International Journal of Religion
2024
Volume: 5| Number 11 | pp. 171 – 180
ISSN: 2633-352X (Print) | ISSN: 2633-3538 (Online)
ijor.co.uk
DOI: https://doi.org/10.61707/ezdhsg71

Psychometric Properties of the General Self-Esteem Test (GSET) in Peruvian Teenagers' students from Lima

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Abstract

The psychometric properties of the General Self-Esteem Test (GSET) have been investigated in Peruvian teenagers' students from Lima. For this, 1,392 participants of both sexes, with ages ranging from 12 to 18 years, took the test. The results have shown that statistically the items meet the necessary values to be accepted. Likewise, the validity of the structure assigned to the original four-domain model has been optimally accepted since the CFA determined the following: CFI=.99; TLI=.99; GFI=1.00, PFGI=.70; RMSEA=.025; SRMR=.030. On the other hand, with respect to reliability, two formulas were worked on (split half and KR20), obtaining in both cases a coefficient of .89, which is considered very high reliability. Finally, a single scale has been developed, without differentiating by sex, with the 25th, 50th and 75th percentiles, because the study of significant differences shows a small size in the magnitude of the effect.

Keywords: *Saving Self-esteem, Psychometric properties, Validity, Reliability, Scale.*

INTRODUCTION

Self-esteem is a psychological variable with great importance for personal development and it is related with various variables such as social skills (Gualda & Lacunza, 2020; Alfaro, et al., 2023), depression (Segovia y del Campo, 2022), emotional intelligence and resilience (Gómez and Jiménez, 2018), jealousy and envy (Reidl-Martínez, 2002), among others. In order to evaluate this variable in adolescents, various tests have been developed, from a psychological perspective, among which the Stanley Coopersmith questionnaire (1967) stands out in its versions for primary school children, adolescents and adults, which are composed of items dichotomous. In Peru, one of the most recent works is that of Mesías (2017) who reviews the Coopersmith by applying it to 398 adolescents between the ages of 11 and 15 from secondary schools in the province of Huallaga, finding reliability of .86 with the KR, in throughout the test, also its 4 factors had KR that ranged between .65 and .75. When performing the confirmatory factor analysis (CFA) with a variance of 50.64%, they describe a CFI of .87, RMSEA of .042, 90% CI of .039 to .045 and TLI of .85. Along the same lines, Sauñi (2017) reviews the Coopersmith properties in San Juan de Lurigancho, working with 720 adolescent students, aged between 11 and 17 years. The reliability obtained was .77 with KR-20 and .73 split half. The validity from the exploratory factor analysis (EFA) shows a KMO .78, and a variance of 45% for a single factor, since the test was reduced to only 16 items after processes that did not show adequate coefficients.

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Subsequently, Reidl's Self-Esteem Scale (1981) was developed, composed of 17 items, ordered on a Likert scale of 4 possibilities, with self-assessments of the subject focused on three dimensions: cognitive, emotional and behavioral and divided in two factors (negative and positive self-esteem). It should be noted that this scale was originally developed only for women in the southern part of Mexico City. In 2002, the test was revalidated in a sample of 1,112 participants of both sexes. Of the total, 29% were undergraduate students and the rest were high school students. The Alpha obtained was .82, for the total, and .82 and .78 for negative and positive self-esteem, respectively (Guillen and Reidl, 2021). The test does not have EFA or CFA; on the other hand, an attitudinal perspective of self-esteem is assumed by stating that its dimensions are affective, cognitive and behavioral. No psychometric studies have been found in Peru, and in their article of 2021 the authors state that the test should be used only with adults.

Then Pope et al. (1988) constructed a self-esteem test for children and another for adolescents, on a three-option Likert scale for two factors (positive and negative self-esteem) and 5 dimensions (social, family, academic, global and body). The authors do not present psychometric data to support the instrument. In Peru, no psychometric works have been found that support the instrument.

