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**THE DEVELOPMENT AND VALIDATION OF IMPLICIT MEASURES OF JOB
SATISFACTION FOR STUDENTS**

A Master's Thesis

Presented to

The Graduate College of
Missouri State University

In Partial Fulfillment

Of the Requirements for the Degree

Master of Science, Industrial-Organizational Psychology

By

Xin Wei Ong

May 2021

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Industrial-Organizational Psychology

Missouri State University, May 2021

Master of Science

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ABSTRACT

Job satisfaction is one of the most researched topics in industrial-organizational psychology and explicit (self-report) measures are the most common assessment method. However, self-report measures are contaminated by inaccurate self-knowledge and impression management artifacts, which may weaken the predictive validity of the measures. The Implicit Association Test (IAT) might address these limitations because the procedure is based on reaction times in classification tasks. This research developed personalized implicit measures of job satisfaction using IATs and investigated their construct validity in a college sample. The construct validity of the measures was investigated with a multitrait-multimethod design. Results indicated problems with some psychometric properties for some measures, while confirmatory factor analyses provided some evidence supporting the IATs' convergent and discriminant validity.

KEYWORDS: job satisfaction, supervisor, coworkers, work, college, implicit measures, Implicit Association Test, Single-Target Implicit Association Test, Personalized Implicit Association Test, confirmatory factor analysis

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In the interest of academic freedom and the principle of free speech, approval of this thesis indicates the format is acceptable and meets the academic criteria for the discipline as determined by the faculty that constitute the thesis committee. The content and views expressed in this thesis are those of the student-scholar and are not endorsed by Missouri State University, its Graduate College, or its employees.

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INTRODUCTION

Job satisfaction is the degree to which an individual's affective response to the overall evaluation of the job is favorable or unfavorable (Jex & Britt, 2014). One's feelings about his or her job are very important, and they can significantly impact behavior. To date, job satisfaction is one of the most popular research topics in industrial-organizational psychology and organizational behavior (Bowling et al., 2018; Jex & Britt, 2014). Like other attitudes, job satisfaction has cognitive, affective, and behavioral components that have crucial implications for organizational effectiveness (Breckler, 1984).

The cognitive component of job satisfaction stands for employees' credence, and thoughts on their job or workplace can vary from exciting, invigorating, boring, or exhausting (Breckler, 1984). Such credence is related to the affective component of job satisfaction, which represents employees' emotions ranging from pleasurable to unpleasurable feelings towards their job (Jex & Britt, 2014). The affective component of job satisfaction can be measured through observing physiological responses or self-report on one's feelings or mood. The behavioral component of job satisfaction involves employees' conduct, overt actions, or verbal responses towards their job ranging from favorable and caring to unfavorable and toxic (Breckler, 1984). For instance, job satisfaction may be manifest in low absenteeism, high organizational tenure, and citizenship behavior (Jex & Britt, 2014). However, the behavioral component may show limited information on one's job satisfaction level as behaviors might not necessarily reflect one's attitudes towards his or her job (Fishbein, 1979; Jex & Britt, 2014). Hence, most job satisfaction measures focus on the affective and cognitive components (Schleicher et al., 2004).

Importance of Job Satisfaction

Understanding job satisfaction can help to address employees' well-being and productivity as most people spend a substantial portion of their lives at work. Thus, job satisfaction has a significant impact on employees' work-related behaviors and attitudes. Much research has been done to explore the relationship between job satisfaction and job performance and led the organizational researchers to name it the "holy grail" of organizational behavior and industrial psychology (Landy, 1976; Weiss & Cropanzano, 1996). The massive amount of research on the job satisfaction-job performance relationship opened the opportunity for researchers to reexamine the relationship between these two variables (e.g., Iaffaldano & Muchinsky, 1985; Judge et al., 2001, Schleicher et al., 2004). Weak (.17) to moderate (.30) correlations have been reported, according to Iaffaldano and Muchinsky (1985) and Judge et al. (2001). Different measurement methods and study designs have been offered as potential causes of variation of results and correlations in these meta-analyses. For instance, Judge et al. (2001) proposed at least seven ways to describe the relationship between job satisfaction-job performance, including causal effect, attitudes lead to behavior, reciprocal relationship, spurious correlation, moderators, no direct relationship, and alternative conceptualization.

Measurement of Job Satisfaction

In reality, job satisfaction is a multidimensional construct that encompasses different facets of satisfaction such as work, coworker relations, supervision, pay, benefits, advancement opportunity, and organizational practices (Wild et al., 2006). To this date, there is a lack of consensus as to which facets are more important, and one may find satisfaction with some facets while at the same time dissatisfaction with others (Ravari et al., 2012).

Due to the popularity of job satisfaction research, psychologists have developed reliable and valid instruments to measure job satisfaction. The most common way to measure job satisfaction is through explicit measures such as self-reports, where a person consciously thinks about how he or she wants to describe himself or herself through completing questionnaires (Wilson & Dunn, 2004). The continuous research in job satisfaction has helped the researchers gather evidence and test-retest reliability over several decades to support the construct validity of the measures of different job satisfaction facets (Jex & Britt, 2004). For example, the Job Satisfaction Survey (JSS) developed by Spector (1985) contains 36 items with Likert response scales measuring nine facets of job satisfaction – pay, promotion, supervision, fringe benefits, contingent rewards, operating procedures, coworkers, nature of work, and communication.

The use of explicit measures has benefited the researchers in assessing job satisfaction as explicit measures are cheap, easy to access, administer, score, and interpret. However, these explicit measures allow a person to think carefully before responding to questions. As a result, scores can suffer from impression management – deceptive efforts to be seen in a more favorable way (Learly & Kowalski, 1990). Besides that, Rosenberg (1969) proposed that evaluation apprehension may be present in the explicit measures and cause respondents to change their responses. For instance, if an individual is responding to a turnover intention survey in his or her workplace, he or she may provide a more positive rating than what he or she thinks so that it is viewed positively by the management.

Implicit Measures – The Traditional Implicit Association Test

To control for contamination from impression management efforts, implicit measures may be used to assess attitudes related to job satisfaction. Greenwald and Banaji (1995) argued

that implicit attitude is “introspectively unidentified (or inaccurately identified) traces of past experience that mediate favorable or unfavorable feelings, thought or action toward a social object” (p.5). Greenwald et al. (1998) created the Implicit Association Test (IAT) to assess implicit attitudes of racial preference and stereotypes using reaction times on classification tasks to measure the strength of association between “target-concept” (category label) and an “attribute dimension” (attribute label).

Participants are presented with stimuli (words) in the middle of a computer screen, and they are required to sort them into alternative categories and attributes by pressing specific letters on the keyboard. Category and attribute labels are displayed in the upper left and upper right corners of the screen, while a stimulus word is presented in the middle of the screen. Participants press the “E” key if the stimulus word belongs to one of the upper left categories—attribute pair and press the “I” key if the stimulus word belongs to the upper right category—attribute pair (see Table 1). If the participants sort the stimulus word to the wrong category, error feedback (the red letter “X”) will appear; participants have to resort the stimulus word to the correct category as soon as possible. The participants must sort the words as fast as possible with minimal mistakes as sorting time is used to calculate the strength of the association between the category and attribute pair. As the sorting time decreases (sort correctly with fewer mistakes), the strength of the association between the category and attribute increases. As the sorting time increases (sort incorrectly with more errors), the strength of the association between the category and attribute decreases (Lane et al., 2007).

