

Journal of Career Development

<http://jcd.sagepub.com>

Linking Leisure Interests to the RIASEC World of Work Map

Patrick Ian Armstrong and James Rounds
Journal of Career Development 2008; 35; 5
DOI: 10.1177/0894845308317933

The online version of this article can be found at:
<http://jcd.sagepub.com/cgi/content/abstract/35/1/5>

Published by:



<http://www.sagepublications.com>

On behalf of:



[University of Missouri-Columbia](http://www.sagepublications.com)

Additional services and information for *Journal of Career Development* can be found at:

Email Alerts: <http://jcd.sagepub.com/cgi/alerts>

Subscriptions: <http://jcd.sagepub.com/subscriptions>

Reprints: <http://www.sagepub.com/journalsReprints.nav>

Permissions: <http://www.sagepub.com/journalsPermissions.nav>

Citations <http://jcd.sagepub.com/cgi/content/refs/35/1/5>

Linking Leisure Interests to the RIASEC World of Work Map

Patrick Ian Armstrong

Iowa State University

James Rounds

University of Illinois at Urbana–Champaign

The present study presents an interpretive framework for linking leisure interests, measured by the Leisure Interest Questionnaire (LIQ), to J. L. Holland's (1997) circumplex model of the world of work. Published data representing correlations between the LIQ and Holland's RIASEC interest types were obtained from Hansen and Scullard (2002). Leisure interest measures were integrated into the RIASEC circumplex using the technique of property vector fitting. By explicitly testing the structural hypothesis in Holland's model, a clearer picture of the relations between work and leisure interests emerge. Visual presentation of leisure interests in the context of the RIASEC circumplex may facilitate the use of the LIQ in applied settings. In particular, an exploration of leisure interests as part of a larger discussion of interests and aspirations may enhance the career-counseling process with clients who are struggling with clarifying their career development plans.

Keywords: *leisure interests; occupational interests; RIASEC types; circumplex models; property vector fitting*

Leisure interests are a potentially useful subset of the larger domain of interests that have been underutilized in career counseling and other applied settings. However, a number of potential career-counseling applications have been identified for leisure interests. In adolescents and other student populations, leisure interests have been put forward as a strategy for increasing the range of potential careers considered by individuals (Munson & Savickas, 1998; Schmitt-Rodermund & Vondracek, 1999). This approach is potentially useful because of the limited range of work experiences of

Authors' Note: Correspondence concerning this article can be sent to Patrick Ian Armstrong, Iowa State University, Department of Psychology, W112 Lagomarcino Hall, Ames, IA 50011-3180; e-mail: pia@iastate.edu.

many adolescents. In adult populations, leisure interests have been identified as a method for discussing career-related decisions with individuals who are dissatisfied with their current career or with individuals who have become unemployed (Mullins & McDaniels, 1998; Walters & Moore, 2002). In particular, using leisure interest measures with adults in the process of making unexpected career transitions may help expand the range of options being considered. Finally, when working with retired individuals or those who are preparing to retire, leisure interests are used to help identify activities that may help compensate for the loss of regular structured activity schedules and sense of identity associated with making the transition away from the workforce (Kerby & Ragan, 2002; Smith, Kielhofner, & Watts, 1986).

Although there is clearly potential for using leisure interest measures to address career development issues, the strategies available to counselors for linking leisure interest and other career-related measures are limited. The primary objective of this article is to link leisure interests to Holland's (1959, 1997) RIASEC model of interests using a statistical method, property vector fitting, that explicitly accounts for the structural model that underlies Holland's theory of interests. Holland's interest-based theory is organized with six personality types and six parallel environments: Realistic (R), Investigative (I), Artistic (A), Social (S), Enterprising (E), and Conventional (C)—referred to collectively as RIASEC. This approach facilitates the use of leisure interests in career counseling by embedding measures of interest in leisure activities within a RIASEC-based map of the world of work. It is proposed that linking leisure and work interests visually will assist the process of connecting leisure interests to potential career choices with adolescents and unemployed adults or linking current career experiences to potential leisure activities with retired adults.

