Evaluation of the validity of the physical exercise peer support questionnaire for college students

Lin Luo1,2,3,*, Xiuxiong Yang1, Xiaojin Zeng1, Naiqing Song2,3,*, Ling Zhou1, Liping Zhang1, Yongbin Yang1 and Jie Yang4

1 College of Physical Education, Guizhou Normal University, Guiyang, China, 2 Basic Education Research Center, Southwest University, Chongqing, China, 3 East China Normal University-Xuhui Postdoctoral Workstation, Shanghai, China, 4 College of Exercise and Health, Shandong Institute of Physical Education, Rizhao, China

Peer support for physical exercise is defined as behaviors such as mutual or one-way provision of material help and/or emotional care and companionship between peers in the physical environment and/or physical behavior. The assessment of peer support is complex and based on reasoning. Trustworthy assessment processes need to provide sufficient evidence of validity. The purpose of this study was to organize, collect, and use Kane’s validity framework to provide validity evidence for the identification of peer support for physical exercise among college students. The article describes the experience of using the framework in this study, considers data related to the four inferences (scoring, generalization, extrapolation, and implication) that emerge from the assessment process. The findings of the study are then interpreted through the four inferences to determine whether this evidence supports the purpose of this study. Based on Kane’s framework to explain the validity process of this study, the study concludes that the evidence in terms of scoring, generalization, extrapolation, and implication supports the use of the PEPSQ for the identification of physical exercise peer support among college students.

KEYWORDS
college students, physical exercise, peer support, validity, PEPSQ

Introduction

The university stage is an important period of individual transition and development, and an important stage of health reserve in adulthood. College students are the future force of national construction, and the physical health of college students has far-reaching significance for national quality improvement and population structure optimization. With the continuous expansion of the enrollment scale of Chinese higher education institutions, the number of college students continues to increase, but the physical health level of Chinese college students shows a gradual downward trend (1, 2). The Report on the Development of Youth Sports in China (2015) points out that the performance of Chinese college students in various physical fitness tests is still at
a low level, and the test results of certain items are sometimes inferior to those of secondary school students (3). In 2020, the Chinese Ministry of Education conducted physical fitness review tests on 1.15 million school students. The results of the test showed that about 30% of college students failed the physical fitness test, the highest percentage among all academic levels (4). Scholars point out that effective health education guidance is needed to improve the physical health level of college students, and the physical health level of college students can be improved by encouraging them to actively participate in physical exercise (5). Although the physical and mental health effects of physical exercise have been widely recognized by the public, the lack of participation in physical exercise among college students is still a common phenomenon. 2015 physical exercise survey data of college students in 23 countries around the world showed that the proportion of insufficient physical exercise among college students was as high as 41.4%. Among them, the percentage of insufficient physical exercise among Chinese college students was 37.0% (6). Therefore, finding the key elements that potentially affect college students’ participation in physical exercise is an important part of developing health education interventions that effectively promote college students’ physical exercise participation and improve their physical health.

Peer support belongs to the category of social support. Mead et al. defined peer support as a system of giving and receiving help based on the key principles of respect, shared responsibility, and mutual help (7). Wentzel et al. defined peer support as the mutual or one-way provision of material help and/or emotional care and companionship, among other behaviors (8). A number of studies have found a positive relationship between peer support and individual physical exercise behaviors. For example, Fitzgerald et al. found that the perceived level of peer support played an important role in adolescent physical exercise behavior among adolescents aged 10–18 years (9). Chen et al. found that peer support enhanced self-efficacy and thus promoted physical exercise frequency among students in grades 9–12 (10). Reimers et al. found that peer support levels were associated with frequency of multiple physical exercise behaviors (outdoor play, sports, or walking transportation) among children aged 6–17 years (11). Sylvia-Bobiak et al. found gender differences in the relationship between peer support and physical exercise behaviors among college students. Peer support influenced physical exercise participation more significantly in male college students than in female college students (12). Therefore, understanding an individual’s perceived level of peer support may be helpful in promoting individual physical exercise behaviors.

Existing research has developed a number of measurement instruments to identify individuals’ perceived peer support. For example, Zimet et al. designed a measure of peer support in their development of the Multidimensional Scale of Perceived Social Support (MSPSS) (13). Mostafaei et al. designed a peer support scale containing five dimensions: informational support, emotional support, instrumental support, feedback, and companionship support (14). Some social support scales are also often used to measure peer support, such as the child and adolescent social support scale (CASS) (15), the College Student Social Support Scale (16), and the Social Support Rating Scale (17). However, given the complexity of an individual’s perceived peer support, conducting accurate and trustworthy assessments can be a challenge. This is because individuals differ in their behaviors such as providing material help and/or emotional care and companionship to each other or singularly in specific contexts or specific behaviors (9). For example, peer support in a health care context often includes emotional, informational, and assessment support. In this setting, emotional support includes expressions of caring, encouragement, careful listening, reflection, reassurance, and often avoids critical or persuasive advice (18). Informational support is the provision of knowledge related to problem solving, including the availability of relevant resources, independent assessment of the problem, alternative courses of action, and guidance on effectiveness (19). Evaluative support, also known as affirmative support, involves the exchange of information related to self-evaluation and includes affirmation of expressions of emotional, cognitive, and behavioral appropriateness (20). Peer support in the workplace, on the other hand, is more concerned with drawing on life experiences, engaging in mutually beneficial discussions, and so on (21). Therefore, it seems essential to conduct context-specific or behavior-specific peer support assessments. To the best of our knowledge of published articles, there are several assessment tools available to identify social support in physical exercise settings. For example, Zhong et al. developed the Exercise Social Support Scale (22), which contains four dimensions, namely emotional support, informational support, instrumental support, and peer support. Sallis et al. developed the Social Support for Exercise Scale, which contains two dimensions: the Family Support for Exercise Scale and the Friend Support for Exercise Scale (23). Farias et al. developed the Social Support for Adolescent Physical Exercise Scale (ASAFA), which consists of two dimensions: parental support and friend support (24). However, most of the existing assessment tools consider peer support as a dimension of social support and do not provide a more detailed assessment of the emotional, informational, and behavioral support provided by peers.

