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# Examining the duality of Holland's RIASEC types: Implications for measurement and congruence☆

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ABSTRACT

Despite theoretical impetus that a person's vocational personality consists of two affective aspects (liking and disliking) there has been little research into this duality of vocational personality. Using semantic differential techniques, we conducted two studies that assessed people's affective responses to different RIASEC work activities. These studies make three contributions. First, in line with Holland's (1997) broader view of vocational interests as a vocational *personality*, we report evidence for a duality, one based on what people like (work activities they are drawn to); and another based on what people dislike (work activities they are averse to). Second, the emotion *interest* is shown to be but one potential indicator of vocational personality. By capturing other types of affective response to work activities, different aspects of vocational personality can be assessed. Third, the duality of vocational personality is applied to Holland's congruence hypothesis. A new type of vocational personality misfit—passive-incongruence is tested that relates negatively to intrinsic job satisfaction. Passive-incongruence also provides incremental validity in predicting intrinsic satisfaction with the variance once accounted for by traditional congruence being subsumed by passive-incongruence. These results suggest that examining what people characteristically dislike (find boring) might be important to understanding job satisfaction.

A person's idiosyncratic likes and dislikes are two affective aspects of their vocational personality (Fryer, 1930; Strong, 1960). Typical interest assessment has focused mainly on what people like doing as shown by the prevalent use of Holland's (1997) high-point RIASEC codes. However, measuring patterns of likes and dislikes are vital to understanding a person's vocational personality (Berdie, 1943; Dawis, 2001; Tyler, 1955). In this paper, we draw on Holland's (1997) conception of vocational personality and dimensional models of emotion to examine the duality of people's affective responses to interest items. Understanding this duality of vocational personality provides unique insight into Holland's (1997) congruence hypothesis.

We begin by reviewing how researchers have argued for the duality of vocational personality. The measurement issues that may have prevented the investigation of the duality are then discussed. One such hurdle is how to assess the underlying duality within the context of vocational interest items using current bipolar scales. To overcome this, semantic differential methods are used to replace bipolar response-formats with unipolar affective anchor-labels from Feldman Barrett and Russell's (1999) circumplex model. Finally, fit is operationalized under this duality within Holland's (1997) congruence hypothesis. To test the duality, we examined how well (mis)fit predicts job satisfaction.

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### 1.1. The duality of vocational personalities

A duality of likes and dislikes emerges early in life. Children learn to differentiate and orient towards activities they like and away from activities they dislike (Tyler, 1955). These likes and dislikes are, in part, crystallized by the rewards (or punishment) and emotional outcomes derived from engaging in the activity (Staats, Gross, Guay, & Carlson, 1973). Although defined differently by researchers, this duality of vocational personality is also inherent in early conceptualizations of vocational personality. Fryer's (1930) acceptance-rejection theory argues that vocational personality is undergirded by pleasant or unpleasant affective responses that are characteristic of the individual. Strong (1960) describes this duality as consisting of appetitive and aversive affective aspects: "We go toward liked activities, go away from disliked activities." (p.12). The appetitive and aversive responses are linked to the potential (un) pleasant feelings the person has come to associate with that activity (Fryer, 1930; Strong, 1960). Subsequently, the liking or disliking directs the person's attention towards the stimuli and energizes action towards or away from stimulus. Taken together, when investigating vocational personality two aspects can be examined: (1) a positive liking aspect that encompasses the person's characteristic approach, acceptance, felt pleasantness, and conative liking of certain stimuli, and conversely (2) a negative disliking aspect that encompasses avoidance, rejection, felt unpleasantness, and conative disliking of certain stimuli. Using Strong's (1960) and Tyler (1955) conceptualization, we use the terms *likes* (*liking*) and *dislikes* (*disliking*) to describe the two aspects of this duality.

Current vocational personality measurement does not directly allow the simultaneous examination of both likes and dislikes. Dawis (2001) viewed the assessment of vocational personality as either a bipolar (dislike-like) or two unipolar continuums. However, scales typically captured responses on a bipolar (dislike-indifferent-like) continuum. In the case of Holland (1997) Self-Directed Search only "likes" are captured. If a disliking aspect of vocational personality exists, using bipolar scales masks its presence, capturing instead a mixture of likes and dislikes that cannot be disambiguated (Cacioppo & Berntson, 1994). When an individual reports "strongly like" using a bipolar scale, the response combines positive and negative evaluations as an amalgamation meaning: "much more like than dislike" rather than a pure positive evaluation (Cacioppo & Berntson, 1994). In contrast, using two unipolar scales (as proposed by Dawis, 2001), a respondent can freely report both positive and negative evaluations. Responses obtained can be unrelated/uncoupled (liking and disliking aspects, $r = 0$), reciprocal (liking and disliking aspects, $r < 0$), or coactive (liking and disliking aspects, $r > 0$; cf., Cacioppo & Berntson, 1994). If the duality does not exist, then we expect a highly negative correlation between liking and disliking aspects ($r \approx -1.0$). If there is a duality, then all three response-patterns uncoupled, reciprocal, and coactive are possible.

To investigate the duality of vocational personality, we use two unipolar scales, one for capturing positive appraisal and another for capturing negative appraisal of work activities. Further, using confirmatory factor analysis (CFA), the validity of this duality can be examined. If vocational personality consists of two aspects (likes and dislikes), we expect a two factor per RIASEC domain latent model to fit the data better. In contrast, if the underlying motivational nature of vocational personality lies on a single bipolar continuum, then a one factor per RIASEC domain latent model would fit the data better (a bipolar dislikes-likes continuum).

**Hypothesis 1.** Vocational personality consists of two parts: likes and dislikes as shown by comparatively better fit for a two factor per RIASEC domain model over a one factor per RIASEC domain model.

### 1.2. The affective measurement of the likes and dislikes duality

Vocational personality is affective in nature. Strong (1960) describes it having "a liking-disliking affective tone." (p.12). Fryer (1930) argued that the appraisal of activities manifest as an individuals' felt pleasantness and unpleasantness towards certain activities, and that these feelings feature a strong and multifaceted emotional component. Measuring both positive and negative *affective responses* to a work activity can capture the separate aspects of likes and dislikes. Consider an example of an individual appraising the activity: "conduct biological research," which might separately invoke both liking and disliking aspects. She/he might experience positive affect because finding out new things in biology is exciting (the liking aspect), but also negative affect because running experiments is tedious (the disliking aspect). In such cases, the unipolar responses to the same stimuli are expected to have a non-zero correlation with each other (Thompson, Zanna, & Griffin, 1995). Alternatively, another individual appraising the same activity may only experience positive affect: finding new things in biology and running experiments are *both* exciting. Thus, one or both duality aspects could be active and captured by affective responses to the activity.

Using affective responses in measuring the duality of vocational personality is both practically and theoretically advantageous. From a practical perspective, the bipolar-item anchors of *like* and *dislike* typically used are antonyms. Using these two anchors directly on a unipolar scale may result in respondents simply reversing their responses. The practical solution is to use semantic differential methods, where an object is rated using different evaluative terms, i.e., affect anchors (Osgood, Suci, & Tannenbaum, 1957). Germane to interest measurement when using affect anchors, individuals would report how interested, nervous, and bored they would feel if they engaged in a work activity. Using a randomized set of affect anchors for responding bypasses the antonym problem, making the duality less apparent (Thompson et al., 1995).

By selectively providing a set of anchors that carry semantic meanings, it is possible to isolate specific components of a construct—i.e., the affective component or tone (Crites, Fabrigar, & Petty, 1994). The use of affect anchors is thus theoretically advantageous since it allows us to investigate which emotions are relevant indicators of this duality; consequently, broadening our understanding of the affective 'tone' of work personality beyond feeling *interested*. To that end, affect anchors are sampled from Feldman Barrett and Russell's (1999) circumplex model which maps emotions along two dimensions, activation (active-passive) and pleasantness (positive-negative). This affective circumplex is partitioned into four quadrants of emotional experience: active-positive,

passive-positive, active-negative, and passive-negative. The emotion commonly associated with vocational personality: *interested*, is located with other active-positive quadrant emotions (Feldman Barrett & Russell, 1999). This suggests that emotions denoted by *both* pleasantness and activation are relevant indicators of the liking aspect of vocational personality (e.g., inspired). We selected affect anchors from the active-positive quadrant of emotional space as indicators for the liking aspect.

