

The Relation between Vocational Interests and the Motivation to Lead

Kim-Yin Chan

University of Illinois at Urbana-Champaign and Ministry of Defense, Singapore

and

James Rounds and Fritz Drasgow

University of Illinois at Urbana-Champaign

Multidimensional scaling is used to examine the relation between vocational interests as conceptualized by Holland's (1973, 1997) hexagonal model and a newly proposed individual differences construct, called the motivation to lead or MTL (Chan, 1999). The findings support the hypothesis that the MTL construct, while correlated with certain interest domains (e.g., social and enterprising), is orthogonal to Holland's hexagonal model of interests. The findings have implications for general theory on the nature of job versus role interests at work and for the MTL construct. © 2000 Academic Press

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It is widely accepted that the domain of vocational interests can be adequately represented by Holland's (1973, 1997) hexagonal model that specifies six general personality types: realistic, investigative, artistic, social, enterprising, and conventional (RIASEC). Holland and others (e.g., Rounds & Tracey, 1993; see also Rounds & Day, 1999, for a review) have shown that the six RIASEC types can be represented in the form of a circle or hexagon existing in a two-dimensional space. Prediger (1982) demonstrated that the two main dimensions distinguishing the six personality types are Data–Ideas and People–Things.

The present study examined the relation between vocational interests as conceptualized by Holland's (1973, 1997) hexagonal model and a newly proposed construct, called the motivation to lead or MTL. The main question was whether the MTL construct is simply part of the two-dimensional RIASEC

Address correspondence and reprint requests to Kim-Yin Chan, Applied Behavioral Sciences Department, Manpower Division—Ministry of Defense, Singapore, Defense Technology Towers, Tower B 16-01, 5 Depot Road, Singapore 109681, Republic of Singapore. Fax: 65-3731577. E-mail: kychan@starnet.gov.sg.

model of vocational interests or is orthogonal to vocational interests. If the latter is true, the MTL construct may provide information that adds to the six interest domains captured in Holland's model.

This research was motivated by two concerns. The first is the general distinction between the content of jobs and the different roles that people play when in a job (e.g., leader versus follower). Here, the fundamental question is whether people's interests in the content of their jobs is independent of their interests in different roles (e.g., leader versus follower) that they play in a job. A related concern is the generality of the MTL construct across different interest domains.

VOCATIONAL/JOB VERSUS ROLE INTERESTS

In a literature review, Fitzgerald and Rounds (1989) used multidimensional scaling to show empirically that the vocational literature could be divided into what Tinsley and Heesacker (1984) had earlier identified as topics associated primarily with "a counseling psychology focus on individuals and their career development and an industrial-organizational psychology emphasis on social-organizational context and the impact of the organization" (p. 107). In their multidimensional scaling plot of topics in the vocational literature, "leadership" appeared in the "industrial-organizational psychology" sector, while "vocational choice" (including Holland's theory) appeared in the "counseling psychology" sector. In parallel fashion, industrial-organizational psychologists Ilgen and Hollenbeck (1991; see also Ilgen, 1994) pointed out that while the behaviors of organizational members are affected both by the content of their jobs and the roles that they play in the job, there is very little overlap in the research literatures in the two topics: "The study of jobs has been dominated by industrial engineers and psychologists interested primarily in the description and in the development of taxonomies" (p. 167), while "research on roles developed primarily in the fields of sociology and social psychology from the interest in the nature of social systems and the interrelationships among people comprising those systems" (p. 169). Based on Ilgen and Hollenbeck's job-role distinction, Holland's structural model of vocational interests would fall under a descriptive theory of the content of jobs. Hence, it is not surprising that Holland's theory does not have much to say about the different roles that people play in the workplace, e.g., that of leader versus follower or judge versus advisor (cf., Sniezek & Buckley, 1995). An interesting question therefore arises: "How is a person's role-related motivation to lead (cf., Miner's, 1977, 1993, theory in which the "motivation to manage" is one form of role motivation at work) related to his or her content-related interest in different jobs?"

THE MOTIVATION TO LEAD

Chan (1999; see also Chan & Drasgow, in press) proposed a new general individual differences construct called the MTL. In a study employing three samples in different work and cultural contexts (i.e., 1594 Singapore military recruits, 274 Singapore junior college students, and 293 American college stu-

dents), Chan showed that MTL could be conceptualized and measured in terms of three correlated-dimensions: Affective/Identity, Social-Normative, and Noncalculative MTL. MTL, therefore, can be measured both as three first-order factors or a single second-order factor (i.e., General MTL). Descriptions of the three first-order MTL dimensions follow:

Affective/Identity MTL

People who score high on this dimension like or prefer to lead and see themselves as leaders. They tend to be outgoing and sociable (i.e., are extraverts), value competition and achievement (i.e., are vertical collectivists), have more past leadership experience than their peers, and are confident in their own leadership abilities (i.e., have high self-efficacy).

Social-Normative MTL

Individuals high on the Social-Normative MTL dimension are motivated by a sense of social duty and obligation and are also accepting of social hierarchies yet rejecting of social equality. Like people high in Affective/Identity MTL, these individuals also tend to have more past leadership experience and confidence in their leadership abilities.

Noncalculative MTL

These individuals are not calculative (as opposed to being calculative about the costs and benefits) about leading. Sociocultural values play a more important role in Noncalculative MTL. Specifically, collectivistic (i.e., group- or other-oriented) values were consistently positively related to Noncalculative MTL, while individualistic (i.e., self-oriented) values were negatively related to Noncalculative MTL. Agreeableness and emotional stability are also fairly consistently and significantly related to Noncalculative MTL, while leadership self-efficacy and past experience are not consistently or significantly related to Noncalculative MTL.