Interests and Holland's Model

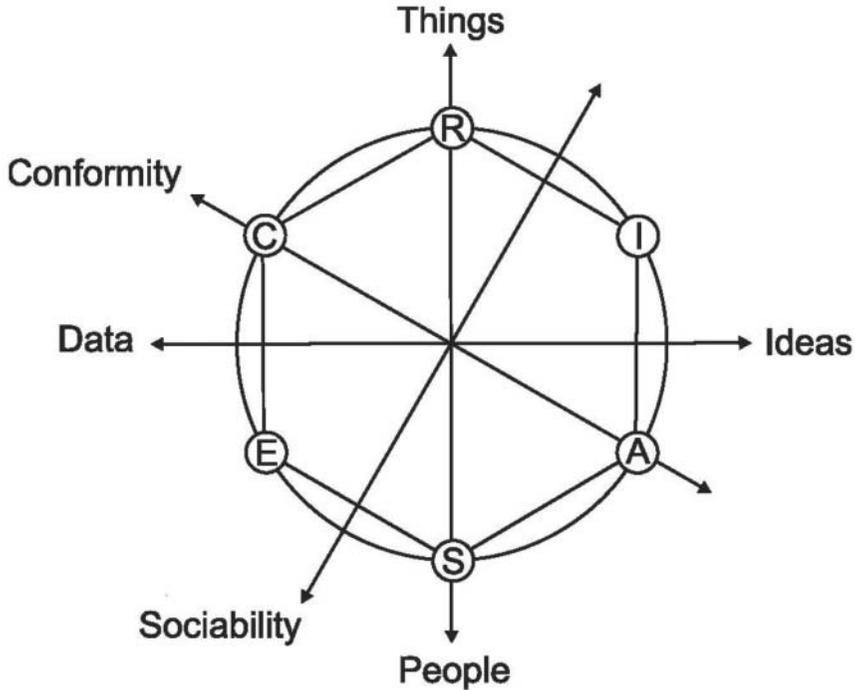
Interests reflect preferences for behaviors, situations, contexts in which preferred activities occur, and the outcomes associated with the preferred activities (Rounds, 1995). As such, interests emerge through the individual's experiences interacting with and adapting to the environment (Lykken, Bouchard, McGue, & Tellegen, 1993). Interests have the potential to impact the development of other traits, such as personality and abilities, because environmental preferences impact the range of experiences that an individual has, thus influencing which traits are developed and refined over time

(Roberts, Caspi, & Moffitt, 2003; Schooler, 2001). This process continues throughout the life span, becoming more stable in adulthood because of the effects of maturation and increasing opportunities to self-select environments, especially learning and work environments (Ickes, Snyder, & Garcia, 1997; Scarr, 1996). Interests provide an organizational framework for educational, work, and leisure environments that can be used in career counseling and other applied settings, as evidenced by the long tradition of using interest measures when matching persons and environments (American College Testing [ACT], 1995; Clark, 1961; Fryer, 1931) and the explicit connections between interests and work environments in Holland's theory.

In the Holland (1959, 1997) model, the link between the individual's personality and the environmental context is direct: The individual's personality is described in terms of preferences for work activities, and work environments are described in terms of the people who work in it and the activities that they perform. The RIASEC personality types are defined by both preferences and aversions that influence the choice of a work environment, and the environments are defined by typical work activities and other demands placed on individuals. Holland's theory has influenced the development of interest measures (Campbell & Borgen, 1999; Gottfredson, 1999), and can also be used to classify occupations and work environments (Gottfredson & Richards, 1999; Muchinsky, 1999). The six RIASEC types are arranged in a circular ordering, with distances between types inversely proportional to the degree of similarity between them (see Figure 1). This structure is referred to by Holland (1997) as a hexagon, although a number of researchers have noted that the underlying circular ordering and structure of the six RIASEC types is a circumplex (Hogan, 1983; Rounds, Tracey, & Hubert, 1992). Research has generally supported the circular ordering of the six RIASEC interest types (Armstrong, Hubert, & Rounds, 2003; Rounds & Tracey, 1993; Tracey & Rounds, 1993).

A notable limitation of previous research linking leisure interests to the RIASEC types is that the focus is on linear bivariate relationships. For example, Hansen and Scullard (2002) have reported correlations between the Leisure Interest Questionnaire (LIQ; Hansen, 1998) and the RIASEC scales of the Strong Interest Inventory (SII; Harmon, Hansen, Borgen, & Hammer, 1994) but do not statistically evaluate the extent to which the intercorrelations between RIASEC and leisure interests are consistent with Holland's structural hypotheses. Focusing on bivariate correlations between RIASEC and Leisure Interest scales fails to capture the multidimensional nature of

Figure 1
Holland's (1959, 1997) RIASEC Model With Dimensions Proposed by
Prediger (1982) and Hogan (1983)



interest structure, and may not effectively represent interrelations between these two sets of interests. A structural analysis would allow for the emergence of a more nuanced and complete picture of the interrelations among individual differences areas by accounting for the degree of similarity between interest types. Modeling the relative strength of associations in a circumplex or other structure makes it possible to identify robust and meaningful relations between distinct sets of individual differences variables that are only moderately correlated. Therefore, in the present article we will examine the data published by Hansen and Scullard (2002) on relations between leisure and work interests using methods of structural analysis that account for the interrelations among the RIASEC types and to provide a visual representation of the structural relations among leisure interests and Holland's model.

A frequently used method for representing a circumplex structure is an orthogonal two-dimensional model in which coordinates specify the relative position of each type. For this reason, the RIASEC interest circumplex is often referred to as a two-dimensional model, and attempts have been made to attach psychologically meaningful labels to the dimensions. As illustrated in Figure 1, the most well-known dimensional interpretation is Prediger's (1982) model of Data–Ideas (contrasting E–C with I–A) and People–Things (contrasting S with R). Hogan (1983) has proposed an alternative interpretation, with a sociability dimension (contrasting S–E with R–I) and a conformity dimension (contrasting C and A). By matching an individual's interests to occupational characteristics by Holland category and representing this information visually using the RIASEC circumplex, it is possible to identify potential career choices for career counseling (McDaniel & Snell, 1999).