In contrast, the emotions that indicate the disliking aspect are less clear. Dislike may be signaled by feelings from two quadrants, one that denotes high activation and unpleasantness, i.e., anxiety and distress; and another that denotes low activation and unpleasantness, i.e., boredom and fatigue. For example, the evaluation of an enterprising work activity (e.g., presenting a sales pitch) might invoke an anxious affective response and aversion to the task. This affective response is different from a task (e.g., managing spreadsheets) that invokes boredom and aversion to the task. Note that high negativity and low activation emotions are not indifference (characterized by both low negativity *and* activation). Rather, boredom is unpleasant (negative) with the person feeling disengaged with an unrewarding task (Pekrun, Goetz, Daniels, Stupnisky, & Perry, 2010). We selected two sets of affect anchors from the active-negative quadrant and passive-negative quadrant as indicators of the disliking aspect, but examine each set in different studies.

Holland's (1997) model of vocational personality (Realistic, Investigative, Artistic, Social, Enterprising, and Conventional) is used to evaluate semantic differential methods. The RIASEC model provides a robust set of expected structural properties and patterns that are diagnostic; allowing us to test if the affective responses fit Holland's RIASEC model. RIASEC domain is expected to conform to a quasi-circumplex structure: RIASEC domains arranged in order around a circumplex but with unequal distances between domains (cf. Armstrong, Hubert, & Rounds, 2003). Specifically, adjacent RIASEC domains (R-I, I-A, A-S, S-E, E-C, and C-R) are more proximal to each other and should exhibit larger correlations compared to other pairs of domains. Alternate RIASEC domains (R-A, I-S, A-E, S-C, E-R, and C-R) are more distal, we would expect correlations smaller than adjacent domain pairs. Finally, opposite domains (R-S, I-E, and A-C) are furthest from each other and should exhibit the smallest correlations. Hence, the size of the interrelationships between domains are expected to be follow the order: adjacent > alternate > opposite domains, evidence for the quasi-circumplex.

**Hypothesis 2.** Responses from affect anchors will exhibit RIASEC ordering expected of Holland's (1997) spatial model.

### 1.3. Prediction of job satisfaction

Our final objective is to examine Holland's (1997) congruence-satisfaction hypothesis using the like and dislike duality. Congruence is typically determined by matching an individual's RIASEC profile to an occupation by utilizing their highest *like* scores from a bipolar scale—in essence indirectly focusing on the liking aspect of the duality (Brown & Gore, 1994). This comes at the cost of failing to model misfit based on a person's dislikes (Hesketh, 2000), i.e., their *in*congruence. By measuring vocational personality using unipolar scales, both types of fit, congruence and incongruence can be linked to job satisfaction. When using unipolar scales, congruence is the match between an individual's RIASEC likes (based on their active-positive affective responses) and the RIASEC profile of their job. Individuals' whose work environment matches their RIASEC likes (what they enjoy doing) would experience a degree of fit with their job and be more satisfied.

Conversely, incongruence is the match between an individual's RIASEC dislikes (based on negative affect) and the RIASEC profile of their job. Individuals' whose work environment matches their RIASEC dislikes (what they are averse to doing) would experience a degree of misfit with their job and should be less satisfied. Because, we sampled negative affect anchors from two quadrants of emotional space: active-negative (e.g., distressed) and passive-negative emotions (e.g., bored), two types of incongruence are tested: active-incongruence and passive-incongruence. We test active-incongruence in Study 1 and passive-incongruence in Study 2.

Job satisfaction is a multi-faceted construct as such not all facets of job satisfaction may relate to interest fit in the same way (Smith, Kendall, & Hulin, 1969). Congruence and incongruence indices are expected to predict theoretically relevant satisfaction facets. Given that vocational personality is often measured by and pertains to the work activities (tasks), we expect all (in)congruence indices to be more strongly related to the intrinsic but not the extrinsic aspects of work (Strong, 1960). Similarly, congruence and incongruence indices are expected to be associated with general job satisfaction, given that general job satisfaction is closely linked with work satisfaction ($r = 0.73$, Stanton et al., 2002). Finally, employees enjoy working with others who are similar to them—-homophily (Holland, 1997). Therefore, (in)congruence indices should also relate to the co-worker satisfaction. In contrast, we do not expect a relationship between the (in)congruence indices with other facets of job satisfaction that are more extrinsic. Facets such as pay, promotion, and supervisor are more likely due to other external circumstances and are thus expected to be unrelated to congruence and incongruence indices (Fisher, 2000).

**Hypothesis 3a.** Congruence is positively related to work, coworker, and general job satisfaction, but not related to pay, promotion, and supervisor satisfaction.

**Hypothesis 3b.** Active-incongruence is negatively related to work, co-worker, and general job satisfaction, but not related to pay, promotion, and supervisor satisfaction.

**Hypothesis 3c.** Passive-incongruence is negatively related to work, co-worker, and general job satisfaction, but not related to pay, promotion, and supervisor satisfaction.

If the likes and dislikes of vocational personality are not bipolar opposites—there are elements of a work activity that invoke both aspects—then it is possible that together *both* are able to explain incremental variance in intrinsic satisfaction. Dominance incremental validity (see: Shrout & Yip-Bannicq, 2017) is examined to test if active- and passive-incongruence indices can predict work

outcomes beyond traditionally used congruence.

**Research question 1.** Does active-incongruence incrementally predict work, co-worker, and general job satisfaction beyond traditional congruence?

**Research question 2.** Does passive-incongruence incrementally predict work, co-worker, and general job satisfaction beyond traditional congruence?

## 2. The present studies

Two studies are reported that investigate the duality of vocational personality using affective responses. In both studies, the structural duality of vocational personality guided by Holland's (1997) RIASEC model is evaluated. Feldman Barrett and Russell's (1999) circumplex model of affect has two dimensions (active-passive and positive-negative) that yield four quadrants of affective anchors. Active-positive affect anchors are tested in both studies and active-negative and passive-negative affective anchors are tested in Study 1 and 2, respectively. In both Studies 1 and 2, active- or passive-incongruence was tested for incremental validity above the traditional method of assessing congruence with liking responses.

## 3. General method

### 3.1. Procedure across studies

Unless otherwise specified, both studies used similar procedures and measures. Participants were recruited from Amazon Mechanical Turk. This online pool has been shown to reliably replicate several key psychological findings as well as provide access to more diverse sample of participants (Behrend, Sharek, Meade, & Wiebe, 2011; Landers & Behrend, 2015). This diversity is particularly advantageous, as it allows the test of the congruence hypothesis across multiple occupations. Three quality control items were used. This included an instruction manipulation check that has been shown to be a valuable tool for removing inattentive responders in online samples: increasing statistical power (Oppenheimer, Meyvis, & Davidenko, 2009). Participants who failed the instructional manipulation check and more than one quality control item, or who were not working adults were removed from the analysis.

Participants reported their current occupational title and provided a short description of work tasks characteristic of their current occupation. Descriptions of their typical work activities to provide information for RIASEC coding of their occupation were also obtained. Occupational title and job description were matched to occupations listed on the Occupation information Network (ONET; National Center for O$_*$NET Development., n.d.) to determine the RIASEC profile of the participant's work environment.

### 3.2. Measures common across studies

#### 3.2.1. Measurement of affective responses

To measure likes and dislikes, semantic differential techniques were adopted where the same work activity is rated multiple times using different anchor labels (Osgood et al., 1957). For example, for the activity “Assemble products in a factory,” participants separately rated the extent they would feel each positive emotion, e.g., enthusiastic, or inspired, etc.; and each negative emotion, e.g., distressed, or upset, etc. See Appendix A in the supplementary material for simplified illustration of the multiple rating of RIASEC activities using different anchor labels. Because employing semantic differential methods greatly increases the required number of responses, we sought to reduce participant fatigue by choosing a subset of activities in each RIASEC domain. To ensure the activities chosen was representative of the RIASEC domains, activities were selected from a large initial item pool of items from existing public domain scales; the RIASEC markers (Armstrong, Allison, & Rounds, 2008) and the O*NET Interest Profiler (Lewis & Rivkin, 1999). From this initial pool of activities, activities were selected that were characteristic of each RIASEC domain according to Holland's (1997) definitions of the domains. The final subsets of activities were six items in Study 1 per RIASEC domain, and five items in Study 2 per RIASEC domain. Participants rated the degree they felt an emotion, if they were to do the activity on a 7-point scale (1 = not at all to 7 = extremely) in Study 1 and on a 5-point scale in Study 2 (1 = not at all to 5 = extremely). For each RIASEC domain, the order that affect anchors were presented was randomized. The RIASEC domains were divided into six blocks and block presentation of the blocks was randomized.

