Metric properties of two alternate forms of Scale of Attitudes Toward Judo

Franjo Prot
Science and Research Centre Koper, Slovenia

Dominik Žanetić and Hrvoje Sertić
Faculty of kinesiology, University of Zagreb, Croatia

e-mail: franjo.prot@gmail.com

Abstract

Collection of 43 items of attitudes toward Judo evaluated on a five-point scale were given to sample of 209 subjects students (135 males and 74 females) students of Kinesiology who completed regular Judo course prescribed by a curriculum. Centroid method of clustering was applied on this collection of items to obtain two preliminary twenty item forms. In the next step, sixteen highest positive principal loadings of each of forms were selected for two alternate forms of scale of attitudes toward judo. Basic psychometric analysis of metric properties of composite measurement for two alternate forms was done, along with confirmatory factor analyses performed on subscales as composite score indicators pertaining to each of the two forms. Measurement models were specified following the basic assumptions of classical test theory so that the models of parallel, tau-equivalent and congeneric tests could directly be compared and evaluated. The analyses proved that the most restrictive model, i.e., that of parallel tests provided excellent fit to the data. Likewise, on a descriptive level, the row scale scores defined as simple sums of items reflect the obvious status of the measures as parallel forms of Scale of Attitudes Toward Judo: their means were $M_{\text{JsumA}} = 61.29$ and $M_{\text{JsumB}} = 61.12$ and standard deviations $SD_{\text{JsumA}} = 9.93$; $SD_{\text{JsumB}} = 9.96$, with the associated student $t$-test of difference, $t = 0.597$, $p>0.5$. Correlation between summation scores was 0.922 and correlation between standardized principal components was 0.925. Correlations of summation scores of forms A and B with personal relation to judo used as an external criterion were 0.741 and 0.698, respectively. The presented evidence clearly shows that the two alternate forms can be used as parallel forms of Scale of Attitudes Toward Judo.

Keywords: attitudes toward judo, parallel forms, measurement properties
### PROGRAM

**Thursday, April 11th 2019**

<table>
<thead>
<tr>
<th>Time</th>
<th>Event Description</th>
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</table>
| 10.00 - 11.30 | Symposium: 9th International Psychometric Symposium Alija Kulenović  
*Convener: Vesna Buško* |
| 11.30 - 12.00 | Stanka / Break                                                                    |
| 12.00 - 13.30 | Symposium: 9th International Psychometric Symposium Alija Kulenović  
*Convener: Damir Ljubotina* |
Franjo Prot, Dominik Žanetić, Hrvoje Sertić

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Trener našeg kluba Dominik Žanetić uspješno je obranio svoj diplomski rad i stekao titulu magistra kineziologije 💪🎓🎓
and now something completely different 😊

- 209 subjects (M=135, F=74)
- student of kinesiology
- Aged 21.7 years
- dominantly in range from 19 to 25 years
- only four subjects aged from 26 to 28 years

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<td>28.0</td>
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<tr>
<td>Total</td>
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</table>
• 43 items pool of Attitudes toward JUDO evaluated on five point scale (Žanetić, 2019)

and

Subjects relation to JUDO on seven point scale - **ODNOS** (Žanetić, 2019)

• 1) Mrzim judo (I hate judo)
• 2) Ne volim judo (I don’t like judo)
• 3) Judo mi se ne sviđa (Judo is not attractive to me)
• 4) Niti volim niti ne volim judo (I do not like nor dislike judo)
• 5) Judo mi se sviđa (Judo is attractive to me)
• 6) Volim judo (I like judo)
• 7) Obožavam judo (I admire judo)
GOAL

• Two short alternate/parallel scales evaluated to subjects relation to JUDO
• CENTROID method of clustering to recognize pairs of similar items in the first stage
**HIERARCHICAL CLUSTER ANALYSIS**