Linking Leisure and RIASEC Interests

When people indicate their preferences for educational, occupational, and leisure activities, they are choosing trait-relevant circumstances to express their identities (Hogan & Roberts, 2000). The challenge for counselors is to find a way to integrate information from different sources to create a cohesive picture linking individuals to career choices. We propose that the theoretical framework of Holland's (1959, 1997) structure of interests can be used to integrate information from different types of measures. The technique of property vector fitting (Kruskal & Wish, 1978; Shivy, Rounds, & Jones, 1999) will be used to illustrate the connections between leisure and work interests by illustrating the orientations of leisure interest measures in the Holland's model.

Property vector fitting was initially developed as an interpretive tool for Multidimensional Scaling (MDS) results (Kruskal & Wish, 1978). This technique uses a linear regression model to place variables from one set of measures into the multidimensional structure of a second set of measures. In the present study, a two-dimensional RIASEC circumplex structure based on Holland's theory will be used in the analyses. The angle of the property vector is calculated from the regression coefficients obtained by regressing measures of association between leisure interests and each RIASEC type onto the structural coordinates specified by Holland's theory. These results can then be illustrated as a line, or *property vector*, emerging from the center of the RIASEC circumplex. In short, the structural relations between leisure interests and Holland's model can be illustrated through the orientation of

each Leisure Interest scale in the RIASEC structure and also by comparing the relative orientations of different leisure interests. This technique represents a potential improvement over previous studies, because instead of focusing on the absolute magnitude of a particular bivariate relationship, the analysis systematically models the relative strength of associations between leisure and work interests across all six Holland types.

Although previous studies on leisure interests have not explicitly tested Holland's structural model, given the potential utility of leisure interests in career counseling, we expected that it would be possible to integrate leisure interests into the RIASEC circumplex. Therefore, it was hypothesized that the Leisure Interest scales developed by Hansen (1998) would fit into the Holland model. In addition, it was predicted that the results obtained using property vector fitting would offer interpretations consistent with Holland's theory and the dimensional models proposed by Prediger (1982) and Hogan (1983) to represent the underlying structure of the RIASEC types. Therefore, measures of leisure interest that involve interacting with people (e.g., Partying, Socializing) should be oriented toward the Social and Enterprising types and leisure interests that involve interacting with things (e.g., Building and Restoring) or being outdoors (e.g., Hunting and Fishing, Camping and Outdoors) should be oriented toward the Realistic and Investigative types. Leisure interests that involve creative pursuits (e.g., Arts and Crafts, Literature and Writing) should be oriented toward the Artistic type, and leisure interests such as Collecting and Computer Activities should be oriented toward the Conventional type.

Method

Data Source

Data representing leisure interests and the RIASEC interest types were obtained from Hansen and Scullard (2002). This study reported intercorrelations between the six RIASEC types, as measured by the General Occupational Themes of the SII (Harmon et al., 1994), and 20 Leisure Interest scales from the LIQ (Hansen, 1998). Data were obtained from Table 3 (see p. 336) of the Hansen and Scullard article for secondary data analysis in the current study.

Sample Characteristics

Hansen and Scullard (2002) reported that 273 undergraduate students (50% female, 50% male) in an introductory psychology course at a large midwestern university were recruited to participate in their study in return

for extra course credit. The age of these participants ranged from 16 to 44, with a mean age of 19.6 years. This sample consisted primarily of freshman and sophomores (89.7%) and was predominately White (85.3%).

Scales

Leisure interests were measured by the 20 scales of the LIQ (Hansen, 1998), which consists of 250 items and instructs participants to indicate on a 3-point scale (*like, indifferent, dislike*) their degree of interest in a wide range of leisure activities. Hansen and Scullard (2002) reported that the 5-week test–retest reliability correlation coefficients for the LIQ with a sample of college students ranged from .61 to .91 with an average test–retest reliability of .84, and that the internal consistency coefficient alpha reliability estimates ranged from .69 to .93, with an average internal consistency reliability of .85. Hansen and Scullard also demonstrated convergent and discriminant validity for the LIQ by administering this measure and the Leisure Activities Blank (McKechnie, 1975) to a sample of 134 college students.

RIASEC interests were measured using the General Occupational Theme (GOT) scales of the SII (Harmon et al., 1994). Median GOT internal consistency reliability is reported in the SII manual as being .92, with a range from .90 to .95, and the median test–retest reliability is .86, with a range from .84 to .91. Numerous studies, including Donnay and Borgen (1996) have demonstrated the predictive validity of the SII, and comprehensive reliability and validity information is included in the test manual.

Statistical Analysis

The statistical technique of property vector fitting (Jones & Koehly, 1993; Kruskal & Wish, 1978) was used to integrate personality characteristics into a two-dimensional RIASEC interest-based circumplex by locating a vector in the structure corresponding to each characteristic. This analysis has several steps. The first step is to determine a set of coordinates representing the structure of the six RIASEC interest types. In the present study, coordinates representing the theoretical structure of Holland's circumplex model were taken from Rounds and Tracey (1993): R (.00, .58), I (.50, .29), A (.50, -.29), S (.00, -.58) E (-.50, -.29), C (-.50, .29). The second step is to obtain scores for each characteristic (or property) that describe the associations between each property and the six RIASEC interest types. Correlations between the LIQ scales and the RIASEC scale scores from the SII were used as measures of association between the two types of interest constructs.