In study 1, ten affect anchors (5 positive and 5 active-negative emotions) were obtained from Mackinnon et al. (1999). For study 2, we were not able to find a scale that consisted purely of passive-negative affect. Thus, emotions from previous research that examined passive-negative emotions were selected, e.g., bored, as well as other emotions that semantically expressed low activation and unpleasantness, e.g., reluctance (Feldman Barrett & Russell, 1999). For full list of affect anchors, see Table 3.

#### 3.2.2. RIASEC affect scores

For each affect anchor used, its corresponding RIASEC affect score can be examined whether it conforms to expected structural properties of Holland's (1997) hexagonal model—evidence that the affect anchor is an indicator of vocational interest. A simplified illustration of how to calculate these scores is provided in the supplementary material (Appendix A). To obtain the RIASEC affect score for an affect anchor, we averaged responses using that anchor across all activities for the RIASEC domain. For example, for the affect anchor *excited*, we averaged all the ‘excited’ responses across all realistic activities yielding the R-excited affect score.

Averaging across six investigative activities for the same anchor yields an I-excited affect score. Because there are ten affect anchors and six RIASEC domains, there are sixty RIASEC affect scores, one set of six affect scores across all ten affect anchors. These affect scores allow us to examine evidence for a dual motivational orientation in CFA.

#### 3.2.3. RIASEC like and dislike scores

To obtain like or dislike scores, for one RIASEC domain, we averaged all the responses using either the positive or negative affect anchors. A simplified illustration of score calculation is provided in the supplementary material. For example, realistic like scores are calculated by averaging responses to the six realistic activities for responses from all five positive affect anchors (an average of 30 responses), yielding a R-like score. Similarly, dislike scores were calculated by averaging responses to six realistic activities for responses from all five negative affect anchors, yielding a R-dislike score. Because there are six RIASEC domains with like and dislike responses, there are twelve RIASEC like and dislike scores (six for like and six for dislike). These scores were used to calculate (in) congruence indices.

#### 3.2.4. Job satisfaction

Across both studies, participants reported their global job satisfaction on the abridged job in general scale (Russell et al., 2004) and job satisfaction facets with the abridged job descriptive index (Stanton et al., 2002). These scales list a set of adjectives describing a facet of job satisfaction. Participants considered a facet of their job (e.g., Pay) and then reported, on a three-point scale (Yes, "?", and No), whether the listed adjective was descriptive of that facet. Responses were coded according to the JDI manual (Balzer, Smith, & Kravitz, 1990). Because an organizational outcome (satisfaction) using an online sample was examined, the generalizability of the job satisfaction scores were compared to diverse offline (field) sample statistics in the papers that developed these measures (Russell et al., 2004; Stanton et al., 2002). Overall, the present online sample statistics were relatively similar compared to those from the offline sample (see Appendix B of the online supplementary material).

#### 3.2.5. Congruence and incongruence indices

We calculated these indices by using each participant's two RIASEC profiles (based on like and dislike scores) and their work environment RIASEC profile. To quantify the degree of congruence/incongruence, a profile correlation was used: the Pearson correlation of an individual's RIASEC profile with the RIASEC profile of their occupation. For a profile correlation $-1$ and 0 represent mismatch and no match, respectively and $+1$ represents a perfect match between their RIASEC profile and the occupation (Kroustalis, Lewis, & Rivkin, 2010). Profile correlation using RIASEC active-positive affect scores with work environment RIASEC scores yield the congruence index; active-negative or passive-negative RIASEC dislike scores with work environment RIASEC scores yield active-incongruence and passive-incongruence indices, respectively.

### 3.3. Analyses

#### 3.3.1. Examining the duality of vocational personality

To test the duality of vocational personality, a confirmatory factor analyses was conducted on RIASEC affect scores using Mplus version 7.11 (Muthén & Muthén, 1998-2012). For all models tested, the Maximum Likelihood estimator, with 1000 iterations, using default marker assignment (the first indicator for every latent factor) was used. In a series of models, we specified the latent trait (RIASEC) and method (affect anchor) factors: i.e., a correlated traits-correlated method model (Lance, Noble, & Scullen, 2002). Regarding RIASEC traits, these models tested for whether a dual likes and dislikes model fit the RIASEC data better (twelve vs. six factors; hypothesis 1). In keeping with the correlated traits-correlated method model, affect anchors were specified as intercorrelated method factors. The modeling of method factors is of import because semantically similar anchors may contribute common method variance when estimating the correlation between trait latent variables: artificially inflating the latent correlation between factors. (see Fig. 1 for simplified diagrams of the model tested.) Because correlated traits-correlated method models can be prone to under identification due to lack of indicators (Edwards, 2003), more details are provided about model specification and breakdown of all parameters estimated for all models in Appendix C of the online supplementary material. All models tested were over identified.

*3.3.1.1. Model A.* This model reflects the case where only the affect anchors (as latent method factors) are driving the data observed. A good model fit to the data would mean that only emotions account for the data observed—the use of affect anchors not the RIASEC factors are driving the observed responses.

*3.3.1.2. Model B.* This model reflects the current understanding and measurement of vocational personality. The responses observed are explained by only the six latent RIASEC factors. A good model fit to the data would be strong evidence *against* the duality of vocational personality (i.e., there is only one bipolar dislikes-likes continuum).

*3.3.1.3. Model C.* This model reflects the proposed duality with 12 RIASEC latent factors, but without affect method factors. A good model fit to the data would be evidence for the duality of vocational personality, but the latent correlations between factors are likely inflated.

*3.3.1.4. Model D.* This model examines vocational personality as six latent RIASEC factors, but models affect anchors as method factors. A good model fit would be evidence *against* the duality of vocational personality after controlling for method factors.

