PSIHOLOGIJA,
2000, 3-4, 491-498

UDK 159.923.072.5

Representativity, Reliability, Homogeneity and Validity of Selwyn's Computer Attitude Scale for 16-19 Education*

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Abstract: This study examined the representativity, reliability, homogeneity and validity of Selwyn's computer attitude scale, 21 items of which were given in the Serbian language. The study used a sample of 113 ninth-grade Gymnasium (high-school) students and found that the translated instrument does successfully measure one underlying construct.

Keywords: computer attitude, computer attitude scale, upper secondary education.

According to Woodrow (1991), our awareness of students' attitudes toward computers is "a critical criterion in the evaluation of computer courses and in the development of computer-based curricula." (p. 165) This is because these attitudes influence not only the acceptance of computers, but also their use as professional tools or teaching/learning assistants.

What has been discovered about computer attitude so far?

Although several studies have found no correlation between gender and computer attitude (Woodrow, 1991; Busch, 1995), most studies found that males show a more positive attitude toward computers than females (e.g. Brosnan, 1998; Kirkpatrick & Cuban, 1998). Furthermore, most studies have demonstrated that computer experience has a positive effect on computer attitude (Selwyn, 1997; Levine & Donitsa-Schmidt, 1998; Kirkpatrick & Cuban, 1998; cf. Woodrow, 1991).

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* Based on a contribution to the 6th scientific conference *Empirical Research in Psychology*, Belgrade-Yugoslavia, 10-11 February, 2000.

Having in mind an increasing interest in studying students' attitudes toward computers in the last ten years (see, for example, Whitley (1997)) and the lack of an appropriate scale for assessing these attitudes in Yugoslav population, the major objective of this study was to chose a suitable computer attitude scale, translate its items into the Serbian language, and examine their psychometric features.

Method

There are many instruments measuring attitudes toward computers such as the Computer Attitude Scale (Nash & Moroz, 1997), the Bath County Computer Attitude Scale (Francis & Evens, 1995) and the Computer Attitude Scale for 16-19 Education (Selwyn, 1997). Some of the developed instruments have been compared in several studies (e.g., Woodrow, 1991; Francis & Evens, 1995). Although all these instruments purport to measure the same construct, they do not sample the same attitude domains. What domains should be primarily sampled? A recent analysis revealed the relevance of three attitude domains: cognitive, affective and behavioural (Kay, 1993), which are, for example, sampled in two scales mentioned above (Nash & Moroz, 1997; Selwyn, 1997). Having in mind their administrations (secondary, preservice, college and teachers vs. 16-19 education) as well the number of their items (40 vs. 21), this study used the Computer Attitude Scale for 16-19 Education (Selwyn, 1997).

The psychometric features of Selwyn's computer attitude scale, 21 items of which were given in the Serbian language*, were examined by using a sample 113 ninth-grade Gymnasium (high-school) students (the students' average age was 16 years and 52 per cent of them were male). The subjects came from four ninth-grade classes comprised 151 students. Of these 151 students, just 113 participated in the study. This is because 26 students were absent from the scale administration, whereas 12 students failed to respond to all 21 items and were therefore excluded from the statistical analysis.

The translated instrument was administered as a 5-point Likert-type questionnaire. It was done by a psychology student under a group setting (one class at a time; all classes within 90 minutes). She told the students that they had to indicate, as honestly as they could, whether they agree or disagree with each statement in the given survey, by circling a relevant number. She also told them that there were no "right" or "wrong" answers, and that their answers would be used for her written project on attitudes. She told the author of this study that she was friendly accepted by the subjects who willingly completed the given task. The author was absent from the scale administration.

The collected data were examined by factor analysis, and scale metric feature analysis (Knežević & Momirović, 1996).

* The original instrument contains 10 items for which scoring is reversed, whereas the translated instrument contains 12 such items.