Given the current physical health status of Chinese college students, there is a need to develop an assessment tool that can effectively identify the perceived level of peer support among college students in a physical exercise setting. Therefore, this study aimed to design a preliminary peer support questionnaire for physical exercise among Chinese college students and to collect validity evidence for the questionnaire based on the Kane framework (25). The validity evidence included four inferential processes of scoring, generalization, inference, and influence,
thereby objectifying the subjectivity and qualitative nature of college students’ perceived levels of peer support in physical exercise settings.

This study follows the Kane framework to produce a workflow that illustrates how it can be used to conduct a validity validation study of the PEPSQ. In a later section of the article, this study describes the study's evaluation setting and evaluation strategy, defines the study's key variables, specifies the study's hypotheses and the evidence collected to test those hypotheses. The results of the evaluation process are also compared to the initial arguments. This study also reflects on and discusses the gaps in the discussion of this study's application of the framework. Using this study's evaluation process, this study demonstrates how to collect empirical data and report the judgment process for PEPSQ validity.

Research method

In collecting and evaluating the validity evidence for the PEPSQ, this study applied the Kane validity framework. In accordance with the characteristics of the Kane framework, decisions must be made prior to the study as to which inferences need to be considered and judgments must be made as to whether the evidence obtained is favorable or unfavorable in the absence of clear guidelines. This research team tested, documented, and reflected on the challenges and final decisions in applying the theory to practice. The following is a specific description of the methodology of this study.

Research overview

Figure 1 illustrates the interpretation of the validity process for this study using the Kane framework. This study focused on the level of perceived peer support among university students in a physical exercise environment. A questionnaire containing five measurement dimensions was initially designed for this study to determine the measurement structure of peer support. The questionnaire addressed interest support, material support, emotional support, behavioral support and information support from peers as perceived by university students in the physical exercise environment. The plan of this study was for the assessor to identify the level of peer support of college students in the physical exercise environment through the PEPSQ and to predict college students' physical exercise behavior based on the results of the PEPSQ scores. Based on this interpretation and use, this study illuminates much of the evidence of validity in the process of constructing the PEPSQ. Based on the Kane framework, this study organizes four validity arguments: scoring, generalization, extrapolation and implication.

In essence, this study traced the assessment of perceived peer support in physical exercise settings among college students. From scoring a single observed entry (scoring), to using observed scores to generate an overall test score representing performance in the testing environment (generalization), to making inferences about what the test score might imply about real-life performance (extrapolation), and then prejudging and making decisions about this information (implication). This study presents this process of validity argumentation using Table 1. Scoring examines the relationship between observed performance and the score or rating generated by that performance; generalization examines the link between a sample of observed performance and the broader domain of all possible performance in the assessment setting; extrapolation focuses on the link between assessment results and other measures of similar performance domains; and implication making examines the integrity of the process leading to the decision and the individual, project or societal Consequences (26).
Analysis plan

This study organized the data collection and analysis of the study by inference categories, scoring, generalization, extrapolation, and implications in the following steps.

In this study, peer support for physical exercise was defined as the behavior of peers providing material help and/or emotional care and companionship in the physical exercise environment and/or physical behavior, either mutually or unidirectionally. Firstly, the core elements of each dimension of the existing questionnaire were analyzed by the subject members based on the literature, for example, the interest support dimension includes interest in the direction of exercise members based on the literature, for example, the interest of the existing questionnaire were analyzed by the subject unidirectionally. Firstly, the core elements of each dimension have less crossover between dimensions were selected after discussion by the group, and experts in the field of physical and health education were invited to evaluate the content validity and make suggestions for modification. Finally, the initial questionnaire containing five dimensions and 42 questions was developed.

The first test had a total of three assessors. The second test had a total of six assessors. The assessors were current graduate students. All assessors received training on the item description 1 week prior to the assessment. The training included the conceptual framework of the assessment design, the role of the assessors, and a detailed description of the scoring instrument and how to apply it.

The assessor is primarily responsible for administering the questionnaire. The completion of the assessment questionnaire was done by the subjects themselves. Raters were asked to avoid sharing perceptions of any performance or sharing assigned scores in order to avoid calibration of the rater over time. All data were completed and data collected directly through the electronic questionnaire platform. Each question was scored from 1 (not at all) to 5 (fully). Data analysis calculates the observed score is related to the target score, the implications (interpretations) are appropriate.

The study hoped to identify the perceived level of peer support among college students in physical exercise settings.

### TABLE 1 Specific evidence to support validity arguments.

| Definition of Kane (26) | Rule is appropriate | Rule is applied as specified | Scoring is free of bias | Data fit the scaling model |
|------------------------|---------------------|----------------------------|------------------------|---------------------------|
| **Generalization**     | Sample is representative of universe of possible observations | Sample is large enough to control for random error | **Extrapolation** | Observed score is related to the target score |
| **Implication**        | Implications (interpretations) are appropriate | Properties of scores support the implications (interpretations) associated with the label |

### Analysis plan

This study organized the data collection and analysis of the study by inference categories, scoring, generalization, extrapolation, and implications in the following steps.

