Examining the measurement invariance of the satisfaction with life scale across different age groups

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Abstract

Measurement invariance allows for the comparison and interpretation of scores obtained from the same scales at different times. In this respect, the purpose of this research is to examine the measurement invariance of the satisfaction with life scale applied to different age groups. The study employs the survey model, a type of quantitative research. The purposive sampling method was used in the research. This method is one of the non-random sampling types. This method collected data from 120 individuals under the age of 25 and 120 individuals over the age of 60 who resided in Ankara. The collected data were divided into two groups according to age: young and old. Measurement invariance was examined in four separate stages by performing Multiple Group Confirmatory Factor Analysis. These are configural, metric, scalar, and strict invariance. The data were examined to determine the configural, metric, and scalar invariance across different age groups by using multiple group confirmatory factor analysis. As a result, configural ($\chi^2/df=0.84$; $p>0.05$), metric ($\chi^2/df=1.26$; $p>0.01$), scalar ($\chi^2/df=1.38$; $p>0.05$), and strict ($\chi^2/df=1.43$; $p>0.05$) invariance are provided that the satisfaction with life scale has invariance properties for two different age levels. This research's application of the satisfaction with life scale scores to various age groups demonstrates measurement invariance and yields results with a similar structure.

Contents

Contribution of this paper to the literature
Life satisfaction may differ depending on adulthood. However, every adulthood period generally uses the same life satisfaction scale. Measurement invariance allows for the comparison and interpretation of scores obtained from the same scales at different times. In this respect, the purpose of this research is to examine the measurement invariance of the satisfaction with life scale applied to different age groups in adulthood.

1. Introduction

Life satisfaction plays an important role in issues such as health, work, and education that people have been dealing with their whole lives. Life satisfaction, which is a subject of positive psychology with roots dating back to ancient times, will be more meaningful when it is considered together with many variables rather than on its own (Diener, Emmons, Larsen, & Griffin, 1985). Neugarten, Havighurst, and Tobin (1961) first used the concept of life satisfaction in their literature. Life satisfaction covers the individual's evaluations of his/her past and present lives.

Life satisfaction is the idea that arises as a result of the comparison between the individual's current resources and future expectations. In this regard, the individual himself/herself is the only criterion of life satisfaction. In order to define life satisfaction, it is important to understand the concept of satisfaction (Subaşı, 2021). As a matter of fact, life satisfaction is conceptualized as the satisfaction that takes place in the experiences of the individual throughout his/her life and is affected by many variables.

There are many factors affecting life satisfaction. Some of these are: physical and mental resilience, age, marital status, having a job, being free, having friends, social environment, doing sports, etc., (Özdevecioğlu & Aktaş, 2007). According to Ummet (2012) some characteristics of individuals with high life satisfaction are as follows:

- Enjoying activities in daily life.
- Having life goals.
- Belief in achieving the set goals.
- Have a positive self-image and see yourself as a valuable individual.
- Optimistic life attitude.

The concept of life satisfaction does not only cover a specific situation; we can meet with the concept of life satisfaction in all areas of our lives (Çevik, 2010). In essence, the concept of life satisfaction serves as a clear indicator of individuals' happy and well-being behaviors. Therefore, when we compare happy individuals with unhappy individuals, it is indicated that happy individuals are more sociable, conduct their relationships correctly, are friendly, are healthy, are more successful professionally, have good financial gains, and synthesize the concept of happiness positively in their whole life (Diener & Seligman, 2002).

In recent years, policymakers and professionals in the psycho-social fields have found the measurement of life satisfaction in various cultures, countries, and life periods to be a remarkable subject (Diener, Inglehart, & Tay, 2013). Professionals and policymakers perceive the macro policies they develop and implement, and they view their reflections on individuals' life perceptions as crucial feedback. Life satisfaction is a concept reflecting an individual's own life evaluation (Diener et al., 1985). There is little difference, or maybe there is no difference, between the recent life perception and the ideal life perception of individuals who are satisfied with their own lives (Boniwell, 2012).

