Article

Properties of a Scale of Self-Care Behaviors Facing COVID-19: An Exploratory Analysis in a Sample of University Students in Huanuco, Peru

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The general objective of this article was to construct and describe the psychometric properties of a scale of self-care behaviors against COVID-19. It was a descriptive, cross-sectional, psychometric validation study of a scale created to measure self-care behaviors in relation to COVID-19 in a total sample of 333 probabilistically selected. Qualitative validity was evaluated by a review of 10 experts and quantitative validity by means of exploratory factor analysis using the principal components method. Internal consistency was measured with Cronbach's alpha twice and the test-retest was evaluated by calculating the intraclass coefficient. The final scale consisted of 29 items. The Kaiser-Meyer-Olkin test of adequacy yielded a value of 0.926, and the Bartlett's test of sphericity $X^2 = 4611$ with a p-value < 0.001. The variance explained by the three retained factors with a total of 29 items was 50.03%. The Cronbach's alpha internal consistency evaluation yielded an initial value of 0.923 and, in a second evaluation, showed a value of 0.936. In addition, the intraclass coefficient in the test-retest yielded a value of 0.929. The instrument created and validated possessed the necessary conditions as a useful and reliable tool for measuring self-care behaviors in relation to COVID-19 in a population of university students and it is important that it can be applied in other regions of the world.

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COVID-19
Peru
self-care
physical health
social health
mental health
validation
instrument

1. Introduction

Due to the COVID-19 pandemic, governments implemented measures such as social distancing [1–3] or quarantines [4–7] to avoid contagion by COVID-19. However, the COVID-19 pandemic evidenced the weaknesses of the Peruvian healthcare system and public health policies [8–10]. Specifically, it can be recognized the lack of organizational support for workers in healthcare facilities [11] generating a growth of intention workers to leave their jobs due to mental distress [12–14]. Population, including young people as university students, is massively exposed to fake news [15] and conspiracy theories [16], which generated many doubts between citizens and increase mental distress [17] generating the search for preventive and curative measures with unproven drugs [9,18] and the self-use of medicinal plants [9,19], which affected the intention to get vaccinated against COVID-19 [20]. Another significant impact is in terms of jobs of people such as small firms [21,22], sports events [23], hospitality industry [24,25], education activities in universities [26–28], healthcare services [29], circular economy projects [30], developing of entrepreneurship [31], technology resources [32], which simultaneously generated price variation in products [33].
Many healthcare systems were weakened to cope with the disease, with little response capacity, which has led to changes in self-care behaviors in the face of COVID-19 [34]. These self-care behaviors comprise a set of daily practices by a person, family, or groups of people to take care of their health. As explained by Galdames-Cruz, et al. [35], self-care can vary according to the individual's experience with a health problem, both personally and with close figures. Lifestyle medicine surges as a multi-disciplinary approach to prevent and/or cure non-communicable diseases such as type 2 diabetes, cancer and cardiovascular disease [36]. Furthermore, it was recommended that the lifestyle medicine multidisciplinary team should focus on the satisfaction of self-care needs of the patient [36]. The World Health Organization (WHO) recommended the adoption of self-care behaviors in the face of COVID-19 by promoting self-care at the physical, mental and social levels [37]. The Peruvian Ministry of Health also established technical criteria and procedures for the care and self-care of the population's physical and mental health in the context of COVID-19 [38]. Peru implemented extraordinary measures aimed at mitigating the spread of COVID-19 infections; as a result, changes in the way the Peruvian population protect themselves was reported [39,40].
In this context, homes have become places of work, study, recreation, and leisure; it is there were university students went from being in person to virtuality, so they have seen the need to change their health self-care behaviors in the face of COVID-19, adapting to new lifestyles [41,42]. Today's university students shape the society of the future and make up a considerable part of the country's economic assets. On the other hand, during the transition to university life, subjects forge certain independence by choosing their eating behaviors in part based on their knowledge and appreciation of foods containing bioactive compounds [43–53], and adopting habits such as smoking, alcohol consumption, psychoactive substances, physical activity, and sex which, in turn, have implications for their physical and psychological health [54–59]. The measurement of self-care behaviors about COVID-19 is essential to implement educational strategies for health intervention at the community level. Therefore, it is essential to identify self-care behaviors in its three main dimensions: self-care of physical, social, and mental health [60], which includes balanced nutrition, hygiene measures, stress management, social relationship, and interpersonal problem-solving skills, physical activity, and exercise, ability to avoid self-medication, consumption of prescription drugs, safe behaviors, recreation and free time management, communication, positive adaptations to life changes and care of morbid processes, among others [37]. Thus, the objective of this study was to develop and validate an instrument to measure validly and reliably the healthy self-care behaviors against COVID-19 in a university context to generate research that helps improve preventive-promotional interventions in the context of COVID-19. Consequently, we constructed and described the psychometric properties of a scale of self-care behaviors against COVID-19 in a sample of university students of Huanuco, Peru.