Later, Grajeda (2010) developed a general self-esteem test in Lima with 30 items, among which a truthfulness scale stands out. As a foundation, the quadridominal cognitive behavioral theory is proposed (Grajeda, 2023), which states that self-esteem "is a hypothetical construct referring to evaluative cognitions about the subjects' own characteristics, abilities, attitudes and behaviors" (p.27), whose nature is learned and not innate, the same that will be modified with the experiences lived throughout their life, experiences that influence private behaviors (thoughts, feelings, conscience, etc.), expressing themselves both in the open behaviors, as well as internal ones (Grajeda, 2019). For the theory, the structure of self-esteem would be composed of the physical, personal, social, and academic domains. The test is therefore made up of these 4 domains, with dichotomous items. The original 2010 study (Grajeda, 2023) determined validity by expert judgment based on Aiken's V, obtaining a coefficient of .97. Likewise, construct validity with the corrected item test correlation, which described indices that ranged between .22 and .70, with exception of items 3 and 28. In relation to reliability, the Split half obtained showed .81 and the study with equivalent tests, carried out with the Coopersmith test (1967) was .87.

Finally, in Peru, Cerna-Dorregaray (2017) develops a Self-Esteem Scale for adolescents following, in accordance with what the author mentions, the humanistic model of Clemens (1998), assuming it as the satisfaction felt when satisfying bonding needs, uniqueness, power and patterns. Unfortunately, the 1998 work by Clemens has not been referenced in the same article, and in the extensive search we have carried out, the cited bibliographic material has not been found. The test consisted of 40 items that were reduced to 35 on a Likert scale. The content validity revealed Aiken Vs that ranged from .80 to 1. The reliability obtained was .86 (Alpha and Omega). No significant differences were found in the complete test according to sex, but there were differences according to age with a slight effect size (Cohen, 1988). The correlations of each dimension with the full scale ranged between .76 and .81. No new psychometric research has been found with this instrument.

A separate point is the Rosemberg Self-Esteem Scale, developed from a sociological perspective by the Doctor of Sociology Morris Rosenberg in 1965, which is not being described in the present study, since we are analyzing instruments clearly developed by psychologists in protection of professional ethics, avoiding intrusion, and using psychological evaluation instruments developed by professional psychologists, in accordance with articles 7 and 46 of the Code of Ethics and Deontology of our College of Psychologists of Peru (2017). Likewise, as can be seen in the referenced title, the same author calls it the self-image scale.

With respect to GSET, only one psychometric study has been found carried out by Ocmin and Segura (2023) in an area of Comas. In this study, we worked with 774 high school students, aged between 12 and 18 years. In it, evidence of content and factor validity was obtained, both of which were adequate. However, a three-factor model is proposed where certain items that logically belonged to one dimension were added within a diametrically different dimension, so the authors finally choose to recommend the original 4-factor model. Furthermore, the reliability obtained by the KR20 was .77. The authors also determine that there is no equity between men and women based on a factorial invariance study, which is why they propose differentiated scales.

Although the instruments present adequate psychometric evidence, in most cases these are obsolete since the passage of years and sociocultural changes have an impact on the obsolescence of the norms (Aliaga & Giove, 1993). On the other hand, in the case of the Pope et al test, no evidence of validity and reliability has been presented and ultimately it is always necessary to have a greater number of instruments that allow comparisons in research or a more efficient measurement of self-esteem. In that sense, the General Self-Esteem Test (Grajeda, 2010) only records one recent psychometric study; however, it would be important to expand the population to ensure the validity of its norms and greater generalization. Considering this, the following research question was formulated: What are the psychometric properties of the GSET in Peruvian adolescent students from Lima?

This research provides a methodological contribution, thanks to the guidelines described in procedure and data analysis, which, due to the precision with which they are described, will allow future replications. At a technological level, an instrument with adequate psychometric characteristics will be presented. At a practical level, students and professional psychologists will be able to use a test with updated standards that will allow them to have a better approach to the self-esteem variable, so that they can prepare reports on them and identify participants who require its development. Finally, at a theoretical level, the four-dimensional structure proposed in the quadridominal cognitive-behavioral theory can be verified from the CFA (Grajeda, 2010, 2023).