Research made about life satisfaction shows that life satisfaction is affected by variables like personality, marriage, job, culture, and life conditions (Luhmann, Lucas, Eid, & Diener, 2013). Many research studies made about the relationship between life satisfaction and age show a U-shape relationship between these two variables (Blanchflower & Oswald, 2008; Stone, Schwartz, Broderick, & Deaton, 2010). Some other research points in the direction that life satisfaction does not change within the life cycle (Inglehart, 1990; Suh, Diener, Oishi, & Triandis, 1998). Also, there are research studies demonstrating that life satisfaction increases in adulthood and old age, and these attract attention in the literature (Blanchflower & Oswald, 2008; Prenda & Lachman, 2001). All these studies make us wonder whether life satisfaction measurement scales can be used without adaptation in all life periods and whether we can obtain reliable results or not.

Different theoretical perspectives on life satisfaction offer different explanations for why it may change with age. Early theories of life satisfaction proposed that objective circumstances like physical health, financial status, and social relationships most directly determine people's happiness (Baltes & Mayer, 1999). As a person ages, these circumstances may change for the worse, leading to a decline in life satisfaction. Other theories, however, suggest that factors such as personality traits and future expectations can also play a role in life satisfaction. For example, researchers have found that people who are more extraverted and have higher self-esteem tend to be more satisfied with their lives (Steel, Schmidt, & Shultz, 2008). Additionally, socioemotional selectivity theory suggests that people may actually become happier and more satisfied with their lives as they age (Carstensen, 1995). This is because older adults may become more aware of their own mortality and focus on making the most of the time they have left. Overall, the research on age-related trends in life satisfaction is mixed. Some studies have found that life satisfaction declines with age, while others have found that it either remains stable or even increases (Carstensen, Isaacowitz, & Charles, 1999). It is likely that a combination of factors, including both objective circumstances and subjective characteristics, play a role in determining life satisfaction at any age.

Life satisfaction, which is an important variable affecting people's lives, causes positive or negative attitudes and behaviors in social life. Merkas, Raboteg-Saric, and Miljkovic (2011) emphasize that individuals with higher levels of life satisfaction socialize more easily and feel healthier both physically and cognitively. From this perspective, it's crucial to measure the life satisfaction of educated young adults under 25 and the life satisfaction of individuals over 60 who have a wealth of life experiences.

Numerous variables influence life satisfaction, as evidenced in the literature. The measurement tools to be used in measuring this characteristic should provide invariance in terms of certain groups. In particular, it is important to emphasize the concept of measurement invariance in terms of determining whether life satisfaction gives similar results in different subgroups that are not homogenous.

According to Classical Test Theory, test and item statistics in validity and reliability calculations about measurement results could change depending on the group and reflect the characteristics of group (Crocker & Algina, 1986). Depending on this limitation in CTT, questions arise about the situations and levels at which the measurement qualifications of observed variables can be considered valid and generalizable. Under that situation, mostly there are questions like "answerers in different cultures can interpret the same item similarly or whether individual differences like age and sex influence answers given" (Vandenberg & Lance, 1998). Therefore, Millsap and Kwok (2004) are conducting measurement invariance studies to find answers to these questions.

The measurement of the same theoretical construct at different measurement times across different testing methods or populations is known as measurement invariance (Meade & Lautenschlager, 2004). This method simultaneously estimates factor models for all groups under comparison.

According to Little (2013) in order for a measurement model to have the same structure in more than one group, the factor structure of the scale has to fit equally to the data obtained in more than one case. In this respect, measurement invariance is the same as factor loads of the items on the scale, correlations between factors, and error variances (Byrne, 1994).