Many questions remain about the MTL construct. One question is the generality of the MTL construct across different work contexts. Chan (1999) proposed that MTL could be construed as a context-independent individual-differences construct and that vocational interests could influence the choice of situations or activities in which a person with high MTL emerged as a leader. This essentially assumed that MTL and vocational interests are conceptually distinct constructs—that people's interests in leading are general, that is, not specific to any particular domain of activity. Statistically, this implied that the MTL construct existed independently of vocational interests.

POSSIBLE RELATIONS BETWEEN VOCATIONAL INTERESTS AND MTL

Structurally, there are three possible ways in which vocational interests may relate to MTL. First, MTL may be a general construct that is independent of

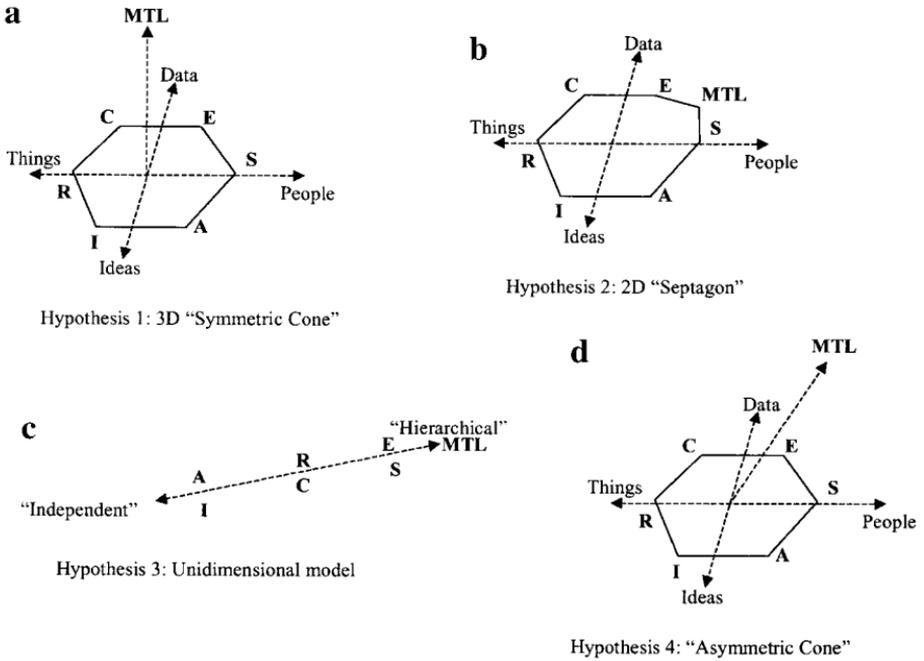


FIG. 1. Four possible structural models of the relationship between the RIASEC and general motivation to lead (GMTL).

vocational interests. Spatially, this relationship can be represented as a three-dimensional cone-shaped structure where MTL is at the apex of the cone, orthogonal to the two-dimensional RIASEC hexagon. The ideal form of such a model would have the “height” dimension of the cone representing the MTL factor, while the base of the cone would continue to form a hexagon (see Fig. 1a). If this model is true, it implies that MTL is general across interest domains, that one can find people who vary in MTL in each of the six interest types.

The second possibility is suggested by a statement made by Singer (1989) that leadership aspirations can be conceptualized as a special case of career choice. If one were to take Singer’s suggestion literally, then a geometric model of the MTL and Holland’s hexagon would include MTL as a seventh “vocational type.” One can imagine this seventh type being labeled “general managerial or leadership interest,” for example. This model can be represented as a polygon with seven instead of six points, but generally conforming to the existing two dimensions of People–Things and Data–Ideas (see Fig. 1b). In contrast to the previous “orthogonal” model, this model implies that the hexagonal RIASEC model may be an incomplete representation of the content of work.

A third possibility is that the MTL may relate positively to certain vocational interest types and negatively to other types. This could be true on the basis of shared personality traits and/or values. For example, Costa, McRae, and Holland

(1984) found significant correlations between social and enterprising interests and extraversion, while Chan (1999) found that extraversion is an antecedent to Affective/Identity MTL. Conversely, Chan found that of the Big Five personality factors, openness to experience was the only one that was indirectly related to the MTL factors. Costa et al. (1984) reported significant relations between investigative and artistic interests and openness to experience. On this basis, it is possible that MTL may be one dimension differentiating vocational types that are typically high in MTL (e.g., social and enterprising types) from those that are typically lower in MTL or where MTL is just not relevant to them (e.g., artistic and investigative types). If this is true, a multidimensional scaling of the six RIASEC interests together with MTL will show a single MTL-related versus non-MTL-related dimension (see Fig. 1c). It is also likely that one will find two clusters of points at the ends of this dimension, one with MTL, social and enterprising types and the other with artistic and investigative types (representing low MTL types).

Finally, it should be emphasized that each of the three models described above represents an ideal structural form. It is certainly possible that the true structural relationship may be a combination of any of the two forms above. For example, one such possibility is a cone with the apex shifted closer toward the Enterprising and Social types (see Fig. 1d). This would be a compromise between the first and second models suggested above.

To summarize, this research explored the relations between vocational interests and the MTL construct. In addition to the use of multidimensional scaling procedures to spatially represent relations between the RIASEC and MTL factors, the correlations between the vocational interest and MTL factors were also studied along with the antecedents of MTL. Specifically, personality was represented by Goldberg's (1997, 1998) Five-Factor Model, social values were represented by Triandis's (1995, 1998) vertical and horizontal individualism-collectivism constructs, and general cognitive ability was represented by university admissions test scores. A confirmatory factor analysis was also performed to establish the relative independence of the vocational interest and MTL measures. Finally, the MTL scores (including central tendency and variance) were also examined across respondents classified according to their "high-point codes" on the RIASEC, as an additional means of determining the relative independence of the MTL construct from the RIASEC variables. The entire effort can be viewed as part of the process of construct validation for both the MTL and vocational interest constructs.

