

Translating, Reliability Testing, and Validating a Norwegian Questionnaire to Assess Adolescents' Intentions to be Physically Active After High School Graduation

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Abstract

This study aimed to test the reliability and validity of a Norwegian measure of adolescents' intentions to be physically active after graduation (the Intention to be Physically Active After Graduation [IPAG] Questionnaire). The development of IPAG involved a translation and back-translation procedure and a test–retest study, performed on 105 adolescents (M age = 17.1, $SD = 0.6$) from three different high schools in Kristiansand, Norway. The four IPAG items loaded on one single factor, demonstrating acceptable factor loadings (.68–.90) and acceptable Cronbach's alpha values (.84 and .84) in both the test and retest assessment. IPAG correlated positively with a measure of attitudes toward physical activity (.61–.71) and a measure of participants' intentions to be physically active next month (.77–.82), supporting both construct validity and criterion-related validity of the IPAG-Questionnaire. Acceptable reliability and validity of IPAG was found, which supports the use of this instrument in future research.

Keywords

test–retest, validation, intention, physical activity

People's intentions to be physically active are, according to the Theory of Planned Behavior (TPB; Ajzen, 1991, 2005), one of the most important predictors of subsequent physical activity behavior. In this sense, intention to be physically active should predict future physical activity participation. The World Health Organization (2004) states that “physical activity is a fundamental means of improving the physical and mental health of individuals” (p. 3). However, inactivity levels are rising in many countries, increasing the prevalence of non-communicable diseases, and thus negatively affecting the general population health (World Health Organization, 2004). Interventions aiming to reverse this trend might benefit from valid measures of intentions to engage in future physical activity.

According to the TPB, peoples intentions to engage in future physical activity is the most important predictor of subsequent physical activity behavior (Ajzen, 1991), and the relationship between intention and behavior is well acknowledged among researchers (Ajzen, 2005; Bandura, 1986). The intention–behavior relationship is well established, both theoretically (Ajzen, 2005; Bandura, 1986) and empirically (e.g., McEachan, Conner, Taylor, & Lawton, 2011). Indeed, de Bruijn and van den Putte (2012) have argued that intention is

a necessary predictor of exercise behavior (see Erdvik, Øverby, & Haugen, 2014, for more information regarding the intention–behavior relationship). Research on the Intentions to be Physically Active After Graduation (IPAG) Questionnaire may therefore be of high relevance with respect to the development of future Norwegian interventions targeting adolescent's physical activity behavior, allowing not only for the assessment of the intervention programs' ability to influence on adolescents' physical activity behavior but also its ability to positively influence physically active adolescents who are at risk of taking on a physically inactive lifestyle. Based on the former, measuring adolescents' intentions to be active might help professionals and academics in identifying groups that are at risk for taking on a physically inactive lifestyle.

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Table 1. The IPAG-Questionnaire: Original (English) and Translated (Norwegian) Version.

	Original version	Norwegian version
Item 1	"I'm interested in developing my physical fitness."	"Jeg er interessert i å utvikle min fysiske form."
Item 2	"Outside PE lessons, I like to do sport."	"Jeg liker å drive idrett utenom kroppsøvingstimen."
Item 3	"After graduation, I would like to take part in sport club training."	"Etter endt skolegang ønsker jeg å være aktiv i et idrettslag."
Item 4	"After graduation, I would like to be physically active."	"Etter endt skolegang ønsker jeg å være fysisk aktiv."

Note. Original version of the IPAG-Questionnaire is derived from Hein, Müür, and Koka (2004). IPAG = Intention to be Physically Active After Graduation.

