Longitudinal invariance analysis of the satisfaction with life scale

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ABSTRACT

This research examined longitudinal measurement invariance in the satisfaction with life scale using two studies. The first followed a sample of 236 university students (93 male and 143 female) who completed the SWLS twice over a two-month interval. The second used a sample of 242 adolescent athletes (133 male and 109 female) who completed the SWLS three times over a period of six months. Confirmatory factor analysis was used to examine longitudinal measurement invariance. For the university student sample, results showed that the SWLS is partial strict invariant (equality of factor patterns, loadings and intercepts across time for all items and equality of item uniqueness for Items 1, 2, 4 and 5 across time). For the adolescent athlete student sample, the SWLS is partial strong invariant (equality of factor patterns, loadings across time for all items and equality of intercepts for Items 2, 3, and 4 across time). For both samples, stability coefficients across time were moderately high and latent factor means were not significantly different across time. Generally, these results suggest that the SWLS has satisfactory psychometric properties for longitudinal measurement invariance.

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1. Introduction

Subjective well-being (SWB) has been an important area of research in psychology, and can be instrumental in helping to improve the lives of individuals. Researchers have put much effort into defining and measuring SWB and have developed indicators to determine why some people have higher SWB than others and how to promote and maintain individuals' SWB (see Diener, 1984; Diener, Suh, Lucas, & Smith, 1999 for a review). To date, two main aspects of SWB have been distinguished: affective and cognitive (Lucas, Diener, & Suh, 1996). The affective aspect of SWB refers to the emotional component whereby levels of positive and negative affect are used to indicate the level of SWB. People who experienced more positive affect than negative affect were regarded as having higher SWB. The cognitive aspect of SWB refers to a conscious cognitive judgment of life in which individuals compare their life circumstances with a self-imposed standard; it is operationalized as life satisfaction (Diener, Emmons, Larsen, & Griffin, 1985). That is, individuals will report high life satisfaction if their perceived life circumstances are in line with their own standard.

In order to measure an individual's SWB for the cognitive aspect, Diener et al. (1985) developed the satisfaction with life scale (SWLS). Because different people may have very different ideas about what constitutes a good life, the SWLS was developed to as-

sess satisfaction with one's life as a whole (Diener et al., 1985). The SWLS has been used extensively since 1985 and has good psychometric properties (Pavot & Diener, 1993). Its internal consistency reliability coefficients range from 0.79 to 0.89 (Pavot & Diener, 1993). Test–retest reliability coefficients of the SWLS were 0.83 for a two-week interval and 0.84 for a one-month interval (Pavot & Diener, 1993). The SWLS also demonstrated adequate construct validity, convergent validity and discriminant validity (Arrindell, Heesink, & Feij, 1999; Lucas et al., 1996; Pavot & Diener, 1993; Sachs, 2003). In addition to these basic psychometric properties, the property of measurement invariance across different groups has also been examined for the SWLS in recent years.

Measurement invariance is an important property, since interpretation of mean differences may be problematic unless the underlying constructs are the same across groups. Previous studies have discussed measurement invariance of the SWLS for gender, age and culture. Shevlin, Brunsden, and Miles (1998) found that the SWLS has the property of strict measurement invariance (i.e., equality of factor loadings, factor variances, item uniqueness, item intercepts and factor means) across gender in a sample of British university students. Wu and Yao (2006) reported the same finding for a sample of Taiwanese university students, finding that male and female groups had the same factor loadings, variance and item uniqueness. However, in a sample of Spanish junior high school students, measurement invariance of the SWLS (Spanish version) was not obtained (Atienza, Balaguer, & Garcia-Merita, 2003). With regard to measurement invariance across ages, Pons, Atienza, Balaguer, and Garcia-Merita (2000) analyzed the measurement

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invariance of the SWLS (Spanish version) across samples of adolescents (aged 11–15 yrs) and the elderly (aged 60–91 yrs). The results indicated that factor loadings and variances were not invariant between the two samples, suggesting that the SWLS is sensitive to age. Recently, Daniel and Petter (2008) tested measurement invariance across sex and age at the same time and reported similar results. They found that the SWLS is invariant across gender in factor loadings and item intercepts, but not across age. Finally, with regard to cultural comparison, Tucker, Ozer, Lyubomirsky, and Boehm (2006) examined measurement invariance in the SWLS across student and community groups from the United States and Russia. They found that the two groups had the same factor loadings when student and community samples were combined. When student and community samples were analyzed separately, the student groups from the US and Russia had the same factor loadings and item slopes, but the community samples did not show invariance.