For example, Greenwald et al. (1998) describe an IAT to assess attitudes toward flowers and insects using an evaluative attribute (categories of good and bad). Participants classified stimulus words as flowers (e.g., tulip, rose, etc.) by pressing the “E” key or as insects (e.g., ant,

bee, etc.) by pressing the “I” key) as fast as possible in the first block of 20 trials. In the second block of 20 trials, words were classified as good (e.g., wonderful, beautiful, etc.) or bad (e.g., awful, nasty, etc.) by pressing the “E” key or “I” key. A category and attribute are paired in the third block of 20 trials (flower + good and insect + bad). This is called a “compatible” block because the category and attribute are paired in the hypothesized manner. The fourth block uses the same sorting procedure as the third block except that the fourth block includes 40 trials. Attribute categories shift sides in block five with “bad” on the left and good on the right, and subjects practice classifying only attribute stimuli for 20 trials. The sixth and seventh blocks use the same sorting procedures as the third and fourth blocks with the reversed pairing of the category and attribute (flower + bad and insect + good). These are called “incompatible” blocks because the category and attribute are paired in a non-hypothesized manner. The IAT score is based on the difference in mean response latencies between the compatible and incompatible blocks. As the mean response latency increases, the strength of association between the category and attribute of the particular pair decreases as compared to the other pair (Lane et al., 2007).

Greenwald et al. (2002) and Lane et al. (2007) provide evidence that the IAT is less susceptible to contamination related to impression management and inaccurate self-knowledge artifacts. Specifically, Greenwald et al. (1998) proposed that the IATs “may reveal attitudes and other automatic associations even for participants who prefer not to express those attitudes” (p. 1464). For instance, an individual might not show negative feelings towards coworkers because he or she does not want to be isolated by his or her coworkers in the workplace. Besides that, an individual’s self-awareness might not truly represent how he or she will act and respond in relevant situations. For instance, an individual may explicitly state he or she does not have a prejudicial bias against minorities but show prejudicial behavior during interaction with others.

The Single – Target Implicit Association Test

Other than the traditional IAT, which employs bipolar target and attribute categories, another version of IAT, the single-target IAT (ST-IAT), was developed by Wigboldus et al. (2004) in an attempt to measure single concepts more successfully. The ST-IAT used a procedure similar to the traditional IAT with the exception that the ST-IAT only has one target category. Since the ST-IAT only measures one category, only five blocks are needed instead of seven by eliminating the first block and the fifth block of the traditional IAT (see Table 2). For example, an ST-IAT can be used to measure implicit attitudes towards flowers (one category) with two attribute labels (good and bad). The first block requires participants to sort stimulus words to attribute labels of good (upper left corner) and bad (upper right corner) instead of the category. The critical block added flower category to either the upper left or right corner depending on the block order on top of the attribute words.

The Personalized Implicit Association Test

Olson and Fazio (2004) proposed an alternative form of IAT to decrease the contamination of the “extrapersonal associations,” which refers to “associations that are available in memory but irrelevant to the perceived likelihood of personally experiencing a positive or negative outcome on interaction with the attitude object” (p. 653). The authors argued that three features from the traditional IAT might lead to extrapersonal associations. Firstly, the category labels (e.g., “pleasant” and “unpleasant”) could have normative implication in which the stimulus word (e.g., wonderful, crash) presented on the screen is automatically categorized to the category of “pleasant” or “unpleasant,” and it does not necessarily represent the attitudes of the respondents. Secondly, the stimulus words for the “pleasant” and “unpleasant” attribute

categories are typically normative positive or negative, which is either like or dislike by everyone universally. Lastly, the traditional IAT will show a red letter “X” error feedback if the participants sorted the stimulus word incorrectly, which illustrates the correct response normatively. Hence, the presence of such normative information might influence one’s attitudes on the performance of the sorting tasks (Olson & Fazio, 2004).

Olson and Fazio (2004) developed a “personalized” IAT by making modifications to the traditional IAT to reduce the influence of normative information. They changed the attribute labels of “pleasant” and “unpleasant” to “I like” and “I don’t like.” Additionally, they removed the red letter “X” error feedback in the personalized IAT as the modified version is measuring one’s preference on the stimulus word rather than sorting it to the normative right category. Their efforts of personalizing the IAT improved the correlations with the explicit measures of the same construct (Boyd, 2017).

Implicit Job Satisfaction

Sumner and Haines (2004) measured implicit job satisfaction by assessing the strength between the category (my job/not my job) and valence (pleasant/unpleasant). Specifically, participants classified the stimuli to the category of “my job” and “not my job” paired with “pleasant” and “unpleasant.” The final averaged response latency indicates the participants’ level of job satisfaction with stimulus words related to their job and not related to their job. The results of their implicit job satisfaction measure yielded significant moderate correlations ($r = .38$, $r = .36$) with the Job Descriptive Index (JDI)’s Work subscale ($\alpha = .90$) and the short form of Minnesota Satisfaction Questionnaire (MSQ; $\alpha = .89$), respectively. Although JDI’s Work subscale is correlated with their implicit job satisfaction measure, they found nonsignificant

correlations between implicit job satisfaction measure and JDI subscales of Pay, Promotions, Coworker, and Supervisor, suggesting that implicit and explicit measures may have different measurement characteristics (Haines & Sumner, 2006). The authors added that they are only able to interpret the findings based on the JDI's Work subscale as participants classified words to the category that represents or does not represent their job. Since the classification of words was different for each participant (e.g., lawyer vs. accounting vs. custodial work), the individual and job differences were present, making these confounds difficult to rule out (Boyd, 2017).

Boyd (2010) used the Single Target IAT (ST-IAT) to assess implicit job satisfaction with other explicit job satisfaction measures and other work-related attitudes and behaviors among participants in the customer service field. Boyd (2010) found significant small correlations of implicit job satisfaction measures with explicit measures of MSQ ($r = .15$) and OJS ($r = .16$), suggesting construct validity among these measures. Additionally, Boyd (2010) also found the relationship between the ST-IAT job satisfaction measure with other explicit affective commitment measures, job involvement, lateness frequency, and turnover intention. However, no relationship was found between the ST-IAT job satisfaction measure with organizational citizenship behaviors, counterproductive work behaviors, or other lateness and absenteeism measures.

Boyd (2017) extended her 2010 study by proposing a personalized implicit job satisfaction measure of the ST-IAT (P-IAT) to improve the accuracy of the implicit job satisfaction measure, increase the correlations with explicit measures targeting on work-related attitudes and behaviors, and increase understanding of job satisfaction conduct in two separate studies.

