the two orthogonal dimensions of the ICM (e.g., McCrae & Costa, 1989).

TABLE 2.—Internal consistency of the interpersonal scales and Cynicism in the normative sample versus the present sample.

Scale	Normative Sample: Men <sup>a</sup>	Normative Sample: Women <sup>a</sup>	Present Sample <sup>b</sup>	AIC
Family Problems	.64	.67	.64	.15
Disaffiliativeness	.51	.43	.38	.11
Interpersonal Passivity	.71	.68	.67	.17
Shyness	.74	.77	.75	.30
Social Avoidance	.78	.77	.78	.26
Cynicism	.80	.80	.72	.15

Note. Normative sample reliabilities are derived from Tellegen and Ben-Porath (2008); AIC = average interitem correlation.

<sup>a</sup>N = 1,138. <sup>b</sup>N = 405.

### RF Interpersonal Scales and Interpersonal Traits

Table 4 presents the correlations and structural summary parameters between the interpersonal scales, Cynicism, and the IAS domain and octant scores, representing the association between the scales and interpersonal traits. Figure 2 displays the projection of the interpersonal scales and Cynicism onto the circumplex space provided by the IAS. Projection involves correlating any given scale with the two dimensions of the circumplex. The correlation with nurturance is plotted on the X-axis (positive to the right and negative to the left) and the correlation with dominance is plotted on the Y-axis (positive moves up from the center point, negative moves down from the center point). Dominance and nurturance dimensions were calculated using the correlation of the interpersonal scales with each of the octants and entering them into the following formulas:<sup>3</sup>

$$\text{Dominance} = .25 [(PA - HI) + .707 (NO + BC - FG - JK)]$$

$$\text{Nurturance} = .25 [(LM - DE) + .707 (NO - BC - FG + JK)]$$

Elevation was calculated by taking the mean of the correlations between a given interpersonal scale and all eight octants of the circumplex. Amplitude was calculated using the formula:<sup>4</sup>

$$\text{Amplitude} = [(r_{cv})^2 + (r_{av})^2]^{1/2}$$

where  $r_{cv}$  is the correlation between dominance and a given MMPI-2-RF interpersonal scale score, and  $r_{av}$  is the correlation between nurturance and a given MMPI-2-RF interpersonal scale score.<sup>5</sup> Finally, angular displacement was calculated using the formula:

$$\text{Angular displacement} = \arctan(r_{cv}/r_{av})$$

Goodness of fit ( $R^2$ ) is calculated using the deviation sum-of-squares of the actual scores from predicted scores based on

<sup>3</sup>Formulae presented for calculating dominance and nurturance are described in more detail in Gurtman (1992) and Wright et al (2009).

<sup>4</sup>Calculations of structural summary parameters are from Ansell, Kurtz, De-Moor, and Markey (2011) but originally reported in Wiggins and Broughton (1991).

<sup>5</sup>This is equivalent to the formula for vector length reported in Wiggins and Broughton (1991).

TABLE 3.—Correlations among MMPI-2-RF interpersonal scales and Cynicism.

	FML	IPP	SHY	SAV	DSF	RC3
FML	1.00					
IPP	-.07	1.00				
SHY	.14**	.43**	1.00			
SAV	.10*	.32**	.41**	1.00		
DSF	.24**	-.01	.24**	.25**	1.00	
RC3	.35**	-.18**	.17**	.00	.21**	1.00

Note. MMPI-2-RF = Minnesota Multiphasic Personality Inventory-2-Restructured Form; FML = Family Problems; IPP = Interpersonal Passivity; SHY = Shyness; SAV = Social Avoidance; DSF = Disaffiliativeness; RC3 = Cynicism.

\* $p < .05$ . \*\* $p < .01$ .

a perfect cosine curve with the same parameters. Typically,  $R^2$  values of .80 and greater suggest adequate model fit, whereas values below .70 are considered inadequate (Gurtman & Pincus, 2003). By this convention, all of the interpersonal scales and Cynicism show good fit to the cosine function (see Table 4). All scales achieved a significant negative association with the dominance dimension with the exception of Cynicism and Family Problems. Similarly, all scales achieved a significant negative association with the nurturance dimension, with the exception of Interpersonal Passivity.

