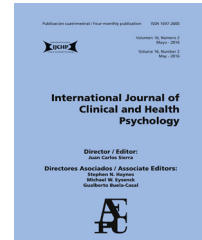




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ORIGINAL ARTICLE

Salutogenic constructs across Pakistan and Germany: A cross sectional study



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KEYWORDS

Measurement invariance;
Cross-cultural comparison;
Positive mental health;
Resilience;
Instrumental study

Abstract

Background/Objective: Protective factors are relevant for mental health in general, however, universality of the instruments has been rarely tested. Therefore, the current study aimed to examine psychometric properties and cross-cultural measurement invariance of salutogenic constructs.

Method: Data was collected from university students of Pakistan ($n = 1,841$) and Germany ($n = 7,890$). Single-group confirmatory analysis (CFA) and multiple-group CFA was tested to examine the proposed factor structure and measurement invariance of Positive Mental Health Scale, Resilience Scale, Perceived Social Support Questionnaire, and Life Satisfaction Scale across student samples from Pakistan and Germany respectively.

Results: We found strong measurement invariance for the Positive Mental Health Scale, Life Satisfaction Scale, and partial strong measurement for the Resilience Scale, and Perceived Social Support Questionnaire.

Conclusions: The results indicate that these scales could be recommended for the meaningful comparison of latent means across cultures. Understanding these differences would further advance our knowledge about the mechanism underlying positive mental health.

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PALABRAS CLAVE

Invariancia de medidas;
comparación intercultural;
salud mental positiva;
resiliencia;
estudio instrumental

Constructos de salud en Pakistán y Alemania: un estudio transversal**Resumen**

Antecedentes/Objetivo: Los factores de protección son relevantes para la salud mental en general. Sin embargo, la universalidad de los instrumentos ha sido raramente probada. Por lo tanto, el presente estudio tiene como objetivo examinar las propiedades psicométricas y la invariabilidad de las mediciones interculturales de constructos salutogénicos.

Método: Se recogieron datos de estudiantes universitarios de Pakistán ($n = 1.841$) y Alemania ($n = 7.890$). El análisis confirmatorio de un solo grupo (CFA) y el CFA de múltiples grupos fueron probados para examinar la estructura de factores propuesta y la invariabilidad de la medición de la Escala de Salud Mental Positiva, la Escala de Resiliencia, el Cuestionario de Apoyo Social Percibido y la Escala de Satisfacción de Vida a través de muestras de estudiantes de Pakistán y Alemania, respectivamente.

Resultados: Encontramos una fuerte invariancia en las mediciones de la Positive Mental Health Scale, la Life Satisfaction Scale, y una medición parcial fuerte en la Resilience Scale y el Perceived Social Support Questionnaire.

Conclusiones: Los resultados indican que estas escalas podrían recomendarse para la comparación significativa de los medios latentes entre culturas. La comprensión de estas diferencias aumentaría aún más nuestro conocimiento sobre el mecanismo que subyace a la salud mental positiva.

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Positive or salutogenic factors have gradually gained popularity in health care over the past few years. These factors focus on unearthing and using one's internal or external personal resources to maintain health and psychological wellbeing (Langeland & Vinje, 2017). For instance, salutogenic factors such as positive mental health, resilience, social support and life satisfaction have been shown to have a clear impact on the development and progression of mental disorders (García-Moya & Morgan, 2016; Wood & Tarrier, 2010). They act as protective factors and reduce the incidences of mental disorders.

Despite the increased recognition of those positive factors, many of their measures are developed and studied in the western nations and primarily implemented in other cultures without cultural adaptation (Cheung, 2012). However, due to differences in language and culture, participants may vary in their interpretation, understanding, and conceptualization of a statement or of an entire scale (Brady, Fryberg, & Shoda, 2018). These differences lead to biases and to non-invariant psychological constructs, thus limiting the generalization of the results worldwide.

The first step in examining a construct in a cross-cultural framework is to investigate its cross-cultural validity and invariance (Van de Vijver, 2007). Van de Vijver, Leung, and Leung (1997) described three steps of testing measurement equivalence: construct equivalence (same structure of construct being studied across various groups regardless of measurement approach), metric or weak equivalence (same measurement units), and scalar or strong equivalence (same origin of scale and measurement unit). The sum (manifest) scores are comparable only when error variances (or uniquenesses) are also invariant, which is the case of strict invariance. However, generally the test

of cross-cultural invariance for psychological constructs is insufficient (Borsboom, 2006). Hence, a detailed investigation of the nature of salutogenic constructs across cultures is long due.