2. Methodology

2.1. Design and Study Population

A descriptive, cross-sectional, psychometric study of validation of a scale to measure self-care behaviors against COVID-19 was conducted in a population of 2000 students of the University of Huanuco in Huanuco, Peru. The study was conducted during July and December 2020. The calculated sample was 333 students, with an expected proportion of 50%, reliability of 95%, and an error of 4.90%. Simple random probability sampling was used, considering a minimum of 5 participants according to the number of items in the instrument (65 items at the beginning of the study). The inclusion criteria were young university students currently enrolled in University of Huanuco. Those who did not wish to participate in the study were excluded.

2.2. Variables and Measurements

The primary variable of the study was oriented to self-care behaviors vis-à-vis COVID-19. We developed the questionnaire, grouping it into 3 dimensions: physical, mental, and social self-care behaviors.

2.3. The Preliminary and Exploratory Phase

At the quantitative level, first, a review of the literature focused on self-care behaviors against COVID-19 was carried out in search of a scale to measure self-care during the COVID-19 pandemic. A recent study performed in Slovakia has validated the correlation between the Patient Health Questionnaire (PHQ-9) for depression and Self-Care Activities Screening Scale (SASS-14) assessing health consciousness, nutrition, physical activity, sleep quality, and interpersonal and intrapersonal coping strategies [61]. The Self-Care Activities Screening Scale (SASS-14) was validated demonstrating good reliability, predictive and convergent validity in coping with COVID-19 lockdown and perceived stress [62]. Because of the social isolation and the increase in telemedicine, various mobile health applications have been used worldwide during the COVID-19 pandemic, which consisted in increasing patient's awareness, self-care, and self-monitor behaviors [63]. A study performed in Iran identified that 15 data elements for self-care are important to be used during mobile-based applications [63]. Some of these self-care data elements include medication reminders, monitor adherence, training about sign and symptoms of COVID-19, recording of daily fever [63]. A study in Chile implemented an eight-week multifaceted mindfulness-based self-care program on medical students' distress and well-being during the COVID-19 pandemic [64]. A reduction in burnout prevalence, stress, self-blaming and traumatic stress were observed, accompanied with a higher mindfulness, resilience, and active coping strategies [64]. It is important to note that no scale was found in Peru, and this corresponds the first study of this kind in Peru. The questions of the questionnaire were adapted initially from various regulations of the Ministry of Health of Peru, documents of the World Health Organization (WHO), among other official and academic publications. Thus, the instrument was designed with a multiple-choice Likert-type scale.

The first version of the questionnaire consisted of 65 items, with 5 options: "never", "rarely", "regularly", "almost always" and "always"; 10 experts and judges then reviewed the questionnaire before undergoing a face validity and quantitative validation analysis. The questionnaire was constructed based on the most relevant questions after reviewing questionnaires or scales in international databases (Pubmed, ScienceDirect, Scielo, and Google Scholar) and other normative documents. Content validity was carried out through the judgment of 10 experts in the form of individual aggregates; this allowed us to have information from each expert. The experts included national and foreign professionals with years of experience in psychometrics and in the clinical and community fields, attending patients with COVID-19 (physicians, nurses, and psychologists).