On the other hand, for the present study, the main objective was to evaluate the psychometric properties of the GSET in Peruvian adolescent students from Lima. In this sense, as specific objectives, the validity, and reliability of the GSET will be determined, as well as one or more scales will be constructed based on possible differences, allowing the interpretation of the scores in relation to the reference population.

METHODOLOGY

Design

Considering the proposal of Ato et al. (2013) an instrumental design has been used. Regarding the type of research, this would be technological since the properties of an instrument are being highlighted, that is, a technique that will be used professionally (Sánchez and Reyes, 2015).

Sample

The sample was made up of 1,392 participants, 1,040 women and 352 men, with an age range that ranged from 12 to 18 years, with an average of 15 years and a SD of 1.41, all from educational institutions belonging to the districts. de Comas and Mi Perú, which are located in Lima and Callao, respectively. To calculate the size of each sample, the formula for finite populations indicated in Abad and Servín (1981) has been used. The sampling used in each district has been probabilistic with proportional allocation, meaning that an attempt has been made to respect the population proportions in the subsamples.

Instrument

General Self-Esteem Test (GSET). Test composed of 30 items, developed by Alex Grajeda Montalvo in 2010, which evaluates self-esteem based on a structure of 4 domains (academic, physical, social and personal), with a scale of truthfulness, which allows eliminating inconsistent protocols. The test can be administered individually or collectively in an age range from 12 to 30 years old, resolving in an average time of 5 minutes. The original study (Grajeda, 2023) determined validity by expert judgment based on Aiken's V, obtaining a coefficient of .97, which is very high. Likewise, construct validity with the corrected item test correlation, the same one that described indices that ranged between .22 and .70, with the exception of 3 and 28. In that sense, Aiken (2003, p. 65) considers values equal or greater than .20. In relation to reliability, the Split half obtained showed .81 and the study with equivalent tests, carried out with the Coopersmith test (1967) was .87. A pilot study carried out by Caccha, 2021, with a sample of 100 adolescent high school students residing in Cercado de Ica, demonstrates a reliability of .81 using the Split half.

Procedure

Authorizations for the use of the databases were obtained from authors of research works that used the GSET during the year 2023, these works were from Ocmin and Segura (2023), Regalado (2024), and Hilario and Villegas (2024). These bases were filtered, leaving only what related to the GSET. Statistical formulas were subsequently applied to determine validity and reliability, which are described below.

Statistical analysis

The prepared spreadsheets were analyzed with the SPSS 27 and Jamovi version 2.3.18 programs. To begin, a descriptive analysis of items was carried out based on frequency, mean, standard deviation, skewness, kurtosis, communalities, corrected homogeneity index and discrimination index. To determine validity, confirmatory factor analysis has been used based on the robust method, taking into account the absolute and incremental adjustment indices. With respect to reliability, the Split half method and the KR 20 have been used since the test presents dichotomous items. Continuing with the analysis, the Kolmogorov-Smirnov normality test was carried out, given that the sample exceeds 50 participants, with this it was possible to determine the abnormality of the scores (<0.05), so to carry out the differential analysis according to sex, we used the Mann Whitney U and Cohen's d was applied to determine the effect size. To construct the scale, the 25th, 50th and 75th percentiles have been considered, corresponding to quartiles 1, 2 and 3, which are associated with the low, medium and high levels.

RESULT AND FINDINGS

Table 1 shows the analysis of the items. The data in the case of skewness and kurtosis are within the range of +1.5/-2.00, that is, the items are smaller than the mean. The values of the communalities exceed .20, which indicates that the content of the items has information in common between them (Nunnally & Bernstein, 1995), in addition the corrected homogeneity index (IHC) presents values that are greater than .30 (Kline, 1986), thus demonstrating that the items are related to the test in general, likewise all the values of the discrimination index are <0.05, being accepted, so it is not considered to eliminate any item. It should be noted that the analysis was not carried out with items 6, 11, 19, 22, 24 and 30, since these are to discriminate the veracity of the answers in the test.

