The LA Aggression Scale for Elementary School and Upper Secondary School Students: Examination of Psychometric Properties of a New Multidimensional Measure of Self–Reported Aggression

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The paper introduces a new multidimensional scale LA (lestvica agresivnosti [Aggression Scale]) for measuring self-reported aggression in elementary and upper secondary school students in Slovenia. The scale has been developed with a special focus on the school setting, using three elementary school samples (preliminary study: N=2777; main study: N=10427 and validity and test-retest study: N=191) representative of 4th and 8th grade students in Slovenia and one upper secondary school sample (N=3253) representative of the final year of upper secondary school in Slovenia. The exploratory analyses using principal component analyses (PCA) revealed a four-factor structure: verbal aggression, physical aggression, internal aggression and aggression towards authority that were interrelated. Confirmatory factor analyses (CFA) showed that the items of the scale formed four factors that were related to the higher order factor. The structure turned out to be stable over different age groups. The scale demonstrated adequate internal consistency, concurrent validity and test-retest stability.

Key words: aggression, school, psychometric property

Aggression, when present in childhood, leads to aggressive behaviour and other forms of maladaptive behaviour in adolescence and later on in adulthood (Flannery, Vazsonyi, & Waldman, 2007; Huessmann, 1994). Despite the fact that aggression is a relatively stable characteristic (Huesmann, Eron, Lefkowitz, & Walder, 1984; Olweus, 1979) there are always children who show a decrease in their level of aggression. The longer the aggressive behaviour persists, the harder it is to change (Connor, 2002). Therefore aggression needs to be targeted as early in the childhood as possible.

Aggressive behaviour has negative outcomes, both short-term and long-term ones, for children and adolescents that are aggressive (e.g. anxiety, exclusion, low educational achievement...) and also for the victims of their
aggressive acts (e.g. anxiety, depression, lower educational achievement, low self-esteem...) (Flannery et al., 2007; Huesmann, 1994). Both, aggressors and victims, are present in schools at the same time and both groups need help and intervention. The school system has the opportunity to identify and at the same time intervene with children’s and adolescents’ aggression. In order to deal with aggression of children and adolescents in schools, proper, psychometrically solid, measures for identifying aggressive children and adolescents are necessary to start with. In our opinion there is a need for measures of aggression developed especially for schools with special focus on screening process. In the review of relevant literature we established that instruments have been developed for evaluating aggression amongst special populations, such as psychiatric inpatients, incarcerated boys, or children with the attention deficit disorder. Some instruments have been developed to evaluate criminal or antisocial behaviour, rather than non-delinquent aggressive behaviour, which is more common in schools (Flannery et al., 2007). Also, some instruments have been developed to be used with college students (Buss & Perry, 1992). However, none of these scales have been adapted for the Slovene language. AQ (Aggression Questionnaire, Buss, & Perry, 1992), i.e. the aggression measure most frequently used in Slovenia, is not appropriate for elementary school children. Since some of the researches had pointed out that frequently used measures of aggression (e.g. AQ) or at least some of their items could be culturally biased (Vigil-Colet, Lorenzo-Seva, Codorniu-Raga, & Morales, 2005), we decided to design our own scale. We focused in particular on the school environment of elementary and upper secondary schools.

Aggressive behaviour disrupts the process of learning and affects the school climate, which is positively connected to students’ educational achievement (Brown, Anfara, & Roney, 2004; Hoy, Hannum, & Tschannen-Moran, 1998). There is a large amount of evidence of achievement and aggression being negatively correlated (Flannery, et al., 2007; Huesmann, 1994; Krall, 2003; Marjanović Umek & Zupančič, 2004; Schwartz, Gorman, Nakamoto, & McKay, 2006). Children who respond with aggressive behaviour in early childhood also frequently develop negative attitudes towards school, which is also strongly related to their lower school achievement (Huesmann, 1994). Besides all mentioned the reduction in aggressive behaviour in school is necessary because being surrounded by aggressive peers is an important predictor of aggressive behaviour being developed in non-aggressive students (Flannery et al., 2007; Huesmann, 1994).