In Study 1, Boyd (2017) used the multitrait-multimethod design (MTMM; Campbell & Fiske, 1959) to assess the implicit (ST-IAT and P-IAT) and explicit measures of the same construct to find construct validity evidence. Specifically, the same construct should be related and differentiated, such that the similar constructs should illustrate a stronger relationship than different constructs to show convergent and discriminant validity. The explicit and implicit measures of job satisfaction were used to examine convergent validity, and attitudes towards Christianity (Wigboldus et al., 2004) were used to examine discriminant validity as these two constructs should not overlap with each other. In Study 2, Boyd (2017) examined the convergent and discriminant validity of P-IAT with both explicit and implicit measures of work-related attitudes and behaviors, including organizational commitment, job involvement, organizational citizenship behavior, counterproductive work behavior, absenteeism, lateness, turnover intention, and other perspective items.

Surprisingly, Boyd (2017) did not find any significant relationships between P-IAT with explicit job satisfaction measures in both studies. A significant and stronger relationship with better convergent validity was found between the ST-IAT with all explicit job satisfaction measures compared to the previous research (i.e., Boyd, 2010). Boyd (2017) found weak convergent and discriminant validity for ST-IAT and P-IAT job satisfaction measures for Study 1 ($r = .18$) and Study 2 ($r = .21$). Additionally, the ST-IAT was significantly correlated with job involvement and counterproductive work behaviors. Higher correlations between the ST-IAT, organizational citizenship behaviors, and counterproductive work behaviors were found when participants gave ratings from other's perspectives than their own perspectives.

The current study sought to replicate and extend the work of Boyd (2017), who developed and validated personalized implicit measures of job satisfaction with a sample of

subjects who held jobs in customer service. This study examines the psychometric properties of student-focused measures of satisfaction and their relationships with theoretically related measures. However, since the current study was conducted in a university environment, only three of the facets of job satisfaction that Boyd examined – the nature of work (the work itself), supervisor relations (supervision), and coworker relations (coworkers). Three personalized IATs were constructed using Boyd’s five-block format and procedure. In addition, three single-target IATs were developed that followed the standard (non-personalized) five-block procedure. In accord with Boyd’s multitrait-multimethod design (MTMM; Campbell & Fiske, 1959), explicit measures of job satisfaction and measures of an unrelated construct involving Christianity were included in order to assess the construct validity of the implicit measures. The hierarchical confirmatory factor analysis (CFA) of nested latent trait models described by Widaman (1985) was used to test hypotheses regarding convergent and discriminant validity.

Hypothesis

It is hypothesized that the implicit measures of job satisfaction (the Work Itself, Coworkers, and Supervision) will be related to the explicit measures (convergent validity) and unrelated to the explicit and implicit attitudes towards Christianity measures (discriminant validity). Several MTMM models will be tested to justify these hypotheses. Similar to Boyd (2017), when examining these measures using the MTMM design, each measure is hypothesized to load on a latent trait factor and a latent method factor, creating a total of four latent factors: implicit and explicit method factors, with job satisfaction and attitudes towards Christianity trait factors.

Table 1. Schematic Overview of the Traditional Implicit Association Test

Block	Left (“E” Key)	Right (“I” Key)
1 (Practice)	Flower	Insect
2 (Practice)	Good	Bad
3 (Practice)	Flower + Good	Insect + Bad
4 (Critical)	Flower + Good	Insect + Bad
5 (Practice)	Bad	Good
6 (Practice)	Flower + Bad	Insect + Good
7 (Critical)	Flower + Bad	Insect + Good

Table 2. Schematic Overview of the Single-Target Implicit Association Test

Block	Left (“E” Key)	Right (“I” Key)
1 (Practice)	Good	Bad
2 (Practice)	Good	Bad + Flower
3 (Critical)	Good	Bad + Flower
4 (Practice)	Good + Flower	Bad
5 (Critical)	Good + Flower	Bad

METHOD

Sample

This study received approval from the Institutional Review Board (IRB) at Missouri State University on November 19, 2019 (IRB-FY2020-381; See Appendix A). Participants ($N = 317$) were recruited from the introductory psychology courses. Since a student sample was used in this research, the job was defined as that of a student taking courses at the university. The participant must be either a Freshman or living on campus to participate in the study. Subjects received research participation units that provided extra credit toward their course grade.

Explicit Measures

The Job Satisfaction Survey (JSS; Spector, 1985) was modified to measure students' attitudes toward several aspects of their job as university students. The final modified scale consisted of 12 items measuring three facets of job satisfaction: supervision, coworkers, and nature of work. Each facet scale consisted of four items which students rated on a six-point Likert scale, ranging from *disagree very much* to *agree very much*. A total score based on all three facets was calculated to obtain an overall job satisfaction measure. Sample items of this scale are "I like doing the things I do at college," "My teachers and advisors are quite competent in doing their jobs," and "I like the people I go to college with." See Appendix B for the complete set of items.

The 18-item Overall Job Satisfaction Scale (OJS; Brayfield & Rothe, 1951) was modified to measure the extent to which the students are satisfied with their job as a whole. These 18 items were rated on a five-point Likert scale, ranging from *strongly disagree* to *strongly agree*. Like the

JSS, a total score of all items was calculated to obtain an overall job satisfaction score from this scale. Sample items of this scale are “Most days I am enthusiastic about my college work” and “I definitely dislike my college (reverse-scored).” See Appendix C for the complete set of items for this scale.

Consistent with Boyd (2017), an explicit measure of one’s attitude toward Christianity developed by Wigboldus et al. (2004) was included to serve as the discriminant validity measure for this study. In accord with Boyd and Wigboldus, it was hypothesized that one’s attitude toward Christianity should be unrelated to their job satisfaction. This measure consisted of three items with responses on Likert scales. The first two items were rated on a seven-point Likert scale, ranging from *totally disagree* to *totally agree* with items like “I am positive about Christianity.” The third item was rated on a nine-point Likert scale, ranging from *extremely negatively* (-4) to *extremely positively* (4) on “How positively or negatively do you evaluate the Christian religion?” Appendix D contains the items for this scale.

Finally, demographic questions involving gender, age, English as the primary language, race/ethnicity, and years of college experience were also included.

Implicit Measures

Three single target job satisfaction IATs (ST-IAT) were created, one for each job satisfaction facet, following the guidelines provided by Lane et al. (2007) and Wigboldus et al. (2004) using Inquisit software program by Millisecond Software. The schematic representation of the five-block single-target IAT is displayed in Table 2 above. Three personalized job satisfaction IATs (P-IAT) were developed to assess job satisfaction facets following Boyd’s (2017) guidelines. These personalized IATs employed the same five-block single-target IAT

procedure displayed in Table 2 above. However, the attribute labels of “Good” and “Bad” were changed to “I like” and “I don’t like.” The error feedback message was eliminated because the subjects were sorting the items based on their perceptions of whether they liked the items.

The D-scoring method described by Greenwald et al. (2003) was used to calculate all IAT effects of the implicit job satisfaction measures. Classification error rates, the variance of D-scores, and internal consistency coefficients for alternative stimuli and category labels were explored through a series of pilot tests before the final set was selected. The category labels and stimuli are displayed in Tables 3 – 6.

