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Research Article

The incremental bias: Likert scale to measure career interest in RIASEC theory

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Abstract

Surveys based on Likert scales continue to dominate research practice. The Likert scale is the most widely adopted scale in social science studies. There has been much debate about the use of a Likert scale (eg: is it classified as ordinal or interval data, response bias, response options). This study aims to prove the weakness of the Likert scale used to measure Holland's Theory of Career Choice (RIASEC) career interest. The number of participants was 1752 high school students. The RIASEC career interest instrument was developed based on the Likert scale. Statistical analysis uses correlation to prove the relationship between types of career interest. The results show a positive correlation between types of career interest. For example, conventional with artistic (r = 0.379), investigation with interpretation (r = 0.286). What's interesting is the correlation between R–S (r = 0.134), I–E (r = 0.286), and A–C (r = 0.379) is positive, the correlation should be negative because the relationship between the two is opposite.

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Introduction

Quantitative research is considered an organized investigation of phenomena by collecting numerical data and statistical, mathematical or computational analysis. The source of quantitative research is the positivism paradigm that uses a statistical approach as a data analysis technique, for example descriptive research, inferential, experimental design, surveys and so on, quantitative research also explains or predicts the relationship between variables which is an important characteristic of quantitative research (Creswell & Creswell, 2018).

Quantitative research relies on the collection and analysis of numerical data to describe, explain, predict, or control variables and phenomena of interest (Gay et al., 2009). One of the principles underlying quantitative research is the philosophical belief that the world is relatively stable and uniform so that we can measure and understand it and make broad generalizations about things in this world.

The psychological scale as a measurement instrument is very important and necessary in quantitative research. The use of Likert scales in instruments is widely used compared to other types of scales or instruments (Joshi et al., 2015; Nemoto & Beglar, 2014). The Likert scale provides advantages, including being able to collect a large number of data or respondents in a short time, which can provide high reliability and validity (Nemoto & Beglar, 2014).

One of the issues that are being debated is whether the Likert scale is ordinal or interval (Jamieson, 2004), although Rensis Likert himself thinks that the Likert method has the quality of an interval scale, many consider the Likert scale to

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be ordinal (Hodge & Gillespie, 2003). The conventional interval scale implies that the difference between two successive scales reflects the same difference in the variable being measured. The nature of the interval on the Likert scale assumes that the intensity of feelings between "strongly disagree" and "disagree" is equivalent to the intensity of feelings on scales in other sequential categories.

Another drawback of Likert scaling comes from its closed response format (Hodge & Gillespie, 2003). Respondents are forced to make a choice from the given options which may not match their actual answer. In fact Russell & Bobko (1992) suggests increasing the number of points on the scale to get closer to a continuous size, although this opinion is still much debated (Croasmun & Ostrom, 2011). Brown & Maydeu-Olivares (2013) assessment of the Likert scale is highly dependent on the interpretation of the scale rating. Individual differences in interpreting the options (scale rating) will affect the validity of the test score.

In fact, the Likert scale is most often used in investigating individual differences, such as motivation, anxiety, and self-confidence (Nemoto & Beglar, 2014), but in some studies of the Likert scale has also been created to measure career interest, such as research from (Oh et al., 2012; Sari et al., 2018).

The development of the Hollands model career interest instrument has received great attention in various studies on vocational education. Holland's theory has become the dominant new paradigm in the last 50 years for describing one's interests (Ambiel et al., 2018). Holland argues that a person's pattern of interest can be described into six main types of interest, namely, Realistic (R), Investigative (I), Artistic (A), Social (S), Enterprising (E), and Conventional (C) which are abbreviated as RIASEC.

One of the career interest instruments is the Self Directed Search (SDS) which was developed by Holland (Campbell & Borgen, 1999; Rayman & Atanasoff, 1999; Reardon & Lenz, 1999). SDS is widely used throughout the world as a measure of interest because it is easy to use and has been tested empirically (Nauta, 2010). Oh et al. (2012) and Sari (2018) developed and researched RIASEC career interests using a Likert scale.