Table 1. *Descriptive analysis of the GSET items in Peruvian teenagers' students from Lima*

ítems	Frecuence %		*M*	*DE*	g_1	g_2	h^2	*IHC*	*id*	Aceptable
	0	1								
I1	45.5	54.5	.55	.498	-.182	-1.970	.458	.387	.000	Si
I2	33.1	66.9	.67	.471	-.718	-1.486	.428	.362	.000	Si
I3	49.1	50.9	.51	.500	-.035	-2.002	.316	.409	.000	Si
I4	45.4	54.6	.55	.498	-.185	-1.969	.226	.362	.000	Si
I5	31.1	68.9	.69	.463	-.817	-1.334	.294	.432	.000	Si
I7	48.3	51.7	.52	.500	-.069	-1.998	.478	.535	.000	Si
I8	39.4	60.6	.61	.489	-.433	-1.815	.297	.435	.000	Si
I9	45.1	54.9	.55	.498	-.197	-1.964	.482	.495	.000	Si
I10	53.6	46.4	.46	.499	.144	-1.982	.472	.469	.000	Si
I12	35.6	64.4	.64	.479	-.604	-1.638	.304	.470	.000	Si
I13	43.6	56.4	.56	.496	-.258	-1.936	.296	.456	.000	Si
I14	33.6	66.4	.66	.473	-.694	-1.520	.416	.554	.000	Si
I15	42.2	57.8	.58	.494	-.314	-1.904	.418	.450	.000	Si
I16	31.8	68.2	.68	.466	-.785	-1.386	.401	.505	.000	Si
I17	28.4	71.6	.72	.451	-.960	-1.079	.448	.524	.000	Si
I18	46.3	53.7	.54	.499	-.150	-1.980	.422	.365	.000	Si
I20	43.7	56.3	.56	.496	-.255	-1.938	.449	.368	.000	Si

I21	34.0	66.0	.66	.474	-.677	-1.544	.402	.533	.000	Si
I23	46.3	53.7	.54	.499	-.150	-1.980	.396	.484	.000	Si
I25	41.5	58.5	.58	.493	-.344	-1.884	.488	.578	.000	Si
I26	36.0	64.0	.64	.480	-.584	-1.661	.413	.552	.000	Si
I27	48.6	51.4	.51	.500	-.055	-2.000	.365	.426	.000	Si
I28	30.0	70.0	.70	.458	-.876	-1.234	.417	.547	.000	Si
I29	42.2	57.8	.58	.494	-.314	-1.904	.330	.430	.000	Si

Table 2 analyzes the construct validity using the CFA and within the absolute fit indices, the $\chi^2/gl=1.97$ is a value less than 3.00, the RMSEA with a confidence index of 95% and the SRMR are lower to 0.05, while, for the incremental adjustment indices the CFI, TLI and GFI, values greater than .90 are shown (Hu & Bentler. 1999) and greater than .93 in the case of the GFI (Cho et al., 2020) so a better fit is shown than the estimators, thus confirming the model proposed by the four domains that make up self-esteem. Considering Escobedo et al. (2015), when incremental fit indices are greater than .95, they are considered optimal. The PGFI evaluates the parsimony of goodness of fit. The coefficient obtained was .70, which exceeds the acceptable value, demonstrating a simil model to the original.

Table 2 *Factorial confirmatory analysis of GSET in in Peruvian teenagers' students from Lima*

χ^2	χ^2/gl	gl	RMSEA [IC 95%]	SRMR	CFI	TLI	GFI	PGFI
Original	1.97	247	.025 [0.023-0.030]	.030	.991	.990	1.00	.70
Acceptable values	≤ 3.00	> 100	≤ .05	≤ .08	> .95	> .90	≥ .93	≥.550

Likewise, Figure 1 shows the distribution of the items in relation to its four domains and how these, at the same time, are related to each other, which affirms the quadridominal model proposed for self-esteem. As mentioned by Aiken (2003), to consider the values of the items acceptable, they must be ≥.20, while Kline (1986) considers that it must be ≥.30. For both cases, the items fully comply with the mentioned values, since items with high values are evident, such as item 25 belonging to the academic dimension with a loading of 1.53 and item 23 of the social dimension with a loading of 1.43. Which indicates the high relationship between the items and their dimensions.