Procedure

All measures were administered to subjects in a university computer lab. Once the participants arrived in the computer lab, a research assistant granted research credits to the participants and verbally brief participants with the informed consent statement presented on the screen (see Appendix E for this statement). Subjects were told, “the purpose of this study is to develop implicit measures of how we perceive and evaluate the nature of work, supervision, and coworkers in the context of our “jobs” as students ... when responding to all items, we want you to be thinking about your experiences as a student at Missouri State University.”

The order in which measures were administered was constant across subjects: the demographic items, the three personalized IATs, the modified JSS facet scales, the single-target IAT for the work itself, the modified OJS satisfaction scale, the single-target IAT for supervision, the single-target IAT for coworkers, the explicit Christianity scale, and the Christianity IAT. Explicit measures were interspersed with IATs in an effort to combat the

tedium and mental fatigue that the administration of multiple IATs can cause. Most participants were able to complete the procedure in about 30 minutes.

Table 3. Category Labels and Stimulus Word for Single-Target IAT - The Work Itself

Good	Bad	Job-Related: The Work Itself
Wonderful	Horrible	Test
Great	Terrible	Class
Joy	Nasty	Homework
Awesome	Bad	GPA
Inspiring	Miserable	Study
		Notes

Table 4. Category Labels and Stimulus Word for Single-Target IAT – Supervision

Good	Bad	Job-Related: Supervision
Wonderful	Horrible	Teachers
Great	Terrible	Instructors
Joy	Nasty	Professors
Awesome	Bad	Advisors
Inspiring	Miserable	Teaching Assistants
		Lecturers

Table 5. Category Labels and Stimulus Word for Single-Target IAT - Coworkers

Good	Bad	Job-Related: Coworkers
Wonderful	Horrible	Classmates
Great	Terrible	Students
Joy	Nasty	Peers
Awesome	Bad	Undergraduates
Inspiring	Miserable	Roommates
		Group Members

Table 6. Category Labels and Stimulus Word for Single-Target IAT - Attitudes towards Christianity

Good	Bad	Christianity-Related Words
Wonderful	Horrible	Church
Great	Terrible	Jesus
Joy	Nasty	Cross
Awesome	Bad	Bible
Inspiring	Miserable	Bethlehem

RESULTS

Sample

Data were cleaned by removing excessive missing values and incomplete data on one or more IAT responses. Additionally, IATs responses with high error rates were removed as well, leaving the IATs with the following correct percentages: 80% correct for ST-IATs The Work Itself and Supervision, 79% correct for ST-IAT Coworkers, and 77.5% correct for ST-IAT Attitudes towards Christianity. No error rates were calculated for P-IATs as the participants categorize stimulus words based on their preferences instead of sorting the stimulus words into the correct categories. A total of 49 cases were eliminated, leaving the final sample of 268 participants. Of the remaining subjects, 70.3% ($N = 189$) identified themselves as female, and 29.4% ($N = 79$) of them identified themselves as males. Participants' ages ranged from 18 to 47 years old ($M_{age} = 19$), with 96% of them under 21 years old. The demographic composition of the sample was: 81% White/ Caucasian, 5.6% multiple ethnicities, 5.2% Black/African American, 4.5% Asian/Pacific Islander, 3.4% Hispanic/Latino, and .4% Native Hawaiian/Other Pacific Islander. Most of the samples (90.7%) were freshmen with an average 1.14 years of college experience. Descriptive statistics for study variables are displayed in Table 7.

By examining the zero-order correlation, we found a weaker relationship between the implicit and explicit measures of the construct variables than expected. For instance, there is no significant relationship between the correlation of ST-IAT The Work Itself and JSS Work's subscale ($r = .09$) and the correlation between P-IAT The Work Itself and JSS Work's subscale was weak ($r = .18, p < .01$). The zero-order correlation results showed that most correlations between implicit and explicit measures were small and nonsignificant according to Cohen's

(1992) standards of Pearson's r (.10 for "small," .30 for "moderate," and .50 for "strong" effect sizes). Of the 78 pairs of correlations, only 35 pairs were significant. All implicit measures illustrated poor reliabilities and failed to meet Nunnally's (1978) recommendations of .70. These issues will be further addressed in the discussion section. Notably, most explicit measures illustrated good reliability and met Nunnally's (1978) recommendations except for the Job Satisfaction Survey subscale of coworkers. See Table 8 for Zero-Order Correlations of Study Variable.

Hypothesis Testing

Confirmatory Factor Analysis (CFA) model comparisons were used to examine the convergent and discriminant validity evidence through the goodness-of-fit statistics for five different models. According to Schumacker and Lomax (2010), it is better to have a smaller chi-square value that is close to the degrees of freedom and not significant. According to Bentler's (1990) recommendation, the CFI values of each model should be greater than .90 to consider as a "good fit" model. Byrne (2010) recommended the Root Mean Square Error of Approximation (RMSEA) value to be less than .08 for a good fitting model. Model 1 is the least restrictive model where both method and trait factors are freely correlated. Then, the more restrictive models (Models 2 – 5) are compared with Model 1.

Figure 1 illustrated the least restrictive model (Model 1) for this study. As mentioned above, Model 1 has two freely correlated method factors (e.g., implicit and explicit) and two freely correlated trait factors (e.g., satisfaction and attitudes towards Christianity). Model 2 consists of two freely correlated method factors and no trait factors (see Figure 2). Model 2 is more restrictive than Model 1 because the trait factors were excluded in the comparison. Model 3

illustrates two freely correlated method factors and two perfectly correlated trait factors (see Figure 3), thus reducing Job Satisfaction and Christianity into one factor. Model 4 contains two uncorrelated method factors and two freely correlated trait factors (see Figure 4). Model 5 illustrates two uncorrelated method factors and two uncorrelated trait factors (see Figure 5).

A set of Confirmatory Factor Analysis (CFA) models were constructed in order to examine the convergent and discriminant validity evidence (Widaman, 1985). Model 1 is the primary model that will be used to compare with the subsequent models. Convergent validity is assessed by comparing Model 1 and Model 2. To assess discriminant validity, Model 1 is compared with Model 3, Model 4, and Model 5, which will be further discussed below. As the Differential Goodness-of-Fit Statistics increases, the evidence of discriminant validity increases as well.

Table 9 displays the summary of goodness-of-fit statistics for all CFA models. The fit statistics results for Model 1, Model 3, Model 4, and Model 5 indicate that all three adequately explain the variance-covariance structure of the MTMM data. The CFI values for these models are greater than .90 as recommended by Bentler (1990), and the RMSEA values are less than .08 as recommended by Byrne (2010). Additionally, Model 1, Model 3, Model 4, and Model 5 fall within the MacCallum et al.'s (1996) standards for 90% confidence interval such that the values are small, and their upper boundaries are less than .10. On the other hand, both the CFI and RMSEA values for Model 2 exceeded the acceptable threshold for adequate fit, (CFI = .17, RMSEA = .177, 90% CI = [.164, .191]).