In this study, peer support for physical exercise was defined as the behavior of peers providing material help and/or emotional care and companionship in the physical exercise environment and/or physical behavior, either mutually or unidirectionally. Firstly, the core elements of each dimension of the existing questionnaire were analyzed by the subject members based on the literature, for example, the interest support dimension includes interest in the direction of exercise members based on the literature, for example, the interest of the existing questionnaire were analyzed by the subject unidirectionally. Firstly, the core elements of each dimension have less crossover between dimensions were selected after discussion by the group, and experts in the field of physical and health education were invited to evaluate the content validity and make suggestions for modification. Finally, the initial questionnaire containing five dimensions and 42 questions was developed.

The first test had a total of three assessors. The second test had a total of six assessors. The assessors were current graduate students. All assessors received training on the item description 1 week prior to the assessment. The training included the conceptual framework of the assessment design, the role of the assessors, and a detailed description of the scoring instrument and how to apply it.

The assessor is primarily responsible for administering the questionnaire. The completion of the assessment questionnaire was done by the subjects themselves. Raters were asked to avoid sharing perceptions of any performance or sharing assigned scores in order to avoid calibration of the rater over time. All data were completed and data collected directly through the electronic questionnaire platform. Each question was scored from 1 (not at all) to 5 (fully). Data analysis calculates the observed score is related to the target score, the implications (interpretations) are appropriate.

The study hoped to identify the perceived level of peer support among college students in physical exercise settings.
Therefore, this study sought additional measures to help validate the performance of the PEPSQ in the real world. The Exercise Social Support Scale (22) developed by Zhong et al. was used in a correlation analysis with this questionnaire to test the inferential effects of the results of this questionnaire test.

The purpose of this study is to construct an assessment tool that can effectively identify the level of perceived peer support among college students in physical exercise setting. Therefore, the peer support scores obtained through the PEPSQ should be able to predict the physical exercise behavior of college students in a real environment. At the same time, the measurement results of PEPSQ should have a certain degree of stability. In this study, 48 college students were randomly selected from the second test for retesting, which was used to test the stability of the PEPSQ assessment results.

**Research results**

Kane’s validity framework emphasizes a chain of inferences from score generation to decisions about the rater, a chain that can be conceptualized as the path that must be followed before sufficient evidence can be obtained. Therefore, the present study reports the results of this study guided by this stepwise conceptualization process.

**Evidence of scoring**

In this study, a questionnaire analysis was conducted using test data from 352 college students to determine the dimensions and items of the PEPSQ. The independence between the observations was first tested. The results of the autocorrelation test showed a Durbin-Watson value of 1.980, which is relatively close to 2, indicating that the observations are independent of each other. The results of the item multicollinearity test showed that VIF < 10 and 1/VIF > 0.1, indicating that there is no multicollinearity problem. After testing for entry independence, a validation factor analysis of the questionnaire was conducted using Amos 23.0 software. In the initial model (Table 6), although RMSEA = 0.080 and $X^2/df = 4.28$ for the model, the significance probability value of $p < 0.05$ reached a significant level, indicating that the fitness of the hypothetical model plot to the observed data needs to be improved and the model needs to be further revised. Therefore, referring to Wu’s suggestion (30), it is assumed that for the model to achieve a better fit, a better approach to model revision is to release certain assumptions. The initial model assumes that there is no correlation between the error variables and then, according to the AMOS correction indicator prompt, it is possible to find some degree of covariation in the error variables of some observed variables. If they are reset to have a covariate relationship with each other, the fitness of the model can be optimized. Thus, this study corrected the model according to the maximum correction value class, releasing multiple assumptions one at a time. The revised model obtained after multiple releases had $X^2/df = 3.41$ and RMSEA = 0.074, with a significance

| Test       | Gender | N   | Age (M ± SD) | Household registration type |
|------------|--------|-----|--------------|-----------------------------|
|            |        |     |              | Citie and town | Rural               |
| First test | Male   | 178 | 20.12 ± 1.40 | 16.9%           | 83.1%               |
|            | Female | 174 | 19.94 ± 1.12 | 20.1%           | 79.9%               |
|            | Total  | 352 | 20.03 ± 1.27 | 18.5%           | 81.5%               |
| Second test| Male   | 517 | 20.15 ± 1.34 | 16.8%           | 83.2%               |
|            | Female | 702 | 20.02 ± 1.34 | 20.9%           | 79.1%               |
|            | Total  | 1,219 | 20.09 ± 1.34 | 18.8%           | 81.2%               |
### TABLE 3  Pearson correlation coefficient table.