The purpose of this study was to translate, test the reliability, and validate a Norwegian version of a questionnaire assessing students' intentions to be physically active after graduation. The IPAG-Questionnaire was originally developed for use in a study by Hein, Müür, and Koka (2004) on 14- to 18-year-old adolescents, and has since been translated into Spanish (Moreno, Moreno, & Cervelló, 2007) and used in previous studies on Spanish adolescents (also called the "Intention to be Physically Active Scale" [IPAS]; Almagro, Sáenz-López, & Moreno, 2010; Moreno-Murcia, Huéscar Hernández, & Cervelló, 2012). The herein validated IPAG measure has also been used in Norwegian research by Erdvik et al. (2014) assessing the contribution of self-determined motivation in physical education to adolescents' intentions to be physically active after graduation. However, the IPAG-Questionnaire has to the best of our knowledge not been validated for Norwegian adolescents. Research articles regarding other Norwegian instruments assessing physical activity intentions have to our knowledge not been published, and have consequently not been made accessible to the research community. In addition, compared with other measures of physical activity intention (e.g., Escartí & Gutiérrez, 2001; Hagger, Chatzisarantis, & Biddle, 2002; Ommundsen, unpublished data), the IPAG-Questionnaire measures intentions in a more distant future. One may also argue that the time perspective found in the IPAG-Questionnaire (i.e., intention to be physically active after graduation) makes IPAG qualitatively different from other instruments. This difference may also contribute to making IPAG a potentially useful instrument in intervention studies aiming for long-term effects.

To make the IPAG-Questionnaire accessible for the use in a Norwegian setting, this study involved translation, reliability testing, and validation of IPAG. A translation back-translation of the IPAG items was therefore performed, before the instrument was subject to a test-retest procedure for the assessment of reliability, criterion-related validity, and construct validity of the IPAG-Questionnaire.

Method

Participants

Second-year students attending three different high schools in Kristiansand, Norway, were invited to take part in the study,

which was approved by the Norwegian Social Science Data Services (NSD). The data collection took place in the months of November and December 2012. Informed consent was given by participants prior to responding to the questionnaire, and the participants were free to withdraw from the study at any time. One hundred fifty-two second-year high school students participated in the test-retest study, of which 105 adolescents (66 boys and 76 girls; M age = 17.1, SD = 0.6) provided complete responses in both test and retest procedure, forming the basis for subsequent reliability and validity testing.

Instruments

Development of the IPAG-Questionnaire. The four items of the IPAG-Questionnaire were translated into Norwegian using the method of forward and back-translation, following the guidelines proposed by Kvamme et al. (1998). The questions were translated from their original English format producing two separate Norwegian versions: one proposed by the first author, another by a bilingual British colleague working at the Institute of Foreign Languages and Translation. Bearing elements of the two separate translations in mind, the translations were then merged to produce one single Norwegian version. The bilingual associate professor translated the Norwegian version back into English and assisted comparing the back-translated items with the four original English questionnaire items to ensure that the correct meaning of the content was retained. Through this process, the Norwegian items were changed to better reflect nuances in the English wording and subsequent understanding (see Table 1).

The IPAG-Questionnaire consists of four questions concerning students' intentions to be physically active after graduation. Students reported their intentions to be active after graduation on a 7-point Likert-type scale anchored from (1) *strongly disagree* to (7) *strongly agree*. Students were asked to consider the following statements: (1) "I'm interested in developing my physical fitness"; (2) "Outside PE lessons, I like to do sport"; (3) "After graduation, I would like to take part in sport club training"; (4) "After graduation, I would like to be physically active." The mean score of the four items was derived into an index representing responders' IPAG (Hein et al., 2004).

Because Russel and Bobko (1992) recommend the use of 7-point Likert-type scales over 5-point scales and Dawes (2008) argues that changing scale format does not necessarily destroy the comparability of historical data, IPAG was validated on a 7-point Likert-type scale.

Attitudes. A questionnaire assessing attitudes toward physical activity was included in the test–retest questionnaire. This questionnaire asks for respondents' attitudes toward physical activity and was derived from research by Lorentzen (2007). The questionnaire was based on the following statements (originally in Norwegian): “Being regularly physically active, the next month will to me be [*sic*]”: (1) “stupid” to (7) “wise,” (1) “harmful” to (7) “valuable” [*sic*], (1) “useless” to (7) “useful,” (1) “wrong” to (7) “right,” (1) “troublesome” to (7) “easy,” (1) “unpleasant” to (7) “pleasant,” (1) “bad” to (7) “good,” (1) “boring” to (7) “interesting.” One represented the most negative attitude and seven the most positive. As in the study by Lorentzen (2007), no definition of regular physical activity was given.

