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Measurement Invariance Testing of Career Anxiety Scale by Gender and Grade Level*

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Abstract. This study aimed to examine measurement invariance of the Career Anxiety Scale developed by Çetin-Gündüz and Nalbantoğlu-Yılmaz (2016). For this purpose, multigroup confirmatory factor analysis was performed to test measurement invariance by gender and grade level. The study group consisted of 415 students studying in the 11th and 12th grades in Nevşehir city center. Within the framework of the study model, measurement invariance was examined using fit coefficients. The analysis results proved the measurement invariance of the Career Anxiety Scale for both genders and 11th-12th grade students.

Keywords: Measurement invariance, the career anxiety scale, multigroup confirmatory factor analysis

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1. INTRODUCTION

Some scholars define adolescence as the period between the ages of 12-18 (Lerner & Steinberg, 2013), while for others, it generally begins at the age of 10 and continues until the early '20s (Steinberg, 2007). Adolescence can be described as a bridge that adolescents must cross to participate in the adult world (Dolgin, 2014). In this period, adolescents' primary psychological task is to develop an identity, and when an adolescent cannot fulfill this developmental task, role confusion occurs (Erikson, 1963). Choosing a profession related to identity development during adolescence is a way of achieving life goals (Dolgin, 2014; Staf, Messersmith & Schulenberg, 2009). Identity is a self-image including many sub-identities such as political identity, sexual identity, cultural/ethnic identity, and physical identity. Career identity is one of those sub-identities (Santrock, 2012). According to Super, suggesting a developmental perspective, career research and decision-making skills play a central role in career development during adolescence (Sharf, 2006).

Although all stages of career development matter, career exploration, typical for adolescents aged 14-24 and characterized by the transition from school to work, can be considered the most troublesome stage (Blustein, Juntunen, & Worthington, 2000). In this stage, adolescents recognize their abilities and interests, gather information about different occupations and education programs, conceptualize their professional identities, and make important career decisions that help them realize themselves (Savickas, 2002). Anxiety is one of the career development factors in this period (Blustein & Phillips, 1988, Vignoli, Croity-Belz, Chapeland, Fillipis & Garcia; 2005). High school years are stressful for adolescents in Turkey, as they are expected to pass a university entrance exam and begin working after high school. Similar procedures can be seen in different countries. For example, students must pass an exam to get a national diploma and then choose a university and profession in France. Therefore, high school years can be very stressful for students (Vignoli et al., 2005). There are high school graduation exams in many states of America. Similarly, high school graduation exams lead to stress and anxiety among students, failing to have a diploma, especially among disabled students. High school graduation exams are associated with negative outcomes for students (Fields, 2011). The turning point of career exploration for Croatian adolescents is the age of 18 when they graduate from high school. Those 18-year-old students have to decide on a proper university education or a job, which decisively guides their future career paths (Babarović & Šverko, 2016). In brief, adolescents are likely to experience anxiety about their career development decisions during their high school years.

Spielberger described the nature and measure of anxiety as a temporary emotional state referring to the feelings of anxiety and tension and heightened autonomic nervous system activity (Spielberg, 1972). Anxiety is characterized by negative emotions, agitated and fearful thoughts, and physical symptoms such as increased blood pressure, sweating, tremors, dizziness, tension, and rapid heartbeat (Barlow, 2002). In other words, anxiety can be explained with emotional and observable reactions such as sadness, sensitivity, and tension caused by stressful situations (Spielberg, 1972 as cited in Büyüköztürk,

1997). Cattell and Scherer (1961) categorize anxiety as *state anxiety* and *trait anxiety* (cited Spielberg, 1972). If you feel anxiety in response to a specific situation, it is called state anxiety (Bourne, 2011). The term state anxiety refers to the complex emotional responses to individual threatening perceptions (Spielberg, 1972). Even state anxiety itself is perceived as threatening (Köknel, 1998). State anxiety varies in intensity and fluctuates over time as a function of stressors (Spielberg, 1972). However, if people think that their values are under threat or they are in a stressful incident, they feel trait anxiety. Trait anxiety is a personality trait characterized by a tendency to feel anxiety in response to a wide range of situations (Spielberger, 1966). It is stable and consistent compared to state anxiety (Köknel, 2014).