Although the property of measurement invariance in the SWLS has been investigated, existing studies focus only on measurement invariance across different groups. Longitudinal measurement invariance (i.e., measurement invariance across time) has not been considered for the SWLS. Similar to measurement invariance across different groups, longitudinal measurement invariance analysis examines the equality of factor structure for a measurement, but its focus is on equality across time. Longitudinal measurement invariance is desirable for a measurement because it ensures that the same construct can be assessed across time and provides a solid basis for mean comparison. In the existing literature, the SWLS was used in longitudinal studies to assess individuals' SWB across time in order to examine the possible longitudinal mechanisms behind SWB (e.g., Lai, Bond, & Hui, 2007) or to monitor intervention effects among patients (e.g., Chan, Ungvari, Shek, & Leung, 2003). However, these studies did not examine whether the SWLS has longitudinal invariance.

Hence, the main purpose of this research is to examine longitudinal measurement invariance in the SWLS to determine whether the SWLS has satisfactory properties for longitudinal comparison. There are two studies. The first is a university student sample that completed the SWLS two times over a two-month interval. The second is an adolescent sample that completed the SWLS three times over a period of six months (three months between two contiguous tests). The test interval of two-months or three-months is selected because participants of both samples are students, choosing a two-months or three-months interval for them would not be too short to test the stability and, on the other hand, it can also ensure that they would not have had a dramatic life change during the study period. The interval of two- or three-months is ideal for the research purpose and the current samples.

For the sake of mean comparison across time, it is desirable for the SWLS to have (at least partial) a strong invariance property (i.e., equality of factor patterns, factor loadings and item intercepts). Thus, this research aims to determine whether the SWLS can satisfy the requirements of (partial) strong invariance. In addition, the stability coefficient across time is computed and latent factor means are compared across time.

2. Study 1

2.1. Method

2.1.1. Participants and procedure

Two hundred and thirty-six (93 male and 143 female) undergraduates from Central Taiwan University of Science and Technology and Nan Kai Institute of Technology voluntarily participated in this study. The research project was announced to students by lectures (they are also researchers in the research team) in class. Students were told that they can participate in a study according to their willingness and they can obtain extra course credits for their participation. Because they are recruited in classes, it is easy for us to obtain longitudinal data from students. Their ages ranged from 18 to 23 years old ($M = 19.62$, SD = 1.29). A set of self-report questionnaires was administered to the participants in a classroom setting. Participants' confidentiality and anonymity were assured. After completing the questionnaires, participants returned them to the administrator directly. Participants completed the questionnaires twice during a two-month interval.

2.1.2. Instrument

Satisfaction with life scale – Taiwanese version. The satisfaction with life scale (SWLS), developed by Diener et al. (1985) is a widely used measure of subjective well-being. Diener et al. (1985) define life satisfaction as a conscious cognitive judgment of life in which individuals compare their life circumstances to a self-imposed standard. Their scale contained five items and employed a seven-point Likert scale, with higher values corresponding to greater satisfaction. The five global evaluation items are: (a) in most ways, my life is close to my ideal; (b) the conditions of my life are excellent; (c) I am satisfied with my life; (d) so far, I have gotten the important things I want in life; and (e) if I could live my life over, I would change almost nothing. The SWLS has shown good reliability and validity (see Pavot & Diener, 1993). Wu and Yao (2006) confirmed the single-factor structure of the SWLS-Taiwan version and revealed that the SWLS-Taiwan version was measurement invariant across gender.