Intention to be Physically Active Next Month (INM-Q). A six-item questionnaire measuring adolescents' intentions to be physically active next month (INM-Q) was also included in the test–retest questionnaire. This instrument was derived from research by Ommundsen (unpublished data). All questions were anchored on a 7-point Likert-type scale, of which four were anchored from (1) “no, absolutely not” to (7) “yes, absolutely” (e.g., “I intend to be regularly physically active within the next month”), whereas the two last items were anchored (1) “very unlikely” to (7) “very likely” (e.g., “How likely is it that you will be regularly physically active during the next month?”). The INM-Q has been validated for use by Ommundsen (unpublished data) who reported a Cronbach's alpha of .95 for the six-item subscale.

Respondents were also asked to report age and gender (boy/girl) as a demographic data.

Procedure

This study involved a test–retest procedure for the validation of the IPAG-Questionnaire. Physical activity intentions were considered to be relative stable and, for the validation the IPAG-Questionnaire, adolescents' were thus asked to answer the same questions two times with 1 week between test and retest. The test–retest procedure allowed for the calculation of test–retest reliability coefficients for each of the four single items comprising the IPAG-Questionnaire. Single items were considered ordinal data and indexes were considered interval data.

Statistical Analyses

Several statistical analyses were performed to assess the reliability and validity of the IPAG-Questionnaire. Whereas test

and retest measures concerning the complete IPAG-Questionnaire was considered continuous and normally distributed, data on each single item constituting the IPAG-Questionnaire was considered ordinal (categories from 1 to 7). Consequently, test–retest correlations and paired difference tests between single items were assessed through non-parametric analyses (Spearman's rank correlation and Wilcoxon-signed ranks test), and test–retest measures concerning the complete IPAG index were assessed through parametric analyses (Pearson's correlation and paired sample *t* test).

In an attempt to embed the measure of adolescents' intentions to be physically active after graduation in a nomological network (Cronbach & Meehl, 1955), the survey also assessed other constructs which were thought to be related to the IPAG-Questionnaire. Based on the measured constructs, criterion-related and construct validity of the IPAG-Questionnaire were examined. Criterion-related validity may, according to DeVellis (2012), be assessed through the investigation of empirical association between a measure and some criterion. Consequently, a measure of intention to be physically active next month (INM-Q; Ommundsen, unpublished data) was used as a criterion for the validation of the IPAG-Questionnaire. As the two questionnaires measuring physical activity intentions (IPAG and INM-Q) were assumed to measure the somewhat same characteristics, the INM-Q was theoretically assumed to be positively related to the IPAG-Questionnaire without sharing a large degree of variance. According to DeVellis (2012), a measure's construct validity is reflected in “the extent to which a measure ‘behaves’ the way that the construct it purports to measure should behave with regard to established measures of other constructs” (DeVellis, 2012, p. 53). Construct validity of IPAG was assessed in this study through the comparison of adolescents' attitudes toward physical activity with scores on the IPAG-Questionnaire. According to the TPB (Ajzen, 1985, 1991), attitudes (together with perceived behavioral control and social norms regarding physical activity) are among the most important predictors of intention to be physically active. Thus, there should be a positive relationship between participants' attitudes toward physical activity and their intentions to be physically active after graduation.

Criterion-related validity and construct validity were determined through the assessment of differences in mean between IPAG and the two other measured constructs. The test–retest correlation between items and potential statistically significant differences between the test and retest assessment regarding the same items were assessed using Wilcoxon-signed rank test. Furthermore, the subscale total from test and retest were assessed by comparing the mean and standard deviation from the test- and retest-assessments, and correlating test and retest values. A paired *t* test was utilized to ensure that there was no statistically significant difference between data from the two measurement procedures. Furthermore, psychometric properties of the IPAG-Questionnaire were assessed through

Table 2. Student *t* Test and Correlation Statistics of IPAG Test and Retest Measures.