Career anxiety refers to negative emotions experienced at any stage of career decision-making or during work (Fouad, 2007; Saka, Gati & Kelly, 2008). In other words, it highlights the concerns related to the career development process (Pisarik, Rowell & Thompson, 2017). Career anxiety may stem from unemployment rates and fear, and career decisions in the labor market. It may arise from career choices and fear of academic failure in high school years (Vignoli, 2015). Career anxiety in high school years may result from academic and professional-life-related career decision concerns among adolescents, the possibility of disappointing family, or the fear of being isolated from family and close friends due to a career (Vignoli et al., 2005; Vignoli, 2015). Some researchers define career anxiety as social anxiety because it is related to a position (Mallet, 2002 as cited in Vignoli et al., 2005), but others indicate that it is a type of trait anxiety (e.g., Mojgan, Kadir, & Soheil 2011; Vignoli et al., 2005). For instance, Campagna and Curtis (2007) associated career indecision with trait and state anxiety, but some studies underlined the correlations between career anxiety and existential anxiety (Pisarik et al., 2017).

The studies on career and anxiety are mainly conducted with university students and focus on the relationships between career decision making, career indecision, and anxiety (e.g., Campagna & Curtis, 2007; Corkin, Arbona, Coleman & Ramirez, 2008; Daniels, Clifton, Perry, Mandzuk & Hall, 2006; Daniels, Stewart, Stupnisky, Perry & LoVerso, 2011; Mojgan, Kadir & Soheil, 2011; Fuqua, Newman & Seaworth; 1988; Fuqua, Seaworth & Newman, 1987; Hawkins, Bradley & White, 1977; Miller & Rottinghaus, 2014; O'Hare Tamburri, 1986; Peng, 2005; Xiao et al., 2014). Additionally, several studies in the literature examined career anxiety among high school adolescents (e.g., Aygün, 2020; Çalı & Doğan, 2021; Göncü Akbaş & Okutan, 2020; Gürgan & Beler, 2021; Kayadibi & Kırdök, 2020; Nalbantoğlu Yılmaz & Çetin Gündüz, 2018; Nalbantoğlu Yılmaz & Çetin Gündüz, 2018a; Okutan & Göncü Akbaş, 2019; Polat, Ayaz Dursun, Dik & Gür, 2021; Şeker, 2021; Taş & Tortumlu, 2021; Tatlı, Kazan & Öngel, 2021). Recent studies used the Career Anxiety Scale developed by Çetin Gündüz and Nalbantoğlu Yılmaz (2016) in order to determine high school students' concerns about occupation choice and parental influences on their career development (Göncü Akbaş & Okutan, 2020; Kayadibi & Kırdök, 2020; Nalbantoğlu Yılmaz & Çetin Gündüz, 2018; Polat, Ayaz Dursun, Dik & Gür, 2021; Şeker, 2021; Tatlı, Kazan & Öngel, 2021). With the use and demand of the scale in different studies in recent years, the need for additional studies on the scale has arisen. It is considered important

that the structure of the Career Anxiety Scale yields similar results in different studies and conditions. Thus, we aimed to test the measurement invariance of this instrument by gender and grade level variables.

In the social and behavioral sciences, measurement and assessment tools evaluate different aspects of human behavior. Such instruments involve items to describe an underlying mechanism to monitor individuals or compare groups over time. For such a comparison to be valid, items must measure identical constructs with the same structures across different groups. Then, we can mention the measurement invariance of a tool (Van de Schoot, Lugtig & Hox, 2012). In other words, measurement invariance is the degree to which measurements have the same psychometric properties across different groups or conditions (Cheung & Rensvold, 1999). If an instrument has measurement invariance, all groups interpret the items and underlying latent factors in the same way. Once invariance is established, future studies can compare latent factor scores' occurrence, determinants, and outcomes. Without measurement invariance, groups or individuals respond differently to items, and consequently, factor means cannot be compared reasonably (Van de Schoot, Lugtig & Hox, 2012).

According to Meredith (1993), there is a four-step logical approach in establishing measurement invariance. Firstly, configurational invariance of a measure is tested to check whether the factor structure is the same across groups without additional equality constraints on the model parameters (Scholten, Velten, Bieda, Zhang & Margraf, 2017). Measurement invariance testing typically requires hierarchical steps that begin with an appropriate multigroup model, in which parameters are subject to equality testing logically and increasingly restrictively. It should be noted that the configural invariance model is the basis on which other invariant measures are compared (Byrne, 2016). Metric invariance is tested to what extent the items measuring the same factor are equivalent across groups. If the assumption is valid, the factor validity of an instrument is equivalent across samples. Scalar invariance implies that not only factor loadings but also item intersection parameters are equal across groups. Strict invariance means that the measurement parameters are identical across groups, and there is zero-tolerance for deviations across groups or measurement conditions (Van De Schoot, Schmidt, De Beuckelaer, Lek & Zondervan-Zwijnenburg, 2015).