2.1.3. Data analysis

In longitudinal measurement invariance analysis, a baseline model needs to be established prior to any invariance constraints to see if patterns of factor structures at different times are the same (configural invariance). Thus, the first step is to build a model to test configural invariance across time. In this model, the five items of the SWLS assessed at T1 are influenced by a latent factor, and the other five items of the SWLS assessed at T2 are influenced by a second latent factor. The two factors may be correlated. In addition, item uniqueness is correlated across time to account for the specific effect associated with each item. The latent factor scale is fixed by setting the first factor loading of each factor at 1. If the baseline model (configural invariance) is supported, further restrictive constraints can then be imposed on the model. First, factor loadings are constrained to be equal across time to test invariance of factor loadings. A chi-square difference test is conducted to see if the baseline model is significantly different from the loading-constrained model. A non-significant chi-square difference test means that factor loadings are invariant across time, satisfying weak invariance. Further, based on the weak invariance model, intercepts are constrained to be equal across time. Chi-square difference tests between the weak invariance model and intercept-constrained model are also conducted. A non-significant chi-square difference test means that intercepts are invariant across time, satisfying strong invariance. Finally, based on the strong invariance, item uniqueness is constrained to be equal across time. A chi-square difference test between the strong invariance model and uniqueness-constrained model is then conducted. A non-significant chi-square difference test means that, in addition to factor loadings and intercepts, item uniqueness is invariant across time, satisfying strict invariance. All the models are estimated by a maximum likelihood estimator with robust correction using Mplus (Muthén & Muthén, 2007). Because the chi-square test is sensitive to sample size, information about other fit indices (CFI, TLI, RMSEA and SRMR) is used to evaluate each model. The general cutoffs for accepting a model for CFI and TLI were equal to or greater than

0.95, and equal to or less than 0.05 for the RMSEA, and less than 0.08 for the SRMR (Hu & Bentler, 1999). However, Hu and Bentler (1999) also mentioned that model fit evaluation based on the above criteria should not be over-generalized. Therefore, in the current study, rules proposed by them were used for reference. Model comparison for invariance analysis relies on a chi-square difference test. A Satorra-Bentler-scaled chi-square statistic is used in the current study; its difference test is conducted according to Satorra and Bentler (2001).

2.2. Results

2.2.1. Descriptive analysis of statistics

Descriptive statistics for each item over time are presented in Table 1, including the mean, standard deviation, skewness, and kurtosis. Table 2 presents correlations among items over time.

2.2.2. Longitudinal invariance analysis

Longitudinal invariance analysis is conducted by several steps. Table 3 presents the results of model fits and comparisons. First, the baseline model for configural invariance is acceptable because of its satisfied values on fit indices (CFI = 0.972; TLI = 0.956; RMSEA = 0.070; SRMR = 0.036), although the SB-χ^2 test is significant (SB-χ^2 (29) = 67.28, p < .01).

Factor loadings are constrained to be equal across time to test for weak invariance. The weak invariance model is acceptable because of its satisfied values on fit indices as well (CFI = 0.970;

TLI = 0.959; RMSEA = 0.068; SRMR = 0.051), although the SB-χ^2 test is significant (SB-χ^2 (33) = 69.24, p < .01). The SB-χ^2 difference test between configural invariance and weak invariance models is not significant ($\triangle$SB-χ^2 (4) = 6.69, p > .05), revealing that weak invariance is supported.

Further, equality of intercepts across time is imposed on the model to test for strong invariance. The strong invariance model also has satisfactory values on fit indices (CFI = 0.965; TLI = 0.959; RMSEA = 0.068; SRMR = 0.060), although the SB-χ^2 test is significant (SB-χ^2 (38) = 79.95, p < .01). The SB-χ^2 difference test between the weak invariance and strong invariance models is not significant (ΔSB-χ^2 (5) = 10.75, p > .05), showing that strong invariance is supported.

Finally, equality of item uniqueness across time is further imposed to test strict invariance. The strict invariance model also has satisfied values on fit indices (CFI = 0.953; TLI = 0.951; RMSEA = 0.075; SRMR = 0.070), although the SB-χ^2 test is significant (SB-χ^2 (43) = 99.43, p < .01). The SB-χ^2 difference test between strong invariance and strict invariance models is significant (ΔSB-χ^2 (5) = 99.43, p < .01), showing that strict invariance is not supported.

We then tested the partial strict invariance of the SWLS using a backward method by removing the constraints that contributed more chi-square values to the model until the partial strong invariance model did not differ significantly from the strong invariance model. By this procedure, a model for partial strict invariance on Items 1, 2, 4 and 5 across two waves is retained. The model fit of partial strict invariance model is also satisfactory (CFI = 0.963; TLI = 0.960; RMSEA = 0.067; SRMR = 0.062), although the SB-χ^2 test is significant (SB-χ^2 (42) = 86.38, p < .01).

2.2.3. Stability coefficient across time

The stability coefficient (correlation between two wave factors) across time is computed using a partial strict invariance model. In order to compute the factor correlation, factor variances are set to 1, and the first factor loading for each factor is freely estimated. The resulting estimated factor correlation is 0.57.

2.2.4. Latent factor mean comparison

Because the strong invariance model is supported, latent factor means across time can be compared. In the partial strict invariance

Table 1
Descriptive statistics of items across time for Study 1 (n = 236).