With respect to convergent validity, the Family Problems scale was, as hypothesized, located in the DE (cold-hearted) octant (angular displacement =  $189^\circ$ ; see Figure 2). However, overall this scale demonstrated small to nonsignificant correlations with the octants of the circumplex, resulting in an undifferentiated profile, as evidenced by the low amplitude value (.13). Thus, although this scale shows good fit to the nomological net provided by the interpersonal circle ( $R^2 = .87$ ), the “signature” of

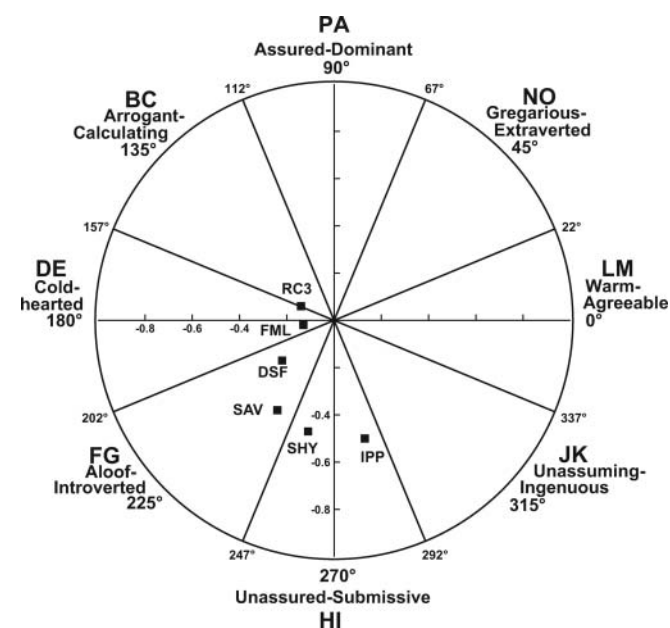


FIGURE 2.—Projection of the MMPI-2-RF Interpersonal scales onto the IAS circumplex. Note. FML = Family Problems; IPP = Interpersonal Passivity; SHY = Shyness; SAV = Social Avoidance; DSF = Disaffiliativeness; RC3 = Cynicism.

TABLE 4.—Correlations and circumplex structural summary parameters between the MMPI-2-RF interpersonal scales, Cynicism, and the octants of the IAS.

	DOM	LOV	PA	BC	DE	FG	HI	JK	LM	NO	<i>e</i>	<i>a</i>	$\delta$	<i>R</i> <sup>2</sup>
FML	-.02	-.13	.04	.07	.11	.19	.02	-.09	-.09	-.11	.02	.13	189	.87
IPP	-.50	.13	-.61	-.31	-.20	.19	.57	.38	.17	-.26	-.01	.51	285	.95
SHY	-.47	-.11	-.44	-.05	.04	.47	.65	.18	.06	-.41	.06	.48	257	.91
SAV	-.38	-.24	-.22	-.04	.09	.59	.38	.11	-.16	-.55	.02	.45	238	.90
DSF	-.17	-.22	-.04	.07	.23	.41	.19	.04	-.13	-.28	.06	.28	219	.94
RC3	.06	-.14	.13	.20	.19	.11	.04	-.12	-.04	-.02	.06	.15	158	.94

Note. MMPI-2-RF = Minnesota Multiphasic Personality Inventory-2-Restructured Form; IAS = Interpersonal Adjective Scales; DOM = dominance dimension; LOV = nurturance dimension; PA = assured-dominant; BC = arrogant-calculating; DE = cold-hearted; FG = aloof-introverted; HI = unassured-submissive; JK = unassuming-ingenuous; LM = warm-agreeable; NO = gregarious-extraverted; *e* = elevation; *a* = amplitude;  $\delta$  = angular displacement; FML = Family Problems; IPP = Interpersonal Passivity; SHY = Shyness; SAV = Social Avoidance; DSF = Disaffiliativeness; RC3 = Cynicism. Correlations > .10 are significant at  $p < .05$ .