Therefore, the current study aims to validate scales of four salutogenic factors in Pakistan, and also test for their measurement invariance between Pakistan and Germany. Pakistan, which fosters a framework of South Asian culture and Islamic society, is a developing country with more than 57 million people aged 19 to 29 years. Germany, on the other hand, focuses on an individual's human rights and benefits. Pakistan and Germany vary in terms of culture, norms and living conditions because people not only live in different environments but also are educated and socialized in different ways. For instance, Pakistan and Germany vary regarding individualism, power distance, long-term orientation, and indulgence (Hofstede, 2001).

With English as one of the official language in Pakistan, many English scales were directly used in research in Pakistan, however, hardly any cross-cultural studies exist. In the current study, we collected data from student population as due to globalization students tend to share comparable values and norms. Therefore, the current study firstly focused on four salutogenic factors – positive mental health, social support, resilience, and life satisfaction - they are among the factors that most closely relate to psychological wellbeing and mental disorders (Wood & Tarrier, 2010).

First, Positive mental health includes predominantly emotional, social and psychological dimensions of psychological wellbeing. It is strongly associated with good physical health, confer resilience, and has protective influence against suicide ideation (Teismann, Brailovskaia, & Margraf, 2019; Teismann et al., 2018). Second, Resilience is consid-

ered as a dimension of psychological wellbeing and coping that helps people to overcome adverse life situations and to cope with the stressful situation by utilizing individual and social resources around them (Durbin et al., 2019). Various studies found the resilience to reduce stress and to inhibit the generation of depression and anxiety (Laird, Krause, Funes, & Lavlaretzky, 2019; Sheerin et al., 2018). In addition to resilience, social support also reinforces the individual's ability to deal with stressful situations and enhances individual's development (Laird et al., 2019), whereas a lack of social support causes various mental disorders (Harandi, Taghinasab, & Nayeri, 2017). Last but not least, Satisfaction with life is also strongly associated with subjective wellbeing (Lombardo, Jones, Wang, Shen, & Goldner, 2018). People with higher life satisfaction are more resistant to mental illness and have higher positive mental health (Wood & Tarrier, 2010).

In sum, the current study aimed to test the cross-cultural applicability of the positive mental health scale (PMH), resilience scale (RS-10), perceived social support questionnaire (F-SozU k-14) and life satisfaction scale (SWLS) in Pakistan. These scales have already been developed or validated in the German cultural framework. Therefore, in order to assess whether these constructs are comparable in both countries, the three levels of invariance were tested (Byrne, 2016). Latent mean differences were also compared PMH, RS-10, F-SozU k-14, SWLS, when an assumption of partial strong measurement invariance was established.

Method

Participants and data collection

The current study received ethical approval from the ethics committee for the Faculty of Psychology (ref: 315) Ruhr University Bochum, Germany. The data for this current study were taken from Bochum Optimism and Mental Health program (BOOM), aimed to explore the positive and negative factors of mental health across different countries. Pakistani University students fluent in English, aged 18 to 50 were recruited from different universities in Pakistan. Participants gave written informed consent for contribution in the study after being assured about anonymity and confidentiality issues. German students took part in the study from October 2011 to December 2015, whereas Pakistani students took part between May 2016 and March 2017. A total of 1841 Pakistani and 7890 German students completed the survey. Demographic information included age, gender, discipline, faculty, and monthly income. Participant characteristics are presented in Table 1.

Measures

Valid versions of the following scales already exist in English, which is the official language in Pakistan and is the medium of instruction in schools. Therefore, we applied the English version of these scales for Pakistani students. The internal consistency of all scales in both samples are presented in Table 2.

Positive Mental Health Scale (PMH-scale; German original version: Lukat, Margraf, Lutz, van der Veld, & Becker,

2016). The PMH-scale was used to measure psychological and subjective aspects of well-being. This instrument includes nine items rated on a 4-point Likert scale ranging from 0 (*I disagree*) to 3 (*I agree*). Previous research revealed good psychometric properties of the PMH-Scale such as Cronbach's alpha $\alpha = .93$. The English version of the PMH-scale was translated from the original language version by using the translation-backtranslation-modification procedure (Berry, 1989).