| Coding | Pearson correlation coefficient | Coding | Pearson correlation coefficient | Coding | Pearson correlation coefficient |
|--------|-------------------------------|--------|-------------------------------|--------|-------------------------------|
| Q1     | 0.584**                       | Q15    | 0.687**                       | Q29    | 0.780**                       |
| Q2     | 0.611**                       | Q16    | 0.688**                       | Q30    | 0.794**                       |
| Q3     | 0.699**                       | Q17    | 0.734**                       | Q31    | 0.801**                       |
| Q4     | 0.654**                       | Q18    | 0.741**                       | Q32    | 0.798**                       |
| Q5     | 0.642**                       | Q19    | 0.713**                       | Q33    | 0.718**                       |
| Q6     | 0.681**                       | Q20    | 0.722**                       | Q34    | 0.736**                       |
| Q7     | 0.671**                       | Q21    | 0.759**                       | Q35    | 0.764**                       |
| Q8     | 0.694**                       | Q22    | 0.755**                       | Q36    | 0.766**                       |
| Q9     | 0.621**                       | Q23    | 0.798**                       | Q37    | 0.740**                       |
| Q10    | 0.615**                       | Q24    | 0.774**                       | Q38    | 0.769**                       |
| Q11    | 0.760**                       | Q25    | 0.702**                       | Q39    | 0.780**                       |
| Q12    | 0.730**                       | Q26    | 0.669**                       | Q40    | 0.776**                       |
| Q13    | 0.657**                       | Q27    | 0.783**                       | Q41    | 0.786**                       |
| Q14    | 0.691**                       | Q28    | 0.750**                       | Q42    | 0.750**                       |

**P < 0.01.

### TABLE 4  Standardized factor loading tables.

| Coding | Factor loading | Common factor variance |
|--------|----------------|------------------------|
|        | Factor 1 | Factor 2 | Factor 3 | Factor 4 |                      |
| Q1     | 0.714    | 0.656    | 0.707    | 0.585    | 0.610                |
| Q2     | 0.799    | 0.743    | 0.579    | 0.619    | 0.608                |
| Q3     | 0.751    | 0.619    | 0.770    | 0.700    | 0.672                |
| Q4     | 0.731    | 0.579    | 0.700    | 0.609    | 0.610                |
| Q5     | 0.782    | 0.619    | 0.770    | 0.700    | 0.672                |
| Q6     | 0.707    | 0.656    | 0.707    | 0.700    | 0.672                |
| Q7     | 0.585    | 0.743    | 0.619    | 0.700    | 0.672                |
| Q8     | 0.656    | 0.619    | 0.700    | 0.609    | 0.610                |
| Q9     | 0.707    | 0.700    | 0.656    | 0.700    | 0.672                |
| Q10    | 0.743    | 0.579    | 0.619    | 0.700    | 0.672                |
| Q11    | 0.743    | 0.619    | 0.700    | 0.609    | 0.610                |
| Q12    | 0.619    | 0.700    | 0.609    | 0.700    | 0.672                |
| Q13    | 0.770    | 0.656    | 0.700    | 0.619    | 0.610                |
| Q14    | 0.700    | 0.700    | 0.609    | 0.700    | 0.672                |
| Q15    | 0.685    | 0.700    | 0.609    | 0.700    | 0.672                |
| Q16    | 0.685    | 0.700    | 0.609    | 0.700    | 0.672                |
| Q17    | 0.751    | 0.700    | 0.609    | 0.700    | 0.672                |
| Q18    | 0.751    | 0.700    | 0.609    | 0.700    | 0.672                |
| Q19    | 0.742    | 0.685    | 0.751    | 0.700    | 0.672                |
| Q20    | 0.742    | 0.685    | 0.751    | 0.700    | 0.672                |
| Q21    | 0.751    | 0.700    | 0.609    | 0.700    | 0.672                |
| Q22    | 0.751    | 0.700    | 0.609    | 0.700    | 0.672                |
| Q23    | 0.751    | 0.700    | 0.609    | 0.700    | 0.672                |
| Q24    | 0.751    | 0.700    | 0.609    | 0.700    | 0.672                |
| Q25    | 0.751    | 0.700    | 0.609    | 0.700    | 0.672                |
| Q26    | 0.751    | 0.700    | 0.609    | 0.700    | 0.672                |
| Q27    | 0.751    | 0.700    | 0.609    | 0.700    | 0.672                |
| Q28    | 0.751    | 0.700    | 0.609    | 0.700    | 0.672                |
| Q29    | 0.751    | 0.700    | 0.609    | 0.700    | 0.672                |
| Q30    | 0.751    | 0.700    | 0.609    | 0.700    | 0.672                |
| Q31    | 0.751    | 0.700    | 0.609    | 0.700    | 0.672                |
| Q32    | 0.751    | 0.700    | 0.609    | 0.700    | 0.672                |
| Q33    | 0.751    | 0.700    | 0.609    | 0.700    | 0.672                |
| Q34    | 0.751    | 0.700    | 0.609    | 0.700    | 0.672                |
| Q35    | 0.751    | 0.700    | 0.609    | 0.700    | 0.672                |
| Q36    | 0.751    | 0.700    | 0.609    | 0.700    | 0.672                |
| Q37    | 0.751    | 0.700    | 0.609    | 0.700    | 0.672                |
TABLE 5 Dimensions and items of PEPSQ.