2.4. Data Collection

The information was collected on two occasions through a virtual survey, with a month between the measurements, to avoid response bias [65]. The first application was carried out in November (the last two weeks) and the second in December 2020 (in the last week). In the first measurement of the variable, 333 students participated. In the second measurement, 62.76% (209) of the total were surveyed to have information for the test-retest. Table 1 shows the original questionnaire to be validated.

Table 1. Initial questionnaire

Physical Health Self-Care
1. Do you wash your hands with soap and water?
2. Do you wash your hands for at least 20 s with soap and water?
3. Do you wash your hands when you get home?
4. Do you wash your hands before preparing food?
5. Do you wash your hands before eating or drinking?
6. Do you wash your hands after blowing your nose, coughing, or sneezing?
7. Do you wash your hands after using the toilet?
8. Do you wash your hands after contact with people, inside or outside your home?
9. Do you wash your hands after inadvertently removing or touching your mask or someone else's mask?
10. Do you wash your hands after contact with animals or pets?
11. In circumstances where you are unable to wash your hands, do you use an antiseptic such as alcohol gel or alcohol 70% solution?
12. Do you avoid touching your mask while wearing it?
13. Do you avoid touching your face when you are out of the house?
14. Do you avoid touching your nose when you are away from home?
15. Do you avoid touching your eyes when you are away from home?
16. Do you avoid touching your mouth when you are away from home?
17. Do you avoid greeting conventionally (hugging, kissing or shaking hands) when you are away from home?
18. Do you use a tissue when sneezing or coughing?
19. Do you use the angle of your elbow when sneezing or coughing?
20. Do you wear a mask or mask cover when going outdoors?
21. Do you wear protective glasses when going outdoors?
22. Do you wear a face shield when going outdoors?
23. Do you wear a jumpsuit when you go outdoors?
24. Do you eat foods rich in vitamin C (oranges, camu camu, strawberries, aguaymanto, etc.)?
25. Do you avoid self-medication in case of fever?
26. Do you take natural remedies to counteract the effects of COVID-19?
27. Do you do some kind of physical activity at home to keep your lungs healthy?
28. Do you avoid consuming alcoholic beverages?
29. Do you avoid smoking cigarettes?

30. Would you call the SAMU number (106) of INFOSALUD (113) or the emergency number of the nearest hospital if you think you have any symptoms of COVID-19?
Social Health Self-Care
31. Do you avoid going out unnecessarily to places where there is a large concentration of people?
32. Do you clean inside and outside your home?
33. When you return to your home, do you perform the disinfection protocol of your clothes?
34. Upon returning to your home, do you disinfect food or consumer products?
35. Do you avoid exposing your most vulnerable family members (elderly, obese, pregnant women and chronically ill) to the risk of contagion?
36. Do you avoid contact with your neighbors or friends?
37. Do you avoid visiting your relatives?
38. Do you keep at least one and a half meters away from any person when you are away from home?
39. Do you stay away, taking extreme measures in front of suspicious people or people with obvious signs of COVID-19?
40. If you were to have flu-like symptoms that make you suspect COVID-19, would you isolate yourself voluntarily or use personal protective measures (masks, gloves, etc.)?
41. Do you do your shopping in your neighborhood bodega with personal protective measures?
42. Do you do your shopping in itinerant markets with personal protection measures?
43. Do you do your shopping in model markets with personal protective measures?
44. Do you order delivery to avoid leaving home?
45. Do you avoid using public means of transportation for your commute?
46. Do you use private means of transportation for your commute?
Mental Health Self-Care
47. Do you inform yourself about the sanitary norms issued by the health authorities?
48. Do you respect the sanitary measures proposed by the government?
49. Do you keep yourself informed about COVID-19 by reliable sources (World Health Organization, Ministry of Health, Regional Health Directorates)?
50. Do you avoid excessive COVID-19 information that causes you unnecessary worry or stress?
51. Do you avoid generating fear about COVID-19 in people around you?
52. Do you promote positive and hopeful messages about the COVID-19 pandemic on social media?
53. Do you try to think positive despite the circumstances?
54. Do you practice breathing and relaxation exercises at home?
55. Do you seek professional help in a situation of anxiety and fear?
56. Do you seek spiritual help in an anxious and fearful situation?
57. Do you set aside time to do activities that you enjoy, indoors or outdoors?
58. Do you keep in touch with your family through phone or video calls?
59. Do you keep in touch with your friends through phone or video calls?
60. Do you control the time you spend in front of an electronic device screen?
61. Do you avoid excessive use of video games?
62. Do you show your gratitude to government authorities through social networks?
63. Do you show your gratitude to health professionals through social networks?
64. Do you show your gratitude to law enforcement (police and military) through social media?
65. Do you show solidarity with the people around you who are being affected by the COVID-19 pandemic?