Table 10 displays the differential goodness-of-fit statistics for nested model comparisons. The Model 1– Model 2 comparison illustrates that Model 2 has substantially poorer goodness-of-fit statistics than Model 1 as there is a degradation in Model 2 ($\Delta\chi^2 = 480.88$, $\Delta df = 12$, $\Delta CFI =$

.80). This represents convergent validity evidence for the trait factors such that the method factors cannot describe the relationships between study variables by themselves. Specifically, the CFI (.97) and RMSEA (.038) values for Model 1 show a better fitting model than CFI (.17) and RMSEA (.177) values for Model 2. The results for Model 1 fall within the threshold recommended by Bentler (1990) and Bryne (2010), whereas the fit statistics results for Model 2 falls outside the recommended threshold.

To assess discriminant validity, Model 1 is compared with three different models, which are Model 1 – Model 3, Model 1 – Model 4, and Model 1 – Model 5. The Model 1 – Model 3 comparison illustrates evidence for discriminant validity as the differences in goodness-of-fit statistics between Model 1 – Model 3 were significant. However, although the Chi-Square test for differences between the models was statistically significant ($\Delta\chi^2 = 480.88, p < .05$), the model fit statistics for Model 3 (CFI = .91, RMSEA = .066, 90% CI = [.048, .084]) fell well within the established guidelines for determining a good fit, which raises the prospect that Model 1 may over-fit the data. This prospect will be further examined in the next section. The Model 1 – Model 4 comparison uses the same logic as the Model 1 – Model 3 comparison in reverse, in that Model 4 requires the method factors to be uncorrelated. The lack of any degradation in the fit statistics ($\Delta\chi^2 = .25, \Delta df = 1, \Delta CFI = .00$) indicates that there is no common method variance across the two sets of explicit and implicit measures. The lack of any degradation in the fit statistics for the Model 1 – Model 5 comparison ($\Delta\chi^2 = .41, \Delta df = 2, \Delta CFI = .00$) illustrates more evidence of discriminant validity since Model 5 requires both method and trait factors to be uncorrelated with each other.

The factor loadings containing all study variables for Model 5 are displayed in Table 11. These results indicate that three-fourths of the indicator variables had significant loadings on the

hypothesized factors (18 out of 24 loadings were significant), which provides moderate support for the construct validity of the measures. However, only two out of six implicit measures loaded on the trait satisfaction factor significantly.

Table 7. Descriptive Statistics for Study Variables

Variables	N	Min	Max	Mean	SD	Alpha
Age	268	18	47	19	3.07	N/A
Years of College Experience	268	1	4	1.14	.48	N/A
Single-Target Implicit Measures						
The Work Itself	268	-.53	.95	.19	.27	.30
Supervision	268	-.51	.85	.20	.26	.22
Coworker Relations	268	-.60	.91	.21	.28	.34
Christianity	268	-.51	1.04	.33	.29	.47
Personalized Implicit Measures						
The Work Itself	268	-.68	1.07	.22	.36	.51
Supervision	268	-1.20	1.00	.27	.32	.53
Coworker Relations	268	-.77	1.03	.28	.29	.41
Explicit Measures						
JSS - Nature of Work	268	4	20	8.81	3.37	.75
JSS - Supervision	268	4	23	7.94	2.72	.72
JSS - Coworkers	268	4	19	8.84	2.77	.57
Overall JSS	268	12	60	25.59	7.12	.82
OJS	268	31	86	61.43	9.30	.87
Christianity	268	3	23	17.25	5.41	.95

Table 8. Zero-Order Correlations of Study Variables

Variables ^a	1	2	3	4	5	6	7	8	9	10	11	12	13
Implicit (ST-IAT)													
1. Work	-												
2. Supervision	.18**	-											
3. Coworkers	.14*	.28***	-										
4. Christianity	.06	.18**	.13*	-									
Implicit (P-IAT)													
5. Work	.20***	.18**	.19**	-.08	-								
6. Supervision	.16**	.33***	.17**	.01	.25***	-							
7. Coworkers	.14*	.17**	.14*	.10	.12*	.24***	-						
Explicit													
8. JSS-W	.09	.07	.07	.00	.18**	.04	.05	-					
9. JSS-S	-.02	.14*	.08	-.06	.09	.06	.01	.45***	-				
10. JSS-C	.07	.02	-.02	-.03	.08	-.03	.11	.50***	.44***	-			
11. JSS-O	.06	.09	.05	-.03	.15*	.03	.07	.84***	.76***	.79***	-		
12. OJS	.16*	.10	.12	-.02	.18**	.09	.12	.80***	.41***	.48***	.73***	-	
13. Christianity	-.03	.05	.05	.30***	-.04	.03	.07	.14*	.11	.09	.14*	.08	-

Note: * $p < .05$; ** $p < .01$, *** $p < .001$

^a Variables names have been simplified due to space restrictions. All variables' names are as follows: Implicit ST-IAT The Work Itself, ST-IAT Supervision, ST-IAT Coworkers, ST-IAT Attitudes towards Christianity, P-IAT The Work Itself, P-IAT Supervision, P-IAT Coworkers; Explicit Job Satisfaction Survey (JSS) Nature of Work, JSS-Supervision, JSS-Coworkers, JSS-Overall Total Score, OJS - Overall Job Satisfaction, Attitudes towards Christianity.

Table 9. Summary of Goodness-of-Fit Statistics for CFA Models

	Model	χ^2	df	CFI	RMSEA	90% CI
1	Two Freely Correlated Method Factors; Two Freely Correlated Trait Factors	63.34	46	.97	.038	[.006, .059]
2	Two Freely Correlated Method Factors and No Trait Factors	544.22	58	.17	.177	[.164, .191]
3	Two Freely Correlated Method Factors; Two Perfectly Correlated Trait Factors	94.95	44	.91	.066	[.048, .084]
4	Two Uncorrelated Method Factors; Two Freely Correlated Trait Factors	63.59	47	.97	.036	[.000, .058]
5	Two Uncorrelated Method Factors; Two Uncorrelated Trait Factors	63.75	48	.97	.035	[.000, .056]

Table 10. Differential Goodness-of-Fit Statistics for Nested Model Comparisons

Model Comparisons	$\Delta\chi^2$	Δdf	ΔCFI
Test of Convergent Validity			
Model 1 vs. Model 2	480.88*	12	.80
Test of Discriminant Validity			
Model 1 vs. Model 3	31.61*	2	.06
Model 1 vs. Model 4	.25	1	.00
Model 1 vs. Model 5	.41	2	.00

* $p < .05$

Table 11. Trait and Method Loadings for CFA Model 5

	Implicit	Explicit	Satisfaction	Christianity
Implicit Measures				
ST-IAT Work	.346***		.196**	
ST-IAT Supervision	.470***		.084	
ST-IAT Coworkers	.442***		.131	
P-IAT Work	.367***		.208**	
P-IAT Supervision	.527***		.098	
P-IAT Coworkers	.350***		.113	
ST-IAT Christianity	.150*			.314***
Explicit Measures				
JSS Work		-.464**	.689***	
JSS Supervision		-.675***	.178	
JSS Coworkers		-.648***	.281	
OJS		-.395*	.845***	
Christianity		-.187*		.956***

