Measuring Physical Activity Self-efficacy, Self-regulation, Social Support among Hong Kong Working Adults: A Validation Study

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Abstract

This study examined the validity and reliability of translated scales to measure physical activity (PA) related self-efficacy, self-regulations and social support in Hong Kong Chinese working adults. 230 subjects, aged 19-63 years) were recruited by convenient sampling. To assess validity of the scales, both factorial validity and criterion validity were evaluated. The factorial validity was conducted by Confirmatory Factor Analyses (CFA) while criterion validity was assessed by correlating measured constructs with self-reported physical activity. Cronbach's alaph was computed to evaluate internal consistency and intraclass correlation coefficient was evaluated to check scales test-retest reliability. The CFA results supported the one-factor structure of the scales. All physical activity correlates were significant ($p < 0.01$) associated with self-reported physical activity. All the scales demonstrated acceptable internal consistency and test-retest reliability. The result provides psychometric support for using the Chinese version of scales to measure PA correlates among Hong Kong working adults.

Keywords: validity, physical activity, self-efficacy, self-regulation, social support

Introduction

Regular physical activity is proven to help prevent and treat noncommunicable diseases like heart disease, stroke, diabetes and breast and colon cancer (W.H.O., 2020). However, there are more than a quarter (28%) of the adult aged 18-64 had not done any moderate or vigorous physical activity for at least 10 minutes at a time in Hong Kong (Department of Health, 2017). Therefore, effective strategies are necessary to promote physical activity among adults in Hong Kong. Meanwhile, there is a need in recognizing and understanding the factors associated with physical activity are needed to modify the behaviour (Sallis & Owen, 1999). Social cognitive theory (SCT) is the proven useful behavioural theory in the development of physical activity behaviour-change intervention (Ince, 2008; Young et al., 2014).

In SCT, Banduras identifies three factors that influence people's behaviours, namely personal, behavioural and environmental factors. Personal factors consist of perceived self-efficacy, knowledge, and outcome expectations related to the behaviour adoption. It includes "beliefs of personal efficacy play a central role in personal change. This focal belief is the foundation of human motivation and action" (Bandura, 2004, p.3). Behavioural factors include proximal and distal goals thatinfluence change in healthy behaviour practices. Short-term attainable goals are the most effective in enacting behaviour changes. This construct reflects the plans or goals and individual develops to carry out the behaviour at a future point (Bandura, 2004). Environmental factors include barriers and support which influence behaviour adoption. Social support is concerned with how and to what extent others help to facilitate and influence an individual's engagement in specific behaviours. Support from others can help to facilitate change.

Each of these constructs plays a vital role in the facilitation of behaviour change. The literature review for this study discovered that the most commonly used SCT constructs in physical activity research include self-efficacy, self-regulation, social support, and outcome expectations.

Self-efficacy "refers to beliefs in one's capabilities to organize and execute the courses of action required to manage prospective situations" (Bandura, 1995, p.2). It is perhaps the most frequently assessed and

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the construct that demonstrates the most robust association with performance of physical activity (Anderson et al., 2010; Winnett et al., 2011). It has been consistently shown to be a predictor for the adoption and maintenance of physical activity behaviour in healthy adults (Rovniak et al., 2002; Sharma et al., 2005). Kaewthummanukul & Brown (2006) also found that self-efficacy is the best predictor of physical activity among employees. A recent systematic review and meta-analysis identified three behaviour change techniques (BCTs); "action planning", "reinforcing effort or progress towardsbehaviours" and "provide instruction" were associated with increase in self-efficacy for physical activity and physical activity behaviour (Williams & French, 2011). These findings are possible for further improve the intervention efficacy for researchers. The construct of self-efficacy is integrated and measured in this study.

Self-regulation is defined as "personal regulation of goal-directed behaviour or performance" (Bandura, 1986, p.98). It is achieved while the human capacity to endure short-term negative outcomes in anticipation of important long-term positive outcome. According to the construct, individuals must be able to take control of their actions and self-monitor their own behaviour so as to change their behaviour effectively. There are six ways in achieving self-regulation, i.e. self-monitoring, goal-setting, feedback, self-reward, self-instruction and enlistment of social support (Bandura, 1997). Studies assessing self-regulation showed positive results for the construct being associated with the performance of physical activity (Anderson et al., 2010; Anderson et al., 2011; Rovniak et al, 2002). Some studies have even found self-regulation to be as strong of a predictor as self-efficacy (Anderson et al., 2011) or a better predictor than self-efficacy for influencing performance physical activity in web-based setting (Anderson et al., 2006). In a meta-regression for effective techniques in healthy eating and physical activity intervention, self-monitoring explained the greatest amount of among-study heterogeneity (Michie et al., 2009). This important construct, which is also the elementary function of electronic activity monitor (Patel et al., 2015), is included in this study.