2.5. Final Phase

The necessary adjustments were made for the final version of the scale to measure self-care behaviors about COVID-19. Next, psychometric evaluation and multivariate analysis were carried out to demonstrate the construct validity of the designed instrument to determine the final number of questions to be included.

2.6. Statistical Analysis

Construct validity through exploratory factor analysis technique (EFA) of principal components was performed. A correlation matrix was elaborated to observe whether most item-total correlations exceeded the value of 0.3 to verify the preconditions before proceeding with construct validity. In addition, the Kaiser-Meyer-Olkin (KMO) measure of adequacy was determined, and Barlett's test of sphericity was applied to verify the significant correlations between the items. The correlation matrix was also

evaluated, extracting the possible factors, the type of rotation applied was Varimax because the correlations calculated were below 0.20 in many of the items, and the total accumulated variance was evaluated, exceeding 50%.
For the evaluation of internal consistency, Cronbach's alpha (α) was used at two moments of scale application, which is because it is the most widely used coefficient for measurement scales in the field of healthcare [66] and a higher value of 0.8 was considered a good indicator of internal consistency [67]. In the case of test-retest reliability measurement, the intraclass coefficient was used to check if very similar scores were obtained two times after applying the instrument. All the data collected were transferred to an Excel spreadsheet and then to the SPSS-IBM v.25.0 statistical package.

2.7. Ethical Aspects

The present study underwent an evaluation and approval of the research ethics committee of the University of Huanuco. In addition, the recommendations of the Declaration of Helsinki and the principles that guide the ethical practice of online studies were followed. For greater transparency, the primary study protocol was registered in the PRISA repository of the Peruvian National Institute of Health (code: EI0000000875). All included study subjects provided informed consent before answering the online survey, describing the confidentiality and anonymity of the respondent's data, the objective and procedure of the study, as well as the option to participate in the study, to withdraw at any time, and to communicate with the research team to clarify any doubts.

3. Results

The sample adequacy measure "KMO" proposed by Kaiser, Meyer, and Olkin was evaluated to test whether the items effectively fit the factor analysis model, and the result obtained was 0.926, which indicated that there were grouped items to form factors. Bartlett's test of sphericity was applied to check whether there was a correlation between the items, and the results obtained indicated that the factor analysis was feasible (Table 2).
Table 2. KMO test and Bartlett's sphericity test

Scale	KMO	Bartlett's test for sphericity		
		X^2	GL	*p*-value
Self-care	0.926	4611.63	406.00	<0.001

Source: Inferential analysis of the self-care scale.

In the case of determining the factors to be retained, 3 factors were considered; these contained eigenvalues above unity with an explained variance of 18.8% for the first factor, 16.4% for the second factor, and 14.9% for the third factor, totaling 50.0% (Table 3).
Table 3. Variance explained by retained factors

Component	Initial eigenvalues			Sums of loads squared by rotation		
	Total	% variance	% accumulated	Total	% variance	% accumulated
1	9.926	34.228	34.228	5.449	18.789	18.789
2	2.968	10.236	44.464	4.747	16.369	35.158
3	1.615	5.568	50.032	4.314	14.874	50.032
4	0.985	3.398	53.430			
5	0.984	3.394	56.824			

Source: Inferential analysis of the self-care scale.