METHOD

Participants

A total of 285 undergraduate students from an Introductory Psychology subject pool in a large midwestern university participated in the study. The sample consisted of 149 females and 134 males. Two respondents did not

indicate their gender. Seventy-six percent of the respondents were freshmen. The age of the respondents ranged from 17 to 24, with a mean age of 18.4. The ethnic breakdown of the sample was as follows: 87.7% Caucasian, 7.7% Asian, 2.5% Black, 2.1% Hispanic. The students came from varied academic backgrounds, including the Liberal Arts and Sciences, Education, and Engineering faculties.

Measures

MTL scale. This self-report measure includes 27 items that assess three factors: Affective–Identity MTL (AIMTL), Social-Normative MTL (SNMTL), and Non-calculative MTL (NCMTL). The items were selected from an original pool of 47 items on the basis of consistently high factor loadings from exploratory factor analyses (i.e., principal axis factoring with varimax rotation) observed in three different samples representing different occupational and cultural groups (see Chan, 1999). Scree plots of eigenvalues suggested that three factors accounted for most of the variance in the data for the three samples, while varimax rotation suggested that the three factors corresponded to those identified in the pilot studies, namely, AIMTL, NCMTL, and SNMTL.

In a 3-month longitudinal study of Singapore military recruits, Chan (1999) showed that the measures of MTL related to two different behavioral criteria, providing incremental validity over other categories of predictors such as general cognitive ability, the Big-Five personality factors, and sociocultural values. The fact that there was no common-method or common-source variance in this predictive validity design suggests that various response biases (e.g., social desirability responding) are not a serious problem for the measurement of MTL.

The instructions for the MTL scale were as follows: “Imagine a typical work or school situation where you are working in a group or team, and the question is raised if someone should be appointed as a group leader. Assume for now that everyone in the group has roughly the same level of training, knowledge, and experience on the job. Please read each statement carefully and choose the one answer that best describes your agreement or disagreement using the scale below.” Examples of the statements were as follows: “I am the type of person who is not interested to lead others” (AIMTL). “Most of the time, I prefer being a leader than a follower when working in a group” (AIMTL). “I am only interested to lead a group if there are clear advantages for me” (NCMTL; note, item is reverse-scored). “I never expect to get more privileges if I agree to lead a group” (NCMTL). “I feel that I have a duty to lead others if I am asked” (SNMTL). “I was taught in the value of leading others” (SNMTL). Participants were asked to indicate their responses five-point Likert-type scale from “Strongly disagree” to “Strongly agree.”

Table 1 presents the summary characteristics of the three nine-item MTL subscales and all other measures in this study. All three subscales had generally good internal consistency reliabilities, with α coefficients between .74 and .92. The three MTL subscales were positively correlated, with $r_{aimtl,ncmtl} = .20$,

TABLE 1
Correlations between Vocational Interests and the Motivation to Lead (MTL),
Big-Five Personality Factors, and Individualism–Collectivism

Scales	<i>M</i>	<i>SD</i>	α	Realistic	Investigative	Artistic	Social	Enterprising	Conventional
UNIACT									
Realistic	26.88	7.02	.87	1.00					
Investigative	30.85	8.12	.90	.44**	1.00				
Artistic	32.89	8.30	.90	.26**	.30**	1.00			
Social	37.69	5.56	.83	.12	.23**	.37**	1.00		
Enterprising	31.41	6.71	.85	.03	−0.06	.07	.43**	1.00	
Conventional	24.60	8.12	.92	.21**	−0.09	−0.25**	−0.08	.50**	1.00
Motivation to Lead									
Affective/Identity	31.39	7.55	.92	.00	.05	.09	.30**	.41**	.04
Noncalculative	34.15	5.27	.82	.04	.09	.14*	.35**	−0.03	−0.17**
Social-Normative	30.74	4.90	.74	−0.07	.00	.04	.36**	.29**	.06
Big-Five personality factors									
Extraversion	34.33	8.23	.90	−0.09	−0.11	.12*	.31**	.26**	−0.07
Agreeableness	41.14	5.65	.82	−0.17**	−0.02	.16**	.42**	.08	−0.14*
Conscientiousness	35.06	6.66	.82	−0.10	−0.09	−0.17**	−0.01	.08	.18**
Emotional stability	31.28	8.11	.88	.22**	.03	−0.09	.07	.09	.04
Openness	37.93	5.45	.78	.12*	.21**	.33**	.16**	.09	−0.10
Individualism–collectivism (INDCOL)									
Horizontal Collectivism	47.11	7.25	.77	−0.04	.05	.08	.36**	.01	−0.10
Horizontal Individualism	50.85	7.28	.81	−0.02	.06	.17**	.12*	.02	−0.02
Vertical Collectivism	43.64	6.96	.63	.03	−0.03	−0.12*	.22**	.07	.04
Vertical Individualism	36.72	9.62	.80	.05	.04	−0.15*	−0.10	.30**	.30**
ACT Examination Score (academic ability)	27.55	2.87	N/A	.14*	.12*	−0.04	−0.08	−0.02	.10

Note. $N = 285$. The sample sizes for the product–moment correlations after pairwise deletion of cases with missing data ranged from 274 to 283. Academic skill level was measured using self-reported scores on the American College Testing (ACT) examination. * $p > .05$ (two-tailed test). ** $p > .01$ (two-tailed test).

$r_{aimtl,snmtl} = .52$, $r_{snmtl,ncmtl} = .35$, indicating that a second-order General MTL (GMTL) factor could be inferred that could account for the common variance in the three first order MTL factors.