The theoretical basis for our scale was based on the definition of aggression being behaviour that is intended to cause harm or one that actually causes harm, physical or psychological, and is directed to oneself or others (Renfrew, 1997). The items were firstly formed using the key expression in the definition: behaviour, since it is directly observable in oneself and others and thus provides us with the possibility to measure aggression. And secondly, also on the other important term: direction. Aggression can be directed towards important others, oneself, as well as objects. Aggression directed to important others (e.g. teachers,
classmates, parents) can take physical or verbal form (Flannery et al., 2007). In our cultural environment, aggression directed to oneself in the form of feelings of guilt, bad mood and pessimism is frequent (Čotar Konrad, 2005) and these items were therefore likewise included in the scale. Because of their important role as authority figures, parents were also included as important others besides the figures in the school setting.

The scale was designed to measure reactive aggression – reactive aggression is namely the one linked to negative outcomes in a school setting. It is related to a lower educational achievement, difficulties in social and cognitive functioning, anxiety etc. (Connor, 2002; Poulin & Boivin, 2000; Vitaro, Brendgen, & Barker, 2006). The scale only included direct forms of aggression since indirect forms are hard to measure with self-report measures (Archer, & Coyne, 2005). And again, direct forms of aggression are likewise the ones linked to negative outcomes and low levels of students’ achievement (Archer & Coyne, 2005; Connor, 2002).

Aggression can be measured with direct and indirect measures (Renfrew, 1997). Our scale belongs to the group of self-report measures that are indirect measures of aggression. That means that information about one’s aggression is gained through his or her self-evaluation. As opposed to projection techniques, self-evaluation measures offer more objectivity, validity, reliability and ease of use (Nunnally & Bernstein, 1994). However, a commonly mentioned criticism is that they give false and more socially acceptable answers. This problem is of special concern when more socially unacceptable behaviours (e.g. aggression) and characteristics are being measured and can be avoided by including the so-called lie scales or by assuring anonymity. In school setting also teachers’ and peers’ evaluation of one’s aggression is frequently used, especially to measure direct aggression in younger students (Flannery et al., 2007). Nevertheless the correlation coefficients between self evaluated aggression and aggression evaluated by others are low and it is recommended to use self-evaluation measures whenever possible. For instance Eron, Walder and Lefkowitz (1971, in: Buss & Perry, 1992) reported 0.33 correlation coefficient; Huesmann and colleagues (Huesmann et al., 1984) reported 0.40 correlation coefficient for males and 0.34 for females and Buss and Perry (1992) reported 0.31 correlation coefficients. The highest congruency can be found when measuring physical aggression (Buss & Perry, 1992).

The new scale is intended to be used by psychologists as part of the school counselling service. They are the ones dealing with aggressive individuals later on in intervention and treatment programmes, whereby a crucial connection between diagnostics and treatment can be made. Our goal was to develop a relatively short tool to be used as a screening tool by school counselling services to detect more aggressive pupils and students and direct them to more focused diagnostics and treatment of clinical psychologist. At this point such a screening tool does not exist in our country. The paper aims at presenting psychometric properties of newly developed scale.
Materials and Method

LA Aggression Scale. When developing the items, different types of aggressive behaviour (internal and external aggression) were listed and directed towards the teachers, peers, students themselves, parents and objects. Keeping in mind school surroundings and typical aggressive behaviour in schools we focused on authority figures (teachers and parents). Since internal aggression and self-directed aggression is a problem in Slovenia (high suicide rates) we added items measuring guilt, bad mood, self destruction and pessimism as indicators of internal aggression that could lead to suicidal behaviour (suicide is a maladaptive aggression turned towards self (Connor, 2002). The initial pool of items was besides the author evaluated by an experienced clinical psychologist dealing with children’s aggression. Out of 96 items 46 were used to form the first version. Again the content validation was made in cooperation with one experienced clinical psychologist and one experienced psychiatrist from the field of youth aggression. Selection was made depending on item content, PCA, reliability and sensitivity analyses. To control the effect of the item order three parallel forms of the scale were used. All three forms consisted of the same items, only the order was shifted. The first version of the scale (46 items) was tested in a preliminary study in an elementary school sample (sample 1). Based on the results of the preliminary study, the second version of the scale with 22 items was developed. The second version was tested on representative samples (samples 2 and 3). The second version was subjected to reliability and validity analyses (sample 4) and based on the results of CFA the final version of the scale with 18 items was developed. The scale was a Likert type scale (1 = totally disagree, 2 = disagree, 3 = something in-between, 4 = agree, 5 = totally agree). The development of the scale is presented in more detail in the Results section.

