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\*Corresponding author: Kahar Abula,  
Department of Sport and Health  
Sciences, Technische Universität  
München, Georg-Brauchle-Ring 60/62,  
München 80992, Germany  
E-mail: [kahar.abula@tum.de](mailto:kahar.abula@tum.de)

Reviewing editor:  
Nikos Zourbanos, University of Thessaly,  
Greece

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## APPLIED PSYCHOLOGY | RESEARCH ARTICLE

# Validation of the Chinese version of the physical activity stages of change questionnaire

Kahar Abula<sup>1\*</sup>, Jürgen Beckmann<sup>1</sup>, Kai Chen<sup>2</sup> and Peter Gröpel<sup>1</sup>

**Abstract:** *Background/Objective:* Sharp decline in physical activity has been observed among Chinese youth in recent decades. The transtheoretical model of behavior change (TTM) provides a useful framework for developing effective intervention programs. Yet the application of the TTM in China has been limited due to the lack of a valid TTM-based questionnaire to examine different stages of physical activity behavior. Therefore, the purpose of the present study was to translate the Physical Activity Stages of Change Questionnaire (PASCQ), which is a well-validated scale based on the TTM, into Chinese and to test the psychometric properties of this Chinese version. *Methods:* The PASCQ was translated from English into Chinese and its internal consistency, one-week test-retest reliability and concurrent validity were tested in a sample of Chinese university students. *Results:* Both the internal consistency and the test-retest reliability satisfied psychometric standards. The Chinese version of the PASCQ also successfully discriminated between individuals with different levels of physical activity, which indicated a good concurrent validity. In particular, participants in the action and maintenance stages reported significantly higher energy expenditure than participants in the precontemplation, contemplation, and preparation stages. *Conclusions:* The results indicate good reliability and concurrent validity of the Chinese version of the PASCQ. The questionnaire may be profitably used to identify individuals at different stages of physical activity behavior, which may help in physical activity promotion programs among Chinese college students.

### ABOUT THE AUTHORS

Kahar Abula is a PhD student at the Chair of Sport Psychology, Technische Universität München, Germany. His research interests include psychosocial and sociocultural aspects of physical activity promotion among Chinese college students. He is involved in developing theory-based interventions sensitive to specific cultural and societal settings in China. The present validation study was a part of his PhD project which addresses the promotion of physically active lifestyle among college students.

Jürgen Beckmann, PhD, is a full professor and head of the Chair of Sport Psychology at the Technische Universität München, Germany.

Kai Chen is an associate professor at the Department of Physical Education, Southwest JiaoTong University, Cheng Du, China.

Peter Gröpel, PhD, is a postdoctoral researcher at the Chair of Sport Psychology, Technische Universität München.

### PUBLIC INTEREST STATEMENT

In the present study, the Physical Activity Stages of Change Questionnaire (PASCQ) was translated and validated in a sample of Chinese college students. Physical activity has usually been considered as an all-or-none phenomenon, which means that scholars arbitrarily categorized individuals into either an active or inactive group. Yet, according to the Transtheoretical Model, adoption of physical activity behavior is an ongoing process of change and individuals go through multiple stages to become physically active. In the current context of dramatically declining physical activity and prevailing obesity among Chinese youth, the validation of the Chinese version of the PASCQ in the present study may contribute to more research on how to promote a physically active lifestyle. This questionnaire is also necessary for the application of the Transtheoretical Model to develop effective stage-matched intervention programs in China.



Kahar Abula

**Subjects: Exercise Psychology; Health Psychology; Sport Psychology**

**Keywords: physical activity; transtheoretical model; stages of change**

### 1. Introduction

Regular physical activity is not an all-or-none phenomenon but an ongoing process of change (Marcus & Forsyth, 2003; Marcus, Rossi, Selby, Niaura, & Abrams, 1992). That means, individuals who are currently inactive may still have the intentions to start exercising again in the future and, at the same time, individuals who are currently physically active may step back into inactivity after some time. However, most intervention programs for physical activity promotion failed to consider the complex, dynamic nature of physical activity behavior and simply categorize individuals into either an active or inactive group (Spencer, Adams, Malone, Roy, & Yost, 2006). Such an arbitrary way of all-or-none dichotomy may impair the effectiveness of the intervention program due to ignoring motivational shifts in the process of adoption and maintenance of physical activity behavior.