ACT Interest Inventory (UNIACT). The 90-item, Level 2 Revised Unisex Edition of the UNIACT (Swaney, 1995) was administered. This version was specifically designed for college students and adults. The technical manual reports that the UNIACT is administered to a total of about 4.2 million persons annually, making it the most used interest inventory in the world. The UNIACT consists of six 15-item subscales measuring each of Holland's six interest categories. Respondents are asked to indicate how much they would like doing each of the 90 activities and given a three-option response scale as follows: (1)

"I would dislike doing this activity," (2) "I am indifferent," (3) "I would like doing this activity." The activities represented in the items are all scored in the same direction (i.e., each subscale score is simply the sum of the response options on the 15 items for that subscale). All six subscales had generally good internal consistency reliabilities, with α coefficients between .83 and .92 (see Table 1).

Big-Five personality factor scales. Goldberg's (1997, 1998) public domain, 50-item measure of the Big-Five personality factors was used. The measure consisted of five 10-item subscales measuring Extraversion, Agreeableness, Conscientiousness, Emotional Stability, and Intellect or Openness to Experience and was derived by Goldberg from an item pool of 1252 English terms, called the International Personality Item Pool. Cronbach α analyses showed that all five subscales had reasonably good internal consistency reliabilities, with α s ranging from .78 to .90 (see Table 1).

Individualism-Collectivism (INDCOL) measure. The INDCOL, designed by Singelis, Triandis, Bhawuk, and Gelfand (1995), was used as a measure of interpersonal values. The original scale consisted of 32 items that could be divided into four subscales with 8 items each, namely, Horizontal Individualism (HI), Vertical Individualism (VI), Horizontal Collectivism (HC), and Vertical Collectivism (VC). For the purpose of this study, people high in HI can be assumed to value their individuality and uniqueness, while high VI people tend to be achievement-oriented and competitive. In contrast, high VC people are accepting of social hierarchies and tend to subordinate their goals to the majority or to authorities, while high HC people value collective harmony and equality (cf. Triandis, 1998).

Chan (1999) performed an exploratory factor analysis on the original 32 items of the INDCOL scale using his combined sample ($n = 2036$). The results indicated that some items loaded more highly on an inappropriate factor than on the expected factor. Hence, a decision was made to drop 1 item from each of the original 8-item subscales to improve discriminant validity among the constructs, resulting in four 7-item scales. The same 7-item scales were used in this study. Cronbach's α for the four scales ranged from .63 to .81 (see Table 1).

Indicator of academic skills level. The students were asked to report their composite score on the American College Testing (ACT) national college admission examination, which is accepted by virtually all colleges and universities in the United States. The ACT assessment tests (ACT Staff, 1997) are based on subjects taught in the high school curriculum (e.g., English, mathematics, and science), and the composite score ranges from a 1 (low) to 36 (high). Given that general intelligence is highly correlated with academic achievement, the ACT score can be used as an indicator of general cognitive ability. Table 1 presents the descriptive statistics for the ACT score for the student sample. The mean ACT score was 27.55, with a SD of 2.87. Note that the sample consisted of students already admitted to the university. Hence, analyses involving this indicator should be treated with caution due to range restriction.

TABLE 2
Fit of Measurement Models

Measures and scales	χ^2	<i>df</i>	SRMR	RMSEA	AGFI	NNFI	CFI
UNIACT and MTL (9 factors and 27 composite indicators)	585.42	288	.051	.060	.83	.91	.95
MTL, Big-Five, and INDCOL (12 factors and 36 composite indicators)	967.28	528	.061	.054	.81	.92	.93
UNIACT, Big-Five, and INDCOL scales (15 factors and 45 composite indicators)	1515.49	840	.055	.053	.77	.91	.92

Note. SRMR, standardized root mean square residual; RMSEA, root mean square error of approximation; AGFI, adjusted goodness-of-fit index; NNFI, nonnormed fit index; CFI, comparative fit index. The complete measurement model with 18 factors and 54 composite indicators was not fitted because the number of parameters exceeded the sample size.

Procedure

The questionnaire was administered to groups of about 50 in an auditorium by the first author. The students received a questionnaire booklet, scantron answer sheets, and a biodata form. The measures were presented in the following order in the questionnaire booklet: Big-Five Personality Factor measure, MTL measure, INDCOL, and UNIACT. The survey was anonymous. All students completed the entire survey within 1 h.

RESULTS

Confirmatory Factory Analysis of Scales

To establish that the various scales measured different constructs, a confirmatory factor analysis (CFA) of the various measures was performed with LISREL 8. Due to the large number of items relative to the sample size, a decision was made to form three multiitem composites for each subscale and to use these multiitem composites as indicators of the factors in the CFA. The covariance matrix of indicators was used in the CFA. The complete measurement model with 18 factors and 54 composite indicators was not fitted because the number of parameters exceeded the sample size. Hence, three CFAs were performed, first the MTL and UNIACT scales only, then the MTL, Big-Five, and INDCOL scales only, and finally the UNIACT, Big-Five, and INDCOL scales.

From Table 2, we observe that the χ^2 goodness-of-fit statistic for the measurement model with MTL and UNIACT subscales (with 9 factors and 27 indicators) was statistically significant, with a value of 585.42 with 288 *df*. Because the χ^2 statistic is affected by sample size, attention was given to other goodness-of-fit indicators (e.g., AGFI, .83; NNFI, .91; SRMR, .051; RMSEA, .060), all of which indicated that the 9 factors provided generally good fit to the data. Similarly, Table 2 also indicates that each of the 12 factors represented by the MTL, Big-Five, and INDCOL measures and 15 factors represented by the

UNIACT, Big-Five, and INDCOL measures is distinct and independent of the other constructs.

Pattern of Correlations

Table 1 presents the correlations between the six UNIACT scales versus the three MTL scales, the Big-Five personality factor scales, and the four INDCOL scales. Each of the vocational interest scales has a unique pattern of relationships with the three MTL factors that is conceptually reasonable on the basis of its pattern of relationships with the Big-Five personality factors, sociocultural values, and general cognitive ability. Specifically, we observe the following.