Aggression Questionnaire (Buss & Durkee, 1957; translated by Lamovec, 1988). AQ is commonly used for measuring aggression in Slovenia and throughout the world (Williams, Boyd, Cascardi, & Poythress, 1996). It was used together with LA in order to test the validity of the newly developed scale. The AQ questionnaire consisted of 75 self-rating items on a two-point scale (1 = agree, 2 = disagree) and measured physical aggression, verbal aggression, negativity, indirect aggression, irritability, hostility, suspiciousness and guilt. On the Slovenian sample, the questionnaire was found to be reliable (α = 0.82) (Lamovec, 1988).

Samples. The sampling process was adapted to TIMSS (Trends in International Maths and Science Studies), which is a large international comparative study measuring achievement in elementary school population (TIMSS) and in upper secondary school population (TIMSS advanced). The scale was administered together with the TIMSS study because TIMSS collects a rich array of students’, teachers’ and principals’ background information that are interesting for our further research on aggression-related factors. The target population for TIMSS in elementary schools are 4th and 8th grade students and for TIMSS Advanced students of the final year of upper secondary schools entering the university level of schooling. The TIMSS schools are randomly sampled out of the pool of all the schools in a country. In the sampled school, the classes are again randomly sampled using the WinW3S program (Olson, Martin & Mullis, 2008). On the class level, all of the students in a class are participating, as long as parental permission has been given (Japelj Pavešič, Svetlik, Kozina, Rožman, & Šteblaj, 2008; Japelj Pavešič, Svetlik, Kozina, & Rožman, 2009).

Different versions of the scales were used in different cycles of the TIMSS study. The first version of the scale (46 items) was administered together with the TIMSS field test in 2006, sample 1 (N = 2777; 1381 females and 1396 males) and the second version (22 items) in the TIMSS main study in 2007 on elementary school samples, sample 2 (N = 10501; 5268 females and 5209 males) and together with the TIMSS Advanced main study in 2008 on the upper secondary school sample, sample 3 (N = 3343; 1660 females and 1743 males). The elementary school sample consisted of two age modules (9 and 13 years of age) and the upper secondary school sample consisted of one age modus (19 years of age). The administration
took place in a classroom setting following TIMSS administration. The administrators were psychology students who had been trained for administration, had elementary psychometric knowledge and were well aware of the importance of anonymity and the need for all of the items in the scale to be answered. There was no time limit for completing the scale. Test-retest stability and validity were additionally tested on a convenience sample of an elementary school sample, sample 4, by trained school psychologists (N=191; 84 females and 107 males).

**Results**

The scale was developed in several steps in four independent studies. The results are presented in their shorter versions with an emphasis on final remarks.

**Preliminary study**

The correlation matrix of the LA first version aggression items was subjected to PCA and oblimin rotation (KMO=0.97; χ² [1891] =51973.45; p<.001). In light of the expectation that several aggression components were correlated (Lamovec, 1988; Buss & Perry, 1992), an oblimin rotation was used. To choose the number of final components, a combination of different criteria was used: the Kaiser-Guttman criteria, Cattel’s scree test and parallel analyses. The Kaiser-Guttman criteria revealed seven components explaining 53.62% of the total variance (eigenvalues with % of explained variance in brackets: 15.04 (32.70%); 2.77 (6.03%); 1.67 (3.62%); 1.53 (3.33%); 1.37 (2.98%); 1.21 (2.63%); 1.07 (2.33%)); the scree test revealed a two-component solution and the parallel analysis revealed a five-component structure. Since all of the methods revealed different numbers of extracted components, the decision was made to analyze the maximum number of components, which was seven. One item was eliminated because it was the only one with high loading on the seventh component. When a six-component structure was left, items that had low loadings or were highly loaded on more than one component were excluded. The six components were measuring verbal aggression VA (M=50.05; SD=17.9), internal indirect aggression IA-I (M=33.25; SD=14.9), aggression towards authority AA (M=30.87; SD=13.6), physical aggression PA (M=48.43; SD=14.9), internal direct aggression IA-D (M=10.01; SD=6.18) and hostility H (M=7.59; SD=4.04). The components were significantly related (r average = .26). The scales sensitivity to the differences in measured aggression was in accordance with the descriptive statistics (M, SD and Q) and the sensitivity coefficients (corrected item to total correlations) adequate (.26 < raverage < .74; r average = .56). The internal consistency of the components was, with the exception of IA-D, adequate VA, α=0.844; IA, α=0.801; AA, α=0.860; PA, α=0.847; IDA, α=0.544; H, α=0.839). The α did not increase with the deletion of single items. In the second version of the scale, items were included that were highly loaded on the first six components. To assure content validity, emphasis was placed on the content of the components.