Social support is defined as "verbal and nonverbal communication between recipients and providers that reduces uncertainty about the situation, the self, the other, or the relationship, and functions to enhance perception of personal control in one's life experience" (Albrecht & Adelman, 1987, p.19). Social support for physical activity includes both tangible behaviours, such as providing rewards for the performance of physical activity, and intangible behaviours, such as encouragement (Beets, Cardinal, & Alderman, 2010). Oh, Lauckner, Boehmer, Fewins-Bliss, and Li (2013) have identified positive associations between emotional social support and physical activity in the internet-based intervention with the elements of social networking sites. At the meanwhile, research of Anderson, Winett and Wojcik (2011) found that perceived social support and use of self-regulatory behaviours were strong predictors of physical activity and nutrition behaviour among the web-health users enrolling in an online intervention. Therefore, the construct of social support is measured in this study.

Outcome expectations, is defined as "beliefs about the likelihood of various outcomes that might result from the behaviours that a person might choose to perform, and the perceived value of those outcomes." (Glanz,Rimer & Viswanath, 2008, p.172). This construct appears to have a modest but meaningful association with performance of physical activity. In the review of Williams, Anderson, and Winett (2005), outcome expectations for physical activity have a small, albeit statistically significant relationship with performance of physical activity among young adult populations. However, in the review of the outcome expectancy construct and its application to research on physical activity, the preliminary empirical investigation of the role of outcome expectancy in understanding physical activity has yield mixed results (Williams et al., 2005). Meanwhile, some studies have shown non-significant relationship between outcome expectations and performance of physical activity (Grim et al., 2011; Rovniak et al., 2002; Winnett et al., 2011). In the 12-week intervention for increasing postnatal woman physical activity level, the result showed that the outcome expectation do not mediate the relationship between intervention and control group (Fjeldsoe et al., 2013). Similar findings was shown that outcome expectations was not significantly associated with the changes in physical activity (Joseph et al., 2013). Taking all these as consideration, outcome expectation is not measured in this study.

In this study, three constructs of particular relevance to behaviour change were measured. They are 1) self-efficacy, one's situation-specific confidence to perform a behaviour; 2) self-regulations, personal regulation of goal-directed behaviour or performance; and 3) social support, help or care received in personal relations and interpersonal exchanges. The scale used to access SCT determinants in PA is frequently used in studies with

adults of English-speaking countries. There were not many validation studies for these three constructs tailored for Hong Kong working adults. For the exercise self-efficacy questionnaire, the Chinese version was validated for the children (Liang et al., 2014) and older audlts (Cheng et al., 2007) in Hong Kong. For social support constructs, the Chinese version has been validated for children in Hong Kong (Liang et al., 2014). There was no study for physical self-regulation questionnaire validated for Hong Kong working adults. Therefore, this study filled the gap and examined the validity and reliability of Chinese version of instruments to assess physical activity self-efficacy, physical activity self-regulations, and social support for physical activity among Hong Kong working adult.

Method

A sample of 230 Hong Kong working adults (93 female and 137 male with mean age 36.5) from 19-63 years old were recruited from convenience sampling by filling the online form. All participants were free from restrictions, such as physical or psychological limitations, to take part in physical activity. Participants completed the written informed consent form prior the study. The study was approved by the Committee on the Use of Human and Animal Subjects in Teaching and Research, Hong Kong Baptist University.

Testing Instruments

Exercise Self-efficacy

A 5-item self-reported instrument used to measure exercise self-efficacy (Marcus et al., 1992). It is designed to measure how confident an individual is that he/ she will perform an exercise in the presence of barriers and adverse conditions, such as when they are tired or when weather is inclement. The items are written to represent three areas presumed by the authors to be important in exercise promotion: negative affect, resisting relapse, and making time for exercise. Subjects response to each item on a five-point Likert type scale (1= "not at all confident" to 5 = 'very confident"). The test-retest reliability for the self-efficacy scale over a two week period was .90 while the internal consistency for the five-item measure was .80-.85 (Marcus et al., 1992).