One indicator of a scale's construct validity is that it measures the same feature in various subgroups. The validity of the measurement tool is analyzed by making comparisons between subgroups. When a measurement tool proposes a construct, it should provide the same measurements under various observation and working conditions. Similarly, studies that aim to uncover differences between groups based on a construct presume that the measurements from the measurement tool for each group possess identical psychometric properties. Thus, measurement invariance in a test means that it gives valid measurements for all groups, or that each item in the test gives the same results for all groups (Tyson, 2004).

Confirmatory factor analysis-based methods examine measurement invariance by testing the similarity of measurement models between groups. This method's most significant advantage lies in its ability to examine all aspects of measurement invariance, including factor loadings, factor variances, and covariance. Measurement invariance is tested by making comparisons among nested (hierarchical) models (Meredith, 1993; Steenkamp & Baumgartner, 1998). When groups at the same competency level answer an item belonging to the measured trait with the same probability, it is considered invariant. The null hypothesis of an item's measurement invariance test for two groups corresponds to the equality of the item parameters in both groups, and the alternative hypothesis corresponds to the difference of the item parameters in the groups (Verhagen, Levy, Millsap, & Fox, 2016).

In the absence of measurement invariance in a measurement tool, there are two main problems. The first one is the validity problem (Borsboom, Mellenbergh, & Van Heerden, 2004). If item functions differ by group, it can be said that the measurement tool does not measure the same construct in the same way in all subgroups. The second problem is that evaluations and comparisons are made by neglecting the fact that the relationship between the construct measured and the items responded to differs for each group (Horn & McArdle, 1992). Measurement invariance tests are analyzed in two different groups: confirmatory factor analysis-based methods and item response theory-based methods.

The first step in determining measurement invariance, configural invariance, aims to investigate whether the same items measure similar constructs between groups. This method simultaneously predicts factor models for all groups. Model fit indexes assess the validity of configural invariance, considering it the basic model. The configural invariance is a baseline model that can be compared to the metric invariance. Once we ensure configural invariance, we investigate metric invariance to determine if the factor loadings between groups are equivalent. The invariance of factor loadings indicates that the structure has the same meaning across groups. Once we achieve metric invariance, we investigate the scaler invariance of item intersections to identify metrically invariant items. Scaler invariance (strong factorial invariance) indicates average equivalence across different groups. After ensuring scaler invariance, the last step is to test strict invariance.

Strict invariance (Meredith, 1993) is the highest level of measurement invariance. Strict invariance requires metric (factor loadings) invariance, scalar (indicator/item intersections) consistency, and error variance invariance. Error variance invariance is considered an invariance of item reliabilities across groups (Schmitt, Pulakos, & Lieblein, 1984); however, it is only valid if factor variances do not change across groups (Cole & Maxwell, 1985; Rock, Werts, & Flaugher, 1978; Vandenberg & Lance, 2000).

Measurement invariance studies of the satisfaction with life scale (SWLS), which was adapted to Turkish by Köker (1991) have been conducted according to gender (Akın Arıkan & Demirtaş, 2020; Erdem, 2023; Özgür, Gümüş, & Durdu, 2010; Tuzgöl-Dost, 2007) and different application times (Akın Arıkan & Demirtaş, 2020). However, no study has yet investigated measurement invariance in relation to age. Finding out whether a measurement tool achieves measurement invariance in various situations and groups is the most crucial aspect of its validity. This study aims to investigate the measurement invariance of the life satisfaction scale across various age groups.

2. Method

2.1. Research Model
The study employed a scanning method based on quantitative research techniques. The scanning method is a research approach that attempts to describe and depict the investigated situation in a similar manner (Karasar, 2009).

2.2. Population and Sample
A purposeful sampling method out of random sampling methods has been used in the research study. By this method, 120 young people below the age of 25 and 120 old people aged above 60 living in Ankara were chosen, and data was collected from this sample.