Results

Although the factor analysis revealed that the instrument was not a four-construct one as reported in Selwyn (1997), the scale metric feature analysis still evidenced that it does successfully measure one underlying construct. The representativity, reliability, homogeneity and validity of the translated instrument are presented in Tables 1-4. Note that the correlation between subjects' total score and half-year mark in informatics was significant ($r_{Sp} = .29$, $p < .01$).

Table 1: The representativity of the translated instrument

Kaiser, Mayer, Olkin measure of sampling adequacy	psi 1	.96
Kaiser, Rice	psi 2	.82
Kaiser	psi 3	.88

Table 2: The reliability of the translated instrument

Reliability Under the Classical Measurement Model		
Guttman	lambda 1	.85
Guttman, Cronbach α	lambda 3	.89
Guttman	lambda 6	.92
Reliability Measures of the First Principal Component		
Lord-Kaiser-Caffrey	beta 3	.90
Measures of Reliability Under Guttman's Measurement Model		
Guttman-Nicewander	rho	.94

Table 3: The homogeneity of the translated instrument

Mean correlation	h 1	.28
Participation of the first Guttman's factor in the total predictable (image) variance	h 2	.59
$1-(\theta^2-\lambda^2) * (m-\lambda^2)^{-1}$	h 5[1]	.51

[1] λ^2 - the first eigenvalue of the correlation matrix; θ^2 - the sum of all eigenvalues greater than 1.

Table 4: The representativity, reliability, homogeneity and internal validity of the translated items

ITEM	REP	REL	HOM	H	B^2
If given the opportunity to use a computer I am afraid that I might damage it in some way.+ (Ukoliko mi se pruži mogućnost da koristim računar, bojim se da bih na neki način mogao/la da ga oštetim.).	.97	.48	.56	.59	.57
Computers help me to organize my work better. ** (Računari mi pomažu da bolje organizujem svoj rad.)	.93	.48	.37	.39	.42
I could probably teach myself most of the things I need to know about computers. (Sposoban/na sam da naučim većinu stvari koje treba da znam o računarima.)	.96	.59	.66	.69	.68
I would avoid taking a job if I knew it involved working with computers.+ (Izbegao/la bih prihvatanje posla kada bih znao/la da uključuje rad na računarima.)	.93	.49	.49	.53	.52
I hesitate to use a computer in case I look stupid.+ (Oklevam da koristim računar da ne bih ispao/la glup/a.)	.96	.47	.56	.60	.58
Computers can enhance the presentation of my work to a degree which justifies the extra effort. ** (Računari mogu poboljšati prikaz mog rada u meri koja opravdava dodatan trud pri njihovom korišćenju.)	.92	.31	.33	.38	.42
*I am in complete control when I use a computer. (Mogu u potpunosti da se snađem kada koristim računar.)	.97	.68	.73	.76	.74
*I feel apprehensive about using a computer.+ (Imam tremu kada koristim računar.)	.97	.55	.59	.63	.61
I can make the computer to do what I want it to do. (Mogu da postignim da računar radi ono što želim da uradi.)	.97	.53	.63	.66	.64
I only use computers in school/college whan told to.+ ** (U školi koristim računare samo kada mi se kaže da to činim.)	.91	.28	.34	.37	.40
I need an experienced person nearby when I use a computer.+ (Kada koristim računar potrebno je da je kraj mene iskusna osoba.)	.98	.67	.72	.76	.74
*Using a computer always scares me a little bit.+ (Rad na računaru me uvek pomalo plaši.)	.97	.59	.60	.63	.62

[2] REP = $(\Sigma^{n}_{j=1} a^2) / (\Sigma^{n}_{j=1} r^2)$ where a = the column elements of matrix $A = UR^{-1}U$ $U^2 = (\text{diag}(R^{-1}))^{-1}$ and R = the correllation matrix / REL - the item variance explained by other items / HOM - the proportion of the first image factor in the total image variance of the item / H - the correlation with the first principal component / B - the correlation with the total score.