Items ^a	Test		Retest		Z value	t value	Correlation (T1-T2)	Item-total correlation	
	Median (IQR)	M (SD)	Median (IQR)	M (SD)				Test	Retest
Item 1	6.0 (2)		6.0 (3)		-0.88		.68**	.83**	.83**
Item 2	6.0 (4)		6.0 (4)		-0.47		.83**	.90**	.90**
Item 3	4.0 (5)		4.0 (5)		-1.11		.73**	.76**	.79**
Item 4	6.0 (2)		6.0 (2)		-0.92		.67**	.84**	.83**
Subscale total ^b		4.96 (1.65)		4.99 (1.63)		-0.52 ^c	.85**		

Note. Item 1 = "I'm interested in developing my physical fitness"; Item 2 = "Outside PE lessons, I like to do sport"; Item 3 = "After graduation, I would like to take part in sport club training"; Item 4 = "After graduation, I would like to be physically active." IPAG = Intentions to be Physically Active After Graduation; IQR = interquartile range.

^aSpearman.

^bPearson.

^c $p = .602$ (two-tailed).

** $p < .01$ (two-tailed).

Table 3. Cronbach's Alpha and Factor Analysis: Intention to Be Physically Active After Graduation (IPAG).

	Item 1	Item 2	Item 3	Item 4	α subscale
Factor loading					
Test	0.87	0.90	0.68	0.88	0.84
Retest	0.87	0.90	0.72	0.87	0.84

Note. Item 1 = "I'm interested in developing my physical fitness"; Item 2 = "Outside PE lessons, I like to do sport"; Item 3 = "After graduation, I would like to take part in sport club training"; Item 4 = "After graduation, I would like to be physically active."

principal component factor analysis (varimax rotation) and Cronbach's alpha. Factor loadings for each item and Cronbach's alpha for the complete questionnaire at the two times of measurement have been reported.

Results

The average age of respondents in the test–retest procedure was 17.1 (± 0.6). The sample consisted of 66 boys (46.5%) and 76 girls (53.5%). Results revealed strong correlations between test and retest measures of single items within the same subscale ($r = .67-.83$, $p < .01$) and no significant differences between test and retest measures of subscale items were identified (see Table 2). With respect to the IPAG-Questionnaire as a whole, test and retest responses were highly correlated ($r = .85$, $p < .01$).

Analyses revealed that the four IPAG items loaded on one single factor, demonstrating acceptable factor loadings (.68-.90) and acceptable Cronbach's alpha values (.84 and .84) in both the test and retest assessment (see Table 3).

The assessment of criterion-related validity and construct validity of the IPAG revealed strong correlations with both the INM-Q and the measure of attitudes (see Table 4).

Table 4. Correlates of Intention to Be Physically Active After Graduation (IPAG).

	Test		Retest	
	r	r^2	r	r^2
INM-Q	.77**	.59	.82**	.67
Attitudes	.61**	.37	.71**	.50

Note. INM-Q = Intention to be Physically Active Next Month–Questionnaire (Ommundsen, unpublished data); Attitudes = Attitudes toward physical activity (Lorentzen, 2007).

** $p < .01$ (two-tailed).

Discussion

The purpose of the study was to assess the reliability and validity of the Norwegian IPAG-Questionnaire. The IPAG-Questionnaire utilized in this study represents a Norwegian version of the scale developed by Hein and colleagues (2004, see Table 1). Research results provided preliminary evidence for sound psychometric properties of the IPAG-Questionnaire. Results from the present test–retest analyses, which were performed on high school students (age 16-18 years), indicate that participants' test and retest responses were consistent. In line with the results from Hein and colleagues (2004), the four items all loaded onto one single factor and, like in the original version, the items demonstrated strong factor loadings (.68-.90 vs. Hein et al.: .67-.79). Strong factor loadings of the IPAG-Questionnaire has also been reported in research by Moreno et al. (2007; .86-.94), using a Spanish five-item version of the questionnaire. Hein and colleagues (2004) obtained a Cronbach's alpha value of .80 in their validation study. Previous research on the Spanish (five-item) IPAG-Questionnaire has revealed Cronbach's alpha values from .75 to .94 (Almagro et al., 2010; Moreno et al., 2007). Sound Cronbach's alpha values (Cortina, 1993) were also

identified in the validation of the Norwegian version of IPAG through analyzing both test ($\alpha = .84$) and retest ($\alpha = .84$) data. Overall, we consider the results to support the validity of the IPAG-Questionnaire.