Specific psychometric properties should be examined for the accuracy of the scores from the tools measuring psychological characteristics. One of those properties is measurement invariance. Whether an instrument measures the same trait should be investigated in studies in which comparisons across groups are important. Therefore, we aimed to test whether the Career Anxiety Scale items were meaningful for all participants by gender and grade levels. We sought answers to the following questions by performing multi-group confirmatory factor analysis:

1. Do the items in the Career Anxiety Scale establish measurement invariance by gender?

2. Do the items in the Career Anxiety Scale establish measurement invariance by grade level?

2. METHOD

Research Model

We sought evidence for the measurement invariance of the Career Anxiety Scale by gender and grade level and used a survey model in the study.

Study Group

This study used the data of Nalbantoğlu-Yılmaz and Çetin-Gündüz (2018) due to the data collection constraints at schools during the Covid-19 pandemic. The study group consisted of 415 11th and 12th-grade students in Nevşehir city center. The reason for choosing the 11th and 12th-grade students was the high possibility of experiencing career anxiety in those grade levels. Of the participants, 61% (n=253) were 11th graders and 39% (n=162) were 12th graders; and 55% (n=228) were girls and 45% (n=187) were boys. The ethics committee approval for this study was obtained from the Ethics Committee of Social and Human Sciences and Arts Board of Başkent University, dated 19/11/2021 and numbered 17162298.600-201

Data Collection Tool

The Career Anxiety Scale, developed by Çetin-Gündüz and Nalbantoğlu-Yılmaz (2016), is a 5-point Likert type instrument including 14 items and two factors: the anxiety related to *the effect of family* and *the choice of profession*. Low scores indicate low career anxiety, and high scores indicate high career anxiety. The total variance explained in the factor analysis performed on two groups was 44.4% and the fit indices were within acceptable ranges ($\chi 2/sd=2.518$, RMSEA=0.067, CFI=0.95, NFI=0.92, NNFI= 0.94, SRMR=0.055, GFI=0.92, and AGFI=0.90). The internal consistency coefficient of "the choice of a profession" sub-dimension was .797, and it was .742 for the "the effect of family" sub-dimension. The confirmatory factor analysis revealed acceptable fit indices ($\chi 2/sd=2.91$, RMSEA=0.068, CFI=0.97, NFI=0.96, NNFI=0.97, GFI=0.99, and AGFI=0.98). For "the effect of family" sub-dimension, the Cronbach Alpha coefficient was 0.877, and McDonald ω coefficient was 0.88. For the "the choice of profession" sub-dimension, it was measured 0.876 and 0.88, respectively.

Data Analysis

A multi-group confirmatory factor analysis (MGCFA) was performed to test the measurement invariance of the Career Anxiety Scale by gender and grade level. Within the framework of the study model, configural, metric, scalar, and strict invariance coefficients were examined using CFI-comparative fit index, $\chi 2/sd$ ratio-a chi-square ($\chi 2$) difference test. A $\chi 2/sd$ ratio less than 3 (Kline, 2005) indicates a perfect fit, but it is considered a moderate fit if it is less than or equal to 5 (Sümer, 2000). A CFI value higher than 0.90 (Bentler, 1995) was set as a criterion. Besides, the fit index differences between models ($\Delta \chi 2/\Delta sd$, ΔCFI) were calculated following the hierarchical models. If the ΔCFI value between models is equal to or less than .01, it proves that the invariance assumption is met (Wu, Li, & Zumbo, 2007).

Normality assumptions were examined using skewness and kurtosis tests. It was found that some of the skewness and kurtosis coefficients were not in the range of +1/-1. The multivariate normality assumption was also checked using the Mardia multiple skewness-kurtosis tests, and the data did not have multiple normalities. Since the data sets did not exhibit multivariate normal distribution, the Robust Maximum Likelihood method and Satorra-Bentler χ2 value were used for MGCFA. The study data were analyzed using Lisrel 8.7 program.

3. FINDINGS

The measurement invariance by gender groups was tested using four models. In Model 1, whether the variance and covariance parameter estimations differed across sub-sample groups was tested. In Model 2, whether the factor loadings of the sub-sample groups were identical in each gender was tested. In Model 3, factor loadings and equality of sub-sample means were tested. In Model 4, all measurement model parameters were found to be invariant across sub-samples. Table 1 shows the measurement invariance results by gender.

Table 1

Measurement Invariance Results by Gender

Model	χ2	sd	χ2/sd	CFI	Model Comparison	Δ χ2/Δsd	ΔCFI
Girl	236.70	76	3.11	0.94	-	-	-
Boy	153.32	76	2.017	0.97	-	-	-
Model 1	395.41	153	2.58	0.96	-	-	-
Model 2	414.30	165	2.51	0.95	2-1	1.57	0.01
Model 3	409.26	163	2.51	0.95	3-2	2.52	0.0
Model 4	424.73	179	2.37	0.95	4-3	0.97	0.0

Table 1 shows the confirmatory factor analysis results for both boys and girls. The fit indices suggested acceptable ranges for both gender groups. Accordingly, the two-factor structure of the Career Anxiety Scale was confirmed for both girls and boys. The model fit indices of boys were better than girls. The model data fit was sufficient to test the configural invariance.