**Main study**

In the main study, the second version of the scale was administered on elementary school students and on the upper secondary school sample. The data from both samples was randomly split in halves. The first half of each sample
was used for PCA and the second half of each sample for CFA. The PCAs were replicated with the second version due to a larger sample size. The structure was confirmed by means of CFA using Mplus (Muthen & Muthen, 1999).

**PCA.**

The correlation matrix of the second version aggression items on the first half of the elementary school sample ($N=5236$) was subjected to PCA and oblimin rotation ($KMO=0.96; \chi^2 [300] =105437; p<0.001$). The Kaiser-Guttman criteria revealed four components explaining 56.50 % of the total variance (eigenvalues with % of explained variance in brackets: 8.59 (39.06%); 1.57 (7.14%); 1.25 (5.67%); 1.02 (4.64%)); the scree test revealed one principal component not followed by an obvious break in eigenvalues function and the parallel analysis showed a three-component solution. According to the method used, the number of extracted components was different, and the rotated component matrixes were therefore further analyzed on the maximum number of extracted components, which was four. Two items were eliminated based on their high loadings on two components. The results showed the second version of the scale measures: PA (4th grade: $M=19.80; SD=8.42$; 8th grade: $M=25.33; SD=7.65$), VA (4th grade: $M=15.54; SD=5.95$; 8th grade: $M=17.30; SD=5.19$), IA (4th grade: $M=6.39; SD=3.30$; 8th grade: $M=8.28; SD=3.26$) and AA (4th grade: $M=6.63; SD=3.39$; 8th grade: $M=8.93; SD=3.38$). The results were congruent to the ones gathered in the preliminary study. The direct and indirect types of internal aggression that formed one component in the preliminary study were here combined into one component which consisted of both direct and indirect types. The $H$ component from the first version was in the second version part of components PA and VA.

The components were significantly related ($r_{average}=.38$).

On the first half of the upper secondary school sample ($N=1670$), PCA and oblimin rotation extracted five components accounting for 57.06 % of the total variance (eigenvalues with % of explained variance in brackets: 6.62 (30.09%); 2.10 (9.56%); 1.63 (7.41%); 1.17 (5.34%); 1.03 (4.66%)). The scree test indicated one principal component not followed by an obvious break in eigenvalues function. There were only two items related to the fifth component, therefore this component was eliminated. What was left was a four-component structure congruent with the structure from the elementary school sample and the results of the parallel analysis. As had been the case with the elementary school students’ sample, the scale measured PA ($M=15.50; SD=4.07$), VA ($M=9.24; SD=2.64$), IA ($M=9.85; SD=2.52$) and AA ($M=7.92; SD=2.45$).

Overall, the content of the components was the same in both samples. Nevertheless there were some of the items that were related to different components in different samples. Since the aim was to develop the scale that measures aggression in elementary and in upper secondary school students in the final version only the items that were loaded on the same components in both samples were kept. The final version consisted of 18 items. The final item loadings in the first four factors are for both samples presented in table 1.
### Table 1. Factor loadings of the final version of the LA scale