Career interest in someone is not singular, meaning that everyone has some or maybe all of the six career interests, and how big is the degree of each interest or a combination of several types. Each type of interest has a correlation with other types (Holland, 1997) which is shown in the form of a hexagon (figure 1). The six types of interests in hexagon order (see figure 1) illustrate the relationship between types of interests such as adjacent, alternate, and opposite. Relationships between adjacent and most related interest types (eg, realistic and investigative), alternate interest types (eg, realistic and artistic; realistic and enterprising) have an intermediate relationship, and opposite interest types (eg, realistic and social) this relationship least related or even opposite (Nye et al., 2012; Wetzel & Hell, 2014).

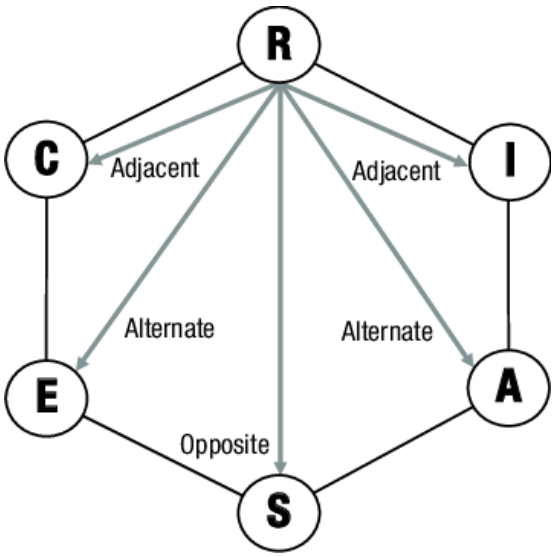

Figure 1. Holland's hexagon model and degrees of congruence

Likert Scale

The popularity of the Likert method stems from a number of facts. First, a Likert scale can be created and modified easily. Second, measurement results in the form of numbers can be directly analyzed with statistics. In general, with Likert scaling, researchers can collect and analyze large amounts of data in less time and effort.

The Likert scale, introduced by Rensis Likert in 1932, is the most widely used psychometric scale in social survey research. It asks respondents to specify their consent. For a 5-point Likert scale, the level of agreement: 1 = strongly disagree (SD), 2 = disagree (D), 3 = neither agree nor agree (NN), 4 = agree (A), and 5 = strongly agree (SA). Depending on what is being measured, the scale label may have different wording. When measuring frequency, for example, labels or words used such as "always, often, sometimes, not always or never" can be used. The Likert scale is well designed for expressing opinions or attitudes.

The Likert scale has been widely used to measure observable behavioral attributes in various areas of social science measurement, such as motivation and self-efficacy (Nemoto & Beglar, 2014). Examples of variables measured include a fondness for music education (Orr & Ohlsson, 2005), Educational and Career Interest (Oh et al., 2012), attitude, career perception, and career interest (Sari et al., 2018).

Holland's RIASEC

Career interest in someone is not singular, meaning that everyone has some or maybe all of the six career interests. Holland (1997) explains that people tend to show more than one, and even have all kinds of interests with the degree of each interest, therefore a person's vocational interest or career interest is a combination of several types. Each type of interest has a correlation with other types (Holland, 1997).

Holland's theory of career departs from personality type as the main factor in career selection and development. This theory assumes that work interest is an aspect of personality, so job descriptions are also related to personality descriptions. The development of his theory rests on the idea that career choice is based on compatibility with personality. He believes that one's job satisfaction is related to similarities between personality and work environment.

Hollands' model of career interest measurement has received great attention in various studies on career interest or vocational education interest. The RIASEC model from Holland (1997) has become the dominant new paradigm in the last 50 years for describing one's interests (Ambiel et al., 2018). One of the career interest instruments is the Self Directed Search (SDS) which was developed by Holland (Campbell & Borgen, 1999; Rayman & Atanasoff, 1999; Reardon & Lenz, 1999). SDS is widely used throughout the world as a measure of interest because it is easy to use and has been tested empirically (Nauta, 2010).