	Mean	SD	Skewness	Kurtosis
T1-Item1	4.32	1.19	−0.11	0.00
T1-Item2	4.32	1.22	−0.04	−0.18
T1-Item3	4.52	1.30	−0.12	−0.56
T1-Item4	4.47	1.28	−0.11	−0.22
T1-Item5	3.70	1.68	0.19	−0.74
T2-Item1	4.34	1.28	−0.17	−0.07
T2-Item2	4.47	1.19	−0.20	−0.03
T2-Item3	4.58	1.23	−0.19	−0.24
T2-Item4	4.53	1.26	−0.23	−0.09
T2-Item5	4.06	1.65	−0.15	−0.76

Table 2
Correlation matrix among items across time for Study 1 (n = 236).

	T1-Item1	T1-Item2	T1-Item3	T1-Item4	T1-Item5	T2-Item1	T2-Item2	T2-Item3	T2-Item4
T1-Item1									
T1-Item2	0.778								
T1-Item3	0.639	0.763							
T1-Item4	0.572	0.604	0.628						
T1-Item5	0.453	0.466	0.480	0.577					
T2-Item1	0.478	0.494	0.444	0.374	0.288				
T2-Item2	0.407	0.447	0.391	0.326	0.218	0.817			
T2-Item3	0.433	0.479	0.466	0.422	0.286	0.792	0.826		
T2-Item4	0.452	0.439	0.389	0.415	0.258	0.744	0.716	0.736	
T2-Item5	0.326	0.304	0.276	0.328	0.300	0.491	0.476	0.480	0.525

Table 3
Model fit of various invariance models for Study 1.

Model	df	SB-χ^2	$\triangle$SB-χ^2	CFI	TLI	RMSEA	SRMR
Configural invariance	29	62.78	–	0.972	0.956	0.070	0.036
Weak invariance	33	69.24	6.69	0.970	0.959	0.068	0.051
Strong invariance	38	79.95	10.75	0.965	0.959	0.068	0.060
Strict invariance	43	99.43	17.19[**]	0.953	0.951	0.075	0.070
Partial strict invariance[a]	42	86.38	7.66	0.963	0.960	0.067	0.062

[**] p < .01.
[a] Partial strict invariance on Items 1, 2, 4 and 5 across two waves.

model, we set the factor mean at Time 1 to zero and freely estimate the factor mean at Time 2. The estimated factor mean at Time 2 is 0.090, which is not significantly different from zero. Hence, the result shows an equality of latent factor means across time.

3. Study 2

3.1. Method

3.1.1. Participants and procedure

Two hundred and forty-two (133 male and 109 female) student athletes from six senior high schools participated in this study voluntarily. The research project was announced to students by teachers (they are also researchers in the research team) at practice time. Students were told that they can participate in a study according to their willingness and they can obtain a small gift for their participation. Because they are recruited in school, it is easy for us to obtain longitudinal data from them. Their ages ranged from 15 to 18 years old ($M = 16.08$, SD = 0.75). The same procedure was applied. Participants completed questionnaires three times over a period of three months.

3.1.2. Instrument

Satisfaction with life scale – Taiwanese version. The same scale from Study 1 is used, but with a six-point Likert scale.

3.1.3. Data analysis

Analysis procedures are similar to Study 1, but in the current sample, a three-wave model is built. In the baseline model, the five items of the SWLS assessed at T1 are influenced by a latent factor, the five items assessed at T2 are influenced by the second latent factor, and the final five items of the SWLS assessed at T3 are influenced by the third latent factor. The three factors are allowed to be correlated. In addition, item uniqueness of the same items is also set to be correlated across time to account for the specific effect associated with each item. The latent factor scale is fixed by setting the first factor loading of each factor at 1. If the baseline model (configural invariance) is supported, further restrictive constraints can then be imposed on the model following the same steps as Study 1.

3.2. Results

3.2.1. Descriptive analysis of statistics

Descriptive statistics for each item across time are presented in Table 4, including the mean, standard deviation, skewness, and kurtosis. Table 5 presents correlations between items across time.

Table 4
Descriptive statistics of items across time for Study 2 ($n = 242$).