Dendrogram using Centroid Method

Rescaled Distance Cluster Combine
### Principal component FormA

<p>| | | |</p>
<table>
<thead>
<tr>
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<td>j12</td>
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<td>j36</td>
<td>.600</td>
<td>j36</td>
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<td>.581</td>
<td>j20</td>
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<tr>
<td>j2</td>
<td>.569</td>
<td>j2</td>
</tr>
<tr>
<td>j14</td>
<td>.563</td>
<td>j14</td>
</tr>
<tr>
<td>j3</td>
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### Principal component FormB

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<tr>
<td>rj16</td>
<td>rj41</td>
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<td>j6</td>
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<td>j30</td>
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<td>j18</td>
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<td>j20</td>
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<td>j14</td>
<td>rj7</td>
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</tr>
<tr>
<td>rj3</td>
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<td>j24</td>
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<td>rj24</td>
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<tr>
<td>j39</td>
<td>-.774</td>
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<tr>
<td>j28</td>
<td>.725</td>
<td>j28</td>
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<td>j17</td>
<td>-.722</td>
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<td>vrijednost</td>
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</tr>
<tr>
<td>1</td>
<td>Svojoj djeci neću dopustiti da se bave judom</td>
<td>0.709</td>
</tr>
<tr>
<td>2</td>
<td>Nikada se ne bih bavio/la judom</td>
<td>0.752</td>
</tr>
<tr>
<td>3</td>
<td>Zaobilazim judo u širokom luku</td>
<td>0.693</td>
</tr>
<tr>
<td>4</td>
<td>Judo je plemenita vještina u kojoj se borci međusobno poštuju</td>
<td>0.660</td>
</tr>
<tr>
<td>5</td>
<td>Smatram judo manje upotrebljivim od drugih borilačkih sportova</td>
<td>0.644</td>
</tr>
<tr>
<td>6</td>
<td>Bavljenje judom razvija samopouzdanje i karakter</td>
<td>0.643</td>
</tr>
<tr>
<td>7</td>
<td>Ispunjuje me kada vidim dobro izvedenu judo tehniku</td>
<td>0.610</td>
</tr>
<tr>
<td>8</td>
<td>Volim pogledati isječke judo borbi na internetu</td>
<td>0.600</td>
</tr>
<tr>
<td>9</td>
<td>Judo razvija ljude i duhovno, a ne samo tjelesno</td>
<td>0.587</td>
</tr>
<tr>
<td>10</td>
<td>Čim budem mogao/la svoju djecu ću upisati na judo</td>
<td>0.587</td>
</tr>
<tr>
<td>11</td>
<td>Judo nije mjesto na Olimpijskim Igrama</td>
<td>0.583</td>
</tr>
<tr>
<td>12</td>
<td>Judo je super jer nas uči kako da se što bolje obranimo</td>
<td>0.581</td>
</tr>
<tr>
<td>13</td>
<td>Judo je sport prikladan za sve uzraste</td>
<td>0.569</td>
</tr>
<tr>
<td>14</td>
<td>Jako cijenim i poštujem judaše</td>
<td>0.563</td>
</tr>
<tr>
<td>15</td>
<td>Judo se bave samo divlji i agresivni ljudi</td>
<td>0.534</td>
</tr>
<tr>
<td>16</td>
<td>Ljudi u kimonu izgledaju smiješno</td>
<td>0.524</td>
</tr>
</tbody>
</table>