<table>
<thead>
<tr>
<th>item</th>
<th>Elementary school sample</th>
<th>Upper secondary school sample</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PA</td>
<td>IA</td>
</tr>
<tr>
<td>I fight a lot when I’m in school</td>
<td><strong>0.829</strong></td>
<td>0.125</td>
</tr>
<tr>
<td>I like fighting very much</td>
<td><strong>0.840</strong></td>
<td>0.019</td>
</tr>
<tr>
<td>If I notice that there’s going to be a fight, I stay nearby</td>
<td><strong>0.461</strong></td>
<td>-0.029</td>
</tr>
<tr>
<td>If nobody sees me, I try to hurt my classmates (e.g. push them, hit them, pinch them...)</td>
<td><strong>0.530</strong></td>
<td>0.040</td>
</tr>
<tr>
<td></td>
<td><strong>0.635</strong></td>
<td>-0.007</td>
</tr>
<tr>
<td>Sometimes I get so angry I destroy the first object that’s within my reach</td>
<td><strong>0.216</strong></td>
<td>0.072</td>
</tr>
<tr>
<td>A lot of people annoy me</td>
<td>0.122</td>
<td>0.552</td>
</tr>
<tr>
<td>My classmates have better luck then I do</td>
<td>-0.043</td>
<td><strong>0.789</strong></td>
</tr>
<tr>
<td>I’m often in a bad mood</td>
<td>0.026</td>
<td><strong>0.753</strong></td>
</tr>
<tr>
<td>I often think that all the bad things happen to me</td>
<td>-0.033</td>
<td><strong>0.709</strong></td>
</tr>
<tr>
<td>If someone offends me, I offend him right back</td>
<td>0.368</td>
<td>0.060</td>
</tr>
<tr>
<td>When I argue with someone I tend to get very loud</td>
<td>0.038</td>
<td>-0.056</td>
</tr>
<tr>
<td>If someone screams at me, I scream back</td>
<td>0.047</td>
<td>-0.077</td>
</tr>
<tr>
<td>If someone makes fun of me, I go crazy</td>
<td>0.201</td>
<td>0.246</td>
</tr>
<tr>
<td>If I don’t agree with the teachers’ rules, I break them, I go crazy</td>
<td>0.377</td>
<td>0.074</td>
</tr>
<tr>
<td>I like to provoke my parents a lot</td>
<td>0.120</td>
<td>0.079</td>
</tr>
<tr>
<td>Sometimes my parents get on my nerves for no particular reason</td>
<td>-0.212</td>
<td>0.110</td>
</tr>
<tr>
<td>If I don’t agree with my parents’ rules, I break them</td>
<td>0.065</td>
<td>0.030</td>
</tr>
</tbody>
</table>

The components were significantly related in both samples. In the elementary school sample, the correlation coefficients ranged from .31 to .48 with an average of 0.38 and in the upper secondary school sample from .22 to .38 with an average of .31. To test the assumption that components in both samples were highly related because of the one general component of aggression lying underneath, a second order PCA was used on the elementary school sample (KMO=0.799; χ²[6]=7.621; 𝑝<0.001) and on the upper secondary school sample (KMO=0.742; χ²[6]=1.405; 𝑝<0.001). As an input, the sum of items was
used in each of the components. The data on both samples showed one principal component of the second order with which all the components were highly loaded. In the elementary school sample, component loadings ranged from 0.729 to 0.865 and the second order component accounted for 67.94% of the total variance. In the upper secondary school sample, component loadings ranged from 0.613 to 0.814 and the second order component accounted for 56.07% of the total variance.

**CFA.**

A CFA was conducted to determine the adequacy of the fit of the model proposed by the PCA. This technique solves a series of hypothesized regression equations to generate an estimated covariance matrix. This estimated matrix was then compared with the observed sample covariance matrix to determine whether the model fit the data (Byrne, 1998). The accuracy of the fit was evaluated using $\chi^2$ statistic which gets smaller as the model fit improves. Since $\chi^2$ statistic tends to be biased on large samples additional fit indexes were used: a comparative fit index (CFI), a Tucker Lewis index (TLI), a standardized root mean square residual (SRMR), and a root mean square approximation (RMSEA). Akaiki’s information criterion (AIC) was used to compare the fit of parallel models (Byrne, 1998; Hu & Bentler, 1999).

The given structure was analysed with CFA on the second half of the elementary ($N=5265$) and the second half of the upper secondary school sample ($N=1671$). Each item was constrained to load only one factor using results from PCA from the first halves of the samples. The model was designed to reflect the hierarchical structure of the four-factor model (4F). As the exploratory analyses on both samples and in the preliminary study indicated a strong first component, the one-factor model (1F) was also considered. The factor loading matrix was, in this model, set to reflect loadings on one factor only.