The transtheoretical model of behavior change (TTM; Prochaska & DiClemente, 1983) was developed to help explain how people change their behavior. In the TTM, behavior change is considered as a dynamic rather than “all-or-none” phenomenon, which means that people go through change as a process over time. In particular, individuals first work through cognitive and affective processes leading to adoption of a new behavior, and then they move to using behavioral strategies to establish a new pattern of behavior. Although the TTM was initially developed to treat addictive behaviors, it has also been widely used as a theoretical framework to change people’s physical activity behavior (Sonstroem, 1988). Marcus et al. (1992) were the first who applied the TTM in the field of physical activity behavior. Marcus et al. argued that, like other health behaviors, physical activity behavior is also an ongoing process and people need to move through different stages to finally alter their physical activity behavior.

Based on the TTM, Marcus et al. (1992) describe five distinct stages involved in the process of exercise behavior change: precontemplation, contemplation, preparation, action, and maintenance. Precontemplators are those who are not physically active and have no intention to become active. Contemplators are also physically inactive but are thinking about becoming active, though no actual action has yet been undertaken. Preparers are physically active, but their physical activity is not at the recommended level (i.e. 150 min of moderate to vigorous physical activity per week; World Health Organization (WHO), 2010). Individuals in the action stage are currently physically active at the recommended level but have been active for fewer than six months. Finally, individuals in the maintenance stage are currently physically active at the recommended levels and have been active for six or more months.

Marcus et al. (1992) have also identified a number of cognitive and behavioral strategies used throughout the stages of change (see also Marcus & Lewis, 2003). Cognitive strategies include increasing knowledge, being aware of risks, caring about consequences to others, comprehending benefits, and increasing healthy opportunities. Behavioral strategies include substituting alternatives, enlisting social support, rewarding yourself, committing yourself, and reminding yourself. Notably, these strategies are not equally relevant when processing through the stages of change; cognitive strategies typically peak in the preparation stage, whereas behavioral strategies typically peak at the action stage. From an applied perspective, individuals at different stages therefore require different intervention strategies to adapt and maintain physical activity behavior (Marcus & Forsyth, 2003; Marcus & Simkin, 1993). Indeed, a number of studies supported that delivering stage-targeted interventions was more effective in increasing participants’ physical activity than delivering general, non-targeted interventions (Marshall & Biddle, 2001).

To test the stages of physical activity behavior change, Marcus and Simkin (1993) developed the Physical Activity Stages of Change Questionnaire (PASCQ). The PASCQ consists of four items that categorize individuals into the five different stages of physical activity behavior change:

precontemplation, contemplation, preparation, action, and maintenance (for details, see the Method section). For construct validity of the scale, Marcus and Simkin compared various types of exercise-staging algorithms and found that the five-stage model best defined the study population. The staging algorithm also discriminated those in the action and maintenance stages from those in the preaction stages (i.e. precontemplation, contemplation, preparation) in the level of self-reported exercise, indicating good concurrent validity (Sarkin, Johnson, Prochaska, & Prochaska, 2001).

Although there is enough evidence for acceptable validity of the PASCQ (see Spencer et al., 2006; for a review) and the scale was previously translated into other languages and used in different countries, for example, France (Romain et al., 2012) and Brazil (Dumith, Gigante, & Domingues, 2007), yet most of the previous validation and intervention studies are limited to Western countries. Thus, it is not clear whether the PASCQ also applies to different, non-Western cultures. The Chinese represent a distinct cultural, social, and ethnic population compared to those in Western countries, and physical activity may thus be perceived differently. There are some kinds of physical activity such as Tai Chi, Wu Shu, stair climbing, and Qi Gong which are very prevalent and common in China but not in Western countries. Moreover, no national physical activity guidelines have been published in China so far, neither are there sufficient mass media health promotion campaigns which would make people more aware of physical activity benefits. Whether or not the PASCQ can be reliably used in China is thus unknown.

Therefore, the purpose of the present study was to translate the PASCQ into Chinese, and to examine reliability and concurrent validity of the Chinese version of the PASCQ in a sample of Chinese college students. The existence of a valid instrument to measure physical activity behavior change may help to effectively apply physical activity programs among the Chinese student population. The PASCQ (Marcus & Simkin, 1993) was translated from English into Chinese by the first author and the translation was verified by three independent experts in exercise psychology. To obtain test-retest reliability, the Chinese version of the PASCQ was administered twice: at the beginning of the study and one week later. The one-week interval was chosen because, unlike traits, physical activity behavior is a dynamic process which may change within weeks. A longer time-period might thus be inappropriate for testing test-retest reliability. To test concurrent validity, we compared the PASCQ with the participants' current level of physical activity (see Marcus & Simkin, 1993; for a similar procedure). It was expected that individuals in action and maintenance engage in physical activity more than individuals in precontemplation, contemplation, and preparation. No differences were expected between individuals in action and maintenance as they should only differ in how long they regularly exercise, with those in action exercising regularly for fewer than six months and those in maintenance for more than six months (Marcus et al., 1992). Similarly, individuals in both the precontemplation and the contemplation stages are currently physically inactive and they should therefore not differ in the level of physical activity.