As explained earlier, the relationship between the types of RIASEC interests is closest and most related (for example, realistic and investigative, artistic and conventional, enterprising and investigative). Interest types that have alternate relationships (eg, realistic and artistic; realistic and enterprising). Interest types that have adjacent (eg, realistic and social) relationships are at least related or even opposite.

Purpose of the Study

This study aims to provide empirical facts about the limitations of the Likert scale for measuring RIASEC career interest. To simplify the analysis process, the following research questions are guided:

- Do the items have sufficient reliability and validity coefficients?
- Are the relationships R–I, A–S, and C–E classified as adjacent?
- Are the relationships R–A, and R–E classified as alternate?
- Are the relationships R–S, A–C, and E–I classified as opposite?

Method

Participant

This research was conducted on high school students in Surabaya, due to the Covid-19 pandemic, data collection was carried out online using the Google Form facility. The number of samples obtained was 1752 students. 22.603% male students and 77.397% female students.

Measurement

The instrument used to measure career interest is the Career Interest Scale which was compiled based on Holland's theory which is often called RIASEC (realistic, investigative, artistic, social, enterprising, and conventional). The preparation of the instrument was based on a Likert scale, with alternative answers ranging from strongly disagree, disagree, neither agree nor disagree, agree, and strongly agree. Prior to field testing the Career Interest Scale instrument, the content validity test was carried out by 7 panelists who had competence in psychometrics. After going through the panel process, it is followed by grammar corrections and field trials.

Results and Discussion

To answer the first question "Do the items have sufficient reliability and validity coefficients?" Data were analyzed using the SPSS application to determine the mean, standard deviation, loading factor, and Cronbach's Alpha. The reliability coefficient of Cronbach's Alpha is realistic 0.906, investigative 0.866, artistic 0.803, social 0.673, enterprising 0.726, and conventional type 0.717 (see table 1).

Table 1. Means, standard deviations, loading factor, and Cronbach's Alpha

Type	Items	Mean	SD	Loading Factor	Cronbach's Alpha
Realistic	R1	2.100	0.890	0.738	0.906
	R2	2.160	0.878	0.710	
	R4	2.190	0.846	0.659	
	R12	2.050	0.782	0.747	
	R22	2.100	0.863	0.784	
	R41	2.120	0.903	0.817	
Investigative	I7	2.920	1.079	0.665	0.866
	I8	2.290	0.892	0.651	
	I11	2.690	1.079	0.696	
	I20	2.300	0.939	0.725	
	I23	2.820	1.027	0.632	
	I24	2.460	0.892	0.616	
Artistic	A13	3.060	1.121	0.548	0.803
	A14	3.040	1.050	0.615	
	A15	3.480	0.968	0.512	
	A30	2.710	1.042	0.678	
	A33	2.850	0.979	0.477	
	A40	2.710	1.039	0.533	
Social	S16	3.380	0.961	0.528	0.673
	S25	3.860	0.879	0.431	
	S26	4.460	0.608	0.422	
	S29	3.030	1.135	0.372	
	S35	2.770	0.965	0.307	
	S38	4.130	0.707	0.440	
Enterprising	E6	2.850	0.965	0.291	0.726
	E9	4.250	0.853	0.297	
	E17	3.240	1.235	0.443	
	E27	2.710	1.121	0.568	

	E31	2.920	1.085	0.418	
	E32	2.940	1.045	0.612	
	E34	3.080	1.067	0.437	
	E36	3.170	0.992	0.278	
Convensional	C3	3.780	0.847	0.476	0.717
	C5	2.430	0.901	0.313	
	C19	2.870	1.062	0.521	
	C28	3.840	0.825	0.488	
	C37	3.760	0.894	0.518	
	C39	3.160	1.144	0.418	

To answer questions 2, 3, and 4 a correlation analysis was carried out, the results can be seen in table 2 and figure 2.