| Dimension       | Item description                                                                                                                                 |
|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------|
| **Interest support** |                                                                                                                                                  |
| Q1              | I have friends who have the same exercise interests as me                                                                                         |
| Q2              | I have friends who share my exercise purpose                                                                                                     |
| Q3              | I have friends who like the same sports stars as me                                                                                              |
| Q4              | I have friends with whom I share the same sports views and ideas                                                                               |
| Q5              | I have friends with whom I get along well in sports                                                                                             |
| Q6              | I have friends who like the same sports brands as me                                                                                             |
| Q7              | I have friends with whom I talk about solving exercise problems                                                                                 |
| **Material support** |                                                                                                                                                  |
| Q9              | My friend provided me with books for physical exercise                                                                                           |
| Q10             | My friend provided me with some places to exercise                                                                                               |
| Q11             | My friend provided me with some water or drinks for physical exercise                                                                            |
| Q12             | My friend provided me with some supplementary food for physical exercise                                                                         |
| Q13             | My friend helped me buy some clothes for physical exercise (e.g., sports clothes, sports shoes, etc.)                                             |
| Q14             | My friend bought me some sports equipment (e.g., basketball, badminton racket/ball, etc.)                                                        |
| **Emotional support** |                                                                                                                                                  |
| Q18             | When I want to quit sticking to my exercise program, my friends encourage me to keep going                                                      |
| Q20             | My friend will comfort me when I have difficulties in physical exercise                                                                        |
| Q21             | My friend will work with me to solve problems I encounter in physical exercise                                                                   |
| Q22             | My friend understands how I feel in physical exercise                                                                                             |
| Q24             | My friend encourages me when I am unable to accomplish my exercise goals                                                                            |
| Q25             | My friends encourage me when I feel inferior because of my poor athletic skills                                                                 |
| Q26             | My friends take care of me when I get injured in sports                                                                                           |
| **Behavioral support** |                                                                                                                                                  |
| Q30             | When I don’t want to play sports, my friend invites me to play sports                                                                           |
| Q31             | Even if my friends don’t play sports, they will be there for me when I play sports                                                                |
| Q33             | Even if my friends have other things to do, they often make time to exercise with me                                                            |
| Q37             | My friends will watch some sports programs with me                                                                                               |

TABLE 6 The results of the questionnaire’s structural validity test.

| Model          | $X^2/df$ | TLI  | CFI  | RMSEA |
|----------------|----------|------|------|-------|
| Initial model  | 4.28     | 0.891| 0.901| 0.080 |
| Revised model  | 3.41     | 0.905| 0.917| 0.074 |

Reliability analysis of the questionnaire

In this study, the reliability of PEPSQ was tested by homogeneity test (Cronbach’s alpha coefficient) and split-half coefficient (Spearman-Brown correlation coefficient). The specific test results are shown in Table 7. The results of the homogeneity test and the split-half coefficient test indicate that the reliability of the PEPSQ is good. Meanwhile, the results of the correlation analysis between the total score of each dimension of PEPSQ and the total score of the questionnaire showed that the correlation coefficients of interest support, material support, emotional support, and behavioral support and the total score of the questionnaire were 0.773, 0.868, 0.884, and 0.914, respectively, indicating that PEPSQ has good reliability (32).

Evidence of generalization

The overall Cronbach’s $\alpha$ coefficient of the PEPSQ was 0.902, indicating that the PEPSQ has good internal consistency. Table 8 shows the results of the analysis of entry reliability, and the Cronbach’s $\alpha$ coefficient and corrected total correlation (CITC value) after removing an entry are provided in the table, respectively.

This study was conducted in both test samples and the sampling strategy was tested for adequacy in establishing a reliable hypothesis for identifying the level of perceived peer support among college students in physical exercise setting. Using data from a sample of 1,219 college students, the study ranked the PEPSQ scores from highest to lowest. The respondents in the top and bottom 25% of the total PEPSQ scores were named as high and low subgroups, and independent sample t-tests were conducted for each entry. The results of the analysis are presented in Table 9. The results indicate that the t-statistic (i.e., the decision value) for each entry was $>10$ and that the scores were significant between the high and low subgroups ($p$-value < 0.01). The findings suggest that the sampling strategy of this study is sufficient to establish a reliable identification
Evidence of extrapolation

The Exercise Social Support Scale was used as the validity standard of PEPSQ. The correlation test results showed that the correlation coefficients of the PEPSQ dimension scores and total scores with the exercise social support scale dimension scores and total scores reached a significant level of $P < 0.01$. This indicates that the PEPSQ has good validity of the validity scale correlation validity to identify the perceived peer support of college students in the physical exercise environment. The results of the analysis are shown in Table 10.

This study further examined the retest reliability of the PEPSQ at 2-week intervals. The results showed that the data of both tests reached a significance level of $p < 0.01$ for all dimensions, and the retest reliability was above 0.7 for all dimensions, indicating that the PEPSQ measures have some stability.

Evidence of implications

The results of this study suggest that researchers or educators can use the PESCQ to differentiate between groups of college students who participate in physical exercise or who do not, and target interventions to different groups, which has implications for practical application. The results of the analysis are shown in Table 11.

Discussion

With reference to Kane's validity framework, this study presents the research process and results of this study by
inference category. As noted above, this drove the data collection and analysis plan for this study. This study operationalised the corresponding validity evidence that the study needed to demonstrate in response to Kane's conceptual definition of scoring, generalization, extrapolation, and implications. This evidence can help to develop support for the validity of the PEPSQ, as well as inferences based on the scores generated. Kane's validity framework emphasizes a chain of inferences from score generation to inference about the test taker's decision, a chain that can be operationalised as a path that must be followed before sufficient evidence can be obtained. Therefore, the operationalisation of this step is used as a guide to report the results of this study.

To form validity arguments, Kane suggested evaluating the evidence and deciding whether to accept or reject it, and/or modify the process and/or the proposed use. In the scoring evidence, evidence of PEPSQ dimensional independence, and evidence of entry differentiation were validated. In the Generalization evidence, both sampling data showed that the sampling strategy of this study was sufficient to establish a reliable identification of college students’ perceived level of peer support in physical exercise settings. In the Extrapolation evidence, the results of the correlation analysis using the Exercise Social Support Scale with this questionnaire showed that the assessment process of this study would predict future real-world performance in real-world physical exercise settings. Also the small-sample retest reliability in meeting the hypothesis (medium to high level) indicates that the PEPSQ measures have some stability. In Implications evidence, given our homogeneity and highly selected participants, the study tested the assessment results to predict physical exercise behavior in real exercise settings. The results of the study showed that the regular exercise group had significantly higher scores and total scores in interest and support, material support, emotional support and behavioral support than the university students in the no regular exercise group. It is suggested that the assessment results of this study can predict the real behaviors in physical exercise settings.