Physical activity self-regulations

A 12-item self-reported instrument (Umstattd et al., 2009) was used to measure physical activity self-regulations in the aspect of 6 factors, i.e. self-monitoring, goal setting, eliciting social support, reinforcements, time management and relapse prevention. Subjects rate each item on a five-point Likert type scale regarding to the frequency (1= "never" to 5 = "very often"). It was a modified version of a 43-item PA self-regulations scale developed by Petosa (1993). The Cronbach's alpha coefficients of the total score and all 6 factors ranged from 0.79 to 0.95 in previous study (Watanabe et al., 2017).

Social Support for Exercise Scale

The Social Support for Exercise Scale (SSES) (Sallis et al., 1987) which consisted of 10 items used to measure social support, from both family and friends for physical activity. In this study, the word "physical activity" was added along with "exercise". The questionnaires were used in different populations, such us college students with high internal consistency estimates ranging from 0.84 to 0.95 (Joseph et al., 2013). Chinese version of SSES was also validated among the children population with reasonable internal consistency estimates ranging from 0.86-0.90 (Liang et al., 2014).

Physical Activity Level

To test scale criterion validity, a previously validated questionnaire, International Physical Activity Questionnaire (IPAQ) – short form, Chinese version (Macfarlane et al., 2007) was completed by participants. Participants stated their total time spent in PA, both frequency and duration of walking, vigorous and moderate activities which lasted for at least 10 minutes, also the time spent in sitting and lying awake subjectively in the last seven days.

These data were then converted to metabolic equivalent scores (MET-min-wk.) for each type of activity by using different weights in MET scores, such as 1 MET for sitting, 3.3 METs for walking, 4 METs for moderate activity, and 8 METs for vigorous activity (Craig et al., 2003).

Procedures

An expert committee was established for the translation process. The committee was composed of two authors, two researchers in exercise science, and a translator. First, the authors examined if there were any culture-specific items in English. Two bilingual Chinese researchers performed forward translation, i.e. from English to Chinese. After that, the independent translator conducted a back translation, i.e. from Chinese to English. A final satisfactory version was reached by discussion among committee members. With a separate sample (n=15) of Hong Kong working adults whose age from 18-65, cognitive interviews were conducted.

They were questioned if they fully understood each item in the translated scales, and if there wereany substitutes expressed more understandable.

Participants were invited for the survey by convenient sampling from November 2017 to January 2018. Participants completed the informed consent. Participants were eligible for inclusion if they were aged 18 years or above, willing to monitor their activity for a seven day period, with a full-time job at the moment of survey and could perform physical activity. Participants were excluded if they were in injured or being affected by illness for mobility. Participants' demographic data (age, height, mass and gender) were reported at the beginning of the test. The questionnaires were administered on two occasions seven days apart to assess test-retest reliability. It took approximately 15-20 minutes to accomplish all three scales.

Data Analysis

Both content validity and criterion validity were assessed. Factorial validity was used as an empirical of extension of content validity. Confirmatory factor analyses with maximum likelihood model were used for scale factorial validity test. The software used was Amos 25.0 (IBM Inc. Armonk, NY). According to the ratio of the sample size to the number of freely estimated parameters greater than 10:1 (Bentler & Chou, 1987), it was adequate to conduct CFA. As the three scales were supposed to be unidimensional, the one-factor model was assessed for each scale using data from the first administration. To assess model fit, the chi square statistics over the degree of freedom ($\chi^2/df < 5$) (Wheaton et al., 1977), the Comparative Fit Index (CFI. >0.9) (Browne & Cudeck, 1993), and the standardized root mean square residual (SRMR, <0.08)(Schreiber et al., 2006) were used in this study. Criterion validity was examined by Pearson correlations between these three constructs and PA behaviour.

For accessing the internal consistency, Cronbach's alpha was computed for each scale, with 0.7 considered as acceptable (Nunnally, 1994). Ratings of each scale were averaged, and scale test-retest reliability was assessed by an intraclass correlation coefficient (ICC) with acceptable level >0.7(Baumgartner et al., 2007).