2.3. Data Collection and Analysis
Diener et al. (1985) developed the satisfaction with life scale (SWLS), which Köker (1991) adapted to Turkish for use in the study. This scale is a one-dimensional, Likert-type scale and has five items. Investigating configural,

metric, scalar, and strict invariances revealed how the SWLS measures invariance based on age and the direction of the research aim.

Researchers typically investigate measurement invariance by gradually testing hypotheses. While searching for measurement invariance, especially configural, metric, and scalar invariances are surveyed. The major level of invariance is configurational. Obtaining evidence of configural invariance means that the item groups of the measurement scale test the same structure (Vandenberg & Lance, 1998). Metric invariance tests whether factor loads are invariant among groups or not. In other words, if metric invariance is obtained, it can be said that individuals in different groups interpret items similarly. In situations where this invariance is not obtained, it can be interpreted that some items may be more important or attract attention in a group compared with individuals in the other group (Byrne, 1994). The scalar invariance level, which is another level, investigates whether mean differences of observable variables result from means of implicit structures.

Whether fit indexes (Chi-square, RMSEA, SRMR, CFI, and TLI) of models obtained gradually are between acceptable separations or not is investigated. In situations where the model adjusts data, the difference between the TLI and CFI values obtained from configural invariance tests and the TLI and CFI values obtained from more limited models was observed. The difference between these values is expected to be too little (Cheung & Rensvold, 2000). If calculated differences are not in the range of -0.01 ≤ ΔCFI ≤ 0.01 ve -0.01 ≤ ΔTLI ≤ 0.01, then it is decided that the invariance condition is not obtained at the related level (Cheung & Rensvold, 2002).

3. Results

Whether there is configural, metric, scalar, and strict invariance in data obtained from young and old individuals according to age is investigated using Multiple Group Confirmatory Factor Analysis. Results of analysis are summarised in Table 1 and Figure 1.

Table 1. Goodness of fit indexes according to invariance analysis results.

Measurement invariance	χ^2	df	p	χ^2/df	$\Delta\chi^2$/df (p)		ECVI	CFI	ΔCFI	TLI	SRMR	RMSEA
Configural	9.24	11	0.59	0.84	----	----	0.22	0.99	----	0.99	0.00	0.00
Metric	18.95	15	0.21	1.26	0.42	0.38	0.30	0.98	0.01	0.99	0.03	0.06
Scalar	33.19	24	0.10	1.38	0.12	0.11	0.23	0.97	0.01	0.98	0.03	0.07
Strict	41.67	29	0.06	1.43	0.05	0.04	0.32	0.97	0.00	0.97	0.03	0.08