the scale is not well differentiated within it. Interpersonal Passivity and Social Avoidance were also located in their hypothesized octants (HI [unassured-submissive] and FG [aloof-introverted], respectively) and both resulted in well-differentiated profiles (high amplitude). Shyness also resulted in a differentiated profile (high amplitude) and was located at 257°, placing it in the HI octant, adjacent to its hypothesized location in FG. Disaffiliativeness was also located in the octant adjacent to where we hypothesized. Disaffiliativeness was located at 219°, which places it in the FG, opposed to DE (cold-hearted) octant. Amplitude was lower than what was achieved with Interpersonal Passivity, Shyness, and Social Avoidance, suggesting a slightly more undifferentiated profile. Finally, Cynicism was located, as hypothesized, near the border of the BC and DE octant at 158°. However, like Family Problems, this scale achieved only small to nonsignificant associations with the majority of the octants of the circle, resulting in an undifferentiated profile (low amplitude). Thus, despite demonstrating good fit to the model (high *R*<sup>2</sup>), little confidence can be placed in the summary theme of this scale (its angular displacement). As would be expected with the near perfect circumplex structure provided by the IAS, elevation values were all approximately zero.

Discriminant validity using the IAS circumplex was demonstrated for those scales that achieved relatively high amplitude. For example, Social Avoidance was most strongly positively correlated with the FG (aloof-introverted) octant ( $r = .59$ ) and was most strongly negatively correlated with the bipolar opposite octant, NO (gregarious-extraverted;  $r = -.55$ ), and as would be predicted, it demonstrated a small ( $r = .11$ ) and nonsignificant correlation ( $r = .09$ ) with the perpendicular octants of BC (arrogant-calculating) and JK (inassuming-ingenuous). Although Interpersonal Passivity and Shyness were both located in the HI (unassured-submissive) octant, the angular location provided a means of discriminating between the two scales. Shyness, located at 257°, was situated to the left of the midpoint of the octant (indicating a cold submissive interpersonal style), whereas Interpersonal Passivity was located to the right of the midpoint (285°, indicating a warm submissive interpersonal style). Social Avoidance and Shyness were both associated with the cold and submissive quadrant of the circle; however, their correlations with dominance and nurturance revealed that although the two scales are equally submissive (Steiger's [1980]  $t = 1.91$ ,  $p = .057$ ), the Social Avoidance scale is colder ( $t = 2.47$ ,  $p = .014$ ) than Shyness. Finally, Disaffiliativeness, although constrained by its low internal consistency reliability, did achieve a moderate correlation ( $r = .41$ ) with the FG octant, and its next highest correlation was with the bipolar opposite octant

NO ( $r = -.28$ ). It also demonstrated nonsignificant correlations with the orthogonal octants BC and JK.

To further evaluate discriminant validity, the MMPI-2-RF interpersonal scales and Cynicism were also correlated with the remaining three factors of the FFM as assessed by the IASR-B5 (see Table 5). With the exception of a moderate correlation between Neuroticism and Shyness ( $r = .42$ ), which would be conceptually expected, all of the associations were either small or nonsignificant.

