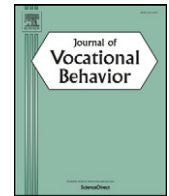




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## Minimizing gender differences in children's interest assessment: Development of the Inventory of Children's Activities-3 (ICA-3)

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## ABSTRACT

The focus of this study was on revising the Inventory of Children's Activities–Revised (ICA-R; Tracey & Ward, 1998) to enhance its psychometric properties while minimizing gender differences in scale scores. The original 30 ICA-R items and an additional 30 items were administered to 70,280 fifth–eighth grades students. The original scoring was compared to a revised scoring method based solely on the empirically best items and a scoring method balancing empirical scoring with minimizing gender differences. All three item sets (original, empirical, and combined empirical/gender balancing) resulted in strong internal consistency estimates and adequate fit to the circular structure, yet the combined empirical/gender method had much lower gender differences especially for the scales measuring Investigative and Social interests. The implications of using the revised scale with children is discussed.

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There are well-documented differences across gender regarding the entry into Science, Technology, Engineering, and Math (STEM) occupations (Ceci, Williams, & Barnett, 2009; Schmidt, 2011; Watt & Eccles, 2008) as well as into helping professions (nursing, teaching, and child care). One of the proposed determinants of such gender differences is the interests of the individuals, with women having more social interests than men (Fouad, 1999; Hansen & Sackett, 1993) and men having more science and realistic interests than women (Su, Rounds, & Armstrong, 2009). There are well-established gender differences on most interest inventories that mirror these occupational differences (Donnay, Morris, Schaubhut, & Thompson, 2005; Hansen, 1984, 1988). These gender differences in interests exist as early elementary school (Liben, Bigler, & Krogh, 2001; Tracey, 2001; Tracey & Ward, 1998). Tracey (2002a) reported that interests in STEM areas (Realistic and Investigative) became even more different across gender with the shift from elementary school into middle school. These gender differences in interests then persist through the entry into college (Tracey & Robbins, 2005). Thus, a key period in interest development appears to be the transition into middle school.

Interest inventories provide a key piece of information and feedback to users. They provide a model with which to organize and think about interests as well as feedback about the relative importance of interests. As such, they can serve to help a user narrow choices to afford a more focused examination of occupations or they can serve to open up unexplored areas. The intervention effect of interest measures is thus a key issue in their use. Given the precipitous increase in gender differences in interest with the move to middle school (Sodano & Tracey, 2007; Tracey, 2002a), it is thus important to select measures that do not accentuate this shift. Providing girls with information that they have Social interests could serve to shut off any examination of more Realistic or Investigative

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interests. Parenthetically, Investigative interests are highly associated with specialized medical occupations. Similarly with boys, high Realistic scores could limit subsequent examination of helping or social areas. The continuance of these gender differences over time argues for possible early interventions to minimize these differences.

These issues have characterized the field of interest assessment since 1974 (National Institute of Education, 1974). One position represented by Holland (1976) argued that inventories should represent the state of the occupational world. Occupations differ across genders and interest inventories should reflect these differences so as to be valid in their predictions. Prediger (Prediger & Cole, 1975; Prediger & Hanson, 1976) argued that inventories should serve to enhance exploration, and thus they should minimize gender differences to encourage individuals seeking less traditional options. This debate has shaped very different approaches to instrument development and the view of the instrument as an intervention (helping to fit into the existing structure vs. working to expand options). While each has some merits, the issues appear less balanced when put in the context of children. The focus on expanding options and preventing premature foreclosure of options seems especially important in children. Later focus can shift toward assessment that represents existing structures but for children it appears too early for such narrowing.