Results

There were 230 (137 males and 93 females) volunteers, mean (SD) age 36.59 (9.49) years participated. Demographic data of the partcipants were presented in Table 1.

Table 1 Descriptive Characteristics of the participants (N=230)

	Male	Female	All
Age	36.0 ±8.63	37.5 ±10.62	36.59 ± 9.49
BMI	22.3 ± 6.75	23.3 ±3.68	23.13 ± 5.70

Table 2 displays initial model fit criteria with no correlations across the items in each scales for a one-factor model. Each scales' CFI was greater than 0.90. Besides, SRMR also suggested acceptable model fit. However, the scales did not show acceptable RMSEA.

Table 2 CFA results for each scale

Scales	χ^2	df	p	CFI	RMSEA	SRMR
Self-efficacy	21.63	5	<0.001	.94	.126	0.05
Social Support	92.17	31	<0.001	.97	.093	0.04
Self-regulations	183.19	51	<0.001	.93	.107	0.05

In the exercise self-efficacy scale, error covariances were detected between item 1 and item 4. The model was thereby modified by setting these two items free to vary from their previously fixed values of zero. The final model had acceptable module fit indices ($\chi^2 = 7.46$, $df =4$, $\chi^2/df =1.86$, RMSEA =0.06, SRMR =0.03).

In the social support for exercise scale, error covariances were detected between item 1 and item 2, item 3 and item 4, item 9 and item 10. The final model with parameters set free to vary had acceptable model fit indices ($\chi^2= 68.19$, $df =29$, $\chi^2/df =2.35$, RMSEA =0.07, SRMR =0.03).

In the physical activity self-regulation scale, error covariances were detected between item 3 and item 4, item 5 and item 6, item 7 and item 8, item 9 and item 10, item 11 and item 12. As the items are similar but not redundant, the final model was modified by setting the mentioned parameters free to vary. The final model with parameters had acceptable model fit indices (χ^2 = 141.2, df =49, χ^2/df =2.09, RMSEA =0.07, SRMR =0.05).

After modification, the confirmatory factor analysis of the scales were tabulated in Table 3.

Table 3 Confirmatory Factor Analysis for the Three Scales

	Self-efficacy		Social Support		Self-regulations	
Index	Initial Analysis	Final Analysis	Initial Analysis	Final Analysis	Initial Analysis	Final Analysis
χ^2	21.63	7.46	92.17	68.19	183.19	141.2
df	5	4	31	29	51	49
χ^2/df	4.32	1.86	2.97	2.35	3.60	2.88
p	<0.001	0.001	<0.001	<0.001	<0.001	<0.001
SRMR	0.05	0.03	0.04	0.03	0.05	0.05
CFI	.94	.98	.97	.98	.93	.97
RMSEA	.126	0.06	.093	0.07	.107	0.07

Cronbach's alpha values of the scales were listed in the Table 4. It demonstrated acceptable internal consistency reliability. There were also acceptable values for each scales' test-retest reliability. Pearson correlation coefficients between scales and self-reported PA were all significant and in the expected directions, also supported the criterion validity of the tested scales.

Table 4 Internal consistency, test-retest reliability of the scales, and correlations between the measured PA correlates and self-reported PA

(N= 230)	Cronbach's alpha	ICC(95%CI)	r
Self-efficacy	.79	0.88(0.84-0.91)	0.31**
Social Support	.95	0.91(0.88-0.93)	0.21**
Self-regulations	.93	0.89(0.86-0.92)	0.23**

**p<0.01

Discussion

This purpose of the study is to investigate the validity and reliability of three translated scales to measure PA correlates (self-efficacy, self-regulation, and social support) for healthy Hong Kong working adults. All three scales were previously developed in English and derived from published instruments and used among adults. However, these scales have not been validated among Hong Kong working adults.

For the factorial validity, all three scales were supported with reasonably good model fit of the one-factor model, with several items were allowed to covary. The validation study of the original exercise self-efficacy (Marcus et al., 1992) conducted in US government and hospital employees, supported the unidimensionality of the English scale. The original social support scale (Sallis et al.,1987) validation used exploratory factor analyses instead of confirmatory factor analyses, and suggested the present 10 items loaded on one factor. Although the physical activity self-regulations have a six-factor model, it also provided a total good fit of model loaded on one factor, i.e. self-regulations (Watanabe et al., 2017). Therefore, the present study was consistent with the previous studies and suggested similar structure among Hong Kong working adults.