#### RF Interpersonal Scales and Interpersonal Problems

Table 6 presents the correlation pattern and structural summary parameters of the interpersonal scales, Cynicism, and IIP-C scores. Figure 3 presents the projection of the interpersonal scales and Cynicism onto the circumplex space provided by the IIP-C. *R*<sup>2</sup> values for all of the scales suggested good model fit. Significant associations were observed between the dominance dimensions and all of the interpersonal scales, with the exception of Disaffiliativeness. Only two scales (Social Avoidance and Disaffiliativeness) were significantly associated with the nurturance dimension and both in the negative direction. Three of the scales (Interpersonal Passivity, Shyness, and Social Avoidance) demonstrated well-differentiated profiles, suggesting that these scales have specificity in their association with interpersonal problems. The remaining three scales (Family Problems, Disaffiliativeness, and Cynicism) resulted in relatively undifferentiated profiles (low amplitude). Disaffiliativeness, Interpersonal Passivity, and Social Avoidance were all located in their hypothesized octants (DE, HI, and FG, respectively). Interpersonal Passivity, Shyness, and Social Avoidance were located in the same octants on the IIP-C as they were on the IAS. Family Problems, Disaffiliativeness, and Cynicism, however, were located in different octants on the IIP-C than

TABLE 5.—MMPI-2-RF interpersonal scales and Cynicism correlated with Five-factor model Neuroticism, Openness, and Conscientiousness.

	Neuroticism	Openness	Conscientiousness
Family Problems	.22	.07	-.04
Interpersonal Passivity	.19	-.26	-.14
Shyness	.42	-.23	-.06
Social Avoidance	.23	.00	-.06
Disaffiliativeness	.08	-.04	-.10
Cynicism	.14	.01	.02

Note. MMPI-2-RF = Minnesota Multiphasic Personality Inventory-2-Restructured Form. Correlations > .10 are significant at  $p < .05$ .

TABLE 6.—Correlations and circumplex structural summary parameters between the MMPI-2-RF interpersonal scales, Cynicism, and the octants of the IIP-C.

	DOM	LOV	PA	BC	DE	FG	HI	JK	LM	NO	<i>e</i>	<i>a</i>	$\delta$	$R^2$
FML	.12	-.04	.32	.29	.20	.12	.04	.07	.14	.20	.17	.13	108	.97
IPP	-.37	.05	-.29	-.08	.05	.39	.53	.46	.17	-.02	.15	.38	278	.97
SHY	-.28	-.08	.02	.21	.23	.68	.56	.42	.21	.05	.30	.29	254	.89
SAV	-.15	-.16	.06	.16	.25	.52	.28	.15	.01	-.04	.17	.22	223	.88
DSF	-.04	-.16	.13	.18	.34	.30	.13	.06	.01	-.02	.14	.16	192	.93
RC3	.10	-.02	.27	.25	.21	.10	.07	.10	.16	.22	.17	.10	100	.98

Note. MMPI-2-RF = Minnesota Multiphasic Personality Inventory-2-Restructured Form; IIP-C = Inventory of Interpersonal Problems Circumplex; DOM = dominance dimension; LOV = nurturance dimension; PA = domineering; BC = vindictive; DE = cold; FG = socially avoidant; HI = nonassertive; JK = exploitable; LM = overly nurturant; NO = intrusiveness; *e* = elevation; *a* = amplitude;  $\delta$  = angular displacement; FML = Family Problems; IPP = Interpersonal Passivity; SHY = Shyness; SAV = Social Avoidance; DSF = Disaffiliativeness; RC3 = Cynicism. Correlations  $> .10$  are significant  $p < .05$ .

they were on the IAS. However, given the low amplitude values associated with these three scales, little confidence is placed in their angular location. Discriminant validity was weaker with the IIP-C, with small significant correlations observed with the majority of perpendicular octants, where correlations should be near zero. For example, the Shyness scale had its highest correlation with the FG octant, thus a nonsignificant correlation with the perpendicular JK octant would be expected. However, a moderate correlation was observed ( $r = .42$ ). Elevation on the IIP-C is related to the general factor and is, therefore, not expected to be zero. Elevation in the context of the IIP-C is interpreted as the mean level of interpersonal distress being experienced across all types of interpersonal problems (Gurtman, 1992; Horowitz et al., 1988; Tracey, Rounds, & Gurtman, 1996). Given that the majority of the correlations among the interpersonal scales and the octants of the IIP-C were small or nonsignificant, elevation was, not surprisingly, also low ( $< .20$ ) for all of the scales, with the exception of Shyness (elevation = .30), suggesting that little interpersonal distress was associated

with the majority of interpersonal problems measured by the MMPI-2-RF in this sample.