For the assignment of each item to each factor, correlation indexes higher than 0.3 were considered after varimax rotation (Table 4). The retained factors were grouped as physical health self-care with a total of 11 items (6, 9, 8, 3, 10, 5, 14, 2, 33, 11, 32); social health self-care which grouped 10 items (39, 40, 38, 35, 35, 42, 31, 41, 65, 19, 17) and mental health self-care which retained 8 items (64, 62, 63, 60, 60, 54, 52, 47, 59) (Table 5).
Table 4. Rotated component matrix

Items	Components		
	1	2	3
6. Do you wash your hands after blowing your nose, coughing, or sneezing?	0.765		
9. Do you wash your hands after inadvertently removing or touching your mask or another person's mask?	0.759		
8. Do you wash your hands after contact with people, inside or outside your home?	0.749		
3. Do you wash your hands when you get home?	0.701	0.328	
10. Do you wash your hands after contact with animals or pets?	0.664		
5. Do you wash your hands before eating or drinking?	0.630		
14. Do you avoid touching your nose when you are away from home?	0.606	0.382	
2. Do you wash your hands for at least 20 s with soap and water?	0.602		
33. When you return to your home, do you follow the protocol for disinfecting your clothing?	0.517	0.406	
11. In circumstances of not being able to wash your hands, do you use an antiseptic such as alcohol gel or alcohol solution of 70%?	0.475	0.415	
32. Do you clean inside and outside your home?	0.462	0.391	
39. Do you stay away from people who are suspicious or have evident signs of having COVID-19?		0.663	

Items	Components		
	1	2	3
40. If you were to have flu-like symptoms that make you suspect of having COVID-19, would you isolate yourself voluntarily or use personal protective measures (masks, gloves, etc.)?		0.661	
38. Do you keep at least one and a half meters away from any person when you are away from home?	0.313	0.621	
35. Do you avoid exposing your most vulnerable family members (elderly, obese, pregnant women and chronically ill) to the risk of infection?		0.609	
42. Do you make your purchases in itinerant markets with personal protection measures?		0.606	
31. Do you avoid going out unnecessarily to places with a large concentration of people?		0.602	
41. Do you do your shopping with personal protective measures?	0.366	0.594	
65. Do you show solidarity with the people around you who are being affected by the COVID-19 pandemic?		0.514	0.466
19. Do you use the angle of your elbow when you sneeze or cough?	0.320	0.496	
17. Do you avoid conventional greetings (hugging, kissing, or shaking hands)?	0.415	0.484	
64. Do you value front-line health care personnel and law enforcement (police and military)?			0.879
62. Do you value government authorities for the measures implemented against COVID-19?			0.871
63. Do you value the daily work of health professionals?			0.840
60. Do you control the time you spend in front of a screen of an electronic device?			0.622
54. Do you practice breathing and relaxation exercises at home?			0.610
52. Do you promote positive messages about the COVID-19 pandemic on social media?			0.607
47. Do you inform yourself about the health regulations issued by health authorities?		0.375	0.387
59. Do you keep in touch with friends through phone or video calls?			0.369

Table 5. Final version of the COVID-19 self-care scale

Factor	Factor name	Items
1	Physical self-care	6, 9, 8, 3, 10, 5, 14, 2, 33, 11, 32
2	Social self-care	39, 40, 38, 35, 42, 31, 41, 65, 19, 17
3	Mental self-care	64, 62, 63, 60, 54, 52, 47, 59

The rest of the items not considered in the three factors and were eliminated because they had no relationship with the fourth or fifth factor during the factor analysis evaluation.

Internal consistency was measured twice, obtaining 0.923 in the first and 0.936 in the second. We consider from these results that the items were reciprocally related (Table 6).