Table 2. Correlation between types of RIASEC career interest

	R	I	A	S	E	C
R	--	.379**	.278**	.134**	.268**	.282**
I		--	.311**	.326**	.286**	.408**
A			--	.305**	.324**	.239**
S				--	.571**	.498**
E					--	.430**
C						--

** p ≤ .01

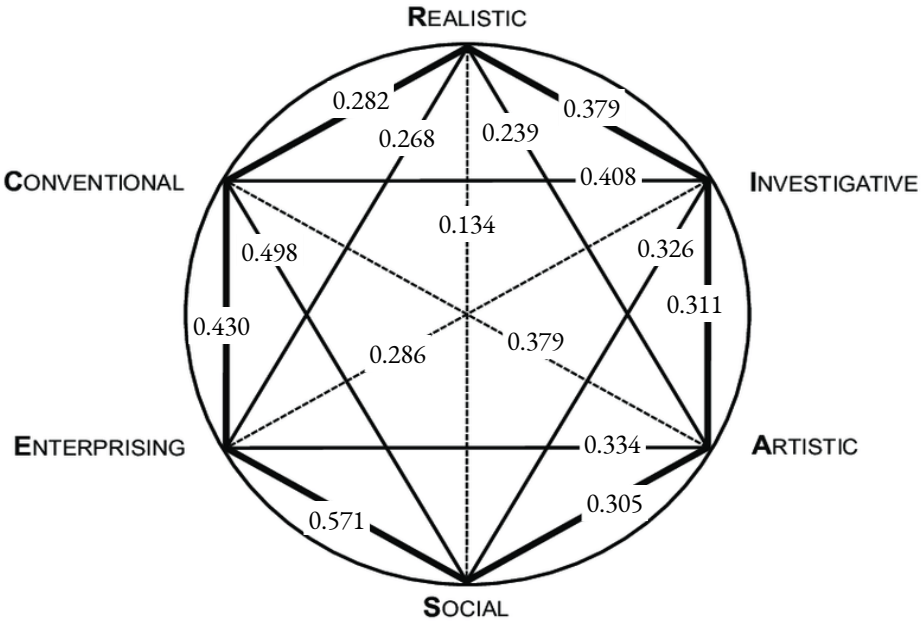

Figure 2. Correlation between types of RIASEC career interest

Do the items have sufficient reliability and validity coefficients?

Cronbach's alpha coefficient for each type of career interest is the lowest at .673 and the highest at .906. George & Mallery (2020) provides a minimum limit of .70 acceptable alpha coefficient. Meanwhile, if you refer to the guidelines presented by Schober & Schwarte (2018) the coefficient of .673 can still be said to be moderate.

The results of the validity test can be seen in the loading factor coefficient (table 1), the higher the coefficient, the higher the level of validity. Referring to the opinion of Schober & Schwarte (2018) regarding the limitations of the item-

total correlation coefficient, there are several items that are still considered weak, such as items on enterprising, social, and conventional which are still considered weak or less than .40. However, Azwar (2015) gives a tolerance of up to a minimum of .250.

It has been described that Holland's RIASEC career interests depicted in a hexagon have interrelationships between types of interests, such as adjacent, alternate, and opposite (Nye et al., 2012; Wetzel & Hell, 2014). The assumption is that types of interests that have an adjacent relationship will have a positive and strong correlation, while types of interests that have an opposite relationship will have a negative correlation. While the types of interests that have alternate relationships have intermediate relationships.

Are the relationships R–I, A–S, and C–E classified as adjacent?

I will start this discussion from adjacent type relationships. The correlation coefficients R–I, I–A, A–S, S–E, E–C, and C–R, show a positive correlation and the correlation is significant at the 0.01 level. The closeness between the RIASEC types indicates compatibility (Nye et al., 2012; Wetzel & Hell, 2014). Realistic and investigative types show people who like to do activities dealing with objects and data (Holland, 1997). Tend to be less sensitive to the social environment and prefer to preoccupy themselves with the world and their own environment. The same type of work is also found in the two personality types, namely laboratory workers, scientists, and mechanics.

Are the relationships R–A, and R–E classified as alternate?