The minimum fit function $\chi^2$ test was significant ($p<.001$) on both samples and in both models (elementary school sample: 4F: $\chi^2 [130] = 3208.668$; 1F: $\chi^2 [208] = 7822.154$; upper secondary school sample: 4F: $\chi^2 [130] = 2037.728$; 1F: $\chi^2 [208] = 3965.357$), which was expected given that the study was based on a very large sample size and that the $\chi^2$ is highly dependent on sample size (Hu & Bentler, 1999). Other indicators however indicated a better fit of the hierarchical 4F model (elementary school sample: CFI=0.912; TLI=0.897; RMSEA=0.067; SRMR=0.047; upper secondary school sample: CFI=0.895; TLI=0.876; RMSEA=0.076; SRMR=0.049) than in the 1F model (elementary school sample: CFI=0.832; TLI=0.813; RMSEA=0.084; SRMR=0.057; upper secondary school sample: CFI=0.835; TLI=0.817; RMSEA=0.084; SRMR=0.056) and a slightly better fit overall in the elementary school sample. The models were also compared with AIC indexes indicating a better fit of the 4F model (elementary school sample AIC= 262638.983; upper secondary school sample AIC=128675.926) compared to the 1F model (elementary school sample AIC=322659.600; upper secondary school sample AIC=157964.024) in both samples.
To compare the model, the AIC index was also used. AIC are comparative fit indexes. Compared to the 1F model, the 4F model showed a better fit on all fit indexes. AS SRMR <0.05 proves an adequate fit (Hu & Bentler, 1999). <0.08 is considered a reasonable fit and an RMSEA <0.05 an excellent fit (Hu, &Benter, 1998). The 4F model showed a good fit on representative elementary and upper secondary school samples. TLI and CFI indexes values <0.90 indicate an acceptable model and values>0.95 indicate an excellent model. An RMSEA <0.08 is considered a reasonable fit and an RMSEA <0.05 an excellent fit (Hu, &Benter, 1998). AS SRMR <0.05 proves an adequate fit (Hu & Bentler, 1999). Compared to the 1F model, the 4F model showed a better fit on all fit indexes. To compare the model, the AIC index was also used. AIC are comparative fit indexes used to compare fit models with lower AIC values showing a better fit (Byrne, 1998).

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Sensitivity of the final version of the scale was analyzed by means of descriptive statistics, sensitivity coefficients and the method of high and low groups. The method of high and low groups divides samples into three groups according to the 33rd and 66th percentile on the component sums and compares means between those groups on each item. All mean differences were significant (p<. 001), with
effect sizes ($\eta^2$) in the elementary school sample ranging from 0.343 to 0.579 and in the upper secondary school sample from 0.285 to 0.548. Sensitivity coefficients were adequate in both samples (elementary school sample: $r_{PA- average} = .60; r_{IA- average} = .51; r_{VA- average} = .53; r_{AA- average} = .59$; upper secondary school sample: $r_{PA- average} = .58; r_{IA- average} = .52; r_{VA- average} = .49; r_{AA- average} = .49$). All items were found to have sufficient sensitivity to differentiate between students with different levels of aggression. The internal consistency of the scores was adequate. For the elementary school sample, Cronbach’s $\alpha$ ranged from 0.724 to 0.830 with an average of 0.768 and for the upper secondary school sample, from 0.702 to 0.808 with an average of 0.734.

**Validity and the test-retest study**

For validity and the test-retest study, a convenience elementary school sample was used ($N=191$, 84 females and 107 males) on which both scales measuring aggression were applied. Descriptive statistics for the validity and test-retest study: PA ($M=11.42; SD=5.11$); VA ($M=10.70; SD=3.96$); IA ($M=10.78; SD=3.58$); AA ($M=7.68; SD=3.69$). To examine concurrent validity, Pearson correlations between aggression scores on LA and AQ were calculated. The scales were highly ($r=.69$) and significantly related ($p<.001$). The high correlation coefficient on the level of general aggression of the measures proved that both measures were measuring the same construct. The correlation matrix on the dimensional level is presented in the table 2.