## DISCUSSION

This study took a nomological net approach to construct validation by exploring the convergence between the MMPI-2-RF interpersonal scales and a circumplex measure of interpersonal traits (IASR-B5) and interpersonal problems (IIP-C) in an undergraduate student sample. Overall, the results are somewhat surprising, as internal consistency reliability was only adequate for half of the scales examined and the pattern of correlations between some of the interpersonal scales and the octants of the circumplex was weaker than expected. Nonetheless, there was evidence of convergent and discriminant validity as scales were, for the most part, located in conceptually expected octants and demonstrated the expected pattern of convergent and discriminant correlations with the octants of the two circumplex measures. Structural summary parameters between the MMPI-2-RF interpersonal scales and interpersonal traits revealed that a predominant interpersonal theme could be attributed to the majority of the interpersonal scales, with the exception of Family Problems and Cynicism. The lower amplitude value achieved with these two scales suggests heterogeneity of interpersonal problems associated with Family Problems and having a cynical worldview, or perhaps that interpersonal problems associated with these two scales might not be due to one's interpersonal traits. A less differentiated pattern was revealed with the IIP-C, as results indicated that a number of the interpersonal scales were associated with a variety of interpersonal problems. Shyness, however, was the only scale where the interpersonal problems being reported were associated with reports of significant interpersonal distress.

An advantage of using circumplex measures to form a nomological net for construct validation was that circumplex measures allowed us to better understand and differentiate between the scales. In particular, it highlighted that a key interpersonal difference between Interpersonal Passivity and Shyness is their degree of warmth—both are related to submissive tendencies, but Interpersonal Passivity is associated with warm submissiveness, whereas Shyness is characterized by a colder type of submissive behavior. Similarly, Shyness and Social Avoidance have in common socially introverted tendencies, but Social Avoidance is colder in nature than Shyness. Shyness can be further differentiated from both Interpersonal Passivity and Social Avoidance through its association with Neuroticism ( $r = .42$  vs.  $r = .19$  and  $.23$ , respectively). This correlation is not unexpected given the anxiety inherent in both Neuroticism and Shyness,

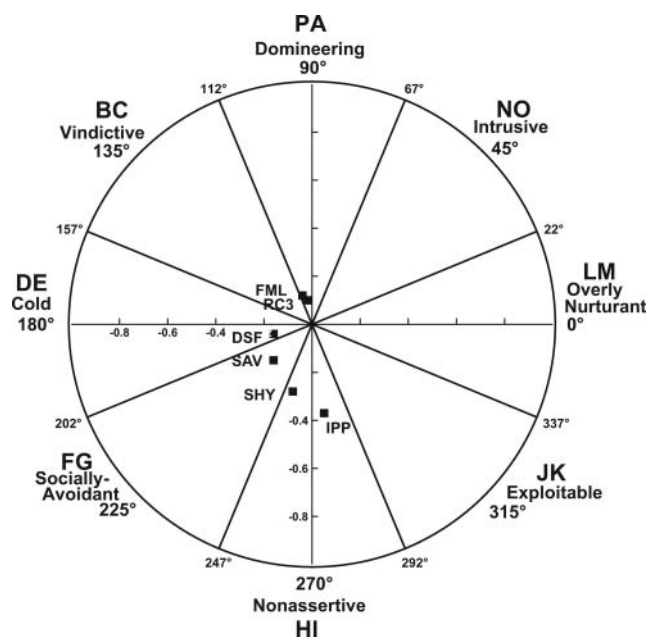


FIGURE 3.—Projection of the MMPI-2-RF Interpersonal scales onto the Interpersonal Problems Circumplex. Note. FML = Family Problems; IPP = Interpersonal Passivity; SHY = Shyness; SAV = Social Avoidance; DSF = Disaffiliativeness; RC3 = Cynicism.