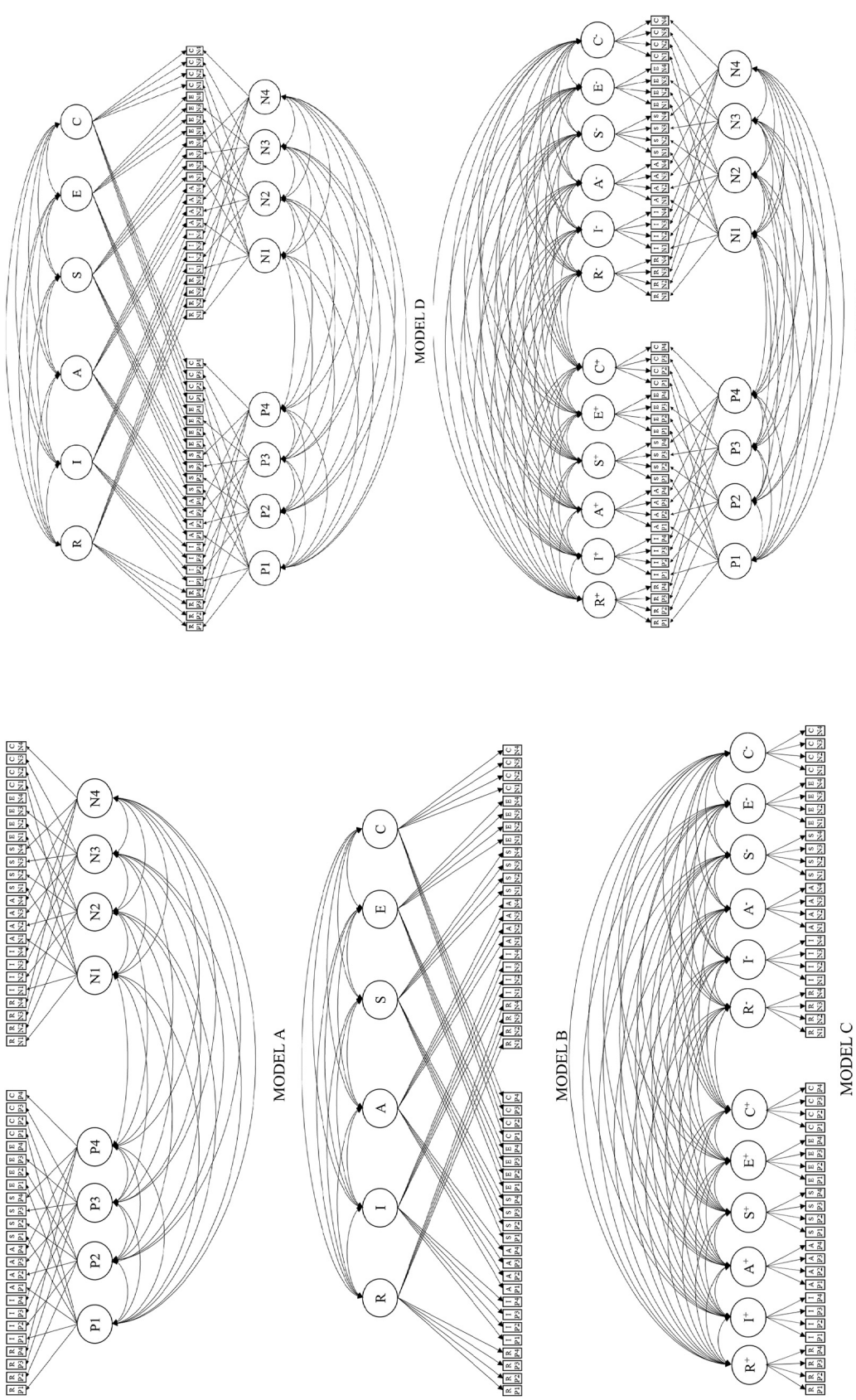


**Fig. 1.** Simplified Models A to E with 4 indicators. R = Realistic, I = Investigative, A = Artistic, S = Social, E = Enterprising, and C = Conventional, superscript (+) = likes factor, superscript (−) = dislikes factor. P refers to positive affect scores. N refers to negative affect scores.

*3.3.1.5. Model E.* This latent structure models the duality with 12 latent RIASEC factors and affect anchor method factors. A good model fit to the data would be evidence for the duality of vocational personality without latent correlation inflation due to method factors.

Where possible, nested models were compared to determine the best fitting model. Multiple fit indices were used to assess which among the proposed models fit the data best and to overcome the problems associated with any one index (e.g., sample size sensitivity or failure to penalize complex models). The following indices were used: Consistent Akaike Information Criterion (CAIC, Bozdogan, 1987), Sample adjusted Bayesian Information Criterion (SBIC, Sclove, 1987), $\chi^2$, (Jöreskog, 1969), Root Mean Squared Error of Approximation (RMSEA, Steiger, 1980), Comparative Fit Index (CFI, Bentler, 1990), Standardized Root Mean Squared Residual (SRMR, Bentler, 1995). For $\chi^2$, CAIC and SBIC indices lower the values indicate better fit (Bozdogan, 1987; Jöreskog, 1969; Sclove, 1987). For CFI values close to 0.95 (0.90), RMSEA values close to 0.06 (0.08), and SRMR values close to 0.08 suggest good model fit (Hu & Bentler, 1999)—benchmarks in brackets suggest adequate fit (Browne & Cudeck, 1993).

### 3.3.2. Structural analyses

Circular unidimensional scaling was used to examine the structural properties of affect anchor scores. Circular unidimensional scaling represents a more direct test of Holland's structural hypotheses (Armstrong et al., 2003); testing for a quasi-circumplex investigates if the ordering of RIASEC domains conforms to that expected of Holland's (1997) hexagon. This method provides the variance-accounted-for as an index of fit to the structural hypotheses. The variance-accounted-for can be compared to effect size guidelines to determine minimal, moderate, and good fit ($R^2$ = 0.36, 0.44, and 0.60, respectively) to a quasi-circumplex model (Armstrong et al., 2003). CUS analyses were performed using MATLAB (version 9.0.0.341360) with functions described in Hubert, Arabie, and Meulman's (2006) book on proximity matrix analyses and code obtained from http://cda.psych.uiuc.edu/srpm_mfiles. Because CUS can be susceptible to local optima problems, a Monte Carlo simulation was conducted with 300 random starts for each RIASEC affect score (10 from each study). Input for CUS analyses was a dissimilarity matrix obtained by linearly transforming RIASEC affect (observed) correlation matrices (1- *r*), resulting a matrix of distances with 0 in the diagonals. Results for all Monte Carlos simulations resulted in only 1 locally optimal solution, suggesting no convergence problems due to multiple local minima.

### 3.3.3. Validity for congruence and incongruence

The validity of congruence and incongruence indices was examined by correlating indices with facets of job satisfaction. In testing incremental validity, when two predictors have a non-zero correlation with each other, using regression models for determining incremental validity inflates Type I error (see: Shrout & Yip-Bannicq, 2017). To reduce inflated type I error, we used a dominance incremental validity method by fitting congruence and a composite of incongruence and congruence as predictors (Rindskopf, 1984). This type of incremental validity demonstrates two findings: first, if the new predictor (incongruence) explains more variance then the current predictor (congruence); second, if incongruence dominates congruence, i.e., incongruence explains the all variance in satisfaction that traditional congruence once explained. We further strengthened our inference for incremental validity using dominance analysis (Azen & Budescu, 2003). We have outlined in greater detail the procedures of applying this two-step approach in the online supplementary material (Appendix D).

## 4. Study 1

### 4.1. Sample and procedures

Participants were 510 working adults from the United States. Applying the criteria of instructional manipulation check, quality control items, and working adults, resulted in a final sample size of 489 participants (55.80% Female, $M_{age}$ = 36.89 years; $SD_{age}$ = 11.57 years). Participants worked an average of 41.34 h per week (*SD* = 8.85 h). We could not calculate the profile correlation for one participant whose negative affect yielded identical scores across all RIASEC domains (i.e., a constant). The sample size is 488 for all analyses involving active-incongruence. We report the correlations and descriptive statistics for Study 1 in Table 1.

### 4.2. Results

#### 4.2.1. Duality of vocational personality

From Table 2, model E overall fit the data best (RMSEA = 0.06, CFI = 0.94, and SRMR = 0.07). The estimated variance-covariance (Psi) matrix for model A was not positive definite. We note that multiple latent correlations exceeded one for model A. We attempted to remedy this in two ways: (a) constraining theoretically impossible latent correlations ($\phi > 1.00$) to one and (b) dropping affective indicators whose latent correlation exceeded one; neither of these approaches work. Eventually, a reduced model A that excluded multiple affective indicators: nervous, enthusiastic, and scared, converged without issues. This reduced model A still did not fit the data well (RMSEA = 0.16, CFI = 0.65, and SRMR = 0.08). These results do not support the interpretation implied by Model A: emotions account for the data observed. The estimation in model D also resulted in a non-positive Psi matrix. The residual variance of the affective indicator *nervous* for the enterprising domain has a residual variance greater than one and latent correlations between the affective indicator *scared* with other factors that exceeded 1. Constraining problematic latent parameters (e.g., error variance and/or correlations) still resulted in estimation problems (e.g., non-convergence). Model D converged when both nervous and scared indicators were dropped from the original model. Generally, the reduced model D fit the data poorly (RMSEA = 0.10, CFI = 0.87, and SRMR = 0.06). For comparison, we fitted a reduced model E with nervous and scared indicators dropped