Crombach Alpha for Form A = 0.892
\sqrt{0.892}=0.9444
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<tr>
<th>Broj</th>
<th>Izmjena</th>
<th>Izjava</th>
<th>Pitanja korelacija</th>
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<tr>
<td>1</td>
<td>rj24</td>
<td>Judo je smiješan</td>
<td>0.731</td>
</tr>
<tr>
<td>2</td>
<td>rj39</td>
<td>Judo me uopće ne zanima, to je bezvezan sport</td>
<td>0.774</td>
</tr>
<tr>
<td>3</td>
<td>j28</td>
<td>Uživam u prakticiranju juda</td>
<td>0.725</td>
</tr>
<tr>
<td>4</td>
<td>rj17</td>
<td>Judo je neshvatljiv i dosadan</td>
<td>0.722</td>
</tr>
<tr>
<td>5</td>
<td>rj41</td>
<td>Uopće ne razumijem judo pravila i ne zanimaju me</td>
<td>0.683</td>
</tr>
<tr>
<td>6</td>
<td>j29</td>
<td>Užitak je svojim sposobnostima nadvladati protivnika</td>
<td>0.658</td>
</tr>
<tr>
<td>7</td>
<td>j21</td>
<td>Judo je više od sporta</td>
<td>0.650</td>
</tr>
<tr>
<td>8</td>
<td>j27</td>
<td>U judu je potrebno puno predanosti i truda, što pozitivno razvija osobine ličnosti</td>
<td>0.643</td>
</tr>
<tr>
<td>9</td>
<td>j33</td>
<td>Svatko bi se u jednom trenutku svog života trebao okušati u judu</td>
<td>0.633</td>
</tr>
<tr>
<td>10</td>
<td>j43</td>
<td>Judo je izvrstan jer potiče pravilan rast i razvoj djece</td>
<td>0.623</td>
</tr>
<tr>
<td>11</td>
<td>j18</td>
<td>Pozitivna načela juda su potpuno primjenjiva u životu</td>
<td>0.603</td>
</tr>
<tr>
<td>12</td>
<td>j31</td>
<td>Judo je zanimljiv sport u kojem svi imaju jednaku mogućnost za napredak</td>
<td>0.602</td>
</tr>
<tr>
<td>13</td>
<td>rj10</td>
<td>Nikad ne bih bio/la s nekim tko se bavi judom</td>
<td>0.598</td>
</tr>
<tr>
<td>14</td>
<td>rj7</td>
<td>Glupo je baviti se judom jer je opasan sport u kojemu su ozljede česte</td>
<td>0.530</td>
</tr>
<tr>
<td>15</td>
<td>j38</td>
<td>Kada je u blizini judo natjecanje, obavezno ga pođem pogledati</td>
<td>0.525</td>
</tr>
<tr>
<td>16</td>
<td>rj40</td>
<td>Judo je vještina u kojoj je cilj ozljediti protivnika</td>
<td>0.496</td>
</tr>
</tbody>
</table>

Crombach Alpha for Form B = 0.904
sqrt(0.904)=0.9508
Chi square Difference between these two correlation coefficients i.e.

Index of reliability JUSUM16A

0.9444

Index of reliability of JUSUM16B

0.9508

Chi square Difference between $r_1=0.9444$ and $r_2=0.9508$ is $\chi^2 = 0.40606$ with $p = 0.524$

Conclusion: Little or no real evidences against the null hypothesis
multivariete relations between forms A and B

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<tr>
<th>Correlation Type</th>
<th>Description</th>
<th>Value</th>
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<tr>
<td>Correlation</td>
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<tr>
<td>Correlation</td>
<td>K1formA and K1formB</td>
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<tr>
<td>Canonical Correlation</td>
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<td>Quasicanonical Correlation</td>
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<td>0.928</td>
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</table>
correlations between forms A & B, & ODNOS

Correlations between the summation score of 16 items of form A and summation score of 16 items of Form B scales of attitudes for Judo and criterion variable ODNOS.

Chi square Difference between these two correlation coefficients i.e. Correlation between JUSUM16A and ODNOS

| 0.741 |

Correlation between JUSUM16B, and ODNOS

| 0.698 |

respectively.

Chi square Difference between $r_1 = 0.741$ and $r_2 = 0.698$ is $\chi^2 = 0.82144$ with $p = 0.365$

Conclusion: Little or no real evidence against the null hypothesis
Correlations between the first principal component of 16 items of form A and the first principal component of 16 items of Form B and relations to the criterion variable ODNOS (personal relation to JUDO).