	Mean	SD	Skewness	Kurtosis
T1-Item1	3.77	1.22	−0.24	−0.27
T1-Item2	3.86	1.29	−0.20	−0.35
T1-Item3	4.29	1.17	−0.29	−0.30
T1-Item4	3.05	1.49	0.31	−0.63
T1-Item5	3.42	1.43	−0.05	−0.75
T2-Item1	3.60	1.17	−0.09	−0.09
T2-Item2	3.88	1.30	−0.32	−0.10
T2-Item3	4.15	1.20	−0.33	−0.20
T2-Item4	3.07	1.42	0.37	−0.46
T2-Item5	3.57	1.30	−0.01	−0.31
T3-Item1	3.71	1.05	0.06	−0.13
T3-Item2	3.85	1.23	−0.26	−0.17
T3-Item3	4.27	1.09	−0.22	0.01
T3-Item4	3.28	1.34	0.22	−0.36
T3-Item5	3.68	1.36	−0.08	−0.40

Table 5
Correlation matrix among items across time for Study 2 ($n = 242$).

	T1-Item1	T1-Item2	T1-Item3	T1-Item4	T1-Item5	T2-Item1	T2-Item2	T2-Item3	T2-Item4	T2-Item5	T3-Item1	T3-Item2	T3-Item3	T3-Item4
T1-Item1														
T1-Item2	0.341													
T1-Item3	0.476	0.564												
T1-Item4	0.394	0.317	0.388											
T1-Item5	0.409	0.245	0.354	0.416										
T2-Item1	0.547	0.244	0.345	0.340	0.310									
T2-Item2	0.337	0.456	0.383	0.301	0.248	0.564								
T2-Item3	0.393	0.353	0.461	0.331	0.351	0.631	0.649							
T2-Item4	0.392	0.331	0.372	0.455	0.330	0.586	0.501	0.592						
T2-Item5	0.450	0.204	0.296	0.277	0.494	0.524	0.340	0.417	0.434					
T3-Item1	0.280	0.252	0.266	0.303	0.139	0.359	0.233	0.285	0.276	0.153				
T3-Item2	0.137	0.273	0.210	0.127	0.070	0.183	0.373	0.297	0.229	0.087	0.453			
T3-Item3	0.118	0.142	0.249	0.226	0.119	0.241	0.204	0.370	0.289	0.093	0.505	0.574		
T3-Item4	0.246	0.122	0.197	0.227	0.141	0.278	0.315	0.318	0.352	0.195	0.433	0.458	0.598	
T3-Item5	0.277	0.210	0.259	0.248	0.347	0.322	0.279	0.281	0.308	0.463	0.460	0.356	0.431	0.511

Table 6
Model fit of various invariance models for Study 2.

Model	df	SB-χ^2	$\triangle$SB-χ^2	CFI	TLI	RMSEA	SRMR
Configural invariance	72	111.82	–	0.966	0.951	0.048	0.051
Weak invariance	80	122.87	11.09	0.964	0.953	0.047	0.059
Strong invariance	90	146.78	25.34[**]	0.952	0.944	0.051	0.062
Partial strong invariance[a]	86	134.55	12.14	0.959	0.950	0.048	0.060

[**] $p < .01$.
[a] Partial strong invariance on Items 2, 3, and 4 across three waves.

3.2.2. Longitudinal invariance analysis

Longitudinal invariance analysis is conducted following several steps. Table 6 presents the results of model fits and comparisons. First, the baseline model for configural invariance is acceptable because of its satisfied values on fit indices (CFI = 0.966; TLI = 0.951; RMSEA = 0.048; SRMR = 0.051), although the SB-χ^2 test rejected the model (SB-χ^2 (72) = 111.82, $p < .01$).

Then, factor loadings are constrained to be equal across time to test weak invariance. The weak invariance model is acceptable because of its satisfied values on fit indices as well (CFI = 0.964; TLI = 0.953; RMSEA = 0.047; SRMR = 0.059), although the SB-χ^2 test rejected the model (SB-χ^2 (80) = 122.87, $p < .01$). The SB-χ^2 difference test between configural invariance and weak invariance models is not significant ($\triangle$SB-χ^2 (8) = 11.09, $p > .05$), revealing that weak invariance is supported.

Further, equality of intercepts across time is imposed in the model to test strong invariance. The strong invariance model also has satisfied values on fit indices (CFI = 0.952; TLI = 0.944; RMSEA = 0.051; SRMR = 0.062), although the SB-χ^2 test rejected the model (SB-χ^2 (90) = 146.78, $p < .01$). However, the SB-χ^2 difference test between weak invariance and strong invariance models is significant ($\triangle$SB-χ^2 (10) = 25.34, $p < .01$), showing that strong invariance is not supported.