Realistic interests. As expected, realistic interests are not related to MTL. Realistic interests are weakly related to emotional stability ($r = .22, p < .01$, two-tailed test) and general cognitive ability ($r = .14, p < .05$, two-tailed test), both of which are generally unrelated to any of the MTL factors. People high in realistic interests are also low in agreeableness ($r = -0.17, p < .01$, two-tailed test), which is positively related to MTL. Hence, from the pattern of correlations, we can conclude that realistic interests are unrelated to interest in leading.

Investigative interests. Investigative interests are unrelated to any of the three MTL factors. Interestingly, investigative interests have only weak relationships with two factors that are themselves generally unrelated to the MTL factors, namely, openness to experience ($r = .21, p < .01$, two-tailed test) and general cognitive ability ($r = .12, p < .05$, two-tailed test). People high in investigative interests also tend to be low in extraversion ($r = -0.11$, not significant at $p = .05$, two-tailed test). Hence, like realistic interests, investigative interests are generally unrelated to MTL.

Artistic interests. There is a very weak relationship between artistic interests and NCMTL ($r = .14, p < .05$ two-tailed test). As could be expected, people high in artistic interests are highly open to experience ($r = .33, p < .01$, two-tailed test) and tend to be unstructured (i.e., low conscientiousness, $r = -.17, p < .01$, two-tailed test). They tend to value their unique identity and independence (high Horizontal Individualism, $r = .17, p < .01$, two-tailed test) but reject the competitive, achievement-oriented type of individualism (i.e., low VI, $r = -.15, p < .01$, two-tailed test). These findings nicely provide construct validity to the vertical–horizontal distinction in Triandis's (1998) individualism–collectivism framework of social values.

Social interests. Social interests are moderately related to all three forms of MTL (i.e., people with social interests like to lead, $r = .30$; are noncalculative about leading, $r = .35$; and will lead because of a sense of duty, $r = .36$; all r 's significant at $p = .01$, two-tailed test). They are also high in agreeableness ($r = .42, p < .01$, two-tailed test), extraversion ($r = .31, p < .01$, two-tailed test), and openness to experience ($r = .16, p < .01$, two-tailed test), all of which were reported by Chan (1999) to be highly related to AIMTL and SNMTL. Chan (1999) found that NCMTL is positively related to collectivist values and negatively related to individualistic values in three samples. A similar pattern of

relationships is observed between social values and the social interest factor ($r_{\text{HC, social}} = +.36$, $r_{\text{VC, social}} = +.22$, $r_{\text{VI, social}} = -0.10$). This pattern of relationships with the INDCOL factors suggest that people with high social interests are likely to function well in collectives (i.e., are high Horizontal Individualism) or in hierarchical structures in a manner that is subordinate and obedient (i.e., high Vertical Collectivism). They are not, however, competitive or achievement-oriented in such hierarchical structures (i.e., low Vertical Individualism). Hence, it seems that of the six vocational types, those highest in social interests are most motivated to lead others for varying reasons.

Enterprising interests. Individuals with such interests like to lead and see themselves as leaders rather than followers (i.e., high in AIMTL, $r = .41$, $p < .01$, two-tailed test), and they will lead as a matter of duty or for normative reasons (i.e., SNMTL, $r = .29$, $p < .01$, two-tailed test). They also tend to be extraverted ($r = .26$, $p < .01$, two-tailed test) and achievement-oriented (i.e., high Vertical Individualism, $r = .30$, $p < .01$, two-tailed test).

Conventional interests. In contrast with artistic interests, which are weakly positively related to NCMTL, conventional interests are weakly, *negatively* related to NCMTL. Note that artistic and conventional types are on opposite ends of the RIASEC hexagon. Perhaps even more interesting are the opposite patterns of relationships between the Big-Five personality factors and the INDCOL values, with artistic and conventional interests (see Table 1). Specifically, where conventional interests are positively related to the Big-Five or to the INDCOL factors, negative relationships are observed in the case of artistic interests. This presents further evidence for the use of the Big-Five personality factors and the INDCOL measures as a basis for interpreting the relationships between the RIASEC model and MTL factors.

Overall, the pattern of correlations suggests that investigative and realistic interests that are in the Things-Ideas sector of Prediger's two-dimensional framework are generally unrelated to MTL. In contrast, social interests, located in the People sector of Prediger's framework, tend to be highly related to all three forms of MTL. People high in enterprising interests like to lead, see themselves as leaders rather than followers, and will lead others because of a sense of duty and norms. However, their interest in leading is unrelated to cost-benefit calculations. Finally, conventional and artistic interests which are on opposite ends of the RIASEC hexagon have weak but opposite relationships with NCMTL. That is, people with strong conventional interests are calculative about the costs versus benefits of leading, while people with high levels of artistic interests are not. In sum, the *combination* of personality and INDCOL values suggested by Chan (1999) as antecedents to MTL facilitate understanding of the relationships between both the RIASEC model and MTL factors.

As a secondary observation, the pattern of relations between the Big-Five personality traits and the RIASEC factors in Table 1 generally supported the conclusions from previous studies of interests and personality. For example, the moderately significant correlations between social and enterprising interests with

extraversion corresponded with past findings reported by Costa et al. (1984), Holland, Johnston, and Asama (1994), and Carless (1999). Carless (1999) and Tokar and Swanson's (1995) observation that artistic and investigative types were moderately correlated with openness to experience were also replicated in this study. While the present study did not aim to replicate these results, it is significant that unlike previous studies that used different measures of vocational interests and personality, the present study used the combination of the UNIACT (Swaney, 1995) and Goldberg's (1998) measure of the Big-Five personality factors. Hence, these secondary observations contribute to the overall construct validity of the RIASEC and Big-Five models.