Third, a linear multiple regression procedure is then used to regress scores for each property over the coordinates for two dimensions in the RIASEC circumplex. The extent to which the characteristic can be integrated into the interest structure is assessed by the variance accounted for (R^2) in the multiple regression procedure, with higher values indicating a stronger systematic relationship between the Leisure Interest scales and the Holland model. Finally, the results of the regression analyses are then used to calculate directional cosines (regression coefficients standardized with the sum of their squared values equal to 1.00) that are used to illustrate the relations between leisure interests and the Holland model by drawing an arrow emerging from the center of the RIASEC circumplex for each Leisure Interest scale. The angle of the arrow relative to the Holland model illustrates its relationship with the six types. These vectors have potential interpretations in both the direction toward which they point, indicating a strong positive relationship with that area of the interest circumplex, and in the opposite direction, indicating a weak or negative relationship. In the present study, vectors representing individual differences characteristics were included in figures if the R^2 value was greater than .50 (Armstrong, Smith, Donnay, & Rounds, 2004).

Results

Results for the property vector fitting analyses are presented in Table 1. The range of R^2 values obtained in the analyses ranged from .49 for the Cards and Games Leisure Interest scale, to .96 for the Computer Activities scale; the median R^2 value was .79. One issue that has emerged in the interpretation of property vector fitting results is the determination of an R^2 cutoff score for determining which property vectors to interpret as being effectively integrated into the spatial model used in the analysis. For example, Armstrong et al. (2004) limited their interpretation of property vector fitting results to those with R^2 values of at least .50, proposing that accounting for 50% of the variance in a measure using this technique is sufficient grounds to warrant inclusion in an integrative model. In the present analyses, 19 out of the 20 LIQ Leisure Interest measures achieve a criterion of R^2 values greater than .50, and the remaining scale of Cards and Games has an R^2 of .49, which is very close to the cutoff. The obtained results clearly suggest that leisure interests can be effectively linked to the RIASEC model of interests. However, the variability in R^2 values observed across Leisure Interest scales also suggests that some leisure interests, such as Computer Activities, Partying,

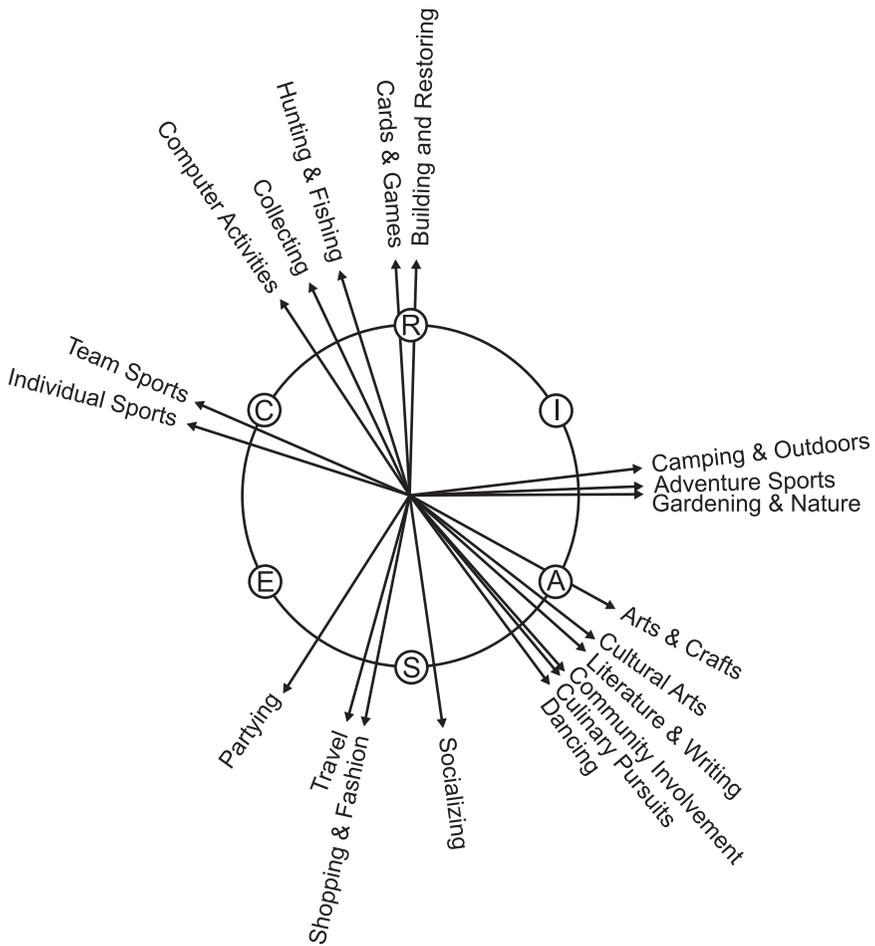
Table 1
Summary of Property Vector Fitting Results