In Model 1, fit indices of both gender groups (χ2/sd=2.58, CFI=0.96) suggested a good configural invariance, which refers that the male and female students used the same conceptual framework in responding to the scale items. The fit indices obtained for Model

2 (χ2/sd=2.51, CFI=0.95) showed the achievement of metric invariance by gender groups. Additionally, we obtained Δχ2/Δsd, and ΔCFI fit indices by subtracting the model fit values of configural invariance from the fit values of the metric invariance, which indicated that the factor loadings of the variables were equivalent by gender. This result indicates that the factor loadings of the variables observed on the career anxiety structure of the female and male student groups are equivalent. This situation also indicates that the meanings of the items may be the same for the comparison groups, but it does not indicate item bias.

In Model 3, scalar invariance was tested, and the fit indices and the Δχ2/Δsd and ΔCFI values across models proved the achievement of scalar invariance. Similarly, the fit indices of Model 4 and the Δχ2/Δsd and ΔCFI values across models revealed that strict invariance was achieved.

Within the scope of the study, we also tested the measurement invariance by grade level. Table 2 presents the measurement invariance results by grade level below.

Table 2

Measurement Invariance Results by Grade Levels

Model	χ2	sd	χ2/sd	CFI	Model Comparison	Δ χ2/Δsd	ΔCFI
11th grade	192.83	76	2.54	0.97	-	-	-
12th grade	212.15	76	2.79	0.92	-	-	-
Model 1	405.99	153	2.65	0.95	-	-	-
Model 2	423.03	165	2.56	0.95	2-1	1.42	0.0
Model 3	417.56	163	2.56	0.95	3-2	2.73	0.0
Model 4	443.77	179	2.48	0.95	4-3	1.64	0.0

According to the fit indices obtained from the confirmatory factor analysis for 11th and 12th-grade students, they were within acceptable ranges for both groups. The fit indices revealed that the model data fit was appropriate to test the configural invariance.

In Model 1, the fit indices suggested the achievement of configural invariance. The Δχ2/Δsd and ΔCFI values obtained from comparing Model 1and 2 and Model 2 fit indices, proving metric invariance, indicated similar relationships across grade-level groups. Accordingly, it was concluded that the 11th and 12th-grade students answered the items in the Career Anxiety Scale in the same way and yielded meaningful comparison results.

In Model 3, fit indices and difference coefficients suggested the achievement of the scalar invariance. Similarly, Model 4 suggested the achievement of strict invariance, which refers that item errors were invariant between the 11th and 12th graders.

4. RESULTS, DISCUSSIONS AND SUGGESTIONS

In this study, we tested the measurement invariance of the Career Anxiety Scale by gender and grade level. The scale is widely used to describe high school students' career concerns about choosing a profession. Cross-group comparisons regarding career anxiety are essential in applied studies, and they are based on the assumption that groups have identical parameters. However, such comparisons are not valid without evidence of equivalence across groups. No study in the literature tested the measurement invariance of the Career Anxiety Scale items. Therefore, we aimed to test it by two variables: gender (male-female) and grade level (i.e., 11th and 12th-grade levels). The analysis results proved the measurement invariance of the Career Anxiety Scale across gender. Similarly, measurement invariance was provided by 11th and 12th-grade levels, which are critical times for career decision-making and career choice.

The measurement invariance results indicated that scale scores were equivalent across the given groups. The male and female 11th and 12th-grade students perceived and interpreted the scale items equivalently, which means that a cross-group comparison regarding career anxiety yields valid and reliable measures for both 11th and 12th-grade and male and female students. According to the results obtained from the research, it can be said that it would be appropriate to compare the career anxieties of the participants between the 11th and 12th grades, between girls and boys.

The results of the research are based on the data obtained from the students participating in the research. For this reason, it is recommended to examine the measurement invariance in different groups in the next step. In the literature, career anxiety among students was evaluated by grade level, gender, school type, parental education status and monthly income (e.g., Aygün, 2020; Gürgan & Beler, 2021; Çalı & Doğan, 2021; Göncü Akbaş & Okutan, 2020; Nalbantoğlu Yılmaz and Çetin Gündüz, 2018; Polat, Ayaz Dursun, Dik and Gür, 2021; Taş and Tortumlu, 2021). In this sense, future studies can test the measurement invariance in different groups and consider different variables. Besides, in this study, multiple groups confirmatory factor analysis was performed to test the measurement invariance of the Career Anxiety Scale by gender and grade level. Future studies can confirm our results by carrying out item response theory analysis.

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