When results of analyses are examined, it is seen that configural (χ^2/sd=0,84;p>0,05), metric (χ^2/sd=1,26;p>0,01), scalar (χ^2/sd=1,38;p>0,05) invariance and strict (χ^2/sd=1,43;p>0,05) invariance is obtained for two different age levels.
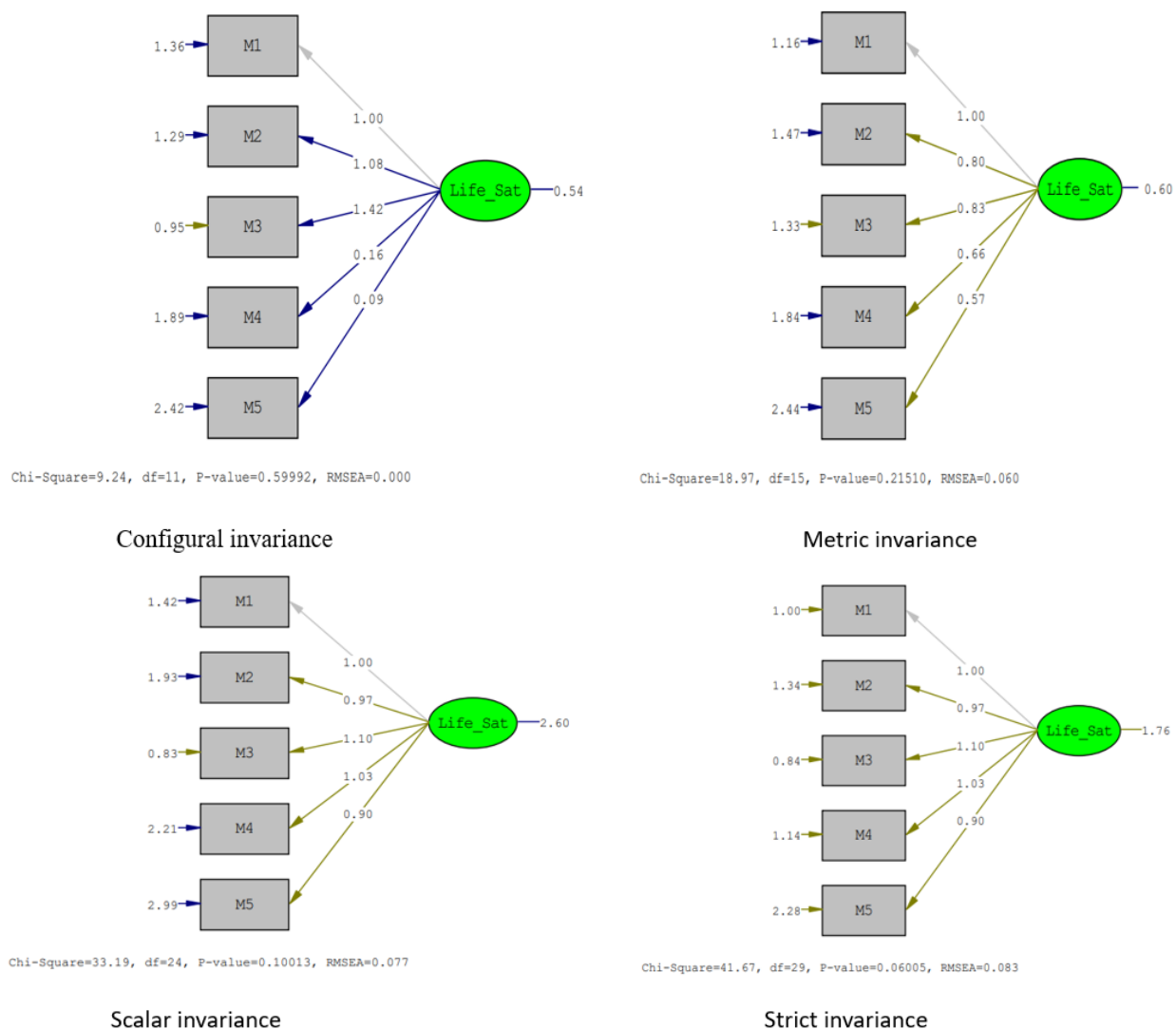

Figure 1. Path diagrams related to configural, metric, scalar and strict invariance.

As a result of data analysis, for the models to be confirmed, χ^2/df, RMSEA, ECVI, CFI, TLI, and SRMR were used as statistical fit criteria. It can be said that in all invariance test phases, fit indexes are in between an acceptable space and model is in good fit with data (RMSEA <0.08, CFI > 0.90, TLI > 0.90; .01 ≤ ΔCFI ≤ 0.01 ve -0.01 ≤ ΔTLI ≤ 0.01). From this point of view, it can be interpreted that life satisfaction scale scores applied to different age groups are equal and give measurements related to the same structure.

4. Discussion

Most research studies apply measurement scales to various groups, with the aim of revealing differences. However, if it is not executed clearly, whether these differences stem from the measurement scale or from the characteristics measured, the results of the research are brought into disrepute.

Invariance is an important psychometric property of a measurement tool (Brown, 2006; Meredith, 1993). Meaningful comparisons between groups at different times require measurement invariance. Failure to ensure invariance could result in inaccurate interpretations of scores and group differences.