Satisfaction with Life Scale (SWLS; English original version: Diener, Emmons, Larsen, & Griffin, 1985; German version: Glaesmer, Grande, Braehler, & Roth, 2011). Life satisfaction was assessed with the well-established SWLS that includes five items rated on a 7-point Likert scale ranging from 1 (*Strongly disagree*) to 7 (*Strongly agree*). Previous research revealed good psychometric properties in both languages (German version: Cronbach's alpha $\alpha = .92$, English version: Cronbach's alpha $\alpha = .87$).

Resilience Scale (RS-11; German original version: Schumacher, Leppert, Gunzelmann, Strauss, & Brähler, 2005; English version: see Brailovskaia, Schönfeld, Kochetkov, & Margraf, 2017). The RS-11 was used to measure resilience. This instrument includes eleven items rated on a 7-point Likert scale ranging from 1 (*Disagree*) to 7 (*Agree*). Previous research reported good psychometric properties for the RS-11 in both investigated languages: (German version: Cronbach's alpha $\alpha = .91$ and English Version Cronbach's alpha $\alpha = .80$).

Brief Form of Perceived Social Support Questionnaire (F-SozU K-14; German original version: Fydrich, Sommer, Tydecks, & Brähler, 2009; English version: see Brailovskaia et al., 2017). The F-SozU K-14 assessed perceived anticipated and subjective support from one's social network. This instrument consists of 14 items rated on a 5-point Likert scale ranging from 1 (*Not true*) to 5 (*True*). Previous research reported good psychometric properties for the F-SozU K-14 in both investigated languages (German version: Cronbach's alpha $\alpha = .94$ and English version: Cronbach's alpha $\alpha = .87$).

Depression Anxiety Stress Scales (DASS; English original version: Lovibond & Lovibond, 1995; German version: Henry & Crawford, 2005). The well-established DASS was used to assess depression, anxiety, and stress symptoms. This instrument consists of three subscales (Depression, Anxiety, and Stress). Each subscale includes seven items. The in total 21 items are rated on a 4-point Likert scale ranging from 0 (*Did not apply to me at all*) to 3 (*Applied to me very much or most of the time*). Previous research reported good psychometric properties for the DASS in both investigated languages (German version: Cronbach's alpha of Depression = .88, Anxiety = .76, and Stress = .86, English version: Cronbach's alpha of Depression = .88, Anxiety = .82, and Stress = .90).

Family affluence scale (FAS-II). The FAS-II measures family wealth with four questions asking the number of vehicles, computers, child's own bedroom, and holidays of the family. The FAS-II was developed by WHO Health Behavior in School-aged Children Study and validated across 35 countries.

Data analysis

Data were checked for missing values and response sets. Psychometric properties including mean, standard deviation,

Table 1 Demographic variables description of all samples.

	Pakistan	Germany
Total N	1,841	7,890
Gender, N (%)		
Female	1,097 (59.6)	4,543 (57.6)
Male	744 (40.4)	3,347 (42.4)
Age		
Mean (SD)	22.84 (3.01)	23.96 (4.64)
Range	18-44	15-65
Family socioeconomic status N (%)		
Low	317 (17.2)	441 (5.6)
Medium	848 (46.1)	3532 (44.8)
High	676 (36.7)	3273 (41.5)
Missing		644 (8.2)

Notes. SD = Standard Deviation.

Table 2 Means, Standard Deviations, Skewness, Kurtosis, Internal Consistency, and inter-correlation matrix across Scales and Countries.

Scales	M	SD	Skew	Kurt	α	RS-11	F-SozU	SWLS	Depression	Anxiety	Stress
Pakistani sample											
PMH	17.42	6.32	-0.58	0.03	0.87	.40	.40***	.37***	-.17***	-.07***	-.06**
Resilience	55.66	12.94	0.70	0.30	0.82		.40***	.32***	-.14***	-.07**	-.05**
F-SozU K-14	49.97	11.04	-0.44	-0.03	0.86			.28***	-.15***	-.04	-.03
SWLS	20.48	6.36	-0.19	-0.49	0.72				-.17***	-.07***	-.10***
Depression	7.75	4.36	0.22	-0.34	0.78						
Anxiety	8.40	4.17	0.12	-0.26	0.72						
Stress	8.56	4.04	0.09	0.02	0.75						
German sample											
PMH	18.25	5.66	-0.54	-0.16	0.91	.44	.48***	.71***	-.69***	-.46***	-.53***
Resilience	56.99	12.30	-1.27	1.65	0.91		.28***	.38***	-.35***	-.23***	-.22***
F-SozU K-14	59.26	10.76	-1.46	2.19	0.94			.44***	-.43***	-.30***	-.24***
SWLS	25.03	6.25	-0.75	-0.04	0.87				-.58***	-.37***	-.36***
Depression	4.55	4.47	1.26	1.04	0.88						
Anxiety	3.24	3.53	1.56	2.56	0.78						
Stress	7.40	4.71	0.61	-0.23	0.85						