## 2. Method

### 2.1. Participants

Two hundred and ninety-eight college students (133 women and 165 men) voluntarily participated in the study. Their age ranged from 17 to 26 years ( $M = 20.9$  years,  $SD = 2.04$ ). The study was approved by the ethic board of the Peking University. All participants provided informed consent before taking part in this study.

### 2.2. Procedure

The PASCQ was translated from English into Chinese by the first author and the translation was verified by three independent experts, one of them working in the USA and two of them working in China, who were all fluent in both English and Chinese. Based on the experts' feedback, Wu Shu, Qi Gong, stair climbing, and Tai Chi were added to the examples of physical activity that are defined in the questionnaire instructions. A pilot test with 15 Chinese students supported the feasibility of this version of the PASCQ. The Chinese version of the PASCQ was administered twice: at the beginning of the study and one week later.

### 2.3. Instruments

Two self-reported scales were included. First, the PASCQ (Marcus & Simkin, 1993) was translated into Chinese and used to test the different stages of exercise behavior (the Chinese version of the PASCQ is presented in the Appendix 1). The PASCQ consists of four items with a binary type (yes/no) response format: “I am currently physically active,” “I intend to become more physically active in the next 6 months,” “I currently engage in regular physical activity,” and “I have been regularly physically active for the past 6 months.” Participants were classified into the five different stages by the following scoring algorithm (Marcus & Simkin, 1993): “I am currently not physically active (1/no), and I am not thinking of doing so for the next 6 months (2/no)” (precontemplation); “I am currently not physically active (1/no), but I am thinking of doing so in the next 6 months (2/yes)” (contemplation); “I am currently physically active (1/yes), but I do not exercise regularly (3/no)” (preparation); “I exercise regularly (1 & 3/yes), but I have been doing so for less than the past 6 months (4/no)” (action); and “I currently exercise regularly, and I have done so for longer than 6 months (1, 3, & 4/yes)”.

As a second step, the short version of the International Physical Activity Questionnaire (IPAQ) (Craig et al., 2003) was employed to assess participants’ level of physical activity. We used the well-validated Chinese version of the IPAQ (Qu & Li, 2004). In this questionnaire, participants recall the frequency and the duration of walking, moderate, and vigorous physical activity (in minutes) in the last seven days across all life domains (e.g. work, leisure-time, transport). The IPAQ consists of seven items. An example item is “During the last 7 days, on how many days did you do such vigorous physical activities as heavy lifting, digging, aerobics, or fast bicycling?” Scoring was conducted according to the IPAQ protocol (see <http://www.ipaq.ki.se>) and the total energy expenditure (metabolic equivalent of task; MET) was calculated as followed: MET minutes per week = 8.0\*vigorous-intensity minutes\*vigorous-intensity days + 4.0\*moderate-intensity minutes\*moderate days + 3.3\*walking minutes\*walking days.

### 3. Results

The Chinese version of the PASCQ showed sufficient internal consistency; the Cronbach’s alpha was 0.71 in both administrations. The one-week test–retest reliability was also sufficiently high; the intra-class correlation coefficient was 0.91 (95% CI, 0.89–0.93). Men and women were equally distributed across the PASCQ stages,  $\chi^2(4) = 4.23, p = 0.38$ .

A one-way analysis of variance revealed significant group differences in the total energy expenditure (MET) across the PASCQ stages,  $F(4, 293) = 34.47, p < 0.001, \eta_p^2 = 0.32$ . Means and standard deviations are presented in Table 1. Post hoc comparisons (Tukey HSD) showed that, as expected, individuals in both action and maintenance had higher total energy expenditure than individuals in all other stages (all  $p$ s < 0.001, Cohen’s  $d$ s > 1.08). Individuals in preparation were slightly more active than those in precontemplation and contemplation, but these differences were not significant ( $p$ s > 0.13, Cohen’s  $d$ s < 0.52). Individuals in action and maintenance did not differ from each other ( $p = 0.73$ , Cohen’s  $d = 0.19$ ). Similarly, the MET was the same in precontemplation and contemplation ( $p = 0.93$ , Cohen’s  $d = 0.22$ ).