A practical example of the effect of this process may illustrate the issues. If for example a girl has some interest in science (a moderate to high Investigative score) but gets interest inventory information stating that her interests are highest in Social areas (i.e., the modal result for girls), this could dissuade her from further exploration into science. Hence, inventories that have less gendered assessments at this age appear especially important. Hence, it is expected that gender differences are especially important at this age but to balance this and to stimulate further exploration and to prevent premature foreclosure of options, any interest instrument for use with this age group should work toward minimizing gender differences, particularly in the Investigative and Social areas. As such, it is important to use interest inventories with children that minimize gender differences.

One of the problems in assessing interests in children is that there are few appropriate measures. Most measures are designed for individuals 14 and up or higher. The Inventory of Children's Activities–Revised (ICA-R; Tracey & Ward, 1998) is one instrument that was designed specifically for use by children with respect to providing scores on Holland's (1997) RIASEC types. Tracey and Ward reported that interests of children are quite gendered in keeping with Gottfredson's (1981, 2005) model. Children sort the world into male and female activities, and as they age, they become more abstract in their conceptualizations (Franken, 1983; Liben et al., 2001; Looft, 1971; Siegel, 1973; Spare & Dahmen, 1984; Stockard & McGee, 1990). The ICA represents these prominent gender differences across the Realistic, Investigative, and Social scales. In keeping with the goal of minimizing gender differences, while still obtaining a psychometrically sound measure, we sought to revise the ICA to minimize gender differences such that its use would serve more to stimulate exploration rather than prompt premature crystallization of interests and narrowing of occupational options.

In using any instrument, it is crucial that the items be responded to in a similar manner. For example, while the meaning of the item "I like to play with toy trucks" may be obvious, it can have a different meaning for different respondents. A boy can view this item as meaning racing and crashing toy trucks, while a girl could interpret playing with trucks to mean the trucks are having a social interaction (this is exactly how one of our daughters played with trucks). Perhaps both the boy and the girl equally like playing with toy trucks, but these responses would be unequal in meaning. Hence, it becomes essential to ensure that the meaning of the items is equivalent across gender. In this study, we took three steps to ensure equivalence. First, we consulted with teachers, parents, and children for potential items that were familiar to both genders so that the children could accurately rate their liking and competence. Further, we sought items that were generally viewed as being similarly interpreted across gender. However, even the most careful item selection procedure may not weed out items that can be viewed differently. By looking at the internal consistency of the subscales, we also had information on the internal consistency of the items. If the toy truck item was capturing more of the social aspects for girls, then it would not be found to relate highly to the other R items in girls but it would in boys.

However, internal consistency does not indicate that the same meaning is being captured only that the responses to the items in a scale agree. To assess the common meaning of the scales, we also assessed the extent to which the circular structure held in for both boys and girls. It could be that the R scale really captured social aspects for girls. For example, besides the toy truck item, an item on fixing a wagon could be interpreted by a girl as the wagon being an ill patient and the child is working to heal it (e.g., "Where does it hurt"). In this case, the correlation of the girls R scale would be fairly similar to the S scale, while this pattern would not be found for the boys. Hence, for the girls, this different interpretation of R items would result in a poor fit to the circular model. Any scale can be designed to minimize gender score differences; however, it is essential that there also be empirical support for the appropriateness of the item content, comparable internal consistency, and finally structural equivalence.

In line with Gottfredson's (1981) model of career development in children, Tracey and Ward (1998) also found that younger children organize their thinking about interests more in line with sex types and activity locus (school versus outside school). These are more concrete representations of their world and the process of developing involves shifting from gender and activity locus based conceptions of interests to more abstract people/things and data/ideas based conceptions. However, given the salience of gender based conceptions of interests to children and the substantial gender difference on Social, Realistic, and Investigative interests especially, it is important to minimize these differences to prevent individuals from foreclosing on possible interest areas prematurely. Given the trial and experimental period of childhood with respect to interests, self-efficacy, and occupations (Tracey, 2001), the possible effects of interest inventories that represent substantial gender differences could be detrimental to the development of interests in non-traditional areas. The present study sought to revise the ICA-R in a manner to minimize gender differences in scores while still demonstrating comparable psychometric support.

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