and thus adds to the construct validity of this scale as a measure of social anxiety. Overall, the majority of the scales were more strongly associated with the dominance dimension than with the nurturance dimension. This is not surprising considering previous research has demonstrated that the warmth dimension is not well represented in the MMPI-2 item pool (Ayearst & Trobst, 2006; Guetter, 1994), which likely extends to the MMPI-2-RF item pool. This is an important finding because it suggests that the interpersonal scales of the MMPI-2-RF might only accurately assess one of the primary dimensions of interpersonal functioning, leaving the other dimension largely unaccounted for, at least in this undergraduate student sample. This is also likely consistent with the MMPI-2 instruments' focus on dysfunction rather than normative variation in personality (the focus of the IAS).

However, the same cannot be said for the weaker communality observed with the IIP-C. The IIP-C and MMPI-2 share something in common that the MMPI-2 and IAS do not: Both have inherent within their item pools a certain amount of problem-focused or otherwise neurotic content. It was possible that, in this respect, the MMPI-2-RF interpersonal scales might demonstrate stronger associations with the IIP-C than the IAS. However, the MMPI-2-RF was built around the RC scales, which have the variance associated with the general first factor, labeled demoralization, removed from their scales. As noted in the technical manual (Tellegen & Ben-Porath, 2008), creation of the specific problem scales (which includes the interpersonal scales) generally followed similar procedures used to develop the RC scales. Item sets representing each construct were factor analyzed along with the Demoralization markers and items that loaded on the Demoralization factor were dropped to the extent feasible and conceptually indicated (e.g., Social Avoidance, Disaffiliativeness, and Interpersonal Passivity should be free of demoralization to the extent conceptually and empirically appropriate, but given that Shyness is an index of social anxiety, some correlation with demoralization would be expected).<sup>6</sup> Thus, any additional variance they may have shared has, in many cases, been removed from the RF scales, possibly accounting for the weaker communality.

Because the IASR-B5 is not only a circumplex measure of interpersonal traits, but also measures the additional factors of the FFM (namely Neuroticism, Openness to Experience, and Conscientiousness), it offers an additional means of evaluating the discriminant validity of the RF interpersonal scales. In this study, evidence for discriminant validity was provided by the small to nonsignificant correlations achieved among all of the RF interpersonal scales (with the exception of Shyness), Cynicism, and Neuroticism, Openness to Experience, and Conscientiousness.

Although the pattern of association among the MMPI-2-RF interpersonal scales, Cynicism, and the ICM were consistent with expectations, the magnitude of the correlations was somewhat weaker than expected. In terms of internal consistency reliability, only three of the six scales evaluated achieved adequate reliability coefficients. The weaker alpha coefficients identified for Family Problems, Disaffiliativeness, and Interpersonal Passivity might have attenuated the magnitude of the correlations that could be achieved with the octants of the IASR-B5

and IIP-C. However, because alpha is affected by scale length, the average interitem correlation was also computed. Mean interitem correlations typically range from .15 to .50, depending on the level of specificity in the measurement of the construct (e.g., Simms & Watson, 2007). When measuring a construct from a broad level, including much of the construct's content domain, average interitem correlations in the range of .15 to .20 are typical. Higher mean interitem correlations (e.g., .40 or .50) are required for a reliable and valid measure of a narrower construct (Clark & Watson, 1995). Average interitem correlations for the interpersonal scales were all between .15 (Family Problems, Cynicism) and .30 (Shyness), with the exception of the Disaffiliativeness scale, which achieved an unacceptably low mean interitem correlation (.11), even for a broad level of measurement. However, the interpersonal scales are part of the lower tier of the hierarchical structure of the MMPI-2-RF, and as such, represent narrow-band measures as opposed to a broad level of measurement. Accordingly, we would have expected higher average interitem correlations for these scales.