Note. PMH Positive Mental Health Scale (0–27); RS-11 Resilience Scale (11 items; 11–70); F-SozU K-14 Questionnaire Social Support (possible min and max values 14–70); SWLS Satisfaction with life Scale (5–35); Skew Skewness; Kurt Kurtosis.

skewness, and kurtosis were analyzed. Internal consistency was measured by Cronbach's alpha. Correlation between PMH, RS-10, F-SozU k-14, SWL scales and negative mental health scales (Depression, anxiety, and stress) were calculated to measure construct validity. The SPSS (version 25.0) was used for the above analyses.

Single-group confirmatory analysis (CFA) was tested (Hirschfeld & Von Brachel, 2014) to examine the proposed factor structure of PMH, RS-10, F-SozU K-14, and SWL scales across both countries. Within each sample, one-factor model was defined for testing. Maximum likelihood estimators were used for model testing. Given that we have a large sample size (>5000), we used a combination of goodness of fit as recommended by Marsh, Hau, and Wen (2004) and by Hu and Bentler (1999). A model was accepted if Standardized Root Mean Square (SRMR) < .08, Comparative Fit Index > .90, Tucker Lewis index (TLI) > .95 and Root Mean Squared Error of Approximation (RMSEA) < .05.

Maximum likelihood estimators were used for model testing.

Furthermore, Jöreskog (1971) multigroup factor analysis approach was used to test measurement invariance of these scales using R-package (Lavaan) (for more detail see: Hirschfeld & Von Brachel, 2014). Configural invariance is analyzed with no equality constraints across groups and confirms whether factor structures are identical across countries. In testing for metric invariance, factor loadings were constrained to be equal across both countries. All intercepts were constrained to be equal across both countries. For the reference country, factor mean was set to 0 and scaling factor to 1. If intercept measurement was established, then scalar measurement could be expected (Millsap & Yun-Tein, 2004). Each model was accepted when (a) CFI, RMSEA and SRMR values showed good model fit, and (b) Δ CFI in association to the previous model was not greater than .01 (Cheung & Rensvold, 2002). If full invariance was

not established, partial weak and partial strong invariance was accepted after estimating freely variant item's factor loading or intercept (Byrne, Shavelson, & Muthén, 1989).

Results

Item characteristics

Psychometric properties of each scale such as mean, standard deviation, skewness, kurtosis and internal consistency are demonstrated in Table 2. The values of skewness and kurtosis for both Pakistani and German samples are near to 0 (e.g., $SK < 2$ and $Ku < 5$), thus we treat all the scales as continuous (Muthén & Muthén, 2009). All variables demonstrated acceptable normal univariate distributions (George & Mallery, 2010) and had slight right-tailed distribution on PMH, and RS-11.

Structure validity

The results of the single group CFAs for PMH, RS-10, F-SozU k-14, and SWL scales of each sample are presented in Table 3–6, respectively. The model fit of the CFA of PMH and SWLS for both samples indicated that the one-factor model was a good fit of the data from both countries. Meanwhile, the model fit of the one-factor model of RS-11 and F-SozU K-14 was modest to poor for both countries, although all factor loadings in both samples were above 0.35.

For RS-11, modification indices showed that there were many correlated error terms between Item 3 (*Keeping interested in things is important to me*) and Item 7 (*I keep interested in things*), Item 10 (*Sometimes I make myself do things whether I want to or not*) and Item 11 (*I have enough energy to do what I have to do*), as well as Item 8 (*I can usually find something to laugh about*) and Item 9 (*I can usually look at a situation in a number of ways*). All these items have similar wording and deal with topics of interest, ability to do tasks and seeing things from different perspectives. After correlating terms model fit improved.