Figure 1 *GSET four-factor diagram in in Peruvian teenagers students from Lima*

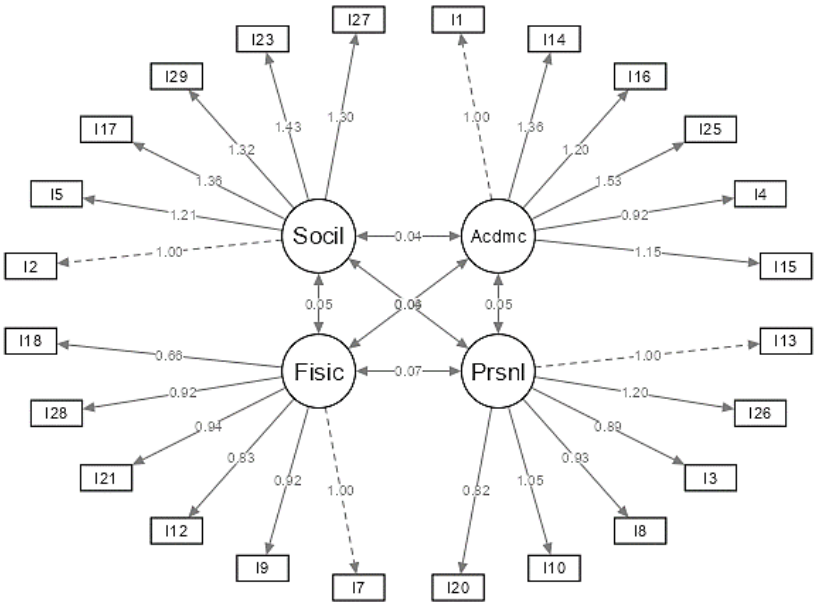

Table 3 *GSET Reliability in Peruvian teenagers' students from Lima*

N° elements	Statistics	Value
24	*Split half*	.89
24	*KR20*	.89

Table 3 shows a very high reliability for the complete test (Pallela and Martins, 2003, p.181). These authors propose that this level occurs at .81 to 1. Both coefficients (Split half and KR-20) obtained the value of .89, demonstrating that the .80 exceeds what is required for adequate reliability (Nunally, 1991; Nunally and Berstein, 1995). Taking Aiken (2003) into account, if the purpose is to compare scores between people, the instrument must have a reliability of at least .85, thus the test proves to be consistent. It should be noted that the six items belonging to the truthfulness dimension were not included in the analysis.

Table 4 *GSET differences between men and women in Peruvian teenagers students from Lima*

Dimensions and Test	Sex	n	Average range	U de Mann-Whitney	Sig.	*d*
Academic	Man	352	858,65	125961,500	.000	0.485
	Woman	1040	641,62			
Social	Man	352	795,39	148231,500	.000	0.289
	Woman	1040	663,03			
Personal	Man	352	838,75	132969,500	.000	0.421
	Woman	1040	648,36			
Physical	Man	352	835,05	134270,500	.000	0.409
	Woman	1040	649,61			
Self-steem	Man	352	857,59	126336,500	.000	0.479
	Woman	1040	641,98			

According to Table 4, significant differences are found in all dimensions and in general self-esteem; however, the effect sizes presented are below 0.5, which indicates a small effect size (Cohen, 1988). Although in the data in the table, men present a relatively greater average range, compared to women, it has been decided to develop a single scale, since the magnitudes of the exposed effect do not reach a considerable proportion in the sample, for which would not be feasible to disaggregate the interpretation of raw scores into standard scores.