Although the four inferred results of this study are relatively positive to illustrate the validity of the PEPSQ. However, this series of processes is primarily intended to illustrate that this

| Coding | CITC | The alpha coefficient of the deleted term | Cronbach alpha coefficient |
|--------|------|------------------------------------------|---------------------------|
| Q1     | 0.625| 0.901                                    | 0.902                     |
| Q2     | 0.492| 0.901                                    |                           |
| Q3     | 0.520| 0.901                                    |                           |
| Q4     | 0.539| 0.901                                    |                           |
| Q5     | 0.495| 0.901                                    |                           |
| Q6     | 0.626| 0.901                                    |                           |
| Q7     | 0.617| 0.901                                    |                           |
| Q9     | 0.640| 0.900                                    |                           |
| Q10    | 0.571| 0.901                                    |                           |
| Q11    | 0.766| 0.894                                    |                           |
| Q12    | 0.674| 0.900                                    |                           |
| Q13    | 0.703| 0.900                                    |                           |
| Q14    | 0.692| 0.900                                    |                           |
| Q18    | 0.830| 0.892                                    |                           |
| Q20    | 0.724| 0.900                                    |                           |
| Q21    | 0.665| 0.901                                    |                           |
| Q22    | 0.697| 0.901                                    |                           |
| Q24    | 0.678| 0.901                                    |                           |
| Q25    | 0.660| 0.901                                    |                           |
| Q26    | 0.711| 0.900                                    |                           |
| Q30    | 0.727| 0.900                                    |                           |
| Q31    | 0.751| 0.900                                    |                           |
| Q33    | 0.784| 0.900                                    |                           |
| Q37    | 0.680| 0.901                                    |                           |

TABLE 8 Results of the reliability analysis of the items.

TABLE 9 Results of the discrimination analysis of items.

| Coding | Mean ± SD | T-value | P-value |
|--------|-----------|---------|---------|
| Coding | Mean ± SD | T-value | P-value |
| High grouping | Low grouping | (N = 318) | (N = 304) |
| Q1     | 3.98 ± 0.86 | 2.56 ± 0.93 | 10.593 | <0.01 |
| Q2     | 4.09 ± 0.71 | 2.76 ± 0.91 | 10.196 | <0.01 |
| Q3     | 4.14 ± 0.64 | 2.47 ± 0.90 | 14.383 | <0.01 |
| Q4     | 4.07 ± 0.77 | 2.60 ± 0.95 | 11.310 | <0.01 |
| Q5     | 4.18 ± 0.66 | 2.86 ± 0.94 | 10.884 | <0.01 |
| Q6     | 4.23 ± 0.66 | 2.72 ± 0.96 | 12.251 | <0.01 |
| Q7     | 4.09 ± 0.71 | 2.58 ± 1.01 | 11.529 | <0.01 |
| Q9     | 3.89 ± 0.79 | 2.48 ± 0.96 | 10.769 | <0.01 |
| Q10    | 3.86 ± 0.91 | 2.23 ± 0.88 | 12.223 | <0.01 |
| Q11    | 4.20 ± 0.68 | 2.22 ± 0.90 | 16.536 | <0.01 |
| Q12    | 4.00 ± 0.73 | 2.26 ± 0.86 | 14.579 | <0.01 |
| Q13    | 3.73 ± 0.89 | 2.06 ± 0.85 | 12.875 | <0.01 |
| Q14    | 4.02 ± 0.68 | 2.27 ± 0.91 | 14.603 | <0.01 |
| Q18    | 4.10 ± 0.61 | 2.40 ± 0.99 | 13.795 | <0.01 |
| Q20    | 4.12 ± 0.66 | 2.57 ± 0.91 | 13.069 | <0.01 |
| Q21    | 4.16 ± 0.58 | 2.52 ± 0.90 | 14.506 | <0.01 |
| Q22    | 4.26 ± 0.55 | 2.66 ± 0.90 | 14.369 | <0.01 |
| Q24    | 4.27 ± 0.59 | 2.60 ± 0.86 | 15.024 | <0.01 |
| Q25    | 4.21 ± 0.64 | 2.75 ± 0.87 | 12.719 | <0.01 |
| Q26    | 4.27 ± 0.56 | 2.83 ± 1.03 | 11.605 | <0.01 |
| Q30    | 4.16 ± 0.73 | 2.32 ± 0.89 | 15.152 | <0.01 |
| Q31    | 4.04 ± 0.77 | 2.15 ± 0.95 | 14.644 | <0.01 |
| Q33    | 3.92 ± 0.82 | 2.18 ± 0.92 | 13.453 | <0.01 |
| Q37    | 4.14 ± 0.72 | 2.30 ± 0.94 | 14.778 | <0.01 |
TABLE 10  Correlation analysis results.