For SWLS, modification indices showed a correlated error term between item 2 (*The conditions of my life are excellent.*) and item 3 (*I am satisfied with my life.*). Both items have similar wording and theme of satisfaction with living conditions.

Criteria validity

Correlation matrixes were investigated between positive constructs (i.e., PMH, RS-11, F-SozU K-14, and SWLS) and negative mental health factors (Depression, Anxiety, and Stress). Within each sample, the mean, SDs, and correlations of these constructs with the total score of each instrument respectively are presented in Table 2. All correlations were statistically significant and in the anticipated direction; positive mental health constructs were negatively associated with depression, anxiety and stress, whereas positively associated with each other.

Multi-group Confirmatory Factor Analysis across cultures

Positive mental health

The results of the measurement invariance using multi-group CFAs for PMH indicated good invariance across both countries (Table 3). Structural (configural), metric (weak) and scalar (strong) invariance showed a good model fit as well as CFI, which suggests that the PMH has same structure, factor loadings and intercepts in both countries, therefore each item contribute equally in measuring the latent variable.

Resilience

Table 4 shows model testing results of measurement invariance for resilience. The configural model and weak invariance model both showed an acceptable global fit. Next, the test of strong measurement invariance indicated poor model fit, as CFI exceeded .01. Expected parameter change suggested higher parameter changes when Item1 and Item 2 were estimated freely. By setting free the constraint of Item 1 (*When I make plans, I follow through with them*) and Item 2 (*I usually manage one way or another*), the CFI value was less than 0.01. Thus, partial strong measurement invariance was established.

Social support

Table 5 presents the model testing results of measurement invariance of F-SozU K-14. The global fit of the configural model and weak invariance model were both acceptable. The drop of the CFI from the full strong invariance model to weak invariance model exceeded 0.01 compared to the weak model. Expected parameter change statistics suggested that factor loadings of Item 1 (*I can easily find someone who will look after my apartment when I am not there*), Item 2 (*There are people who take me as I am, without limitations*), Item 11 (*There are people who share joy and sorrow with me*) and Item 12 (*With some friends and family I can really let loose*) were not equal across both countries (Kaplan, 1989). After releasing constraints of these items, partial strong measurement invariance was established.

Satisfaction with life

Table 6 displays the model testing results of measurement invariance for the SWLS. In testing measurement invariance, configural, weak and strong invariance assumption for the SWLS was supported, and the global fit of this model remained good.

Latent mean comparison

After fulfilling the precondition of latent means, latent mean comparisons of PMH, RS-10, F-SozU k-14, and SWLS were investigated between Pakistani and German university students. Pakistani sample was used as reference group. All

Table 3 Single group CFA results and cross-cultural measurement invariance tests results of the Positive Mental Health Scale.

Models	N	Chi ² /df	RMSEA	90% C.I.	CFI	TLI	SRMR	ΔCFI
Single group CFA-Original one factor model								
Pakistan	1,841	197.691/27	.059	.051-.066	.970	.960	.028	
Germany	7,847	1300.676/27	.078	.074-.081	.968	.957	.027	
Multiple group CFA								
Configural		1498.367/54	.074	.071-.078	.968	.958	.025	
Weak		1570.280/62	.071	.068-.074	.967	.961	.031	.001
Strong		1905.049/70	.074	.071-.076	.960	.958	.034	.007

Note. RMSEA = root mean square error of analysis; 90% C.I. = 90% confidence interval of RMSEA; CFI = Comparative fit index; SRMR = standardized root mean square residual.

Table 4 Single group CFA results and cross-cultural measurement invariance tests results of Resilience scale.

Models	N	Chi ² /df	RMSEA	90% C.I.	CFI	TLI	SRMR	ΔCFI
Single group CFA-Original one factor model								
Pakistan	1,841	438.954/44	.070	.064-.076	.908	.885	.044	
Germany	7,194	3875.379/44	.110	.107-.113	.899	.874	.047	
Single group CFA ($\theta_{3,7}$; 10,11; $\delta_{8,9}$ free)								
Pakistan		361.740/41	.065	.059-.071	.925	.900	.040	
Germany		2073.787/41	.083	.080-.086	.947	.928	.034	
Multiple group CFA								
Configural		2435.527/28	.080	.077-.082	.944	.925	.033	
Weak		2483.812/92	.076	.073-.078	.943	.932	.035	.001
Strong		3281.594/102	.083	.081-.086	.925	.919	.043	.018
Partial strong τ_1 free		3085.195/101	.081	.078-.083	.930	.923	.047	.013
Partial strong τ_2 free		3098.338/101	.081	.079-.084	.929	.923	.042	.014
Partial strong τ_1, τ_2 free		2852.128/100	.078	.076-.081	.935	.928	.040	.008