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

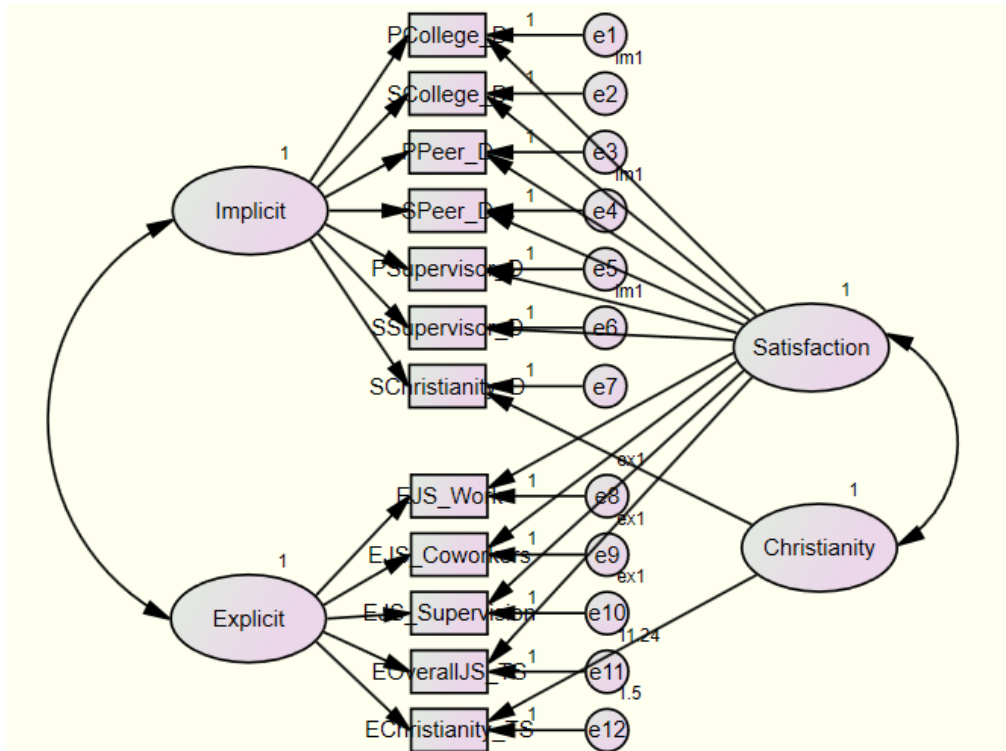


Figure 1. CFA Model 1: Two Freely Correlated Method Factors and Two Freely Correlated Trait Factors.

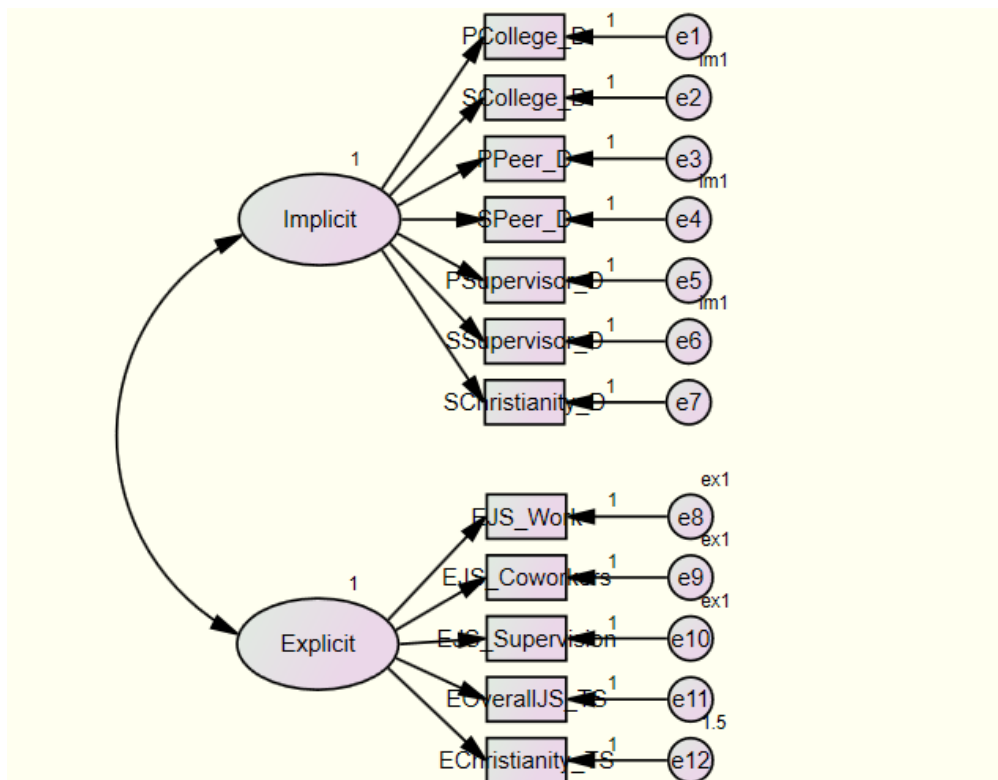


Figure 2. CFA Model 2: Two Freely Correlated Method Factors and No Traits Factors.

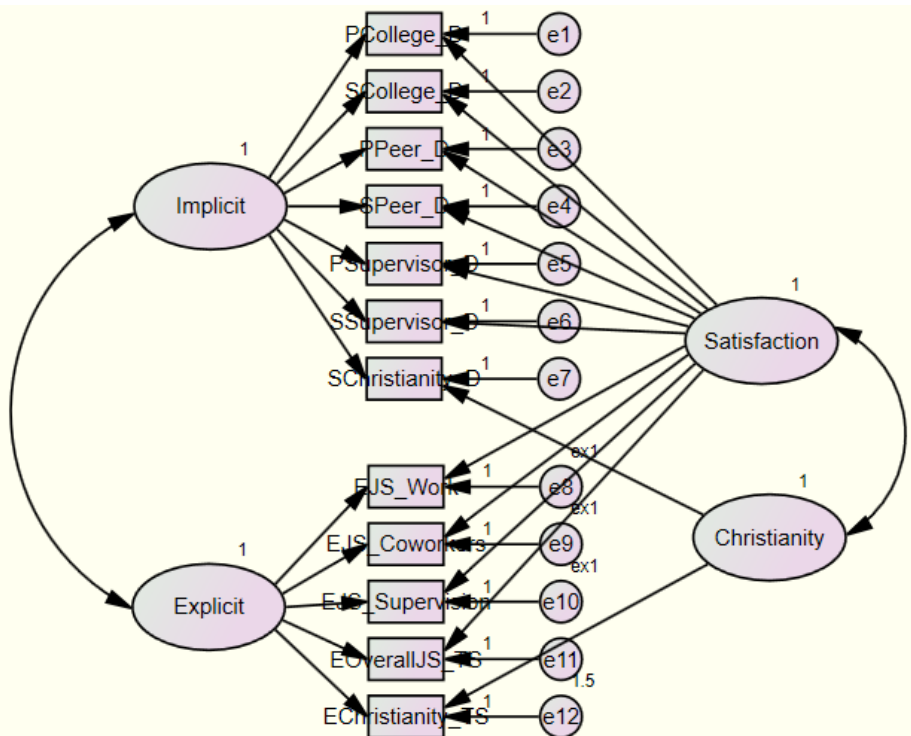


Figure 3. CFA Model 3: Two Freely Correlated Method Factors and Two Perfectly Correlated Trait Factors.