Scale	Directional Cosines		R^2
	Dimension 1	Dimension 2	
Computer Activities	-.55	.83	.96
Partying	-.54	-.84	.93
Arts and Crafts	.88	-.48	.91
Cultural Arts	.79	-.61	.89
Dancing	.60	-.80	.89
Gardening and Nature	1.00	.01	.88
Literature	.75	-.66	.88
Travel	-.27	-.96	.81
Culinary Pursuits	.69	-.83	.80
Adventure Sports	1.00	.04	.79
Community Involvement	.66	-.75	.79
Socializing	.14	-.99	.75
Individual Sports	-.95	.30	.71
Building and Restoring	.03	1.00	.70
Shopping and Fashion	-.19	-.98	.70
Camping and Outdoors	.99	.11	.67
Hunting and Fishing	-.30	.95	.62
Collecting	-.43	.90	.58
Team Sports	-.92	.40	.53
Cards and Games	-.06	1.00	.49

and Arts and Crafts, are very strongly linked to the RIASEC interest types, whereas for other leisure interests, such as Cards and Games, Team Sports, and Collecting, the links to RIASEC are not as strong.

The directional cosines presented in Table 1 were used to embed the LIQ Leisure Interest measures into the RIASEC circumplex, creating the visual representation of the interrelations between leisure and work interests presented in Figure 2. The orientation of the property vectors representing each Leisure Interest scale, relative to the RIASEC types, provides important information linking the domains of leisure and work. In many cases, the interpretation of the placement of Leisure Interest scales will be compatible with the dimensional models proposed by Prediger (1982) and Hogan (1983). For example, the Leisure Interest scales of Arts and Crafts is oriented toward the Artistic type, the Building and Restoring type is oriented toward the Realistic type, and the Socializing scale is oriented toward the Social

Figure 2
Leisure Interests Integrated Into the Holland Model



type. Overall, these results support Holland's type definitions and provide additional evidence directly linking leisure and work activities. However, in some cases, the orientation of the Leisure Interest scale is somewhat different than what might be predicted using the RIASEC model. For example, the Camping and Outdoors, and the three Sports-related Leisure Interest scales are not pointing toward the Realistic type, despite the fact that athletics and outdoor work are often associated with this type in measures of Holland's model. Based on these potential discrepancies between predictions made

using Holland's model and the current findings, additional research may be needed to clarify leisure interest definitions in relation to definitions of the RIASEC types.

The key advantage of the property vector fitting approach demonstrated in these results is an increased capacity to model the strength and direction of associations between leisure and RIASEC interests systematically and visually. Counselors who are familiar with Holland's model, when presented with the data from Hansen and Scullard (2002) may be able to "eye-ball" the relations between leisure and work interests. For example, the highest correlations for Culinary Pursuits reported in Hansen and Scullard were for the A (.38) and S (.35) types, and the lowest correlation were for the R (.08) and E types (.13). In comparison, the highest correlation for Hunting and Fishing scales is for the R (.59) type and the lowest correlation is for the A (-.13) type. Based on this information, we might infer that individuals with Artistic interests like to cook but do not like to hunt, and individuals with Realistic interests like to hunt and so forth. However, the complete table of LIQ-RIASEC scale correlations includes 120 unique values representing relations between leisure and work interests. Information presented in this form is somewhat ungainly, making it difficult to use effectively in a career-counseling session, especially with clients who are unfamiliar with the interpretation of correlation coefficients. Therefore, the use of property vector fitting provides a mathematical model for presenting this information visually, thereby increasing its utility in career counseling and other applied settings.

Discussion

Linking Leisure and Work Interests

Interest measures can be used to assess individual differences in preferences for behaviors, situations, contexts in which preferred activities occur, and the outcomes associated with the preferred activities (Rounds, 1995). Information obtained from interest measures can be very useful in the counseling process when working with individuals who are making career-related decisions and transitions. Despite their potential utility, leisure interests have received little attention in career counseling and other applied settings when compared to other types of interest measures. Using the technique of property vector fitting, measures of leisure interests were successfully integrated into Holland's (1959, 1997) RIASEC model of the world of work. By linking leisure and work interests spatially, the potential utility of leisure interests for

discussing career development issues with individuals at different life stages is enhanced.

Previous studies have, on occasion, discussed linkages between leisure and work interests but have not included multivariate analyses that explicitly account for the circumplex structure that underlies the RIASEC model of the world of work. Counselors who are familiar with Holland's model, when presented with the data from the original study by Hansen and Scullard (2002), may be able to make inferences about relations between leisure and work interests. When working with clients, however, the process of making interpretations may be difficult because of the number of correlations reported by Hansen and Scullard. Therefore, the current findings make an important contribution by systematically integrating leisure and work interests into an easily interpretable, two-dimensional visual map of the world of work.

Holland's theory has been used to develop a wide range of career-related interventions for matching interests to career choices, and visual representations of the world of work map facilitate the process of presenting information and exploring career-related options in the counseling process (Rounds & Day, 1999). With many of the property vectors illustrated in Figure 1, the interpretation of the placement of Leisure Interest scales within the RIASEC model will be compatible with the dimensional models proposed by Prediger (1982) and Hogan (1983); therefore, many of the current results may not be that surprising to readers who are familiar with Holland's (1997) structural hypotheses. There are, however, some results that may be initially surprising. For example, the Team Sports and Individual Sports measures point toward the Conventional Type, whereas the Camping and Outdoors, Adventure Sports, and Gardening and Nature measures fall in between the Investigative and Artistic types, although each of these scales represent physical or outdoor activities that are traditionally linked to the Realistic type. However, the alignment of these leisure interests is consistent with the Conformity dimension proposed by Hogan, and also with the Structured-Dynamic dimension of interests proposed by Armstrong et al. (2004).