**Table 1**
Correlations and descriptive statistics for Study 1.

| Variable | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. | Congruence | – | | | | | | | | | | | | | | | | | | | | |
| 2. | Incongruence | 0.05 | – | | | | | | | | | | | | | | | | | | | |
| 3. | R-likes | −0.09 | −0.03 | (0.97) | | | | | | | | | | | | | | | | | | |
| 4. | R-dislikes | 0.03 | 0.01 | 0.21 | (0.96) | | | | | | | | | | | | | | | | | |
| 5. | I-likes | −0.09 | −0.02 | 0.50 | 0.04 | (0.97) | | | | | | | | | | | | | | | | |
| 6. | I-dislikes | −0.02 | −0.07 | 0.26 | 0.72 | 0.02 | (0.96) | | | | | | | | | | | | | | | |
| 7. | A-likes | −0.15 | 0.07 | 0.36 | 0.11 | 0.42 | 0.04 | (0.97) | | | | | | | | | | | | | | |
| 8. | A-dislikes | 0.00 | −0.17 | 0.13 | 0.65 | 0.02 | 0.69 | 0.00 | (0.95) | | | | | | | | | | | | | |
| 9. | S-likes | 0.07 | 0.05 | 0.41 | 0.08 | 0.44 | 0.05 | 0.55 | 0.00 | (0.98) | | | | | | | | | | | | |
| 10. | S-dislikes | −0.01 | 0.00 | 0.12 | 0.70 | −0.02 | 0.68 | 0.06 | 0.67 | −0.01 | (0.95) | | | | | | | | | | | |
| 11. | *E*-likes | 0.01 | 0.00 | 0.57 | 0.14 | 0.41 | 0.21 | 0.32 | 0.09 | 0.48 | 0.10 | (0.97) | | | | | | | | | | |
| 12. | E-dislikes | 0.02 | 0.04 | 0.11 | 0.66 | 0.00 | 0.64 | 0.05 | 0.63 | 0.01 | 0.69 | 0.08 | (0.97) | | | | | | | | | |
| 13. | C-likes | 0.07 | 0.04 | 0.61 | 0.20 | 0.34 | 0.22 | 0.37 | 0.11 | 0.48 | 0.14 | 0.55 | 0.12 | (0.97) | | | | | | | | |
| 14. | C-dislikes | 0.00 | 0.07 | 0.22 | 0.76 | 0.03 | 0.73 | 0.07 | 0.61 | 0.07 | 0.70 | 0.16 | 0.70 | 0.21 | (0.97) | | | | | | | |
| 15. | General | 0.18 | 0.01 | 0.06 | −0.06 | 0.10 | −0.08 | 0.01 | −0.07 | 0.10 | −0.07 | 0.06 | −0.13 | 0.04 | −0.10 | (0.90) | | | | | | |
| 16. | Work | 0.25 | 0.00 | 0.06 | −0.01 | 0.13 | −0.05 | 0.07 | −0.03 | 0.11 | −0.03 | 0.04 | −0.04 | 0.04 | −0.04 | 0.78 | (0.87) | | | | | |
| 17. | Co-worker | 0.14 | 0.04 | 0.04 | −0.07 | 0.09 | −0.09 | 0.04 | −0.08 | 0.14 | −0.11 | 0.09 | −0.08 | 0.00 | −0.08 | 0.56 | 0.50 | (0.77) | | | | |
| 18. | Supervisor | 0.01 | −0.02 | 0.02 | −0.12 | 0.05 | −0.08 | 0.01 | −0.13 | 0.08 | −0.10 | 0.01 | −0.16 | −0.03 | −0.13 | 0.42 | 0.36 | 0.43 | (0.85) | | | |
| 19. | Pay | 0.03 | −0.04 | 0.06 | −0.12 | 0.04 | −0.12 | −0.10 | −0.09 | 0.02 | −0.07 | 0.14 | −0.19 | 0.02 | −0.13 | 0.42 | 0.32 | 0.28 | 0.24 | (0.89) | | |
| 20. | Promotion | 0.08 | 0.06 | 0.06 | 0.01 | 0.07 | 0.00 | −0.04 | −0.04 | 0.00 | −0.01 | 0.08 | −0.06 | 0.06 | 0.00 | 0.40 | 0.39 | 0.34 | 0.38 | 0.41 | (0.91) | |
| 21. | DAM | −0.15 | −0.06 | 0.28 | 0.06 | 0.35 | 0.03 | 0.25 | 0.05 | 0.20 | −0.01 | 0.17 | −0.08 | 0.13 | 0.04 | 0.11 | 0.11 | 0.10 | 0.10 | 0.04 | 0.14 | (0.80) |
| | Mean | 0.00 | −0.06 | 3.41 | 1.88 | 4.48 | 1.71 | 4.73 | 2.00 | 4.60 | 2.02 | 4.13 | 2.45 | 3.44 | 1.70 | 2.09 | 1.85 | 2.13 | 1.60 | 1.96 | 1.01 | 3.45 |
| | SD | 0.47 | 0.47 | 0.44 | 1.38 | 0.94 | 1.46 | 0.90 | 1.46 | 0.96 | 1.34 | 0.92 | 1.41 | 1.19 | 1.39 | 0.93 | 0.93 | 1.02 | 0.82 | 1.09 | 0.98 | 0.59 |

Note. N = 489. Cronbach's alphas in parentheses on the diagonal. All correlations above 0.09 are statistically significant at the $p < 0.05$ level. Likes score based on active-positive affective responses, dislikes score based on active-positive affective responses, Incongruence: Active-incongruence.

**Table 2**
Summary of fit indices from confirmatory factor analyses.

| | CAIC | SBIC | $\chi^2$ | *df* | RMSEA | RMSEA (90% CI) | | CFI | SRMR |
|---|---|---|---|---|---|---|---|---|---|
| Study 1 | | | | | | | | | |
| Model A[a] | 76,472.79 | 76,247.79 | 25,297.4 | 1665 | 0.17 | 0.17 | 0.17 | 0.48 | 0.10 |
| Model B | 78,539.49 | 78,344.49 | 27,579.87 | 1695 | 0.18 | 0.18 | 0.18 | 0.43 | 0.30 |
| Model C | 60,107.57 | 59,861.57 | 8781.14 | 1644 | 0.09 | 0.09 | 0.10 | 0.84 | 0.07 |
| Model D[a] | 62,977.67 | 62,677.67 | 11,262.85 | 1590 | 0.11 | 0.11 | 0.11 | 0.79 | 0.13 |
| Model E | 56,132.19 | 55,781.19 | 4050.56 | 1539 | 0.06 | 0.06 | 0.06 | 0.94 | 0.07 |
| Study 2 | | | | | | | | | |
| Model A[a] | 42,914.20 | 42,689.20 | 18,464.36 | 1665 | 0.19 | 0.18 | 0.19 | 0.34 | 0.16 |
| Model B | 37,075.75 | 36,880.75 | 12,826.31 | 1695 | 0.15 | 0.15 | 0.15 | 0.56 | 0.14 |
| Model C | 31,059.23 | 30,813.23 | 6469.11 | 1644 | 0.10 | 0.10 | 0.10 | 0.81 | 0.07 |
| Model D | Model did not converge | | | | | | | | |
| Model E | 28,775.15 | 28,424.15 | 3483.61 | 1539 | 0.07 | 0.06 | 0.07 | 0.92 | 0.06 |

Note. Study 1 $N = 489$; Study 2 $N = 293$. Model A: Affect factors only; Model B: six RIASEC factors; Model C: Twelve RIASEC factors (six likes and six dislikes); Model D: Model with six RIASEC factors and affect method factors; Model E: Model with Twelve RIASEC likes and dislikes factors with affect methods factor. CAIC: Consistent Akaike Information criterion, SBIC: Sample size adjusted Bayesian Information Criteria.
[a] Non-positive definite Psi Matrix.

(RMSEA = 0.06, CFI = 0.95, and SRMR = 0.07). Model E still resulted in better fit than Model D. One possible reason for the theoretically impossible latent correlations in model D between latent factors is due to model misspecification with missing factors common to the indicators, i.e., the need for separate like and dislike factors, resulting in inflated correlations.

We conducted the nested model comparisons with the models that did not have problems in converging. Comparing the nested model B (six RIASEC factors) with model C (twelve RIASEC factors), finds model C to be a better fit—evidence for the duality of like and dislike aspects ($\Delta\chi^2$ (51, $N = 489$) = 18,798.73, $p < 0.001$). However, comparing the nested model C with model E, again finds model E to be a better fit with the data—supporting the duality of vocational personality (Hypothesis 1) and controlling for affect anchor as a methods factor ($\Delta\chi^2$ (105, $N = 489$) = 4730.58, $p < 0.001$). Factor loadings and latent correlation for models are reported in Appendix E Tables E1 to E12.

#### 4.2.2. *Affective measurement of vocational personality*

Results from CUS suggest a pattern of inter-correlations (predicted ordering) expected of Holland's structural hypothesis where $R^2 = 0.60$ is a benchmark for a good/strong fit (Armstrong et al., 2003). Overall, active-positive RIASEC affect scores showed good fit to a quasi-circumplex (Mean $R^2 = 0.72$, *SD* $R^2 = 0.16$), evidence that affect anchor scores functioned as indicators of RIASEC likes (see Table 3). Similarly, active-negative RIASEC affect scores overall showed at moderate to good fit with a quasi-circumplex, (Mean $R^2 = 0.57$, *SD* $R^2 = 0.13$). These results suggest that affective responses to work activities are indicators of RIASEC vocational personality, supporting Hypothesis 2.