| Instrumental support | Material support | Emotional support | Behavioral support | PEPSQ |
|-----------------------|------------------|-------------------|--------------------|-------|
| 0.453**               | 0.630**          | 0.514**           | 0.678**            | 0.659** |
| Informational support | 0.479**          | 0.547**           | 0.490**            | 0.543** |
| Affective support     | 0.468**          | 0.457**           | 0.648**            | 0.464** |
| Peer support          | 0.419**          | 0.622**           | 0.554**            | 0.627** |
| ESSS                  | 0.517**          | 0.651**           | 0.624**            | 0.669** |

**P < 0.01.

TABLE 11  Comparison of PEPSQ scores of different groups.

|                          | Regular exercise group (n = 155) | No regular exercise group (n = 1,064) | T-value |
|--------------------------|----------------------------------|--------------------------------------|---------|
|                          | Mean ± SD                        | Mean ± SD                            |         |
| Interest support         | 24.38 ± 5.18                     | 21.31 ± 5.05                         | 4.727** |
| Material support         | 19.22 ± 4.68                     | 16.61 ± 4.49                         | 4.448** |
| Emotional support        | 24.56 ± 5.18                     | 21.90 ± 5.39                         | 4.044** |
| Behavioral support       | 12.89 ± 3.41                     | 11.22 ± 3.44                         | 3.807** |
| PEPSQ total score        | 81.05 ± 15.81                    | 71.04 ± 15.42                        | 5.035** |

**P < 0.01.

The study’s argument for PEPSQ validity is not a conclusion, but rather represents a series of positive steps in research aimed at building and refining the evidence for PEPSQ validity. Applying Kane’s validity framework, this study’s argument for the validity of the PEPSQ is demonstrated through an operationalised argument for four processes: scoring, generalization, extrapolation, and implications. Reflecting on the entire process of this study, the Kane framework helped structure the study’s organizational and analytical framework. The validity of the PEPSQ is a chain of evidence strung together. However, in this study, challenges were encountered in deciding how to prioritize the collection and reporting of evidence across the four inferential dimensions. Because there is a paucity of research literature related to physical exercise peer support, this made it difficult for the research team to determine from the available studies which weak and problematic links must be prioritized in the design of this study. Therefore, the research design for the weak and problematic links in this study may not be adequate and may leave important evidence gaps in the validity argument.

At the same time, there are some limitations in this study. First, the stability of the study results may be affected by the sample data in this study due to the sampling method, and further validation through a large national sample data is needed in the future. Second, these data were obtained from the subjects’ self-assessment reports, and the data results may be affected by the subjects’ text reading comprehension ability, and their understanding of the questionnaire items may vary. Finally, the evidence for the four inferential processes in this study was based only on subjects who completed the questionnaire in its entirety, which resulted in a lower error rate for the questionnaire, but this may have partially influenced the results of the test.

Conclusion

The PEPSQ, developed in this study, has four dimensions and twenty-four items. This study used the Kane validity framework to identify and examine the validity process of the PEPSQ. Evidence based on the four inferential processes of scoring, induction, extrapolation, and influence of the Kane framework supports that the PEPSQ can be used to measure the level of perceived peer support in physical exercise settings among Chinese college students.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The studies involving human participants were reviewed and approved by the Ethics Review and Approval of the Academic Committee of the Physical Education College of Guizhou Normal University (No. 20210310). The patients/participants provided their written informed consent to participate in this study.

Author contributions

XY, LL, and NS conceived the study and performed data analysis and interpretation. LL and XY prepared the manuscript. LZh, LZha, YY, and JY participated in data collection. XZ was involved in the revision of the paper. All authors have read and approved the final manuscript.
Funding

This study was funded by the Doctoral Fund of Guizhou Normal University [No. GZNUD (2018)-8], the Youth Growth Project Fund of Guizhou Provincial Department of Education [Qianjiaohe KY (2021) 291], and the Guizhou Provincial Education Planning Fund Project (2021A058).

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

References

1. Guo RF, Xu JF, Li L, Lu YL, Feng LS. A comparative study of Chinese and foreign adolescent physical health assessment systems. Chin J Sport Sci Technol. (2019) 53:3–13. doi: 10.16740/cast.2019091

2. Research Group on Physical Fitness and Health of Chinese Students. Survey Report on Physical Fitness and Health of Chinese Students. (2014). Beijing: Higher Education Press (2018).

3. Guo JI, Yang H. China Youth Sports Development Report. Beijing: Social Sciences Literature Publishing House (2015).

4. Xu Y, Chen JI, Xu Y, Liao WH. Research on the current situation and countermeasures of the management of physical health monitoring and evaluation of college students in Guangdong Province. Higher Educ. Exp. (2020) 8:106–10. Available online at: https://www.cnki.com.cn/Article/CJFDTotal-GJYX2008018.htm

5. Gang I. Exploration on the practice of physical health management of contemporary college students. Chin School Health J. (2021) 42:1121. Available online at: https://www.cnki.com.cn/Article/CJFDTotal-XJWS202107042.htm

6. Prochaska JJ, Rodgers MW, Sallis JF. Association of parent and peer support with adolescent physical activity. Res Quart Exerc Sport. (2002) 73:206–10. doi: 10.1080/02701367.2002.10609010

7. Mead S, Hilton D, Curtis L. Peer support: a theoretical perspective. Psychiatr Rehabil J. (2001) 25:134–41. doi: 10.1037/h0095032

8. Wentzel KR, Batelle A, Russell SL, Looney LB. Social supports from teachers and peers as predictors of academic and social motivation. Cont. Educ Pract. Psychol. (2010) 35:193–202. doi: 10.1016/j.cedpsych.2010.03.002