It is also interesting to note that there are areas of the RIASEC circumplex that are not associated strongly with any of the LIQ leisure interest measures. In particular, the area around Enterprising and the area between Realistic and Investigative do not appear to be well-represented by the LIQ scales. This finding suggests that there may be opportunities to develop additional leisure interest measures to represent the non-work-related activity preferences associated with individuals with strong Enterprising or Investigative interests. More generally, this finding also suggests that using the RIASEC

model, combined with property vector fitting, as an integrative model may help researchers to identify potential areas of focus for the development or revision of measures.

Integrated Models and Counseling Applications

Potential applications for this integrated model include adolescents, who have little direct work-related experience to call on when making important decisions, and retirees, who are making the transition away from work activities and must find new ways to fill their time. The orientation of the property vectors representing each Leisure Interest scale provides an interpretive framework for discussing the relations between leisure and work interests and activities when working with career-counseling clients.

According to the socioanalytic model of identity development (Hogan & Roberts, 2000), activity preferences reflect attempts made by individuals to find environments that are compatible with their sense of self. In career counseling and other applied settings, the challenge for practitioners is to find strategies for integrating information about the individual with information about the world of work to facilitate this process of self-expression through career choice. Holland's (1959, 1997) theory provides a conceptual framework for organizing information about individuals and work environments. The utility of this approach is illustrated by the present findings because of the points of convergence identified between leisure and work interests. Although the current structural analyses primarily reflect work environments, it is in the context of a work environment where individuals must find a match to their personality traits, abilities, values, and other characteristics to achieve successful work adjustment. Educational and work environments may be essential to understanding how individual differences measures are interrelated, because it is environmental conditions that place demands on individuals, and these demands are clearly articulated in school and work settings (Schooler, 2001). The present study adds leisure interests to the range of issues that can be explored in the career development process by providing a visual representation of linkages between leisure and work interests in the RIASEC world of work map.

One of the strengths of Holland's theory for career counseling is the use of a spatial model to present information visually to clients (Rayman & Atanasoff, 1999). Individual differences in adherence to the RIASEC model have been linked to successful outcomes in career counseling. Tracey and Darcy (2002) found that individuals who perceived the world of work consistently with

Holland's theory model were more certain about their career choices and also displayed less indecision in their career decision-making process. Tracey and Darcy's results suggest that as clients become more familiar with the RIASEC model, they begin making more effective career choices. By linking leisure interests to the Holland model visually, the current results could be used to help increase client's understanding of Holland's theory. This approach may be particularly useful with individuals who have limited work experience or knowledge of career opportunities. Although they may have difficulty expressing their aspirations and interests in terms of a specific career, these individuals may be able to reveal other types of interests, such as leisure activity preferences, that can then be linked to Holland's model of career choices. For example, individuals with interests in Cards and Games or Partying may have difficulty linking these interest to career choices, but by showing the linkages to the RIASEC model (i.e., Realistic with Cards and Games; Partying with Enterprising and Social), these individuals can become more familiar with the world of work through exploring career options associated with the relevant Holland types.

Individuals' perceptions of which work environments would be good matches are often expressed through interests, and interest measures are an important cornerstone of many career-counseling interventions. The present study presents an interpretive framework for leisure interests by embedding the LIQ scales into Holland's RIASEC circumplex, creating a map of the world of work that includes leisure activities. In addition to providing a potential avenue for introducing individuals to the RIASEC world of work map and Holland's theory of interest types, there are a number of other potential applications for leisure interests in career counseling that may be facilitated by the use of this LIQ-RIASEC map. When working with adolescents, exploring leisure interests may be an effective strategy for increasing the range of career options being considered (Munson & Savickas, 1998; Schmitt-Rodermund & Vondracek, 1999). The finding that LIQ scales can be linked to RIASEC work interests provides additional support for the use of leisure interest measures as a strategy for expanding the range of career options being considered by students with limited work experience. The same approach may be effective when working with adults who have become dissatisfied with their current job or with individuals who are struggling with an unexpected career change caused by unemployment, illness, or other unforeseen circumstances (Mullins & McDaniels, 1998; Walters & Moore, 2002). Also, when working with retired adults, the use of the LIQ-RIASEC map can help identify leisure activities that may be a good match for individuals based

on their work experiences to help compensate for the loss of career-related activities (Kerby & Ragan, 2002; Smith et al., 1986).