**Table 3**
Structural analyses results across all studies.

| Affect anchor | $R^2$ | Affect anchor | $R^2$ |
|---|---|---|---|
| Positive emotions | | | |
| Study 1 | | Study 2 | |
| Interested | 0.82 | Attentive | 0.52 |
| Alert | 0.63 | Alert | 0.47 |
| Determined | 0.53 | Absorbed | 0.52 |
| Enthusiastic | 0.80 | Interested | 0.76 |
| Inspired | 0.91 | | |
| Mean | 0.74 | Mean | 0.57 |
| SD | 0.16 | SD | 0.13 |
| Negative emotions | | | |
| Study 1 | | Study 2 | |
| Distressed | 0.55 | Unwilling | 0.69 |
| Afraid | 0.55 | Sluggish | 0.49 |
| Nervous | 0.34 | Reluctant | 0.51 |
| Scared | 0.46 | Hesitant | 0.52 |
| Upset | 0.76 | Bored | 0.63 |
| | | Tired | 0.51 |
| Mean | 0.53 | Mean | 0.55 |
| SD | 0.15 | SD | 0.08 |

Note. Study 1 $N = 489$, Study 2 $N = 293$. $R^2$ = Variance accounted for in circular unidimensional scaling based on fit to quasi-circumplex model.

**Table 4**
Dominance incremental validity results for Study 1 and 2.

| Step | Variables | General | | | Work | | | Co-worker | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | 95% CI | | | 95% CI | | | 95% CI | |
| | | β | *LB* | *UB* | β | *LB* | *UB* | β | *LB* | *UB* |
| Study 1 | | | | | | | | | | |
| | Congruence | 0.21* | 0.08 | 0.33 | 0.27* | 0.15 | 0.39 | 0.20* | 0.07 | 0.32 |
| | Combined variable | 0.01 | − 0.12 | 0.13 | 0.00 | − 0.12 | 0.12 | 0.06 | − 0.07 | 0.18 |
| Study 2 | | | | | | | | | | |
| | Congruence | − 0.08 | − 0.33 | 0.17 | − 0.05 | − 0.30 | 0.20 | − 0.13 | − 0.38 | 0.13 |
| | Combined variable | − 0.29* | − 0.53 | − 0.04 | − 0.27* | − 0.52 | − 0.03 | − 0.27* | − 0.52 | − 0.02 |

Note. Study 1 $N = 488$; Study 2 $N = 293$. Standardized β reported. Study 1, Combined variable includes active-incongruence; Study 2, Combined variable includes passive-incongruence. Combined variable = incongruence + (− congruence), to preserve the expected negative relationship on incongruence after adjusting for congruence, see Appendix D.

* $p < 0.05$, 95% confidence interval does not include zero.

#### 4.2.3. Congruence and active-incongruence

From Table 1, correlational results supported the criterion validity of congruence in predicting job satisfaction, but not for active-incongruence. Congruence and incongruence indices were relatively distinct ($r$ (488) = 0.05, $p = 0.32$).

Congruence was positively related to the more intrinsic facets of work ($r$ (489) = 0.25, $p < 0.01$), co-worker ($r$ (489) = 0.14, $p < 0.01$), and general ($r$ (489) = 0.18, $p < 0.01$) job satisfaction. Congruence did not relate to extrinsic facets of satisfaction: pay ($r$ (489) = 0.03, $p = 0.35$), promotion ($r$ (489) = 0.08, $p = 0.21$), and supervisor satisfaction ($r$ (489) = − 0.02, $p = 0.69$). We did not find a relationship between active-incongruence with: general ($r$ (488) = 0.01, $p = 0.89$), work ($r$ (488) = 0.00, $p = 0.96$), co-worker ($r$ (488) = − 0.04, $p = 0.35$), pay ($r$ (488) = − 0.04, $p = 0.21$), promotion ($r$ (488) = 0.06, $p = 0.21$), and supervisor satisfaction ($r$ (488) = − 0.02, $p = 0.69$).

Results from the regression using the combined variable did not find evidence for dominance incremental validity of active-incongruence over congruence for any facet of satisfaction (see Table 4 for results). Dominance analysis results indicate that congruence had complete dominance over active-incongruence in predicting general ($D_{ij} = 0$), work ($D_{ij} = 0$), and co-worker satisfaction ($D_{ij} = 0$), i.e., in all possible regression models, congruence always explained more variance than active-incongruence. Thus, we did not find a support for incremental validity for active-incongruence (Research question 1).

#### 4.2.4. Discussion

In support of hypothesis 1 and 2, we found evidence for the duality of vocational personality and that affective responses—other than *feeling* interested—can serve as indicators of vocational personality. We found model E to be a better fit with the data compared to all other competing models. These CFA results provide evidence for a duality of vocational personality. CUS results showed that overall; active-positive and active-negative RIASEC affect scores had reasonable fit with Holland's (1997) RIASEC model.

In support of hypothesis 3a, Study 1 results indicated a positive relationship between active-positive based congruence and work, co-workers, and general job satisfaction; congruence was also not related to pay, promotion, and supervisor satisfaction. Contrary to hypothesis 3b, we did not find a relationship between active-incongruence and facets of satisfaction, despite the relative independence between the two congruence variables.

Given the lack of clarity as to which negative emotions are indicators of vocational personality, affective anchors from other emotion quadrants may be useful for understanding the disliking aspect of the duality. In Study 2, we sought to replicate our findings with active-positive affective anchors (e.g., interested and inspiring), but investigate the dislikes aspect using negative affective anchors from the passive-negative quadrant of emotional space. Accordingly, we examine the predictive and incremental validity of passive-incongruence.

## 5. Study 2

### 5.1. Sample and procedures

Participants were working adults from the United States. The data were collected in two back-to-back batches resulting in a sample size of 339. If a respondent took the survey twice, only their first response was used. After removal of repeat responders and data cleaning steps as outlined in the general methods section, the final sample size is 293 participants (51.20% Female, $M_{age} = 39.01$ years; $SD_{age} = 12.68$ years). Participants worked an average of 41.80 h per week ($SD = 7.41$ h). In Study 2, we also measured turnover intention and subjective vocational interest fit but did not examine them in the current paper. With the inclusion of more variables, we were mindful of potentially increasing response fatigue. Thus, the total number of activities per RIASEC type was reduced from six to five and scale points per item from seven to five. Activities were selected from the RIASEC markers in the O*NET Interest Profiler (Armstrong et al., 2008). To capture passive-negative emotions, six passive-negative emotions that denoted low-activation and negative-valence (bored, hesitant, reluctant, sluggish, tired, and unwilling) were selected. Positive emotions were

measured using four active-positive emotions capturing high-activation and positive-valence (absorbed, alert, attentive, and interested).

### 5.2. Results

The correlations and descriptive statistics for Study 2 are presented in Table 5.

#### 5.2.1. Duality of vocational personality

In conducting the CFA, the estimated variance-covariance (Psi) matrix for model A was not positive definite, due to multiple latent correlations that exceeded 1 (see Table 2). Like Study 1, we attempted to remedy this by constraining correlation values to 1 but this did not resolve the problems with convergence. Eventually, a reduced model with three affective anchors (absorbed, reluctant, and sluggish) converged without problems. This reduced model, however, fit the data poorly (RMSEA = 0.21, CFI = 0.48, and SRMR = 0.12). These results are against the interpretation implied by Model A: emotions account for the data. It possible that the theoretically impossible latent correlations between latent factors are due to missing factors common to the indicators, i.e., RIASEC factors, that are unaccounted resulting in impossible correlations. We conducted the nested model comparisons with the models that did not have problems in converging.

Similar to Study 1, we had problems estimating model D: it failed to converge. We attempted to rule out alternate explanations for why the model did not converge. These include: (a) differences in scaling, (b) factor to indicator ratio, (c) poor scale reliability, (d) under identification, (e) sample size, and (f) model misspecification (Brown, 2006; Chen, Bollen, Paxton, Curran, & Kirby, 2001). These explanations were ruled out because the model and/or dataset were: (a) generated using measures with the same number of scale points, (b) had reasonable indicator to factor ratio ($p/r$ ratio = 3.75), (c) had reasonable scale reliability (average α for affect indicators = 0.82), and (d) was over identified. It is possible that the non-convergence observed in Study 2 model D was due to fitting a complex model to data from a smaller sample ($N_{\text{Study2}} = 293$) than was used for model Study 1's model D ($N_{\text{Study1}} = 489$). However, because model D in Study 1 also resulted in an improper solution, and model E, a more complex model than model D, converged without problems, sample size was not the main reason model D failed to converge. The best explanation for failure to converge seems to be model misspecification.