For the criterion validity, the significant correlations, i.e. p< 0.01 of all scales with self-reported PA reinforced the scales' validity in Hong Kong working adults. In the present study, the exercise self-efficacy scale demonstrated a moderate correlation with self-reported PA, and the correlation was stronger (0.31 > 0.25) than the previous study (Huanget al., 2011). This also echoed with the findings in other countries that self-efficacy was an important correlate of PA (Mendoza-Vasconez et al., 2018).

The reliability of the scales were reflected by the acceptable level of internal consistency. All the items were correlated with the corresponding scales with a minimum value of 0.40 (Blunch, 2013). For the self-efficacy scale, test-retest reliability was .90 in the previous study (Marcus et al., 1992). The test-retest reliability of social support ranging from 0.84 to 0.95 in the earlier studies (Joseph et al., 2013; Liang et al., 2014). However, the test-retest reliability of self-regulation in original English version has not been mentioned. In the present study, test-retest reliability of each scale was acceptable, i.e. >0.7(Baumgartner et al., 2007).

There were several limitations to this study. First, the samples are convenience samples, which may limit the generalization of the study. Besides, as the study was conducted through an Internet-based questionnaire, it might cause a selection bias. For example, participants who had considerable amount of physical activity might not have the habit to use the Internet or online form may be reluctant to take part in this survey.

Also, only subjective measured PA was examined in this study. In the future study, objective measured PA would also be included. Furthermore, no items in the present study were specifically developed for Hong Kong working adults. A culture-specific measure may be more appropriate for Hong Kong working adults. This research just acts as a starting point for further expanding the theoretically-defined relationships posited within SCT by providing a valid, abbreviated measure of physical activity related self-efficacy, self-regulation and social support for use in Hong Kong working adults.

Conclusion

This study revealed that the Chinese version of exercise self-efficacy, physical activity self-regulations and social support for exerciseare in good validity and reliability which targeted Hong Kong working adults.

Disclosure Statement
There is no commercial association with any companies that might create conflicts of interest relevant to this study. Ka Man Tam is the Lecturer of Hong Kong Institute of Vocational Education. No competing financial interests exist.

References

Albrecht, T. L., & Adelman, M. B. (1987). Communicating social support. SAGE

Anderson, E. S., Winett, R. A., & Wojcik, J. R. (2011). Social cognitive determinants of nutrition and physical activity among web-health users enrolling in an online intervention: the influence of social support, self-efficacy, outcome expectations, and self-regulation. Journal of Medical Internet Research, 13(1), e28. https://doi.org/10.2196/jmir.1551

Anderson, E. S., Winett, R. A., Wojcik, J. R., & Williams, D. M. (2010). Social cognitive mediators of change in a group randomized nutrition and physical activity intervention: social support, self-efficacy, outcome expectations and self-regulation in the guide-to-health trial. Journal of Health Psychology, 15(1), 21–32. https://doi.org/10.1177/1359105309342297

Anderson, E. S., Wojcik, J. R., Winett, R. A., & Williams, D. M. (2006). Social-cognitive determinants of physical activity: the influence of social support, self-efficacy, outcome expectations, and self-regulation among participants in a church-based health promotion study. Health Psychology : Official Journal of the Division of Health Psychology, American Psychological Association, 25(4), 510–520.

Bandura, A. (1986). Social foundations of thought and action: a social cognitive theory. PrenticeHall series in social learning theory (Vol. 1).

Bandura, A. (1995). Self-Efficacy in Changing Societies. Cambridge University Press.

Bandura, A. (2004). Health promotion by social cognitive means. Health Education & Behaviour, 31(2), 143–64. https://doi.org/10.1177/1090198104263660

Baumgartner, T. A., Jackson, A. S., Mahar, M. T., & Rowe, D. A. (2007). Measurement for evaluation in physical education and exercise science (8th ed.). McGraw-Hill.