Range restriction and nonnormal distributions are considered another reason for attenuation of correlations between constructs of interest. Both range restriction and nonnormality are common in student samples and personality research, and in particular when abnormal traits are assessed in normal or nonclinical samples. As such, it was possible that few of the MMPI-2-RF interpersonal scales and interpersonal problems scales as measured by the IIP-C would be elevated in our student sample. If true, this would also account, in part, for the stronger link between the interpersonal scales and interpersonal traits (IAS) compared to interpersonal problems (IIP-C) and the low elevation achieved with the IIP-C. As reported in Table 1, none of the interpersonal scales demonstrated significant deviations from normality (see Curran, West, & Finch, 1996), although technically, any departure of skew and kurtosis from zero represents departure from normality. To evaluate the effect range restriction might have had on the current analyses, we calculated the variance associated with MMPI-2-RF interpersonal scale scores in clinical samples reported in the MMPI-2-RF technical manual and compared them to the variances reported in Table 1. Restricted range in score variation relative to clinical samples was clearly the case for the Disaffiliativeness (variance = 182.25 in an outpatient community sample vs. 78.50 in this sample),<sup>7</sup> Social Avoidance (169.00 vs. 87.98), and Family Problems (196 vs. 115.35) scales. It is likely that IIP-C octant scores also suffered similar range restriction given the use of a student sample, and we would expect a greater range of interpersonal problems to be reported in more dysfunctional samples.<sup>8</sup>

As mentioned earlier, it is clear from the findings reported here that Cynicism and Family Problems are only weakly associated with interpersonal content at best. Although Cynicism has shown strong correlations with personality trait measures of interpersonal mistrust and alienation (e.g., Ingram et al., 2011; Sellbom & Ben-Porath, 2005; Sellbom et al., 2008), this scale is likely better conceptualized as a reflection of a worldview

<sup>7</sup>Based on  $SD^2$  (averaged across gender) as reported in the technical manual for an outpatient community mental health center.

<sup>8</sup>The IIP manual does not include clinical norms for comparison purposes so a direct comparison of variance in scores in a clinical sample versus the present sample was not possible. Descriptive statistics for the IAS and IIP-C in this sample are available from the first author on request.

<sup>6</sup>Items loading on Demoralization were dropped, except when they were part of a facet reflecting actual demoralization variance (e.g., suicidal ideation), in which case a separate scale was created (see Tellegen & Ben-Porath, 2008).

concerning others and negative emotionality than actual interpersonal functioning. Little research (independent of the technical manual) has explored the correlates of Family Problems; however, at least some item content appears to be linked to concepts such as social support, as well as how one thinks or feels about his or her family of origin or current family, as opposed to measurement of interpersonal functioning. It is noteworthy that the largest correlations (albeit only moderate in magnitude) for Family Problems were with the domineering (PA) and vindictive (BC) octants of the IIP-C, which is expected of externalizing measures. As such, it is possible that the Family Problems scale could be considered an externalizing rather than interpersonal specific problems scale, particularly because there is also item overlap between Family Problems and RC4 (Antisocial Behavior). Based on the results of this study, it appears that Family Problems and Cynicism might prove to have meaningful interpersonal consequences, but are not themselves inherently interpersonal. Interpersonal characterizations of a given MMPI-2-RF profile are, therefore, best acquired by interpretation of just four of the five scales designed for this purpose, namely Interpersonal Passivity, Social Avoidance, Shyness, and Disaffiliativeness.

The conclusions of this study must be considered in light of several limitations. First, the order of administration of the MMPI-2 and the IPC measures was not randomized; thus, it is unclear the extent to which results could be influenced from order effects. However, we do not believe there is any reason to assume that order effects would influence these results given the mono-methodology employed. Second, results are limited by the use of a student sample that was predominately female, which poses problems for generalizability. These results will need to be replicated in clinical, as well as more gender-balanced samples. Third, as previously noted, restricted range of scores affected the reliability of some of the RF interpersonal scales and IIP-C octants, and therefore, attenuated any possible correlations achieved with these scales. Given this attenuation, the pattern of associations demonstrated in this study provides promise for increased evidence of convergent validity in more dysfunctional samples.

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