Note. τ_1 = When I make plans, I follow through with them. τ_2 = I usually manage one way or another. RMSEA = root mean square error of analysis; 90% C.I. = 90% confidence interval of RMSEA; CFI = Comparative fit index; SRMR = standardized root mean square residual.

Table 5 Single group CFA results and the cross-cultural measurement invariance tests results of the Perceived Social Support Questionnaire.

Models	N	Chi ² /df	RMSEA	90% C.I.	CFI	TLI	SRMR	ΔCFI
Single group CFA-Original one factor model								
Pakistan	1,841	437.602/77	.053	.048-.058	.941	.930	.036	
Germany	7,701	6596.651/77	.105	.103-.107	.909	.892	.047	
Multiple group CFA								
Configural		7070.253/154	.097	.095-.099	.912	.896	.042	
Weak		7154.780/167	.094	.092-.096	.911	.903	.045	.001
Strong		9118.771/180	.102	.100-.104	.886	.885	.059	.025
Partial strong τ_1 free		8777.142/179	.100	.099-.102	.890	.888	.057	.021
Partial strong τ_1, τ_2 free		8354.420/178	.098	.096-.100	.896	.893	.054	.015
Partial strong $\tau_1, \tau_2, \tau_{11}$ free		8143.438/177	.097	.095-.099	.898	.895	.053	.013
Partial strong $\tau_1, \tau_2, \tau_{11}, \tau_{12}$ free		7841.198/176	.096	.094-.097	.902	.899	.051	.009

Note. τ_1 = I can easily find someone who will look after my apartment when I am not there, τ_2 = There are people who take me as I am, without limitations, τ_{11} = There are people who share joy and sorrow with me. τ_{12} = With some friends and family I can really let loose. RMSEA = root mean square error of analysis; 90% C.I. = 90% confidence interval of RMSEA; CFI = Comparative fit index; SRMR = standardized root mean square residual.

Table 6 Single group CFA results and cross-cultural measurement invariance tests results of Satisfaction with Life Scale.

Models	N	Chi2/df	RMSEA	90% C.I.	CFI	TLI	SRMR	ΔCFI
Single group CFA-Original one factor model								
Pakistan	1,841	28.118/5	.050	.033-.069	.989	.977	.022	
Germany	7,721	76.385/5	.043	.035-.052	.996	.992	.012	
Single group CFA ($\theta_{2,3}$ free)								
Pakistan	1,841	15.355/4	.039	.020-.061	.994	.986	.016	
Germany	7,721	74.117/4	.048	.039-.057	.996	.991	.012	
Multiple group CFA.								
Configural		89.472/8	.046	.038-.055	.996	.996	.011	
Weak		282.890/12	.069	.062-.076	.987	.978	.032	.009
Strong		452.755/16	.076	.070-.082	.979	.973	.038	.008

Note. RMSEA = root mean square error of analysis; 90% C.I. = 90% confidence interval of RMSEA; CFI = Comparative fit index; SRMR = standardized root means square residual.

mean differences between Pakistan and Germany were significant apart from RS-11 ($z = -1.66, p = .096, d = -0.77$). The German sample had significantly higher latent means of PMH ($z = 3.94, p < .001, d = 0.058$), F-SozU K-14 ($z = 25.50, p < .001, d = 0.38$) and SWLS ($z = 0.74, p < .001, d = 0.99$) than the Pakistani sample.

Discussion

The current study is a first attempt to investigate whether four primary salutogenic constructs are same across student samples from Pakistan and Germany. The present study investigated the psychometric properties and measurement invariance of four salutogenic factors across Pakistani and German university students. In general, all positive constructs indicated good psychometric properties in both samples. Testing of measurement invariance of all positive constructs demonstrated configural and full weak measurement invariance indicating the same structure and factor loadings of positive mental health (PMH), resilience (RS-11), social support (F-SozU K-14) and life satisfaction scale (SWLS) across Pakistan and Germany. Full strong measurement invariance was established for the PMH, and SWLS, while all other scales showed partial strong measurement invariance. Latent means comparisons indicate that German students reported higher positive mental health, life satisfaction, and social support compared to Pakistani students.