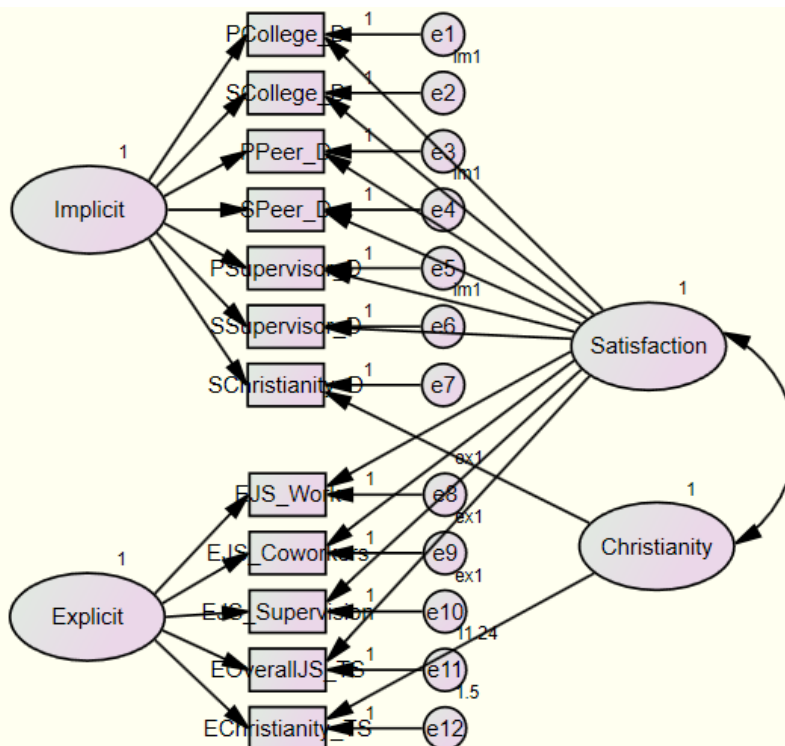


Figure 4. CFA Model 4: Two Uncorrelated Method Factors and Two Freely Correlated Trait Factors.

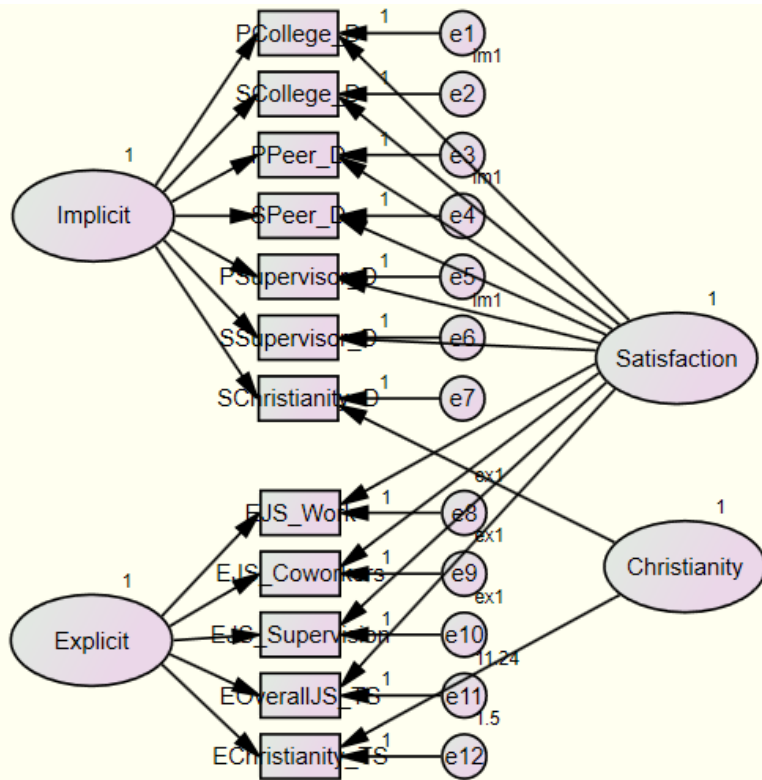


Figure 5. CFA Model 5: Two Uncorrelated Method Factors and Two Uncorrelated Trait Factors.

DISCUSSION

This study sought to extend and replicate the work of Boyd (2017) within the framework of college students in their learning work roles. More specifically, the purpose of this study was to develop and validate job satisfaction measures that can be used to assess students' college experience and attitudes accurately. According to the model fit statistics, Model 5 (the hypothesized model) fits the data too well – four factors are more than the number required to explain the similarities and differences captured in the variance-covariance matrix.

To assess the convergent and discriminant validity of the implicit and explicit measures, more restrictive models were added and compared with Model 1. The nested model comparisons indicated that there was a degradation in the fit statistics when there were no latent trait factors and only method factors (Model 2). In other words, the relationships among variables cannot be explained by the method variance alone. Although a model containing two method factors and one trait factor was a poorer fit than a model containing two trait factors, the fit statistics (CFI and RMSEA) for the single trait model fell well within the generally accepted limits for a good fit ($CFI > .90$ and $RMSEA < .08$). Taken with results of comparisons with models that force both the method factors and the trait factors to be uncorrelated, this suggests that a model with two uncorrelated method factors and two perfectly correlated trait factors (one trait factor; Model 3) may be the best fit for these data. These results differ from those of Boyd (2017), who found support for a four-factor model. One possible explanation for this finding may be that the implicit measure of attitudes towards Christianity was essentially uncorrelated with any of the job satisfaction measures. Additionally, the JSS Work's subscale and JSS Overall Score are the only job satisfaction measures that were correlated with the attitudes towards Christianity

explicit measure. Lastly, the moderate correlation between the explicit and implicit measures of attitudes towards Christianity could be easily explained by the common method factor.

A similar suggestion may explain why the implicit measures did not load on the satisfaction factor. In other words, the implicit measures were essentially uncorrelated with the explicit measures, and the correlation among the implicit measures was well explained by the implicit method factor. However, these results, too, differ from those of Boyd (2017) and the reason for this remains unexplained.

Although pilot tests of the single target and personalized satisfaction IATs suggested they had adequate psychometric properties, the data for the main sample indicated otherwise. In particular, the internal consistency coefficients for all implicit measures fell outside Nunnally's (1978) recommendation for being "adequate" (.70). This means that the relationships between the implicit and explicit measures were severely attenuated by measurement error. Indeed, only five of the 25 correlations in the monotrait-heteromethod rectangle of the MTMM correlation matrix achieved significance. While most of the correlations in the monotrait-monomethod triangle for the implicit satisfaction measures achieved significance, these tended to be in Cohen's (1992) range for "smaller" effect size (i.e., in the neighborhood of .10 to .30). These facts help explain the lack of evidence supporting the construct validity of the implicit measures in the factor loading matrix for the hypothesized model: relationships were severely attenuated due to unreliability in the implicit measures. Hence, future research should address improving the psychometric properties of the implicit measures. Additionally, future research should focus more on finding the relationship between the personalized IAT and single-target IAT to develop personalized implicit measures that can measure job satisfaction more accurately. The present study suffered on these fronts.