As found in Study 1, model E fitted the data best (RMSEA = 0.06, CFI = 0.94, and SRMR = 0.04). The nested model comparisons were conducted with the models that did not have problems in converging and similar results to the Study 1 were found. First, comparing the nested model B (six RIASEC factors) with model C (twelve RIASEC factors), again finds model C to be a better fit ($\Delta\chi^2$ (51, $N$ = 293) = 7014.00, $p < 0.01$). Lastly, comparing the nested model C with model E, again finds model E to be a better fit with the data ($\Delta\chi^2$ (105, $N$ = 293) = 2246.39, $p < 0.01$). In sum, our CFA results support the duality of vocational personality and controlling for affect anchors as a method effect, in support of Hypotheses 1. Factor loadings and latent correlation for models are reported in Appendix E Tables E13 to E21.

#### 5.2.2. Affective measurement of vocational personality

In support of Hypothesis 2, results from CUS suggest a pattern of inter-correlations (predicted ordering) expected of Holland's (1997) RIASEC model. Overall, active-positive RIASEC affect scores showed moderate-good fit to a quasi-circumplex, (Mean $R^2$ = 0.53, SD $R^2$ = 0.15)—evidence that affect anchor scores functioned as indicators for the positive liking aspect. Similarly, passive-negative RIASEC affect scores showed moderate-good fit to a quasi-circumplex, (Mean $R^2$ = 0.55, SD $R^2$ = 0.08). Altogether, these results suggest that affective responses to work activities could be indicators for the vocational personality, in support of Hypothesis 2.

#### 5.2.3. Congruence and passive-incongruence

In Study 2 results mostly supported the criterion validity of both congruence indices (see Table 5). Congruence was positively related to intrinsic facets of work ($r$ (293) = *0.*18, $p < 0.01$) and general ($r$ (293) = 0.17, $p < 0.01$) job satisfaction, but only marginally with co-worker satisfaction ($r$ (293) = *0.*11, $p$ = 0.06. As hypothesized congruence did not relate to extrinsic facets of pay ($r$ (293) = *0.*02, $p$ = 0.72), promotion ($r$ (293) = *0.*06, $p$ = 0.28), and supervisor satisfaction ($r$ (293) = − 0.04, $p$ = 0.54).

Passive-incongruence was negatively related to commensurate facets of work ($r$ (293) = − 0.21, $p < 0.01$), co-worker ($r$ (293) = − 0.16, $p < 0.01$), and general ($r$ (293) = − 0.20, $p < 0.01$) job satisfaction, but not to pay ($r$ (293) = − *0.*05, $p$ = 0.44), promotion ($r$ (293) = − 0.09, $p$ = 0.13), and supervisor satisfaction ($r$ (293) = − 0.05, $p$ = 0.39).

Regarding research question 2, we found evidence for dominance incremental validity for passive-incongruence. Using regression and after adjusting for congruence, passive-incongruence (through the combined variable) significantly predicted general, work, and co-worker satisfaction (see Table 4). In contrast, congruence did not significantly predict general, work, and co-worker satisfaction. Running the regression model with only congruence, we found congruence to be a significant predictor for satisfaction: general satisfaction, $\beta$ = 0.18, $t$ (290) = 0.31, $p < 0.01$, 95% CI [0.07, 0.29]; work satisfaction, $\beta$ = 0.19, $t$ (290) = 0.19, $p < 0.01$, 95% CI [0.08, 0.30]; and co-worker satisfaction, $\beta$ = 0.12, $t$ (290) = 0.19, $p < 0.05$, 95% CI [0.01, 0.23]. Dominance analysis results indicated that passive-incongruence had complete dominance over congruence in predicting general ($D_{ij}$ = 1), work ($D_{ij}$ = 1), and co-worker satisfaction ($D_{ij}$ = 1), i.e., in all possible regression models, passive-incongruence always explained more variance than congruence. Results from multiple regression and dominance analysis provide evidence for the dominance incremental validity of passive-incongruence.

**Table 5**
Correlations and descriptive statistics for Study 2.

| | Variable | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. | Congruence | – | | | | | | | | | | | | | | | | | | | | |
| 2. | Incongruence | −0.62 | – | | | | | | | | | | | | | | | | | | | |
| 3. | R-likes | −0.07 | 0.04 | (0.95) | | | | | | | | | | | | | | | | | | |
| 4. | R-dislikes | 0.07 | −0.04 | −0.52 | (0.97) | | | | | | | | | | | | | | | | | |
| 5. | I-likes | −0.19 | 0.12 | 0.50 | −0.27 | (0.96) | | | | | | | | | | | | | | | | |
| 6. | I-dislikes | 0.13 | −0.11 | −0.21 | 0.61 | −0.63 | (0.97) | | | | | | | | | | | | | | | |
| 7. | A-likes | −0.24 | 0.17 | 0.31 | −0.06 | 0.43 | −0.22 | (0.95) | | | | | | | | | | | | | | |
| 8. | A-dislikes | 0.09 | −0.13 | −0.07 | 0.35 | −0.20 | 0.50 | −0.57 | (0.96) | | | | | | | | | | | | | |
| 9. | S-likes | 0.05 | −0.07 | 0.37 | −0.07 | 0.41 | −0.17 | 0.40 | −0.13 | (0.94) | | | | | | | | | | | | |
| 10. | S-dislikes | −0.04 | −0.02 | −0.02 | 0.32 | −0.16 | 0.43 | −0.09 | 0.38 | −0.56 | (0.95) | | | | | | | | | | | |
| 11. | E-likes | 0.12 | −0.09 | 0.38 | −0.06 | 0.40 | −0.10 | 0.29 | −0.04 | 0.46 | −0.14 | (0.92) | | | | | | | | | | |
| 12. | E-dislikes | −0.03 | 0.09 | −0.02 | 0.51 | −0.12 | 0.51 | 0.02 | 0.35 | −0.10 | 0.50 | −0.40 | (0.95) | | | | | | | | | |
| 13. | C-likes | 0.17 | −0.17 | 0.40 | −0.16 | 0.27 | −0.05 | 0.13 | 0.06 | 0.44 | −0.19 | 0.47 | −0.17 | (0.95) | | | | | | | | |
| 14. | C-dislikes | −0.13 | 0.22 | −0.11 | 0.49 | −0.07 | 0.36 | 0.11 | 0.27 | −0.09 | 0.39 | −0.11 | 0.50 | −0.54 | (0.98) | | | | | | | |
| 15. | General | 0.17 | −0.20 | 0.03 | −0.02 | 0.06 | −0.06 | 0.04 | −0.02 | 0.13 | −0.10 | 0.12 | −0.13 | 0.05 | 0.00 | (0.91) | | | | | | |
| 16. | Work | 0.18 | −0.21 | 0.04 | 0.01 | 0.13 | −0.08 | 0.04 | 0.01 | 0.12 | −0.09 | 0.11 | −0.11 | 0.04 | 0.01 | 0.84 | (0.90) | | | | | |
| 17. | Co-worker | 0.11 | −0.16 | 0.04 | 0.00 | 0.07 | −0.04 | 0.04 | −0.04 | 0.18 | −0.10 | 0.13 | −0.11 | 0.00 | 0.04 | 0.64 | 0.55 | (0.80) | | | | |
| 18. | Supervisor | −0.04 | −0.05 | −0.02 | −0.02 | −0.03 | 0.02 | −0.01 | 0.04 | 0.08 | −0.07 | 0.03 | −0.08 | 0.04 | −0.02 | 0.57 | 0.46 | 0.56 | (0.83) | | | |
| 19. | Pay | −0.02 | −0.05 | −0.10 | −0.03 | −0.08 | 0.05 | −0.09 | 0.08 | −0.05 | −0.01 | 0.03 | −0.11 | 0.01 | −0.01 | 0.56 | 0.43 | 0.37 | 0.47 | (0.89) | | |
| 20. | Promotion | 0.06 | −0.09 | 0.01 | −0.11 | −0.08 | −0.04 | −0.09 | 0.01 | −0.04 | −0.06 | −0.01 | −0.16 | 0.01 | −0.05 | 0.47 | 0.47 | 0.39 | 0.49 | 0.49 | (0.91) | |
| 21. | DAM | −0.10 | 0.09 | 0.25 | −0.22 | 0.34 | −0.27 | 0.22 | −0.05 | 0.21 | −0.15 | 0.10 | −0.14 | 0.10 | −0.02 | 0.13 | 0.10 | 0.08 | 0.10 | 0.05 | 0.16 | (0.80) |
| | *Mean* | 0.05 | −0.03 | 2.64 | 2.60 | 3.06 | 2.32 | 3.40 | 1.87 | 2.94 | 2.49 | 3.20 | 2.41 | 2.52 | 2.61 | 2.03 | 1.85 | 2.10 | 1.94 | 1.56 | 1.03 | 3.49 |
| | *SD* | 0.46 | 0.47 | 0.90 | 1.00 | 0.97 | 0.96 | 0.94 | 0.82 | 0.92 | 0.91 | 0.81 | 0.87 | 0.87 | 1.07 | 0.97 | 1.06 | 0.87 | 0.95 | 1.07 | 1.03 | 0.08 |