<table>
<thead>
<tr>
<th>Dimension</th>
<th>PA</th>
<th>VA</th>
<th>IA</th>
<th>AA</th>
</tr>
</thead>
<tbody>
<tr>
<td>physical aggression</td>
<td>.569**</td>
<td>.402**</td>
<td>.369**</td>
<td>.343**</td>
</tr>
<tr>
<td>verbal aggression</td>
<td>.579**</td>
<td>.625**</td>
<td>.328**</td>
<td>.487**</td>
</tr>
<tr>
<td>negativity</td>
<td>.363**</td>
<td>.435**</td>
<td>.339**</td>
<td>.292**</td>
</tr>
<tr>
<td>indirect aggression</td>
<td>.592**</td>
<td>.600**</td>
<td>.386**</td>
<td>.571**</td>
</tr>
<tr>
<td>irritability</td>
<td>.319**</td>
<td>.484**</td>
<td>.401**</td>
<td>.317**</td>
</tr>
<tr>
<td>hostility</td>
<td>.272**</td>
<td>.362**</td>
<td>.511**</td>
<td>.242**</td>
</tr>
<tr>
<td>suspiciousness</td>
<td>.282**</td>
<td>.346**</td>
<td>.510**</td>
<td>.217**</td>
</tr>
<tr>
<td>guilt</td>
<td>-.097</td>
<td>-.011</td>
<td>.169*</td>
<td>-.074</td>
</tr>
</tbody>
</table>

Notes. ** $p<.001$; * $p<.05$

Additional test of scales’ validity are significant age and gender differences in line with the aggression theory. The analyses were conducted on the sample 2 and on the sample 3 data. The gender differences were significant in the groups of elementary school students but not in upper secondary school students. Male elementary school students, 4th and 8th grade, were more aggressive compared to female elementary school students. 8th grade elementary school students were more physically, verbally, internally aggressive and more aggressive towards authority when compared to 4th grade elementary school students. Secondary school students were significantly less physically and verbally aggressive and on the other hand more internally aggressive when compared to both groups of elementary school students. Secondary school students reported higher level of aggression towards authority then 4th grade students and lower level then 8th
grade students do. The results were congruent with the findings of the research literature indicating higher aggression of males when compared to females and different developmental paths for different types of aggression in question. (Kozina, 2012).

Reliability was examined by means of the test-retest method and the measure of internal consistency (Cronbach’s α). The test-retest method applies the same measure after a certain period of time to test the stability of the results in time (Nunnally & Bernstein, 1994). The test-retest method was used with a one-month period on a convenience sample of elementary school students in Slovenia. Aggression is, in time, a relatively stable individual characteristic (Huesmann et al., 1984; Olweus, 1979) and changes in the level of aggression in a one-month period are thus not to be expected. The first students answered the final version of the scale and after a month the same students answered the same scale again. The test-retest stability was estimated with Persons’ correlation coefficients. All coefficients were moderately high ($r_{PA}=.62; r_{VA}=.70; r_{IA}=0.59; r_{AA}=.57$) and significant ($p<.001$).

DISCUSSION

The current study evaluated the psychometric properties of the newly developed LA aggression scale with data on three independent samples of elementary and one of the upper secondary school students.

The scale was developed to evaluate self-reported aggressive behaviour. PCA revealed a four-factor structure measuring three types of aggression: internal aggression (IA), external aggression (VA and PA) and aggression towards authority (AA). Internal aggression was measured using one factor which was called internal aggression and combined both direct and indirect forms. Indirect and direct forms of internal aggression, which were separate factors in preliminary studies, showed low internal consistency and were at a later time in the main study combined in one single factor. Internal aggression is of special importance in our cultural surroundings due to high suicide rates in our country. Therefore is of our special interest to detect and help these children in the school surrounding in order to prevent more severe aggressive acts towards one self. As expected the validity tests showed highest correlation of IA factor with the AQ factors hostility, suspiciousness and irritability. These are all types of behaviour that are basically internal states. Hostility was also part of our scale in the preliminary analyses, whereas later on in the final version, it became part of other factors, namely IA factor. External aggression can opposed to internal aggression be more easily observed by others (e.g. teachers). LA scale measure external aggression using two factors: physical aggression (PA) and verbal aggression (VA). They are two different types of external aggression which is also evident from the pattern of inter correlations of LA and AQ scales. PA is highly correlated with physical and verbal aggression and also with indirect
aggression. And at the same time VA is the highly related to physical aggression, verbal aggression and indirect aggression. Both types of external aggression are also highly correlated with indirect aggression that was not directly measured in the LA. Therefore we can assume that LA factors PA and VA to some extent measure also indirect types of aggression. Aggression towards authority was a separate factor revealed because of the special school setting that the scale had been constructed for. In the school setting, authority figures are namely strongly present and aggression towards them is more obvious than in other settings. AA factor is highly correlated to AQS’ indirect aggression and also to AQS’ verbal aggression. Since aggression towards authority is in the school system highly sanctioned it is expressed as indirect aggression or verbal aggression (not physical aggression). The aggression towards authority factor is an especially useful tool in the school setting since it provides information on aggression that is not acted out due to school restrictions but has negative effects on an individual nevertheless.