**Table 1. Means (and standard deviations) of the total energy expenditure (MET) across the stages of physical activity behavior**

	<i>n</i>	%	Total energy expenditure
Precontemplation	33	11.1	1,113.83 (785.01)
Contemplation	103	34.6	962.18 (605.10)
Preparation	73	24.5	1,305.79 (726.28)
Action	27	9.1	2,673.19 (1,616.68)
Maintenance	62	20.8	2,402.86 (1,297.89)

#### 4. Discussion

The results of this supported the reliability and the concurrent validity of the Chinese version of the PASCQ. Both the Cronbach's alpha and the one-week test-retest reliability were in accordance with psychometric standards. Moreover, the questionnaire successfully discriminated between individuals with different physical activity levels. Individuals in action and maintenance reported significantly higher energy expenditure in the last 7 days than individuals in precontemplation, contemplation, and preparation. These results are in line with similar validation studies in Western countries (Hausenblas, Dannecker, Connaughton, & Lovins, 1999; Hausenblas, Dannecker, & Downs, 2003).

Potential benefits of the validated Chinese version of the PASCQ include both diagnostics and intervention. According to Prochaska and DiClemente (1983), people in different stages generally use different strategies for behavior change. For example, individuals in the preaction stages (i.e. precontemplation, contemplation, and preparation) typically use more cognitive and fewer behavioral strategies than individuals in the more active stages (i.e. action and maintenance). In particular, those in precontemplation and contemplation benefit especially from increasing knowledge of physical activity effects, providing tips for everyday life, and setting specific physical activity goals, whereas those in preparation especially value self-monitoring devices such as pedometers and exercise apps. Further, people in action and maintenance need strategies to prevent relapse and continue being physically active, which may include keeping the physical activity interesting by varying the route, inviting friends, or rewarding oneself (Reed, Velicer, Prochaska, Rossi, & Marcus, 1997). The identification of individuals that are classified in different stages, such as by using the PASCQ, thus helps to deliver stage-matched intervention programs, thereby contributing to successful behavior change.

Better diagnostic of physical activity behavior change is also necessary when considering the rapid decline in physical activity behavior among Chinese in recent decades (Ng & Popkin, 2012). The average level of physical activity per week has fallen by 32% from 1991 to 2006, and merely 13.2% of Chinese men and 8.4% of Chinese women reported of engaging in leisure-time exercise in 2006 (Ng, Norton, & Popkin, 2009). Notably, the PASCQ contributes to better understanding of who is at which stage of physical activity behavior change and, consequently, what intervention strategies should be applied (Suminski & Petosa, 2002). This may in turn help delivering effective intervention programs to reverse the trend of declining physical activity in China.

To sum up, the present work extends the existing literature by translating the PASCQ into Chinese and providing support for the validity of this version. However, the present results are limited to Chinese college students. Whether or not the results of the present study can be generalized to other age and education groups is unknown. Researchers are welcomed to replicate the present study with different age and education samples, and in different regions in China.

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#### Competing Interest

The authors declare no competing interest.

#### Author details

Kahar Abula<sup>1</sup>  
E-mail: [kahar.abula@tum.de](mailto:kahar.abula@tum.de)  
Jürgen Beckmann<sup>1</sup>  
E-mail: [juergen.beckmann@tum.de](mailto:juergen.beckmann@tum.de)  
Kai Chen<sup>2</sup>

E-mail: [kai.chen@tum.de](mailto:kai.chen@tum.de)

Peter Gröpel<sup>1</sup>

E-mail: [peter.groepel@tum.de](mailto:peter.groepel@tum.de)

<sup>1</sup> Department of Sport and Health Sciences, Technische Universität München, Georg-Brauchle-Ring 60/62, München 80992, Germany.

<sup>2</sup> Department of Physical Education, South West Jiao Tong University, Cheng Du, China.

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## Appendix 1

The Chinese version of the physical activity stages of change questionnaire.

### 体力活动阶段变化量表

请仔细阅读以下题目，并在是或者否上打钩。

体力活动包括快速行走，跑步，骑自行车，游泳，或者任何需要付出同样强度的努力的活动。

1. 我目前参加体力活动。 是 否
2. 我打算在接下来的 6 个月参加更多的体力活动。 是 否

有规律的体力活动是指，每周至少 5 天，每天至少 30 分钟的中高等强度的体力活动。比如，你可以在一天内一次性地走路 30 分钟或者把它分三次，每次走 10 分钟以达到总共 30 分钟的目标。

3. 目前我参加有规律的体力活动。 是 否
4. 在过去 6 个月中我一直在参加有规律的体力活动。 是 否

计分方法：

前预期阶段：第一题 = 否，第二题 = 否

预期阶段：第一题 = 否，第二题 = 是

准备阶段：第一题 = 是，第三题 = 否

行动阶段：第一题 = 是，第三题 = 是，第四题 = 否

维持阶段：第一题 = 是，第三题 = 是，第四题 = 是



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