(nastavak tabele)

ITEM	REP	REL	HOM	H	B^3
Most things that a computer can be used for I can do just as well myself.+ ** (Većinu stvari koje računar može da uradi mogu i ja sam/a podjednako dobro da uradim.)	.77	.14	.18	.20	.26
I avoid coming into contact with computers in school/college.+ (U školi izbegavam dodir sa računarima.)	.94	.47	.53	.56	.56
If I get problems using the computer, I can usually solve them in one way or the other. (Ako nastanu problemi pri korišćenju računara, uglavnom mogu da ih rešim na neki način.)	.98	.55	.69	.74	.73
I hesitate to use a computer for fear of making mistakes I can't correct.+ (Oklevam da koristim računar zbog straha da ne napravim greške koje ne mogu da ispravim.)	.93	.46	.45	.49	.50
Computers can allow me to do more interesting and imaginative work. (Računari mi omogućuju da načinim interesantniji i maštovitiji rad.)	.96	.63	.54	.58	.59
I will use computers regularly throught school. (Tokom školovanja ću redovno koristiti računare.)	.97	.60	.60	.64	.64
* I need somebody to tell me the best way to use a computer. ** (Imam potrebu da me neko upućuje kako da na najbolji način koristim računar.)	.90	.34	.26	.29	.31
Computers make me feel uncomfortable.+ (Računari kod mene izazivaju osećaj nelagodnosti.)	.98	.53	.63	.68	.67
Computers make it possible to work more productively. (Računari omogućavaju da radi produktivnije.)	.94	.42	.43	.48	.49
ITEM	REP	REL	HOM	H	B

* original items negated

** items that may be omitted; the retained items loaded greater than .40 on the first factor

+ items for which scoring is reversed

[3] REP = $(\Sigma_{j=1}^{n} a_j^2) / (\Sigma_{j=1}^{n} r_j^2)$ where a = the column elements of matrix A= $UR^{-1}U$ U^2= $(diag(R^{-1}))^{-1}$ and R = the correllation matrix / REL - the item variance explained by other items / HOM - the proportion of the first image factor in the total image variance of the item / H - the correlation with the first principal component / B - the correlation with the total score.

Concluding Remarks

This study confirmed that Selwyn's computer attitude scale indeed has good psychometric features. Having in mind construct justification proposed by Momirović (1997), further research may demonstrate that the construct of computer attitude: (a) has a position in relation to other similar or related constructs that is proposed by some underlying theory; and (b) cannot be reduced to some other existing construct(s) such as non-verbal intelligence, extraversion and emotional stability. Further research may also focus on gender differences in computer attitude among Yugoslav students, and, if there are such differences, examine them in terms of computer experience, interest in computers, and other relevant variables.

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Reprezentativnost, pouzdanost, homogenost i valjanost Selvinove skale stava prema kompjuteru za učenike srednje škole

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Rezime: Razmatrana je reprezentativnost, pouzdanost, homogenost i validnost Selvinove skale stavova prema računarima čiji su ajtemi dati na srpskom jeziku. Korišćen je uzorak od 113 učenika prvog razreda gimnazije. Utvrđeno je da prevedeni instrument zaista uspešno meri jedan uporišni konstrukt.

Ključne reči: stavovi prema računarima; skala stavova prema računarima; srednjškolsko obrazovanje.

Репрезентативность, надежность, гомогенность и достоверность шкалы отношения по Сельвину к компьютеру для учеников средней школы

ДЖЁРДЖЕ КАДИЕВИЧ

Рассматривается репрезентативность, надежность, гомогенность и достоверность шкалы отношения по Сельвину к вычислительным машинам, айтемы которых даны на сербском языке. Исследование проведено на

примере 113 учеников первого класса гимназии. Автором утверждается, что данным инструментом действительно успешно измеряется один опорный конструкт.

Ключевые слова: отношения к вычислительным машинам, шкала отношений к вычислительным машинам, среднее школьное образование.