Table 6. Internal consistency over time

Initial Cronbach's alpha	Final Cronbach's alpha	Number of elements
0.923	0.936	29

Source: Internal consistency analysis of the self-care scale.

For the test-retest evaluation, the virtual survey was applied for the second time to 209 (62%) students. We found the intraclass correlation coefficient, obtaining a coefficient $\alpha = 0.929$ (Table 7).

Table 7. Test-retest reliability

Number of items	Intraclass correlation coefficient	F	*p*-value
29	0.929	169.987	< 0.001

Source: Test-retest reliability analysis of the self-care scale.

The final version of the instrument is shown in Table 8.

Table 8. The final version of the instrument

Physical Health Self-Care
1. Do you wash your hands for at least 20 s with soap and water?
2. Do you wash your hands when you get home?
3. Do you wash your hands before eating or drinking?
4. Do you wash your hands after blowing your nose, coughing, or sneezing?
5. Do you wash your hands after contact with people, inside or outside your home?
6. Do you wash your hands after inadvertently removing or touching your mask or another person's mask?
7. Do you wash your hands after contact with animals or pets?

8. In circumstances of not being able to wash your hands, do you use an antiseptic such as alcohol gel or alcohol solution of 70%?
9. Do you avoid touching your nose when you are away from home?
10. Do you avoid conventional greetings (hugging, kissing, or shaking hands)?
11. Do you use the angle of your elbow when you sneeze or cough?
Social Health Self-Care
12. Do you avoid going out unnecessarily to places with a large concentration of people?
13. Do you clean inside and outside your home?
14. When you return to your home, do you follow the protocol for disinfecting your clothing?
15. Do you avoid exposing your most vulnerable family members (elderly, obese, pregnant women and chronically ill) to the risk of infection?
16. Do you keep at least one and a half meters away from any person when you are away from home?
17. Do you stay away from people who are suspicious or have evident signs of having COVID-19?
18. If you were to have flu-like symptoms that make you suspect of having COVID-19, would you isolate yourself voluntarily or use personal protective measures (masks, gloves, etc.)?
19. Do you do your shopping with personal protective measures?
20. Do you make your purchases in itinerant markets with personal protection measures?
Mental Health Self-Care
21. Do you inform yourself about the health regulations issued by health authorities?
22. Do you promote positive messages about the COVID-19 pandemic on social media?
23. Do you practice breathing and relaxation exercises at home?
24. Do you keep in touch with friends through phone or video calls?
25. Do you control the time you spend in front of a screen of an electronic device?
26. Do you value government authorities for the measures implemented against COVID-19?
27. Do you value the daily work of health professionals?
28. Do you value front-line health care personnel and law enforcement (police and military)?
29. Do you show solidarity with the people around you who are being affected by the COVID-19 pandemic?

4. Discussion

The scale for measuring self-care behaviors against COVID-19 in our study was found to be valid and reliable. In the context of the COVID-19 pandemic, young populations are a high-risk group in Latin American countries since mortality associated with COVID-19 is higher in young and middle-aged people compared to Western European countries [68]. The knowledge of these findings would allow specific interventions or reforms necessary to prevent the spread of COVID-19. In Peru and other Spanish-speaking countries, adequate instruments are needed to measure self-care behaviors related to COVID-19 [69]. Therefore, our scale was found to have adequate internal consistency, presenting three differentiated components (physical, social and mental health self-care). In the determination of factors, 3 were retained, denominated as self-care of physical, social, and mental health, with a total of 29 items and explaining an accumulated variance of 50.03%, which is considered a minimum value according to previous reports [65].