Multidimensional Scaling of General MTL and Vocational Interests

In the introduction, we proposed three different ways in which MTL could relate to vocational interests. We used multidimensional scaling to evaluate the relations of Holland's RIASEC model to the MTL construct. In the interest of parsimony, we used the second-order GMTL factor instead of the three first-order MTL factors in these analyses.

Multidimensional scaling refers to a class of techniques that are used to investigate the structure underlying data. More specifically, the technique organizes proximity data by portraying the similarities among a set of objects in terms of spatial relationships. We used the nonmetric ALSCAL program (Young & Lewycky, 1979) provided in SPSS 9.0 (SPSS Inc., 1999) to perform the multidimensional scaling analyses for studying relations between MTL and the RIASEC scales. All analyses were performed using three multiitem composite indicators per factor by summing groups of items in each subscale. Among the considerations in forming the composites was that each composite should include items with a range of corrected item-scale total correlations and non-overlapping item content. Scale total scores were not used in the multidimensional scaling analyses because the small number of input variables would affect the reliability of the estimates. Conversely, we decided against using item-level indicators because they would result in untidy multidimensional scaling plots with too many points and because we were not interested in the unique variances of individual items. All multidimensional scaling analyses were based on Euclidean distances calculated from the standardized composite indicators.

First, an attempt was made to check that the RIASEC model could be replicated in the existing data. ALSCAL stopped after four iterations because the S-stress improvement was less than .001. Kruskal's (1964) stress index was .10, while the R^2 statistic was .95, indicating an acceptable fit of the model to the data. Note that the stress index is a "badness-of-fit" indicator with a minimum value of 0 and a maximum of 1.00. The R^2 statistic is a "goodness-of-fit" index with the maximum of 1.00. Figure 2 presents the multidimensional scaling plot for the 18 indicators representing the six factors of the UNIACT. In general, the two-dimensional RIASEC model was nicely replicated with the three composites for each of the six factors spatially closer together than the distance between the

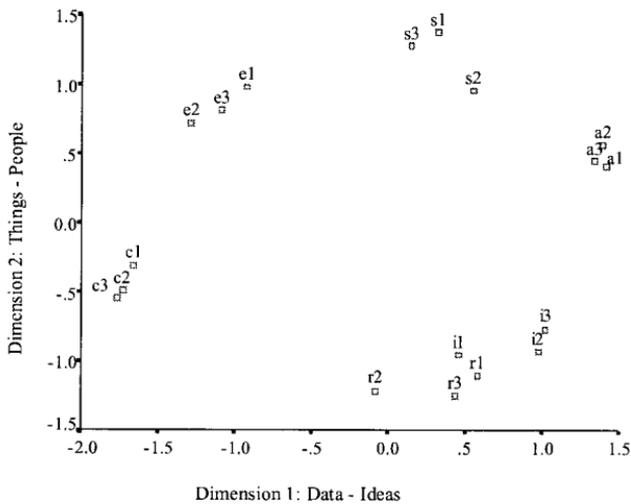


FIG. 2. Two-dimensional multidimensional scaling analysis of UNIACT data (three multiitem composites per scale).

clusters of composites. The only exception was that one of the investigative composites (i1) was closer to the realistic cluster than the other two investigative composites. This was possibly due to a sampling error in the formation of the composite.

Next, a series of two-, three-, and four-dimensional multidimensional scaling analyses were performed with 21 composites representing the RIASEC factors and the GMTL factor. Each GMTL composite was formed by averaging three multiitem composites that were previously used in the confirmatory factor analyses of the AIMTL, NCMTL, and SCMTL scales. The stress and R^2 indices of model fit to the data for the two-, three-, and four-dimensional solutions were as follows: stress, .11 and $R^2 = .928$, for the two-dimensional solution; stress, .073 and $R^2 = .962$, for the three-dimensional solution; and stress, .033 and $R^2 = .990$, for the four-dimensional solution. From the fit indices, it was clear that the three-dimensional model provided a better fit than the two-dimensional model. Although there was an improvement in fit from three to four dimensions, a check of the stimulus coordinates on the fourth dimension showed it to be uninterpretable relative to the RIASEC model or MTL construct. We also compared our stress values with Monte Carlo studies (Spence & Ogilvie, 1973). Spence and Ogilvie report that random stress values for a three-dimensional solution with 21 stimuli should approximate .215. Our observed stress value of .073 was more than 20 *SD* below that reported by Spence and Ogilvie. Moreover, given that the multidimensional scaling was not employed in a totally exploratory manner, we decided to focus our attention on the three-dimensional solution.

Figure 3 presents various representations of the three-dimensional solution. Figure 3a, which presents the first two dimensions of the three-dimensional

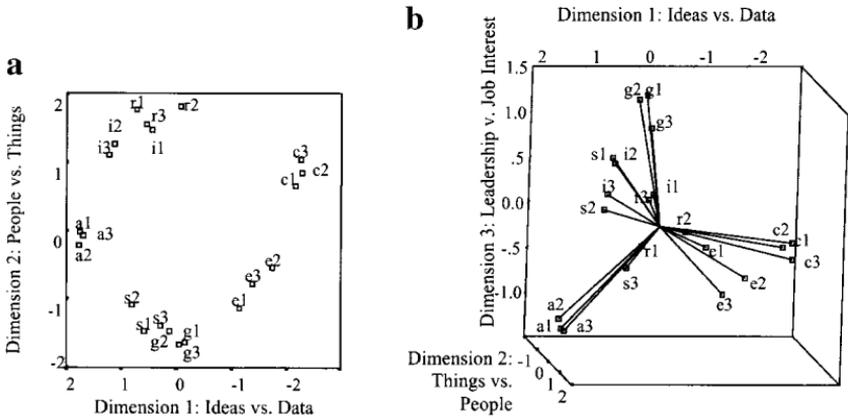


FIG. 3. Three-dimensional multidimensional scaling of GMTL and vocational interest composites. Composites for GMTL are labeled g1 to g3. Similarly, composites for the vocational interest factors are labeled with the first letter corresponding to the RIASEC model. (a) Represents the 3-D plot rotated to show only the first two dimensions. (b) The complete three-dimensional representation with lines drawn from the centroid to the points.