Measurement invariance is used to analyze whether the same scale construct measures the same characteristic across different groups. Such analysis is necessary to make comparisons in determining construct validity in different groups (Putnick & Bornstein, 2016). Many studies examining the measurement invariance of measurement instruments have shown that it is very difficult to meet the assumptions of invariance analyses. Particularly, strict measurement invariance is very rarely verified. Strict measurement invariance is a condition in which all measurement parameters are exactly the same across subgroups. This means that there is zero tolerance for deviations between groups (Van De Schoot, Schmidt, De Beuckelaer, Lek, & Zondervan-Zwijnenburg, 2015). In many studies, since the invariance of error variances is insignificant in the explanation of latent mean differences, this step can be skipped, or if this step is not achieved, latent factor means can be compared (Vandenberg & Lance, 2000). This study followed these steps and observed that the life satisfaction scale provided measurement invariance at all stages across different age groups.

Observing the literature, researchers frequently conducted studies on the measurement invariance of the life satisfaction scale in various samples and cultures, particularly focusing on gender (Checa, Perales, & Espejo, 2019; Tomás, Gutiérrez, Sancho, & Romero, 2015). Moreover, some researchers (Atienza, Balaguer, & García-Merita, 2003; Sovet, Atitsogbe, Pari, Park, & Villieux, 2016) found that some items of the life satisfaction scale are invariant. However, researchers have not yet conducted invariance measurements for the age variable.

Among the groups addressed in this study are young adult individuals under the age of 25. Another field that has an important effect on the life satisfaction of these young adults is the satisfaction of higher education. According to the literature, higher education life satisfaction refers to the satisfaction of university students with university education and university experiences (Erol & Yıldırım, 2016). Higher education life satisfaction refers to university students' general satisfaction with the university, satisfaction with faculty members, satisfaction with university facilities, satisfaction with psychosocial and psychological counselling services offered by the university, and satisfaction with university administration. It is of great importance for both universities and students to know the quality of life/satisfaction of university students.

When the studies on the factors affecting life satisfaction are examined, Martikainen (2009) in his study with young adults living in Finland, showed that close relationships, working life, living habits, and future expectations explain life satisfaction at different levels. In a review study, Jiang, Yuen, and Horta (2020) stated that the quality of education, campus support services, limited social integration with Chinese students, financial difficulties, sub culturalist, language barriers, and perceived discrimination affect life satisfaction.

Another age group considered in this study is 60 years and over. When the studies on life satisfaction in higher age groups (over 60 years) are examined, Moon and Kim (2018) found that age, income, and education have a significant effect on life satisfaction, but gender, marital status, and employment have no effect. In their study with people aged 65 and over, Fernández-Ballesteros, Zamarrón, and Ruiz (2001) analyzed sociodemographic conditions and psychosocial factors affecting life satisfaction. In this study, it was found that income level and education directly affected life satisfaction, and psychosocial factors indirectly affected it through some mediating variables.

This study demonstrated that the SWLS invariance test results, comprised of five items in an age-specific dimension, demonstrate the model's ability to exhibit all invariance conditions. That is, in studies conducted with different age groups, differences between groups do not result from the measurement tool. So, it would be useful to carry out comparative studies of the variables discussed above in terms of young and old individuals with the results of this study. Researchers have stated that life satisfaction follows a non-linear path when it is considered in terms of the measured characteristic depending on age (from young adulthood to old age). From this perspective, De Ree and Alessie (2011) found that life satisfaction increases with age in various life periods and decreases in others. On the other hand, Diener (1984) suggested that various age groups differ slightly in terms of life satisfaction. The presence of different views in the literature is considered important in terms of the construct validity of the findings of this study and obtaining more reliable results in comparative studies. Depending on the results of this study, it can be advised to use SWLS in intercultural comparisons and investigate whether measurement invariance is obtained for different cultures.

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