Table 5 *GSET scale for Peruvian teenagers students from Lima*

Levels	Percentils	Domains				General self-steem
		Academic	Social	Personal	Physical	
Top	75	5-6	5-6	5-6	5-6	19-24
Half	50	3-4	4	3-4	3-4	12-18
Low	25	0-2	0-3	0-2	0-2	0-11

According to Table 5, three levels are observed with percentiles of 25, 50 and 75, which cover the four domains and the complete test. The interpretation is carried out by crossing the raw score with the percentile and the associated level. Thus, for example, a person who obtains the following scores 3, 3, 2 and 2 respectively for each domain (academic, social, personal and social), will be located at the medium and low level, while, for the general score, he will obtain the sum of 10 points, placing it at the low level.

Discussion

The first result consisted of carrying out the descriptive analysis of the items, where it was observed that there is a greater frequency of responses for the score of zero in item 10, with 53.6%, while for score one the frequency was 71.6. % in item 17, similarly these data agree with that of Ocmin &Segura (2023), who in the

frequency of responses, for score zero, item 10 showed greater predominance with 59.7% and for score one item 17 presented 76%, these results indicate that there are no biases or trends in the responses. Regarding asymmetry and kurtosis, the values in this research ranged between +1.5/-2.00, in the same way, it happened in the study by Ocmin & Segura (2023) where g_1 and g_2 are higher than the range of +/-1.5, this tells us It would be indicating that in both cases the data do not fit the normal distribution curve. For the communalities, the values found were between 0.226 and 0.488 belonging to item 4 and item 25, considered acceptable, since they exceed the minimum value of 0.20, demonstrating the common relationship, this is supported by Nunnally & Bernstein (1995) who They mention that the items have a common relationship and therefore measure the same variable. Different data were found in the communities of a study in Huaquillay-Comas, where the minimum value was 0.43 and the maximum was 0.75, belonging to item 5 and 26 (Ocmin & Segura, 2023), evidencing superiority in the values in comparison with those obtained in this study, in the same way they differ in the study by Grajeda (2023) where it was observed that the minimum value of communality is 0.115 for item 2, while the maximum value was 0.540 for item 14. Other points that were determined in this analysis were the corrected homogeneity index (IHC) where all the items showed acceptable values having at least 0.36, this is stated by Kline (2003) who states that the minimum value must be 0.30 to be accepted, thus the discriminative index (Id) was also established, accepting all items when they were below 0.05. In comparison with the results of the study by Ocmin & Segura (2023), it is found that the values obtained by the items in the IHC were equal to and greater than 0.20, while the Id of all the items were values equal to 0.00, however, in the work of Grajeda (2023) there were values of less than 0.20 and only one item exceeded the ID. In summary, these differences may be because the samples in these studies are different in terms of quantity, which can generate greater variability in the responses, and it is also observed that most of their values have increased compared to the aforementioned studies.

The second result determined the structural validity from the GSET. Both absolute and incremental adjustment indices have been found that demonstrate the correctness of the proposed model in four domains of self-esteem. Thus, the $\chi^2/df=1.97$ is a value less than 3.00, the RMSEA (.025) and the SRMR (.030) are less than .05, while, for the incremental adjustment indices, the CFI (.99), TLI (.99) show appropriate values since they are greater than .90, (Hu & Bentler. 1999) and greater than .93 in the case of the GFI, which was equal to 1.0 (Cho et al., 2020), Therefore, it shows a better fit than the reference estimators, which even according to Escobedo et al. (2015) would be optimal since they are greater than .95. Likewise, the PGFI that sees the parsimony of the goodness of fit index has been .70. A partially similar result is that of Ocmin & Segura (2023), who, working with 774 high school students aged 12 to 18, in an area of Comas, found a $\chi^2/df=1.98$, a RMSEA (.032), an SRMR (.040), a CFI (.925), a TLI of (.916) and a parsimony adjustment of 1.12 and .845 for the original and the proposed 4-factor model. As can be seen, the comparisons favor our research, since better results are presented in both the absolute, incremental and parsimony adjustments. On the other hand, the indices obtained are also better than those of Mesías (2017) who, when reviewing the Coopersmith applied to 398 adolescents aged between 11 to 15 years from secondary schools in the province of Huallaga, found a CFI of .87, RMSEA of .042 and TLI of .85. Considering that for a sample greater than 100 the appropriate values should be CFI >.95, RMSEA ≤.05 and TLI >.90, their incremental fit indices would not be adequate (Escobedo et al., 2016).