Due to the nature of the sample used in the study, some aspects measured might not be relevant to the students (e.g., roommates). Although the sample was recruited from the introductory to psychology courses, only 90.8% of them were freshmen. Additionally, students are taking multiple courses with multiple instructors during a semester, indicating that they have several supervisors. Future studies should specify the sample's requirements (i.e., freshmen only, thinking about the supervisor as their introductory to psychology course's instructor) so that the implicit measures are relevant to the targeted participants and study requirements.

The final caveat of this study regards the overfitting of models. According to Byrne (2010), the overfitting model “involves the specification of additional parameters in the model after having determined a criterion that reflects a minimally adequate fit” (p.91). Concerns are raised by Bentler (1990), Byrne (2010), and MacCallum et al. (1996) when the goodness-of-fit statistics exceed recommended “good fit” threshold ($CFI > .95$, $RMSEA < .04$). The goodness-of-fit statistics for Model 1, Model 4, and Model 5 are within this range, and hence, the data are overfitted by the factors in these models. This overfitting could be caused by including additional parameters that are (a) reflecting non-replicable weak effects, (b) causing standard errors to inflate significantly, and (c) influence the primary parameters in the model, although the substantive meaningfulness of these parameters is somewhat ambiguous (Byrne, 2010; Wheaton, 1987). After considering (a) the statistical significance and feasibility of all parameter estimates and (b) the goodness-of-fit statistics of these models ($CFI > .95$, $RMSEA < .04$), I conclude that my hypothesized model fits the data too well as four factors are more than what is needed to explain the similarities and differences captured in the variance-covariance matrix.

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APPENDICES

Appendix A: Human Subjects IRB Approval



To:

Donald Fischer
Psychology
Xin Wei Ong

Date: Nov 19, 2019 8:31 AM PST

RE: Notice of IRB Exemption

Study #: IRB-FY2020-381

Study Title: The Development and Validation of the Implicit Job Satisfaction Measure

This submission has been reviewed by the Missouri State University Institutional Review Board (IRB) and was determined to be exempt from further review. However, any changes to any aspect of this study must be submitted, as a modification to the study, for IRB review as the changes may change this Exempt determination. Should any adverse event or unanticipated problem involving risks to subjects or others occur it must be reported immediately to the IRB.

This study was reviewed in accordance with federal regulations governing human subjects research, including those found at 45 CFR 46 (Common Rule), 45 CFR 164 (HIPAA), 21 CFR 50 & 56 (FDA), and 40 CFR 26 (EPA), where applicable.

Researchers Associated with this Project:

PI: Donald Fischer

Co-PI: Xin Wei Ong

Primary Contact: Xin Wei Ong

Other Investigators: Kurtis Payne, Lauren Krieg, Thomas Ryan, Xin Wei Ong, Brooke Watson, Lindsey Carpentier, Haein Won, Max Lischwe

Appendix B: Job Satisfaction Survey (JSS, Spector, 1985) [modified]

Using the scale provided below each statement, please indicate how much you agree with each statement.

Disagree very much
Agree Slightly

Disagree Moderately
Agree Moderately

Disagree Slightly
Agree very much

Supervision

1. My teachers and advisors are quite competent in doing their jobs. (1)
2. My teachers and advisors are unfair to me.* (4)
3. My teachers and advisors show too little interest in the feelings of students.* (7)
4. I like my teachers and advisors. (10)

Coworkers

1. I like the people I go to college with. (2)
2. I find I have to work harder at college because of the incompetence of people I work with.* (5)
3. I enjoy the people I go to college with. (8)
4. There is too much bickering and fighting at college.* (11)

Nature of Work

1. I sometimes feel college is meaningless.* (3)
2. I like doing the things I do at college. (6)
3. I feel a sense of pride in doing my work at college. (9)
4. College is enjoyable. (12)

* Reverse-scored items.

Appendix C: Overall Job Satisfaction (OJS) Scale by Brayfield and Rothe (1951) [modified]

Using the scale provided below each statement, please indicate how much you agree with each statement.

Strongly Disagree Disagree Neither Agree nor Disagree Agree Strongly Agree

1. College seems like a hobby to me.
2. College is usually interesting enough to keep me from getting bored.
3. It seems that my friends are more interested in their college.*
4. I consider college rather unpleasant.*
5. I enjoy college more than my leisure time.
6. I am often bored with college.*
7. I feel fairly well satisfied with college.
8. Most of the time I have to force myself to go to college.*
9. I am satisfied with college for the time being.
10. I feel that this college is no more interesting than others I could go to.*
11. I definitely dislike my college.*
12. I feel that I am happier in my college work than most other people.
13. Most days I am enthusiastic about my college work.
14. Each day of college work seems like it will never end.*
15. I like my college work better than the average student does.
16. College work is pretty uninteresting.*
17. I find real enjoyment in my college work.
18. I am disappointed that I ever went to college.*

* Reverse-scored items.

Appendix D: Explicit Attitude Measures Towards Christianity (Wigboldus et al., 2004)

Please select one response for each question below.

1. I am positive about Christianity.
2. I am negative about Christianity.

Totally Disagree Moderately Disagree Slightly Disagree

Neither Agree Nor Disagree Slightly Agree Moderately Agree

Totally Agree

3. How positively or negatively do you evaluate the Christian religion?

Extremely Negatively (-4) Neutral (0) Extremely Positively (4)

Appendix E: Informed Consent Statement

The purpose of this study is to develop implicit measures of how we perceive and evaluate the nature of work, supervision, and coworkers in the context of our “jobs” as students. In addition to completing some questionnaire items, this study involves taking several Implicit Association Tests or IATs. The IAT is a procedure which records your reaction times on classification tasks. You will be asked to press alternate computer keys as words are presented one at a time on the screen. When responding to all items, we want you to be thinking about your experiences as a student at Missouri State University. It should take you about 30 minutes to complete the entire study.

There are no anticipated risks associated with the procedures and stimuli to which you will be exposed during the study. However, in-person research participation during the Covid-19 pandemic does carry an associated risk of infection. To minimize this risk, we are situating participants no less than six feet apart and requiring that all participants and experimenters be masked at all times during data collection. This policy is consistent with Missouri State University’s current policy to mitigate the spread of Covid-19.

Participation in this study is voluntary and you can withdraw at any time, without penalty. You will receive two units of credit for participating. Your identity as a subject in this study is confidential – no names or other personally identifying information will be retained or reported.

The faculty member responsible for this study is Donald Fischer (417-836-4164; Hill Hall 332) in the Psychology Department and he will answer any questions you may have regarding this study. You can also ask me (a research assistant) any questions you have about this study. Do you have any questions you wish to ask at this time?

Please silence your cell phones like you would if you were watching a movie, and put them out of sight.

You may now click on the link in the email message.