solution, reveals the familiar RIASEC arrangement of the vocational interest composites, with the GMTL composites located between social and enterprising interests. Figure 3a also suggests that Dimensions 1 and 2 correspond approximately to Prediger’s Ideas–Data and People–Things dimensions. From Fig. 3b, we observe the “cone-shaped” structure as suggested in Fig. 1d, with the GMTL factor at the apex and the RIASEC factors forming the base of the structure. The base of the cone does not, however, conform to a strict circular arrangement because certain factors like realistic, conventional, investigative, and artistic interests are pushed farther “out and away” from the center of base, while social, realistic interests are “pulled in” toward the center of the base. Overall, we can infer from the multidimensional scaling results that the MTL construct is relatively independent of the RIASEC model.

Examining MTL by RIASEC High-Point Codes

To complement the CFA and multidimensional scaling analyses, we examined the distribution of MTL scores according to the respondent’s high-point code on the UNIACT-R. Each respondent’s scores on the six UNIACT scales were first converted into percentile ranks using the norms provided for college students and adults in the *Technical manual* of the UNIACT-R (Swaney, 1995). The scale in which the respondent had the highest percentile rank was his or her high-point code on the RIASEC. Respondents with ties in the two highest percentile ranked scores were excluded from the analyses, leaving a total of 265 respondents with the following high-point codes: 31 realistic, 49 investigative, 81 artistic, 45 social, 33 enterprising, and 26 conventional.

Figure 4 presents the box plots of the AIMTL (a), NCMTL (b), and SNMTL

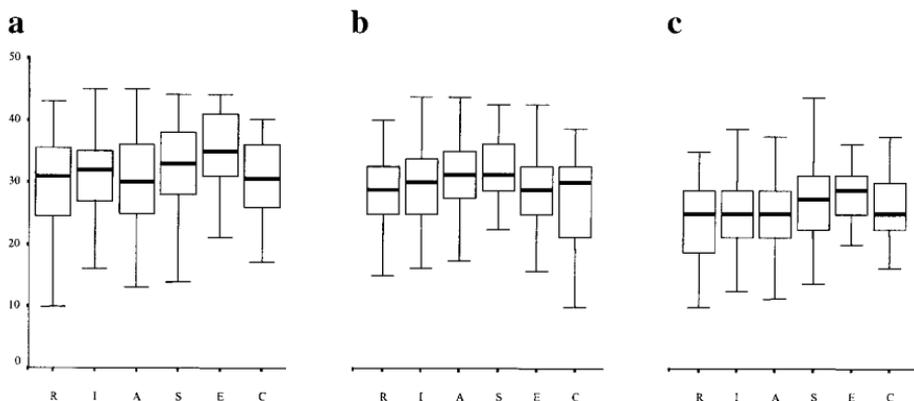


FIG. 4. Box plots of Affective/Identity (a), Noncalculative (b), and Social-Normative (c) MTL against RIASEC high-point code types.

(c) scores for the respondents grouped according their high-point code on the RIASEC model. Table 3 summarizes the results of tests of the hypotheses of equal means and equal variance across groups. First, the box plots indicated that the interquartile range of MTL scores was relatively similar across the different

TABLE 3
Tests of Homogeneity of Variance and Equal Means across High-Point Code Types

Test of homogeneity of variance				Test of equal group means					
Levene statistic	<i>df</i> 1	<i>df</i> 2	<i>p</i>	Source	SS	<i>df</i>	<i>MS</i>	<i>F</i>	<i>p</i>
Affective/Identity motivation to lead (AIMTL)									
1.60	5.00	259	.16	Between groups	714.76	5	142.95	2.71	.02
				Within groups	13675.09	259	52.80		
				Total	14389.85	264			
Noncalculative motivation to lead (NCMTL)									
1.10	5.00	259	.36	Between groups	333.57	5	66.71	2.46	.03
				Within groups	7025.94	259	27.13		
				Total	7359.51	264			
Social-Normative motivation to lead (SNMTL)									
0.82	5.00	259	.53	Between groups	336.45	5	67.29	2.85	.02
				Within groups	6118.99	259	23.63		
				Total	6455.44	264			

Note. Total $N = 265$ respondents excluding those with tied highest and second highest RIASEC scores: 31 Realistic (R), 49 Investigative (I), 81 Artistic (A), 45 Social (S), 33 Enterprising (E), and 26 Conventional (C).

RIASEC high-point code types. This was confirmed by the Levene test of homogeneity of variance, where we failed to reject the hypothesis of equal variances across groups for the three MTL scores at the .05 level. Second, the box plots indicated that the median MTL scores did not differ much across groups. This was again supported by the relatively small F statistics in the one-way analyses of variance that were not significant at the .01 level. Overall, the findings indicate that the MTL construct is relatively independent of the RIASEC, as measured by the UNIACT-R, and that one is able to find a relatively equal spread of MTL in the each of the vocational interest types.