Alternate type relationships (eg, R–A, and R–E) have a positive and significant correlation at the 0.01 level, indicating moderate paired congruence where in this congruence there are some similarities but not dominant and not as strong as the relationship between R–I or S– E. Realistic and artistic types are in different dimensions, realistic is in things while artistic is in the people dimension (Prediger, 1982), but there is still a closeness because realistic and artistic both exist in the dimension of objects.

For example, realistic types are said to have an "aversion" to activities favored by social types and vice versa. Artistic and conventional types are "opposites in the hexagonal model, and they imply multiple opposites" (Holland, 1997). Overall, it appears that the theory-based two dimensions fit the hexagonal model.

Are the relationships R–S, A–C, and E–I classified as opposite?

There are three pairs of opposite types, namely realistic with social, investigative with enterprising, and artistic with conventional (R-S, A-C, and E-I). The opposite type means that the higher the realistic type, the lower the social type interest. Theoretically, realistic types are said to have “aversion” to activities favored by social types (Prediger, 1982), and conversely artistic and conventional types “are opposites in the hexagon model, and they imply a lot of opposites” (Holland, 1997). The research results show otherwise, the correlation coefficients in the R–S, A–C, and E–I type pairs are all positively correlated. this shows results that are not in line with the theory of the hexagonal model. In general, the correlation confirms that the RIASEC circumplex structure on the opposite properties will be negatively correlated (Wetzel & Hell, 2014).

The development of a Likert scale instrument is arranged for each type of interest (eg Realistic, Investigative, Artistic, Social, Enterprising, and conventional) separately. So in answering do not compare with other types that are opposite. This can be types that should be opposite and will have scores that are equally high. To clarify this statement, see the following example.

Table 3. Example for test

	SA	D	N	A	SA
I enjoy repairing power tools				√	
I enjoy participating in social activities				√	

SD: Strongly disagree D: Disagree N: Neutral A: Agree SA: Strongly agree

When respondents are asked to choose between strongly disagreeing and strongly agreeing, it is possible for respondents to choose the same option (for example, agree) for all items even though the items are opposite. Respondents should have answered different options when faced with two opposing items (for example, the first item was answered agree, and the other item was answered disagree).

Here it is clear that the Likert-type career interest scale is unable to provide a difference between one type of interest and the opposite type of interest. When someone is asked to choose "do you prefer tea or coffee drinks" then there should be different choices of the two drinks, it is impossible for the interest in the two drinks to have the same score.

In the example above, the two items of interest according to the RIASEC hexagon model from Holland are of opposite types, but the respondents respond the same way. Response bias can affect Likert scale items (Brown & Maydeu-Olivares, 2013; Guenole et al., 2018). Basically, the assessment of a single stimulus item (Likert scale) relies on the assumption that respondents interpret the rating scale in the same way (Friedman & Amoo, 1999).

Conclusion and Implications

Holland's RIASEC career interest is depicted in a hexagon. Each type has a relationship with the other types (adjacent, alternate, opposite). In theory, the adjacent and alternate types are positively correlated and the opposite type is negatively correlated, but the results show different things (the opposite type relationship is positively correlated). The Likert scale has a bias in measuring RIASEC career interest. The Likert scale belongs to the single response scale of the respondent's interpretation.

Guidance and counselling services in schools aim to assist students in aligning their interests with their learning activities. As one of the tools to assist counsellors in directing students according to their interests is the career interest instrument. Much research and development of career interest instruments has been carried out (see Bartlett et al., 2015; Burns, 2014; Chartrand et al., 1990; Tracey, 2008). But it still needs to be done because of the development of science, technology, and culture.

The Likert scale is most often used in research (Nemoto & Beglar, 2014), including to measure career interest (Oh et al., 2012; Sari et al., 2018). Holland's RIASEC career interests depicted in hexagons have a relationship between types of interests, such as adjacent, alternate, and opposite (Nye et al., 2012; Wetzel & Hell, 2014). There are three pairs of opposite types, namely Realistic with social, Investigative with Enterprising and Artistic with Conventional, meaning that the higher the realistic type, the lower the social type interest. The results of the study show different facts, especially in opposite type pairs, all correlation coefficients are positive and significant, meaning that these results are in contrast to the concept depicted on the hexagon.

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