Note. N = 293. Cronbach's alphas in parentheses on the diagonal. All correlations above 0.12 are statistically significant at the $p < 0.05$ level. Likes score based on active-positive affective responses, dislikes score based on passive-positive affective responses, Incongruence: Passive-incongruence.

#### 5.2.4. Discussion

We replicated the findings in Study 1 of the duality and affective measurement of vocational personality. Similarly, we found the latent model with dual RIASEC factors (separate likes and dislikes) with anchor method factors to be a better fit with observed data when compared to alternate model specifications. These results provide evidence for the duality of vocational personality: likes and dislikes. Results from the structural analyses showed that the affect anchors scores exhibited intercorrelations expected of Holland's hexagon.

Hypotheses 3a and 3c, were largely supported. Similar to Study 1, congruence was positively related to work and general job satisfaction, but not pay, promotion, and supervisor satisfaction. Importantly, a negative relationship between passive-incongruence and work, co-worker, and general job satisfaction was found, but no relationship for extrinsic facets (pay, promotion, and supervisor satisfaction). We found some evidence for predictive validity for both congruence and passive-incongruence. However, results from multiple regression and dominance analysis suggest that including passive-incongruence as a competing predictor not only predicts satisfaction, but the variance once accounted for by congruence is completely subsumed under passive-incongruence. It is possible that passive-incongruence explains more of variance due to the asymmetric nature between positive and negative appraisals. Individuals are more affected by activities that bore them than by activities that engage them (Baumeister, Bratslavsky, Finkenauer, & Vohs, 2001). Passive-incongruence may be more important to understanding the link between vocational personality and job satisfaction compared to congruence based on likes.

## 6. General discussion

We systematically investigated whether there was an underlying duality using affective responses as indicators of vocational personality. Informed by semantic differential methods, we captured individuals' affective responses to RIASEC activities, using affect anchors rather than traditional ‘like’ and ‘dislike’ evaluative terms. In both studies, models that specified the vocational personality duality while controlling for possible methods factors consistently fit the data better when compared with other competing models. Factor models that represented data either as driven by purely affective response or a single bipolar motivational orientation consistently showed poor fit. These results provide support for an underlying duality of vocational personality. Structural analyses also consistently indicated that RIASEC scores obtained using the different affect anchors, exhibited the structural properties characteristic of Holland's (1997) RIASEC model. This provides further evidence that obtaining affective responses is a viable means to measure Holland's vocational personality. This is in support of Holland's (1997) theory of vocational personality—that responses to interest inventories, capture more than just *interest* (p. 8), but include a more complex constellation of different components such as affect (Staats et al., 1973). Rather than solely consisting of feeling interested in a work activity or environment per se, the positive liking aspect of vocational personality may be broadened to include other emotions such as inspired and enthusiastic. Of note, RIASEC affect scores from both active-negative and passive-negative anchor responses exhibited Holland's RIASEC model. Thus, the underlying disliking aspect of vocational personality may consist of two sub-processes, one indicated by active-negative emotions and another by passive-negative emotions. Taken together, using unipolar scales and affect anchors, we can examine not only the activities a person finds interesting and are drawn to, but also the activities they find aversive (distressing or boring).

Because we used affect anchors from three quadrants (one for like and two for dislike), we could re-examine the Holland's (1997) congruence hypothesis using three fit-indices. The first fit index based on the liking aspect, congruence, is derived from affect anchors that capture affective responses to work activities that are high in activation and high in pleasantness. Across both studies, we find as expected that active-positive congruence consistently predicted the expected intrinsic facets of satisfaction but not extrinsic facets like pay satisfaction. The second fit index based on the dislike aspect, active-incongruence, is derived from anchors capturing affective responses to work activities that are high in activation and high in unpleasantness. We found this index did not predict any of the facets of job satisfaction—despite structural analyses and confirmatory factor analysis indicating that a disliking aspect of vocational personality was driving the observed responses. The third index based on the disliking aspect, passive-incongruence, is derived from affect anchors that capture affective responses to work activities that are low in activation and high in unpleasantness. We found passive-incongruence negatively predicted the expected intrinsic facets of satisfaction but not extrinsic facets like pay.

The present research findings have theoretical implications. They provide a link between vocational personality and theories of emotion. That vocational personality includes affective responses to stimuli is akin to how affect is studied in emotion psychology. For instance, the concept of emotional schema represents enduring affective-cognitive structures developed through experience (Izard, 2007). These emotional schemas can be activated by relevant stimuli, soliciting emotions corresponding to that schema. Thus, vocational personality may instead be conceptualized as crystallized or learned emotional schemas that represent enduring emotional dispositions towards various work activities (Staats et al., 1973). Of practical importance, passive-incongruence showed incremental validity, in explaining additional unaccounted variance. However, it did more than explain incremental variance; passive-incongruence explained the variance previously accounted for by active-positive (traditional) congruence. Therefore, if individuals experience misfit in their job because the activities are boring (thus engaging the disliking aspect), they would feel less satisfied in their job, even if the job contains some activities that fit their vocational personalities. These results dovetails and complements more recent research on boredom (e.g., Pekrun et al., 2010), that suggests that what bores people at work is important for understanding work outcomes. More broadly, passive-incongruence may provide insight into why students avoid subjects such as science or mathematics (Elsworth, Harvey-Beavis, Ainley, & Fabris, 1999; Larson, Pesch, Bonitz, Wu, & Werbel, 2014). Rather than a lack of interest, aversion to these subjects may due to boredom. In both cases, vocational personality misfit (passive-incongruence) may be one source of such boredom.

### 6.1. Limitations and future directions

Although we tried to examine as many emotions as possible, given the myriad of discrete emotions available, it was impossible to examine the complete emotion space or emotion families. We did not explore emotions from the quadrant of passive-positive (e.g., feeling calm), or affect anchors from active-positive and passive-positive quadrants simultaneously, or more than two quadrants simultaneously. The apriori selection of at least three semantically different anchors from three quadrants will result in reasonable factor to indicator ratio for testing model E ($p/f$ = 3.6). Although the anchor 'interested' ($R^2$ = 0.82) expectedly had good structural fit to Holland's model, other anchors both positive (e.g., attentive, $R^2$ = 0.47) and negative (e.g., nervous, $R^2$ = 0.34) exhibited poorer fit. Future research is needed to find other affect anchors that better conform to Holland's model or, alternatively, examine if the lower fit observed are typical non-interest anchors. We did find incremental validity for passive-incongruence over congruence using unipolar measurement. With our focus on only unipolar scales, it is uncertain if unipolar scales still provide incremental validity compared to bipolar scales. Future research is needed examining how our affective anchors compare to bipolar anchors typically used.

In Study 1, we did not find a link between active-incongruence and any of the facets of job satisfaction. Instead of job satisfaction, it is possible the utility of active-incongruence lies in predicting negative outcomes beyond the scope of our studies, e.g., work withdrawal. Alternatively, there might be a restriction of range as respondents who felt highly activated with negative emotions are not likely to remain in the job; in contrast, individuals might be more willing to endure a job that bores them.

Attempted replications may extend the comparisons for the generalizations of duality latent model across different groups and settings. One potential question whether the factor loadings for positive and negative affect are the same for women and men via measurement invariance. In addition, examining affective responses from the active-negative and passive-negative quadrants simultaneously would be important given the differences observed in the criterion validity of active-incongruence and passive-incongruence for job satisfaction.

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