In a test–retest it is important to consider the time elapsing between the two assessments (Allen & Yen, 1979). This is because of limitations related to test–retest reliability testing of questionnaires, like the potential for learning, carryover effects and recall effects (Allen & Yen, 1979; Marx, Menezes, Horovitz, Jones, & Warren, 2003). According to Marx et al. (2003), most researchers have chosen a time interval between test and retest ranging from 2 days to 2 weeks. This time frame is generally perceived to be a reasonable compromise in avoiding both the recollection bias and actual changes in the empirically measured phenomenon (Marx et al., 2003). The reliability of a measure may appear low if the time interval between assessments is relatively long, and the socio-psychological construct is unstable (Allen & Yen, 1979). The measure of adolescents' intentions to be physically active next month was considered less stable than the measure of intention to be physically active after graduation. The longer time interval between the two assessments, the more changes one need to expect in subsequent answers (Allen & Yen, 1979). Hence, in an attempt to strengthen the reliability of the present study, the retest assessment was performed the week following the test-assessment. However, whether the herein chosen time interval is too short or too long is difficult to determine. Nevertheless, considering that the IPAG-Questionnaire measures intentions in a more distant future, considerable change from 1 week to another was not expected.

The study results revealed a strong correlation between IPAG and Lorentzen's (2007) measure of adolescents' attitudes toward physical activity (test = .61, retest = .71). This indicates that respondents who intend to be more physically active after graduation also possess more positive attitudes toward physical activity. However, the IPAG-Questionnaire appears to correlate even stronger with the INM-Questionnaire by Ommundsen (unpublished data; test = .77, retest = .82), showing that intention to be physically active next month is strongly associated with adolescents' intentions to be physically active after graduation. Altogether, these findings support both construct validity and criterion-related validity of the IPAG-Questionnaire and strengthens the assumption that the questionnaire is adequate for measuring adolescents' intentions to be physically active after graduation.

However it should be noted that, despite researchers acknowledging intention as a predictor of behavior (Webb & Sheeran, 2006), it is still not completely clear to which degree intention to be physically active after graduation has the ability to predict future behavior. It has been identified that 24% to 60% of reported intentions are followed by behavior, with the occurrence of physical activity behavior being dramatically lower in the group of non-intenders than in the group of

intenders (de Bruijn & van den Putte, 2012; Rhodes, Courneya, & Jones, 2003; Sheeran, 2002). The fact that intention may be considered a prerequisite of exercise behavior, physical activity intentions among youth should be considered relevant in a public health perspective. However, it should be noted that assessing the predictive validity of IPAG has not been of focus in the present study and longitudinal research is necessary to further determine the predictive ability of the IPAG-Questionnaire and similar instruments.

Another limitation in this study is related to the criterion-related validity of the IPAG-Questionnaire being determined through comparison with an unpublished intention measure, because this was the only identified Norwegian measure of physical activity intentions. The current study also has limited information about participants with regards to relevant background information such as demographics and physical activity level. Moreover, the sample only consists of 105 seventeen-year-old adolescents from one medium-sized city in Norway. These limitations should be considered when interpreting the findings from this work, and future research would do well to further explore the validity of the IPAG-Questionnaire.

Conclusion

This aim of this study was to assess the reliability and validity of four questionnaire items originally developed by Hein et al. (2004) for the measurement of students' intentions to be physically active after graduation. The IPAG-Questionnaire appears to be acceptable for use among Norwegian adolescents in the age of 16 to 18 years. The reliability and validity of the questionnaire was supported and it seems reasonable to justify the use of this instrument in future research.

Declaration of Conflicting Interests

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