A couple of self-care scales have been validated previously, the Self-Care Activities Screening Scale (SASS-14) was validated in Italy demonstrating good reliability, predictive and convergent validity in coping with COVID-19 lockdown and perceived stress [62]. The second scale was the Self-Care in COVID-19 (SCOVID) Scale, which was validated in Italy demonstrating adequate validity and reliability [70]. Within the same line, in Spain, Martínez, et al. [62] carried out a study with factorial analysis obtaining a KMO = 0.821, where they managed to retain 4 factors, which they named as health awareness, nutrition, physical activity, sleep, and intrapersonal and interpersonal coping skills. In that study, a total of 14 items in the scale-out of a total of 24, raised at the beginning of the analysis, explaining 43.3% of the variance [53]. Another study on the validation of a self-care scale in professionals in the United States, using a confirmatory analysis, resulted in a total of 2 dimensions with 18 items, out of 38 initial items that passed the evaluation [71].

A recent study performed in Slovakia reported that well-practiced self-care activities should be immediately implemented in an individual's life in order to reduce depressive symptoms [61]. It was reported that sleep quality played an important role, while health consciousness, gender and age also play a critical role that should not be overlooked [61]. This study showed that females and younger individuals need targeted interventions in the terms of depression during the COVID-19 pandemic in Slovakia [61]. A study in Iran evaluated the important indicators for self-care in mobile health applications during the COVID-19 pandemic [63]. It was identified that reminders to take medication and its adherence, the training in COVID-19 signs and symptoms, as well as recording daily fever were the most significant requirements to include in mobile health applications to monitor infectious diseases [63,72]. Medication reminders such as voicemails, app notifications and text messages have been considered critical as self-care behaviors for infectious diseases [73] such as tuberculosis [74] and HIV [75]. A study in Spain performed two analyses: an initial (exploratory) one, with the participation of 226 people, to discover the underlying factor structure and reduce the number of items in the original tool to an influential group of items related to self-care [53]. Subsequently, they conducted a confirmatory factor analysis on a new sample of 261 participants to test the factorial solutions' fit and goodness of fit [53]. Likewise, in Chile, a study "Validation of the Self-Care Agency Assessment (ASA) scale in Chilean adolescents" was developed in 2020, whose results evidenced the cultural adaptation of some terms of the scale [76]. The exploratory factor analysis suggested the retention of five factors and one factor per sedimentation graph; the structural equations of the possible models resulted in fit index values close to satisfactory [76]. Another study in Chile implemented an eight-week multifaceted mindfulness-based self-care program on medical students' distress and well-being during the COVID-19 pandemic [64]. A reduction in burnout prevalence, stress, self-blaming and traumatic stress were observed, accompanied with a higher mindfulness, resilience, and active coping strategies [64]. For this, validated scales were utilized observing a decreased emotional exhaustion after the program [64].

Although the present study was not carried out with confirmatory factor analysis, all this compared to our findings highlights the importance of further analyses of a confirmatory nature to have a better tool that allows us to address the issue of self-care in times of the COVID-19 pandemic. Finally, the evaluation of the test-retest has been widely used to determine instrument concordance [77,78]. Out results are similar to the values previously reported by Lee et al. (ICC = 0.97) when validating a self-care scale in a group of professionals from different areas [76].

In sum, our instrument contains the necessary conditions to become a valuable and reliable tool for measuring self-care behaviors against COVID-19 in a group of young university students. The study is not free of limitations; the virtual survey could generate response bias. Although it is not possible to make a complete inference to the entire university population of the country, the characteristics of the students should be considered. There were domains done according to the moment of the second wave

of the COVID-19 pandemic in Peru. However, the patterns chosen have been those of greater relevance and consistency to avoid making a long instrument, which causes other types of bias related to the time of making the respective filling. Likewise, the study was only conducted in Huanuco, which is located in the central region of Peru. Thus, it does not adequately represent the general population of Peru and could induce a selection bias, limiting the generalization of the findings to samples from other regions of Peru. Therefore, it is necessary to have a more representative and diverse sample (with different educational levels, employment status, income level, history or presence of chronic diseases, etc.) to compare and generalize the results. Despite the limitations, the above results indicate that the scale of self-care behaviors against COVID-19 is a helpful instrument to understand self-care behaviors better and may also be helpful in large-scale studies in health emergency and third wave situations.

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