We then test the partial strong invariance in the SWLS using the backward method by dropping constraints that contribute more chi-square value to the model until the partial strong invariance model did not have significant differences from the weak invariance model. By this procedure, a model for partial strong invariance on Items 2, 3 and 4 across three waves is retained. The model fit of the partial strong invariance model is also satisfactory (CFI = 0.959; TLI = 0.950; RMSEA = 0.048; SRMR = 0.060), although the SB-χ^2 test is significant (SB-χ^2 (86) = 134.55, $p < .01$).

3.2.3. Stability coefficient across time

Stability coefficient (correlation between three wave factors) across time is computed using partial strong invariance model. In order to compute the factor correlation, factor variances are set to 1, and the first factor loading for each factor is freely estimated. The resulting factor correlation between Time 1 and Time 2 is 0.69, the factor correlation between Time 1 and Time 3 is 0.41 and the factor correlation between Time 2 and Time 3 is 0.47.

3.2.4. Latent factor mean comparison

Because the partial strong invariance model is still supported, latent factor means across time can be compared. In the partial strong invariance model, we set the factor mean at Time 1 as zero and freely estimate factor means at Times 2 and 3. The estimated factor mean at Time 2 is −0.005, and the factor mean at Time 3 is 0.033. Both do not differ significantly from zero. Hence, the result shows an equality of latent factor means across time.

4. Discussion

This study examines longitudinal measurement invariance in the SWLS across time. For the university student sample, results

show that the SWLS is partial strict invariant (equality of factor patterns, loadings and intercepts across time for all items and equality of item uniqueness for Items 1, 2, 4 and 5 across time), thus ensuring that the SWLS is an adequate measurement for longitudinal mean comparisons over a two-month interval for university student. The results also reveal that Items 1, 2, 4 and 5 have the same reliability across time because the item uniqueness of these items is time-invariant. Moreover, the SWLS also has a moderate stability with a coefficient of 0.57 over a two-month interval. The factor means across time are also invariant.

For the adolescent student athlete sample, results showed only that the SWLS is partial strong invariant (equality of factor patterns, loadings across time for all items and equality of intercepts for Items 2, 3, and 4 across time), which has already provided a basis for longitudinal mean comparisons. Moreover, in the sample, the SWLS also has moderate stability, with coefficients ranged from 0.41 to 0.69. The stability coefficient between Time 1 and Time 2 is 0.69 (three-month interval), higher than that between Time 1 and Time 3 (0.41, six-month interval) and Time 2 and Time 3 (0.47, three-month interval). Finally, factor means across three waves are invariant.

Study 1 and Study 2 suggest using different items of the SWLS in longitudinal usage for an undergraduate and adolescent student sample. Under the basic requirement of a strong invariant property for longitudinal usage, Study 1 reveals that all items in the SWLS are strong invariant for undergraduate student sample, but Study 2 shows that only Item 2, 3, and 4 are strong invariant for adolescent students. This could be that the contents of Item 1 (In most ways, my life is close to my ideal) and Item 5 (If I could live my life over, I would change almost nothing) are not suitable for adolescent students because these two statement are far from their life experiences and result in an unstable interpretation and response to these two items.

However, more studies are needed to examine longitudinal measurement invariance in the SWLS because the sample and design of the current study are limited. For example, the current study uses only university and adolescent student samples. The SWLS, although used mainly for student samples in most psychological research, is also widely used in other samples, such as community adults in different cultures (Tucker et al., 2006), the elderly (Pons et al., 2000), and schizophrenia patients (Chan et al., 2003). In addition to the limitations of sample characteristics, the time interval in the current study is two to three months. Because not all longitudinal studies are conducted within a certain time interval (like the time interval used here), different time spans are desirable for testing the duration of invariance properties.

Moreover, we investigated partial invariance properties in the SWLS for the current two samples through a backward method. Although we did find partial invariance properties in the SWLS, this partial invariance investigation should be treated with caution as it is more exploratory than confirmatory. This is another reason more studies are needed to clarify longitudinal measurement invariance in the SWLS.

Given the limitations of sample, time interval, and exploratory-wise partial invariance structure, we are not able to generalize our

findings to other samples and designs; instead, we would mention that longitudinal measurement invariance is an important psychometric property of the SWLS, especially when it is administered in a longitudinal study. Future studies should pay more attention to this property.

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