Chi square Difference between these two correlation coefficients i.e.

Correlation between $K_1$ form A and ODNOS

$0.719$

Correlation between $K_1$ form B and ODNOS

$0.693$

respectively.

Chi square Difference between $r_1 = 0.719$ and $r_2 = 0.693$ is $\chi^2 = 0.27709$ with $p = 0.599$

Conclusion: Little or no real evidences against the null hypothesis.
The following lines were read from file D:\9th psychometric symposium\pipol prot\CTT_parallel.spl:

Judo skala stavova - model paralelnih testova
Observed Variables jusum8a  jusum8b  jusum8c  jusum8d
Covariance Matrix from File judo.cov
Latent variable judo_a judo_b
Sample size 209
jusum8a = 1*judo_a
jusum8b = judo_a
jusum8c = 1*judo_a
jusum8d = judo_a
Equal Error Variances: jusum8a  jusum8c
Equal Error Variances: jusum8b  jusum8d
Set the error covariance between jusum8b and jusum8d free
Set the path from judo_a to jusum8b and path from judo_a to jusum8d to be equal
Path Diagram
End of Problem
Sample Size = 209

Judo skala stavova - model paralelnih testova

Covariance Matrix

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<tr>
<th></th>
<th>jusum8a</th>
<th>jusum8b</th>
<th>jusum8c</th>
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<td>jusum8b</td>
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<td>18.795</td>
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<tr>
<td>jusum8c</td>
<td>32.015</td>
<td>20.963</td>
<td>34.583</td>
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<tr>
<td>jusum8d</td>
<td>22.417</td>
<td>15.762</td>
<td>22.111</td>
<td>20.419</td>
</tr>
</tbody>
</table>

Total Variance = 111.405 Generalized Variance = 8122.835
Largest Eigenvalue = 98.071 Smallest Eigenvalue = 3.755
Condition Number = 5.111
Judo skala stavova - model paralelnih testova

Number of Iterations = 4

LISREL Estimates (Maximum Likelihood)

Measurement Equations:

\[ \text{justm}^a = 1.000 \cdot \text{judo}_a, \text{ ErrorVar.} = 4.081, R^2 = 0.887 \]
Standerr: (0.400)
Z-values: 10.198
P-values: 0.000

\[ \text{justm}^b = -0.676 \cdot \text{judo}_a, \text{ ErrorVar.} = 4.968, R^2 = 0.747 \]
Standerr: (0.257)
Z-values: 26.274
P-values: 0.000

\[ \text{justm}^c = 1.000 \cdot \text{judo}_a, \text{ ErrorVar.} = 4.081, R^2 = 0.887 \]
Standerr: (0.400)
Z-values: 10.198
P-values: 0.000

\[ \text{justm}^d = -0.676 \cdot \text{judo}_a, \text{ ErrorVar.} = 4.968, R^2 = 0.747 \]
Standerr: (0.257)
Z-values: 26.274
P-values: 0.000

Error Covariance for justm^d and justm^b = 1.123
(0.443)
2.537

Normed Fit Index (NFI) 0.992
Non-Normed Fit Index (NNFI) 0.998
Parsimony Normed Fit Index (PNFI) 0.827
Comparative Fit Index (CFI) 0.998
Incremental Fit Index (IFI) 0.998
Relative Fit Index (RFI) 0.991
Critical N (CN) 475.494

Root Mean Square Residual (RMR) 0.864
Standardized RMR 0.8303
Goodness of Fit Index (GFI) 0.984
Adjusted Goodness of Fit Index (AGFI) 0.969
Parsimony Goodness of Fit Index (PGFI) 0.492

Chi-Square for Independence Model (6 df) 860.704
P-Value for Test of Close Fit (RMSEA < 0.05) 0.515
Thank You very much for your attention!

See You next time !!!

Hrvoje Sertić

Dominik Žanetić

Franjo Prot