9. Fitzgerald A, Fitzgerald N, Abber C. Do peers matter? A review of peer and/or friends’ influence on physical activity among American adolescents. J. Adoles. (2012) 35:941–58. doi: 10.1016/j.adolesc.2012.01.002

10. Chen H, Sun H, Dai J. Peer support and adolescents’ physical activity: The mediating roles of self-efficacy and enjoyment. J. Pediatric Psychol. (2017) 42:569–77. doi: 10.1093/jpepsy/jsw103

11. Reimers AK, Schmidt SCE, Demetriou Y, Marzi I, Woll A. Parental and peer support and modelling in relation to domain-specific physical activity participation in boys and girls from Germany. PLoS ONE. (2019) 14:e0223928. doi: 10.1371/journal.pone.0223928

12. Sylvia-Bobaiak S, Caldwell LL. Factors related to physically active leisure among college students. Leisure Sci. (2006) 28:73–89. doi: 10.1080/01940400500332728

13. Zimet GD, Dahlem NW, Zimet SG, Farley GK. The multidimensional scale of perceived social support. J. Person Asses. (1988) 52:30–41. doi: 10.22099/jta.2021.38853.2906

14. Mostafaei Alar I, Houseinethad H. The development and validation of peer support questionnaire (PSQ). J Teach Lang Skills. (2020) 39:67–109. doi: 10.22099/jta.2021.38853.2906

15. Kerres Malecki C, Kilpatrick-Demary M. Measuring perceived social support: development of the child and adolescent social support scale (CASSS). Psychol. School. (2002) 39:1–18. doi: 10.1002/pts.10094

16. Barrera M, Sandler IN, Ramsay TB. Preliminary development of a scale of social support: studies on college students. Am J Commun Psychol. (1981) 9:433–47. doi: 10.1007/BF00918174

17. Chen NY. Research on the Relationship Between Internet Addiction, Peer Support and Overall Self-Worth of College Students. Hangzhou: Zhejiang University (2007).

18. Helgeon V, Gottlieb BH. Support Groups. Social Support Measurement and Intervention: A Guide for Health and Social Scientists. Oxford: Oxford University Press (2000).

19. Wilks TA, Shinar O. Measuring Perceived and Received Social Support: Social Support Measurement and Intervention: A Guide for Health and Social Scientists. Oxford University Press (2000). p. 86–135. doi: 10.1093/med:psych/9780191512670.003.0004

20. Visvesvaran C, Sanchez JI, Fisher J. The role of social support in the process of work stress: a meta-analysis. J Voc Behav. (1999) 54:314–34. doi: 10.1006/jvbe.1998.1661

21. Rebeiro Gruhl KL, LaCarre S, Galiste S. Authentic peer support: work challenges and opportunities for an evolving occupation. J Mental Health. (2016) 25:78–86. doi: 10.1080/09638237.2015.1057322

22. Zhong T, Hu L, Liu XG. Establishment and reliability and validity of exercise social support scale. Sports Sci Res. (2019) 40:42–7. Available online at: http://www. cpphp.cqu.cn/qk/82694x/201906/7100387899.html

23. Sallis JF, Grossman RM, Pinski RB, Patterson TL, Nader PR. The development of scales to measure social support for diet and exercise behaviors. Prev.Med. (1987) 16:825–36. doi: 10.1016/0091-7435(87)90222-3

24. Parris Júnior JC, Mendonça G, Florindo AA, Barros MVGD. Reliability and validity of a physical activity social support assessment scale in adolescents-ASAFA Scale. Rev Brasil Epidemiol. (2014) 17:535–70. doi: 10.1590/1809-450320140020006ENG

25. Cook DA, Brydges R, Ginsburg S, Hatala R. A contemporary approach to validity arguments: a practical guide to Kane’s framework. Med Educ. (2015) 49:560–75. doi: 10.1111/medu.12678

26. Kane MT. Validating the interpretations and uses of test scores. J Educ Meas. (2013) 50:1–7. doi: 10.1111/jedm.12000

27. Anderssen N, Wald B. Parental and peer influences on leisure-time physical activity in young adolescents. Res Quart Exerc Sport. (1992) 63:341–8. doi: 10.1080/02701367.1992.10686754

28. Hohepa M, Scragg R, Schofield G, Koh GS, Schaaf D. Social support for youth physical activity: importance of siblings, parents, friends and school support across a segmented school day. Int J Behav Nutr Phys Act. (2007) 4:1–9. doi: 10.1186/1479-5868-4-54

Publisher's note

All claims expressed in this article are solely those of the authors and do not necessarily represent those of their affiliated organizations, or those of the publisher, the editors and the reviewers. Any product that may be evaluated in this article, or claim that may be made by its manufacturer, is not guaranteed or endorsed by the publisher.

Supplementary material

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpubh.2022.871306/full#supplementary-material
29. Mao FZ, Han YF, Fang Y. Research progress of statistical screening methods for scale entries. Mod Prev Med. (2015) 42:1–3. Available online at: https://core.ac.uk/download/pdf/41435069.pdf.

30. Wu ML. Structural Equation Modeling - Operations and Applications of AMOS. 2nd ed. Chongqing: Chongqing University Press (2010).

31. Hu LT, Bentler PM. Cutoff criteria for fit indexes in covariance structure analysis: conventional criteria versus new alternatives. Struct Equ Modeling. (1999) 6:1–55. doi: 10.1080/10705519909540118

32. Nunnally JC, Bernstein IH. Factor analysis I: The general model and variance condensation. In: Psychometric Theory. 3rd ed. New York, NY: McGraw Hill (1994). p. 447–90.