DISCUSSION

Overall, the findings support the hypothesis that the MTL construct, while correlated with certain interest domains (e.g., social and enterprising), is largely orthogonal to or independent of Holland's hexagonal model of interests. Confirmatory factor analyses showed that the MTL construct as assessed by self-report measures was relatively independent of the RIASEC factors as measured by the UNIACT. We also found that the observed pattern of correlations between the MTL and RIASEC measures was interpretable with the help of their common relations with measures of personality and values. Specifically, we found that social interests related positively to all three MTL factors, and enterprising interests are related to Affective-Identity MTL and Social-Normative MTL, but not Noncalculative MTL. We also showed that conventional and artistic interests had weak but opposite relations with Noncalculative MTL (i.e., conventional types were more calculative about leading, while artistic types were not calculative). Finally, we also found that realistic and investigative types located in the Things-Ideas sector of Prediger's framework were unrelated to the MTL construct.

The multidimensional scaling analyses showed that the MTL and RIASEC constructs were best represented in the form of a three-dimensional, cone-shaped structure, with the RIASEC forming the "base" of the cone and GMTL forming the apex. Examination of the distribution of MTL scores across the RIASEC high-point code types indicated that one could find a relatively equal spread of leadership interest across the six vocational interest types and that the mean MTL scores did not differ substantially across the high-point code types. Note that further replication of the high-point code analyses are required with larger and more representative samples, and possibly with different measures of RIASEC, before generalizations can be made with regard to the relation between the distribution of MTL and RIASEC high-point code types.

Nevertheless, the convergence of findings across different analytic approaches provides support for the proposition that MTL may be construed as a general construct that is independent of the domain of interest or activity. The findings also imply that Holland's RIASEC model is complete in its representation of the content of jobs and that one can refer to varying degrees of leadership role interests *within* each of the six domains of job content captured in the RIASEC.

Furthermore, the findings also suggest that there is a need to complement Holland's model job content interests with other theories of work role interests. This implies that that vocational theories and counseling efforts should not only examine the content of work but also the different roles that people play in their vocations—one of which refers to the role of the leader versus follower at work.

Recently, a number of researchers have suggested that a third dimension underlies Holland's RIASEC model. These proposals include a Complexity dimension (Gottfredson & Holland, 1996), a Prestige dimension (Tracey & Rounds, 1996), and a Sex-type dimension (Einarsdóttir & Rounds, in press). Common to all these approaches is that the third dimension was developed through structural studies of interest or occupational data. The third dimension proposed by the present study differs from these previous efforts. We examined two sets of established, individual difference variables, both resting on theory, to evaluate how they interact: It seems that they bring independent information to the understanding of roles within occupations and jobs in organizations. The RIASEC-MTL model may inform research on organizational efforts to understand satisfaction and satisfactoriness.

At a broader theoretical perspective, this study has brought together the study of role-based interest with job content-based vocational interests. In their chapter in the *Handbook of Industrial and Organizational Psychology*, Ilgen and Holtenbeck (1991) called for an integration of the literatures on jobs and roles, suggesting "organizational" notions of "prime beneficiary" and "the universe of task elements" as the basis for integrating job and roles. In this article, we suggest an alternative framework for unifying jobs and roles that may be found in social-learning models of leadership and career choice development. Chan (1999) adapted Lent, Brown, and Hackett's (1994) social-learning approach to career choice development, proposing that leadership development takes place through a cycle that begins with MTL (that has as its antecedents personality, values, leadership self-efficacy, and leadership experience). MTL affects participation in leadership roles and training, leading to the acquisition of leadership knowledge and skills. These acquired skills and knowledge count toward one's leadership experience, which in turn increases one's leadership self-efficacy and MTL. This sociodevelopmental approach presents what Fitzgerald and Rounds (1988) would label a "counseling psychology" perspective to the study of jobs and roles, an approach that has been neglected by industrial-organizational psychologists.

We studied only one form of role interest related to working life, that is, leadership role interests, which refer only to the "vertical" aspects of social structures in the work environment. Indeed, others such as Belbin (1981, 1993) have suggested more "horizontal" roles that people play in work teams (e.g., resource investigator, idea-generator, or "plant," the completer-finisher who attends to the details of the team's product). There is perhaps a need for better theory and more research on the development of interests in the different roles that people play at work, along with the development of their job content or

vocational interests. For example, one can argue that the development of job content interests is particularly important prior to one's entry into the world of work (i.e., during high school and college). In contrast, the development of social role interests in the work context (including both team role and leadership interests) takes place only after individuals begin working in organizations, including being members of study or project teams in college. This notion is akin to the call by Hall (1990) for an integration of the vocational and organizational career development literatures. Hall noted that vocational researchers have tended to focus on the occupational choices of high school and college students, while organizational career researchers have tended to focus on the career development processes during adult working life, specifically their careers in organizations. Perhaps what is needed is an integrative, social learning theory of career development that accounts for the different choices that people encounter over a life span perspective of working life that takes into account the different social contexts of work.

Perhaps the main weakness of this study is its correlational design and reliance on self-report data. However, as Brinberg and McGrath (1985) pointed out, all research methodologies are flawed, and it is ultimately through the convergence of findings with different research designs and methods that one can gain confidence in scientific knowledge. We argue that the methodology employed in this study has presented valid evidence pertaining to the *theoretical* relation between leadership and vocational interests. It is unlikely that the present findings were severely affected by common-method variance—given that numerous near 0 correlations were found among variables that were expected to be unrelated (see Table 1). Moreover, the UNIACT and MTL measures have been shown separately to have criterion-related (including predictive) validity. The establishment of a theoretical relation between leadership and vocational interests in this study leads to further questions that will require different research designs to answer. For example, future researchers may wish to examine the relative predictive validity of RIASEC versus MTL scores in relation to the job content and leader role descriptions of job incumbents (e.g., can we predict leadership in a particular vocational domain with just the three-point codes of a measure of Holland's model, or does having the MTL scores for the individuals add to such a job-role prediction?) Indeed, it is our hope that this study has opened up for counseling, vocational, and industrial-organizational psychologists new research possibilities in the study of the development and outcomes of job- and role-related interests.

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