With respect to reliability, both the Split half method and the Kuder-Richardson formula (KR-20) have been used, recommended for dichotomous items (Merino & Charter, 2010). For both cases, a coefficient of .89 has been found, which is considered a very high reliability for the complete test (Pallela and Martins, 2003). Likewise, the coefficient obtained exceeds .80, which is what is required for adequate reliability (Nunally, 1991; Nunally and Berstein, 1995). In the same sense, considering Aiken (2003) for comparative cases of scores between people, the instrument must have a reliability of at least .85. For the present case it has been .89 which demonstrates its high consistency. The result obtained is higher than that of Mesías (2017) who worked with the Coopersmith Scale and obtained a KR20 of .86 in secondary students from Huallaga. It is also higher than what was obtained with the Coopersmith by Sauñi (2017), who, in San Juan de Lurigancho, found a KR-20 of .77. In the same way, it slightly surpasses the Self-Esteem Scale developed by Cerna-Dorregaray (2017), who obtains .86 in both Alpha and Omega. Likewise, it is higher than that originally obtained with the GSET by Grajeda (2010), where the split half was .81; and Ocmin &Segura (2023) who, with the GSET, found a KR20

equal to .77. In summary, comparisons with the reviewed antecedents of self-esteem tests for adolescents demonstrate that the reliability currently obtained is greater than all others and therefore the GSET appears more consistent.

Finally, prior to creating scales, possible differences according to sex have been studied. The results show the existence of significant differences in all dimensions and also in general self-esteem, however, the magnitudes of the effect have been small (Cohen, 1988). Although men present a relatively greater average range compared to women, they do not reach a considerable proportion in the sample, so it would not be feasible to disaggregate the interpretation of raw scores into standard scores. Due to this, a single scale is proposed, taking into consideration the Pc 25, 50 and 75 associated with the low, medium and high levels (Nunally, 1991). A different work has been that of Ocmin &Segura (2023) who, after carrying out the factorial invariance analysis, assume the existence of non-equity and propose two scales, one for each sex. It should be noted that in this work the size of the effect was not calculated, so it could not be determined exactly if the magnitude was important enough to prepare two scales, what is more, if we observe the scores for each level, they are almost similar and equal to that of the present work, so for example in the two works the high category ranges from a score of 19 to 24 in both cases.

CONCLUSION

GSET has adequate evidence of validity and reliability, with the indices obtained being higher in comparison to previous studies with the GSET and to the studies reviewed with other self-esteem tests applied in adolescents from Lima. The descriptive statistics of the items are adequate and allow us to conclude that all of them are accepted as part of the GSET. The adjustment, incremental and parsimony index allow us to conclude that the GSET presents an optimal factorial structure of 4 domains, therefore a high construct validity. The GSET has a very high level of reliability. The significant differences between men and women do not reach a considerable effect size to develop more than one scale. A scale with three levels has been developed, which allows the interpretation of the self-esteem scores obtained by those evaluated, with respect to their relative position in the reference population.

Acknowledgments

We are grateful for the transfer of the databases to colleagues Franklin Ocmin, Roger Segura, Katherine Hilario, Josselyn Villegas and Rosario Regalado.

Authors roles

AGM: Research manager,

GCC: Correction of style and format of the article,

JDR: Text writing,

AQP: Text writing,

SRR: Analysis of data,

YSG: Database organization,

JSP: Correction of style and format of the article,

SOS: Processing, data analysis and interpretation.

Funding

Self-financed

Conflict of interests

The authors declare that they do not present any conflict of interest when carrying out this research and article.

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