The second-order PCA revealed the possibility of the higher-order aggression factor. CFA confirmed a four dimensional hierarchical structure of aggression. In our case, the four dimensional hierarchical model showed a better fit in the elementary and the upper secondary school sample. The results showed a slightly better fit on the elementary school sample, most likely due to preliminary analyses done on the elementary school sample, which is one of the limitations of the present study. The items were selected based on preliminary analyses conducted on the elementary school sample, not the upper secondary school sample even compared to one dimensional model of aggression. The results could be different if the upper secondary school sample had also been included in preliminary analyses. The LA structure is in line with other research revealing hierarchical multidimensional structure of aggression (Archer & Coyne, 2005; Buss & Perry, 1992; Fossati, Maffei, Aquarini, & Di Ceglie, 2003). Since the four factor structure of our scale is believed to measure a common underlying construct of aggression, their scores can be summed up to obtain a total score, which indicates the subject’s overall level of aggressiveness in a school setting. The general factor of aggression was also revealed in the studies by Buss and Perry (1992), who also established a hierarchical four factor structure, however their questionnaire measured verbal aggression and physical aggression together with hostility and anger. Anger is known to be the emotional basis of aggression and hostility the cognitive basis of aggression. In later versions of the same questionnaire, only physical and verbal aggressions were kept (Fossati et al, 2003). Similarly, Underwood (Archer & Coyne, 2005) established a hierarchical four factor structure of aggression. His special interest was indirect aggression; therefore he placed indirect and social aggression besides physical and verbal ones.

Psychometric properties of LA scale found to be adequate. Across samples, LA scale showed adequate internal consistency and stability in time. High coefficients of internal consistency are important because future researchers will need a smaller sample size to detect meaningful differences (DeVellis, 1991).
Construct validity was primarily tested with exploratory analyses of the structure, which proved to be similar in different studies and in different samples. The structure was confirmed with CFA. Age and gender differences are in line with other research and aggression theory and therefore can be treated as one of the validity proofs. Additionally, evidence of convergent validity was a high correlation between aggression measured by the LA scale and aggression measured by the AQ questionnaire. Given that the LA aggression scale is a recently developed measure, additional studies are needed to provide further evidence of reliability and validity. The external validity of the scale was tested using AQ questionnaires for measuring adult aggression. The AQ was chosen because it has been widely used in Slovenia. The lack of instruments for measuring aggression in schools by school psychologists is one of the reasons for developing a new scale. Nevertheless, additional validity test using measures of children’s aggression are needed and are planned in the future research.

The results are representative for three populations in Slovenia: 4th grade elementary school students, 8th grade elementary school students and final-grade upper secondary school students entering the university level of education. In elementary schools, the plan is to administer the scale in other grades as well. As for the upper secondary level, other types of upper secondary schools should also be included. The fact is that our upper secondary school sample only includes students of the final year and only students of a special type of schools that prepare students for university. Since these types of schools are not the most problematic as far as aggressive behaviour is concerned, it is for the sake of further research and scale development important to include vocational upper secondary schools as well. The application of the scale to other contexts in addition to schools is not of our special interest since our aim was to develop a special scale for the school setting. Another possible limitation is the use of the self-report, however, some studies nevertheless showed that the construct validity of self-reports is superior to the validity of other measurement approaches (Howard, 1994) and self-reports have the great advantage of ease-of-use and inexpensive data collection.

Even with these limitations, the present data on reliability and validity of the scale are generally in line with the theoretical assumptions and show the need to measure aggression in the school setting with measures developed for these settings. The scale can be used as a tool to detect individuals that are more aggressive and provide them with additional help and inclusion in various aggression prevention programmes. The factor structure gives us the opportunity to analyze the aggression in more detail and focus prevention programmes on specific types of aggression (e.g. internal, verbal physical). In this sense the negative outcomes of aggressive behaviour, for both aggressors and their victims, mentioned in the introduction could be prevented. During its development, the scale became shorter and was therefore easier to use. The scale provides a measure to screen aggressive behaviour in schools, independent of whether aggression is an expression of a serious psychological disorder or a passing state of learned behaviour.
REFERENCES