Limitations and Future Directions

Although the current study demonstrates both the utility of property vector fitting as an integrative technique and the potential utility of leisure interests linked to the RIASEC world of work map, there are a number of limitations to these findings that should be addressed in future research. The LIQ scales generally fit the RIASEC model well, but there was a wide range of R^2 values observed in the results, and there is some potential ambiguity in interpreting these differences. Some measures, such as Computer activities ($R^2 = .96$) or Arts and Crafts ($R^2 = .91$) fit the model very well. In comparison, other measures such as Collecting ($R^2 = .58$) and Team Sports ($R^2 = .53$) were clearly associated with the Holland model but with lower R^2 values. It may be possible to revise measures with lower R^2 values to more closely reflect the order predictions in Holland's model, or it may be the case that some leisure interests are simply not as strongly associated with the RIASEC types. Additional research is needed to evaluate the implications of these differences in counseling and other applied settings.

Another limitation of this study is the use of a sample representing predominantly White, midwestern college students. To the extent that leisure interests vary as a function of age, racial or ethnic identity, or geographic location, additional research may be needed to evaluate the utility of this model with a wider range of career-counseling clients. It may also be useful to evaluate gender differences in the structure of leisure interests in a larger sample.

In addition to providing a strategy for visually representing associations between leisure and work interests, the present results provide validity evidence for using the LIQ in career counseling. The LIQ has the potential to be a very effective leisure interest measure for use in career-counseling applications because of the strong associations observed between the LIQ scales and the RIASEC types. Additional research is needed to evaluate how well other leisure interest measures can be embedded into the RIASEC model of the world of work and also to examine in more detail those regions of the RIASEC circumplex that did not include leisure interests. In particular, there were no leisure interests pointing toward the I and E areas of the model, which suggests that additional research is needed to investigate the leisure interests of people with strong I or E vocational interests. Nevertheless, for career counselors and others involved in providing guidance to individuals making important career-related decisions who are interested in adding leisure interests to their

repertoire of assessment measures, the LIQ would be a good place to start. The LIQ has strong psychometric characteristics, represents a wide range of leisure activities, and can now be linked to RIASEC-based assessments and career interventions using the world of work map presented here in Figure 2.

References

- American College Testing, Inc. (1995). *Technical manual: Revised unisex edition of the ACT Interest Inventory*. Iowa City, IA: Author.
- Armstrong, P. I., Hubert, L., & Rounds, J. (2003). Circular unidimensional scaling: A new look at group differences in interest structure. *Journal of Counseling Psychology, 51*, 297-308.
- Armstrong, P. I., Smith, T. J., Donnay, D. A. C., & Rounds, J. (2004). The Strong ring: A basic interests model of occupational structure. *Journal of Counseling Psychology, 51*, 299-313.
- Campbell, D. P., & Borgen, F. H. (1999). Holland's theory and the development of interest inventories. *Journal of Vocational Behavior, 55*, 86-101.
- Clark, K. E. (1961). *The vocational interests of nonprofessional men*. Minneapolis: University of Minnesota Press.
- Donnay, D. A. C., & Borgen, F. H. (1996). Validity, structure, and content of the 1994 Strong interest inventory. *Journal of Counseling Psychology, 43*, 275-291.
- Fryer, D. (1931). *The measurement of interests in relation to human adjustment*. New York: Henry Holt.
- Gottfredson, G. D. (1999). John L. Holland's contribution to vocational psychology: A review and evaluation. *Journal of Vocational Behavior, 55*, 15-40.
- Gottfredson, L. S., & Richards, J. M., Jr. (1999). The meaning and measurement of environments in Holland's theory. *Journal of Vocational Behavior, 55*, 57-73.
- Hansen, J. C. (1998). *Leisure Interests Questionnaire*. St. Paul, MN: JHC Consulting.
- Hansen, J. C., & Scullard, M. G. (2002). Psychometric evidence for the leisure interest questionnaire and analyses of the structure of leisure interests. *Journal of Counseling Psychology, 49*, 331-341.
- Harmon, L. W., Hansen, J. C., Borgen, F. H., & Hammer, A. L. (1994). *Strong Interest Inventory applications and technical guide*. Palo Alto, CA: Stanford University Press.
- Hogan, R. T. (1983). A socioanalytic theory of personality. In M. M. Page (Ed.), *Nebraska symposium on motivation 1982. Personality: Current theory and research* (pp. 55-89). Lincoln: University of Nebraska Press.
- Hogan, R. T., & Roberts, B. W. (2000). A socioanalytic perspective on person/environment interaction. In W. B. Walsh, K. H. Craik, & R. H. Price (Eds.), *New directions in person-environment psychology* (pp. 1-24). Mahwah, NJ: Lawrence Erlbaum.
- Holland, J. L. (1959). A theory of occupational choice. *Journal of Counseling Psychology, 6*, 35-45.
- Holland, J. L. (1997). *Making vocational choices* (3rd ed.). Odessa, FL: Psychological Assessment Resources.
- Ickes, W., Snyder, M., & Garcia, S. (1997). Personality influences on the choice of situations. In R. Hogan, J. Johnson, & S. Briggs (Eds.), *Handbook of personality psychology* (pp. 165-195). New York: Academic Press.