Beets, M. W., Cardinal, B. J., & Alderman, B. L. (2010). Parental social support and the physical activity-related behaviours of youth: a review. Health Education &Behaviour, 37(5), 621–44. https://doi.org/10.1177/1090198110363884

Bentler, P. M., & Chou, C. P. (1987). Practical Issues in Structural Modeling. Sociological Methods & Research, 16(1); 78-117. https://doi.org/10.1177/0049124187016001004

Blunch, N. J. (2013). Introduction to structural equation modeling using IBM SPSS statistics and AMOS. SAGE.

Craig, C. L., Marshall, A. L., Sjöström, M., Bauman, A. E., Booth, M. L., Ainsworth, B. E., …& Oja, P. (2003). International physical activity questionnaire: 12-country reliability and validity. Medicine and Science in Sports and Exercise, 35(8), 1381–95. https://doi.org/10.1249/01.MSS.0000078924.61453.FB

Department of Health, HKSAR. (2017). Behavioural Risk Factor Survey (April 2016). Retrieved from https://www.chp.gov.hk/files/pdf/brfa_report_april_2016_eng.pdf

Fjeldsoe, B. S., Miller, Y. D., & Marshall, A. L. (2013). Social cognitive mediators of the effect of the MobileMums intervention on physical activity. Health Psychology : Official Journal of the Division of Health Psychology, American Psychological Association, 32(7), 729–38. https://doi.org/10.1037/a0027548

Glanz, K.; Rimer, B.K.; & Viswanath, K. (2008). Health behaviour and health education: theory, research, and practice. (K.Glanz, K. Rimer, B.K., Viswanath, Ed.) (4th ed.). Jossey-Bass.

Grim, M., Hortz, B., & Petosa, R. (2011). Impact evaluation of a pilot web-based intervention to increase physical activity. American Journal of Health Promotion, 25(4), 227–30. https://doi.org/10.4278/ajhp.081216-ARB-307

Huang, Y.-J., Wong, S. H., Salmon, J., & Hui, S. S. (2011). Reliability and validity of psychosocial and environmental correlates measures of physical activity and screen-based behaviours among Chinese children in Hong Kong. The International Journal of Behavioural Nutrition and Physical Activity, 8, 16. https://doi:10.1186/1479-5868-8-16

Ince, M. L. (2008). Use of a social cognitive theory-based physical-activity intervention on health-promoting behaviours of university students. Perceptual and Motor Skills, 107(3), 833–6. https://doi.org/10.2466/pms.107.3.833-836

Joseph, R. P., Pekmezi, D. W., Lewis, T., Dutton, G., Turner, L. W., & Durant, N. H. (2013). Physical activity and social cognitive theory outcomes of an Internet-enhanced physical activity intervention for African American female college students. Journal of Health Disparities Research and Practice, 6(2), 1–18.

Kaewthummanukul, T., & Brown, K. C. (2006). Determinants of employee participation in physical activity: critical review of the literature. AAOHN 54(6), 249–61. http://www.ncbi.nlm.nih.gov/pubmed/16800402

Liang, Y., Lau, P. W. C., Huang, W. Y. J., Maddison, R., & Baranowski, T. (2014). Validity and reliability of questionnaires measuring physical activity self-efficacy, enjoyment, social support among Hong Kong Chinese children. Preventive Medicine Reports, 1, 48–52. https://doi.org/10.1016/j.pmedr.2014.09.005

Macfarlane, D. J., Lee, C. C. Y., Ho, E. Y. K., Chan, K. L., & Chan, D. T. S. (2007). Reliability and validity of the Chinese version of IPAQ (short, last 7 days). Journal of Science and Medicine in Sport, 10(1), 45–51. https://doi.org/10.1016/j.jsams.2006.05.003

Marcus, B. H., Selby, V. C., Niaura, R. S., & Rossi, J. S. (1992). Self-Efficacy and the Stages of Exercise Behaviour Change. Research Quarterly for Exercise and Sport, 63(1), 60–66. https://doi.org/10.1080/02701367.1992.10607557

Mendoza-Vasconez, A. S., Marquez, B., Benitez, T. J., & Marcus, B. H. (2018). Psychometrics of the self-efficacy for physical activity scale among a Latina women sample. BMC Public Health, 18(1), 1097. https://doi.org/10.1186/s12889-018-5998-0

Michie, S., Abraham, C., Whittington, C., McAteer, J., & Gupta, S. (2009). Effective techniques in healthy eating and physical activity interventions: a meta-regression. Health Psychology : Official Journal of the Division of Health Psychology, American Psychological Association, 28(6), 690–701. https://doi.org/10.1037/a0016136

Nunnally, J. C. (1994). Psychometric theory (3rd ed.). McGraw-Hill Ed.