Positive mental health

The measurement invariance testing for PMH demonstrated full strong measurement invariance, suggesting that the score of PMH can be used in direct mean comparison across cultures. Moreover, latent mean comparison indicates that Pakistani students experience less positive mental health. Due to poor educational system and financial crises, Pakistani students experience emotional and educational challenges such as relationship problems, competition for good grades, uncertainty regarding the future, which badly influences their psychological well-being. These findings are consistent with the previous studies of [Bibi, Blackwell, and Margraf \(2019\)](#) and [Irfan \(2016\)](#), who reported that Pakistani

students face many challenges during their university life and experience various psychological issues.

Resilience

The Resilience scale showed a modest fit with the original one-factor model in both countries. One possible reason for the poor model fit of RS-11 in the German sample could be that the item selection process for RS-11 was established according to statistical criteria rather than a theoretical concern. Furthermore, partial strong measurement was established by releasing the intercept of Item 1 (follow through with plan) and Item 2 (manage one way or another). Both items were more strongly associated with the trait resilience in the German sample as compared to the Pakistani sample. A possible explanation could be that in Pakistan people usually do not plan their work and routines as much as people in Germany, therefore may fail to manage their life in one way or another. Therefore, these items do not fit the circumstances in Pakistan. Our findings of measurement invariance of resilience are in contrast with [Yang, Li, and Xia \(2012\)](#), who found only four of 14 items invariant across U.S. Chinese and Taiwanese students. Therefore, cross-cultural comparisons should be interpreted with caution. In addition, no significant differences were found for resilience latent mean comparison, indicating that both German and Pakistani students have an equal ability to cope with adverse situations of life.

Social support

For social support, partial strong measurement invariance was established with the freely estimating of the intercepts of Item 1 (easily find someone to look after apartment), Item 2 (people who take me as I am) Item 11 (people to share joy and sorrow with), and Item 12 (let loose with people). The intercepts of all these items were higher in the German sample apart from Item 11. This could be because F-SozU K-14 is developed in German cultural framework and put emphasis on instrumental social support, therefore, these items may not fit the culture of Pakistan. However, in Pakistan people have strong social bonds and extended family members usually live together. They have less

instrumental social support and selflessly support each other (Jibeen, 2016). Results also indicated that the mean scores of German students were higher than Pakistani students. However, effect sizes were small, therefore these results should not be over-interpreted.

Life satisfaction

For life satisfaction, strong measurement invariance was established as well. Results of the latent mean comparison of the four variant items indicated that German students scored higher on life satisfaction compared to Pakistani students. It could be because Pakistani students experience more financial, academic, family and political issues, which influence their quality of life and thus lowers their life satisfaction. Results are in line with previous studies which found that western students experience less academic stress than Asian students, who as a result experience less life satisfaction (Nguyen, Le, & Meirmanov, 2019; Xiong, 2018).

In spite of the strengths of the present study such as the large sample size and the cross-cultural setup, the following limitations should also be considered. First, a convenient purposive sampling technique was used to collect the data, which may not be truly representative of the populations. Second, the justification for nonequivalent intercepts of resilience, social support, and life satisfaction scales are still unclear, since traditional or methodological factors might have contributed to the items' non-invariance (Van de Vijver, 2007). Future studies may use focused group research to explore the potential sources of biases. Third, though latent means comparison was based on only non-biased items which could underrepresent the construct. There are many differences between the two countries that may explain the variances we found in the current studies, such as individualistic and collectivistic cultural, developing and developed status, economic status, and religious. Future studies may further investigate whether any of those factors can explain the variances between countries.

Conclusion

In a nutshell, the PMH, RS-10, F-SozU k-14, SWLS scales indicated good psychometric properties in both samples and proved to be valid and efficient instruments to assess positive mental health factors in both Pakistani and German students. Cross-cultural measurement testing of these constructs showed full strong and partial strong measurement invariance, thus allowing latent mean comparisons across cultures. This study can raise awareness among researchers aiming at investigating cross-cultural comparison in the field of clinical, positive and social psychology.

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