- Jones, L. E., & Koehly, L. M. (1993). Multidimensional scaling. In G. Kern & C. Lewis (Eds.), *A handbook for data analysis in the behavioral sciences: Methodological issues* (pp. 95-163). Hillsdale, NJ: Lawrence Erlbaum.
- Kerby, D. S., & Ragan, K. M. (2002). Activity interests and Holland's RIASEC system in older adults. *International Journal of Aging and Human Development*, *55*, 117-139.
- Kruskal, J. B., & Wish, M. (1978). *Multidimensional scaling*. Newbury Park, CA: Sage.
- Lykken, D. T., Bouchard, T. J., Jr., McGue, M., & Tellegen, A. (1993). Heritability of interests: A twin study. *Journal of Applied Psychology*, *78*, 649-661.
- McDaniel, M. A., & Snell, A. F. (1999). Holland's theory and occupational information. *Journal of Vocational Behavior*, *55*, 74-85.
- McKechnie, G. E. (1975). *Manual for the Leisure Activities Blank*. Palo Alto, CA: Consulting Psychologists Press.
- Muchinsky, P. M. (1999). Applications of Holland's theory in industrial and organizational settings. *Journal of Vocational Behavior*, *55*, 127-135.
- Mullins, S. R., & McDaniels, C. (1998). The process of relating leisure activities of displaced workers to occupations. *Journal of Career Development*, *25*, 31-40.
- Munson, W. W., & Savickas, M. L. (1998). Relation between leisure and career development of college students. *Journal of Vocational Behavior*, *53*, 243-253.
- Prediger, D. J. (1982). Dimensions underlying Holland's hexagon: Missing link between interests and occupations? *Journal of Vocational Behavior*, *21*, 259-287.
- Rayman, J., & Atanasoff, L. (1999). Holland's theory and career intervention: The power of the hexagon. *Journal of Vocational Behavior*, *55*, 114-126.
- Roberts, B. W., Caspi, A., & Moffitt, T. E. (2003). Work experiences and personality development in adulthood. *Journal of Personality and Social Psychology*, *84*, 582-593.
- Rounds, J. (1995). Vocational interests: Evaluating structural hypotheses. In D. J. Lubinski & R. V. Dawis (Eds.), *Assessing individual differences in human behavior: New concepts, methods, and findings* (pp. 177-232). Palo Alto, CA: Davies-Black.
- Rounds, J., & Day, S. X. (1999). Describing, evaluating and creating vocational interest structures. In M. L. Savickas & A. R. Spokane (Eds.), *Vocational interests: Meaning, measurement, and counseling use* (pp. 103-133). Palo Alto, CA: Davies-Black.
- Rounds, J., & Tracey, T. J. (1993). Prediger's dimensional representation of Holland's RIASEC circumplex. *Journal of Applied Psychology*, *78*, 875-890.
- Rounds, J., Tracey, T. J., & Hubert, L. (1992). Methods for evaluating vocational interest structural hypotheses. *Journal of Vocational Behavior*, *40*, 239-259.
- Scarr, S. (1996). How people make their own environments: Implications for parents and policy makers. *Psychology, Public Policy, and Law*, *2*, 204-228.
- Schmitt-Rodermund, E., & Vondracek, F. W. (1999). Breadth of interest, exploration, and identity development in adolescence. *Journal of Vocational Behavior*, *55*, 298-317.
- Schooler, C. (2001). The intellectual effects of the demands of the work environment. In R. J. Sternberg & E. L. Grigorenko (Eds.), *Environmental effects on cognitive abilities* (pp. 363-380). Mahwah, NJ: Lawrence Erlbaum.
- Shivy, V. A., Rounds, J., & Jones, L. E. (1999). Applying vocational interest models to naturally occurring occupational perceptions. *Journal of Counseling Psychology*, *46*, 1-12.
- Smith, N. R., Kielhofner, G., & Watts, J. H. (1986). The relationships between volition, activity pattern, and life satisfaction in the elderly. *American Journal of Occupational Therapy*, *40*, 278-283.

- Tracey, T. J., & Darcy, M. (2002). An idiothetic examination of vocational interests and their relation to career decidedness. *Journal of Counseling Psychology, 49*, 420-427.
- Tracey, T. J., & Rounds, J. (1993). Evaluating Holland's and Gati's vocational-interest models: A structural meta-analysis. *Psychological Bulletin, 113*, 229-246.
- Walters, L. E., & Moore, K. A. (2002). Reducing latent deprivation during unemployment: The role of meaningful leisure activity. *Journal of Occupational and Organizational Psychology, 75*, 15-32.

Patrick Ian Armstrong, PhD, is an assistant professor of psychology at Iowa State University. He received his MA and PhD from the Department of Educational Psychology at the University of Illinois at Urbana-Champaign. His research interests include factors influencing identity development, especially those related to educational experiences and career choices; the measurement of individual differences in interests, personality, values, and ability perceptions; and multicultural issues in career counseling and assessment. He also enjoys bird watching, collecting vintage typewriters, and spending time with his family.

James Rounds, PhD, is a professor of educational psychology and psychology at the University of Illinois at Urbana-Champaign. He received his PhD from the Department of Psychology at the University of Minnesota. His research has a focus on vocational interests and how they change over the life span, examining the structure of interests and how that structure develops and changes in the life course. Other research areas include the reciprocal influences among personality, interests, and abilities, with a focus on constructing models, career development in adulthood, and assessment of personality traits and work values. He also enjoys fishing in Canada, camping with family in the Rocky Mountains, and reading Georges Simenon.