Oh, H. J., Lauckner, C., Boehmer, J., Fewins-Bliss, R., & Li, K. (2013). Facebooking for health: An examination into the solicitation and effects of health-related social support on social networking sites. Computers in Human Behaviour, 29(5), 2072–2080. https://doi.org/10.1016/j.chb.2013.04.017

Patel, M. S., Asch, D. A., & Volpp, K. G. (2015). Wearable Devices as Facilitators, Not Drivers, of Health Behaviour Change. JAMA, 313(5), 459–460. https://doi.org/10.1001/jama.2014.14781

Petosa, P. S. (1993). Use of social cognitive theory to explain exercise behaviour among adults. ProQuest Dissertations and Theses.

Rovniak, L. S., Anderson, E. S., Winett, R. A., & Stephens, R. S. (2002). Social cognitive determinants of physical activity in young adults: A prospective structural equation analysis. Annals of Behavioural Medicine, 24(2), 149–156. https://doi.org/10.1207/S15324796ABM2402_12

Sallis, J. F., Grossman, R. M., Pinski, R. B., Patterson, T. L., & Nader, P. R. (1987). The development of scales to measure social support for diet and exercise behaviours. Preventive Medicine, 16(6), 825–836. https://doi.org/10.1016/0091-7435(87)90022-3

Sallis, J. F., & Owen, N. (1999). Physical activity and behavioural medicine. Sage Publications.

Sharma, M., Sargent, L., & Stacy, R. (2005). Predictors of leisure-time physical activity among African American women. American Journal of Health Behaviour, 29(4), 352–9. http://www.ncbi.nlm.nih.gov/pubmed/16006232

Umstattd, M. R., Motl, R., Wilcox, S., Saunders, R., & Watford, M. (2009). Measuring physical activity self-regulation strategies in older adults. Journal of Physical Activity & Health, 6 Suppl 1, S105-12. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/19998856

Watanabe, K., Kawakami, N., Adachi, H., Inoue, S., & Meyer, M. R. U. (2017). Internal consistency, convergent validity, and structural validity of the Japanese version of the Physical Activity Self-Regulation scale (PASR-12) among Japanese workers: A validation study. Journal of Occupational Health. https://doi.org/10.1539/joh.16-0143-OA

Wheaton, B., Muthen, B., Alwin, D. F., & Summers, G. F. (1977). Assessing reliability and stability in panel models. Sociological Methodology, 8, 84–136

World Health Organization (2015, June 26). Healthy workplaces: a WHO global model for action. http://www.who.int/occupational_health/healthy_workplaces/en/

World Health Organization (2020). Noncomuunicable diesease: promoting physical activity to prevent and control noncommunicable diseases. http://www.emro.who.int/noncommunicable-diseases/publications/questions-and-answers-on-promoting-physical-activity-to-prevent-and-control-noncommunicable-diseases.html

Williams, D. M., Anderson, E. S., & Winett, R. A. (2005). A review of the outcome expectancy construct in physical activity research. Annals of Behavioural Medicine : A Publication of the Society of Behavioural Medicine, 29(1), 70–9. https://doi.org/10.1207/s15324796abm2901_10

Williams, S. L., &French, D. P. (2011). What are the most effective intervention techniques for changing physical activity self-efficacy and physical activity behaviour--and are they the same? Health Education Research, 26(2), 308–22. https://doi.org/10.1093/her/cyr005

Winnett, R., Anderson, E., Wojcik, J., Winett, S., Moore, S., &Blake, C. (2011). Guide to health: a randomized controlled trial of the effects of a completely web-based intervention on physical activity, fruit and vegetable consumption, and body weight. Translational Behavioural Medicine, 1(1), 165–174. https://doi.org/10.1007/s13142-010-0006-y

Young, M. D., Plotnikoff, R. C., Collins, C. E., Callister, R., & Morgan, P. J. (2014). Social cognitive theory and physical activity: a systematic review and meta-analysis. https://doi.org/10.1111/obr.12225