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Alexandra PREDOIU, Radu PREDOIU, Georgeta MITRACHE, Vasilica GRIGORE, Mihaela PĂUNESCU

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Group Dynamic in Handball Teams – the Importance of Intellectual Abilities or How to become the Informal Leader

Alexandra PREDOIU¹, Radu PREDOIU², Georgeta MITRACHE³, Vasilica GRIGORE⁴, Mihaela PĂUNESCU⁵

Abstract: To be popular in a group or in a sports team can be important, but to be rejected must be avoided. Most functional groups and teams have a leader, which can be designated by the coach (formal leader) or elected by the team members (informal leader). The present research focused on identifying important cognitive abilities of the informal leader in the case of preadolescent handball players grouped, after performing a sociometric assessment in terms of the sport-related competence, in three categories: “popular”, “neglected/controversial” and “rejected”. Knowing cognitive dimensions specific to athletes who score high for the preferential status index (PSI) after performing a sociometric assessment, we could be able to intervene, facilitating the social integration of the rejected or neglected/controversial athletes in sports teams. 60 female handball players, from four handball teams from Romania, participated at the study. Each team comprised 15 athletes and represented the „reference group“, within which status was determined. The cognitive dimensions explored through our study were the verbal and nonverbal intelligence and the topographical memory. In the case of the preadolescent athletes (subsequent to the application of one-way ANOVA) significant differences were found between the results of the investigated groups (“popular”, “neglected/controversial” and “rejected”), for: topographical memory efficiency and verbal and nonverbal skills. The results emphasize important intellectual dimensions of the informal leader that may positively influence a successful social integration of the athletes in the team.

Keywords: Verbal and nonverbal intelligence, topographical memory, sociometry, informal leader, handball.

¹ N.U.P.E.S., Bucharest, Romania, alexandra.predoi@yahoo.com.
² N.U.P.E.S., Bucharest, Romania, radu.predoi@yahoo.com.
³ N.U.P.E.S., Bucharest, Romania, georgetamitrache@gmail.com.
⁴ N.U.P.E.S., Bucharest, Romania, liligri@yahoo.com.
⁵ N.U.P.E.S., Bucharest, Romania, misu.paunescu@yahoo.com.
1. Introduction

Most preteens and teenagers want to be popular in a group or in a sports team and nobody wants to be rejected by peers. The difference between a group and a sports team (a handball team) is that the team represents more than a group of people with common goals and objectives. The superiority of the team lies in the fact that individual contributions are considered to be complementary, the action of individuals is interdependent and coordinated and each member has a specified particular role (Zlate, 2004, p. 399). In team sports, members interact and intervene to improve team functioning. Contemporary wisdom (Griffin, Phillips & Gully, 2014, p. 265) states that most functional groups and teams have a leader, which can be designated by the coach (formal leader) or elected by the team members (informal leader). The latter, the informal leader is the individual that has power among the group members earned through competent work, expertise on the field, athletic abilities and other skills that make him to be perceived as being the best player in the team (Dahlkemper, 2013, p. 138).

In a sport group we can appreciate and understand the dynamics of the relationships between athletes by observing the collaboration between them during the training tasks, training sessions, leisure time (extra-sporting activities), to which we can associate the individual or collective conversation. An appreciation method with a higher degree of precision and rigor is the sociometric method (Șerban, 1987, p. 114). A considerable body of research evidence was gathered over many decades of measuring children’s and adolescent’s peer popularity using the sociometric technique (Peterson, 2014, p. 255). Sociometry is generally defined as the measurement of social relations in groups (Asher & Gottman, 1981, p. 91). Authors (Moreno, 1960, p. 734) appreciate the sociometric test as an instrument that examines social structures by measuring the attractions and repulsions that occur between individuals in a group. Social status, popularity, social acceptance or rejection are the most common constructs that are assessed with sociometrics (Spodek & Saracho, 1994, p. 82).

The human mind cannot function without the support of a memory system, which involves storing and processing information, in order to perform cognitive tasks (Cornoldi & Vecchi, 2003, p. 75). Topographical memory, can be described as the memory for visual and spatial information (Andrewes, 2016, p. 372) being the ability to retain and operate with geographical or topographical relationships (Mendoza & Foundas, 2008, p. 685). Topographical memory is decisively affected by the quality of the psychomotor stimulation in childhood, by systematically practicing physical exercises specific to various types of sports. Research studies show that
children’s performance concerning topographical memory is poor before 8 years of age, both for orienting and for recognising routes, but 12-year-olds can perform similarly to adults (Cornell, Heth & Alberts, 1994). Topographic representations (as a version of spatial representations) refer to the spatial layout of objects on a field surface, involving relationships of position (of some elements with respect to others), of direction and of distance (Turcu, 1975).

Along the time researchers discussed about fluid and crystallized intelligence (Horn & Cattel, 1966). While fluid intelligence describes abilities that are not dependent on prior education and experience (are innate), crystallized intelligence describes competences that rely on knowledge, skills acquired from experience. Traditionally, the tests measuring fluid intelligence are nonverbal, whereas tests considered to measure crystallized intelligence are verbal. However, it seems that “crystallized” and “fluid” are not very good labels for the verbal and nonverbal tests. As specialized literature stated “it is incorrect to assume that tests of nonverbal fluid reasoning are somehow measuring intelligence in its purest form, completely divorced from experience and culture” (Kaufman, 2013, p. 192). Similarly, a verbal test (e.g., vocabulary test) or a general knowledge test often involves deduction, inference, demanding fluid reasoning capacities. Yet, as the author mentions, fluid reasoning requires inferring underlying patterns based on minimal data, while tasks implying a well-organized knowledge base call fewer demands on fluid reasoning.

2. Problem Statement

Informal leaders, in sports context are those leaders whom the team members themselves choose to follow and to which everyone looks when a decision has to be made or when a difficult situation appears during training or competitions (Griffin, 2007, p. 354). The informal leader leads by example, hard work and dedication (Weinberg & Gould, 2015, p. 158). Although within a team, each member has a role to play in helping the team achieve its goals (Pride, Hughes & Kapoor, 2014, p. 294), informal leaders hold key roles: they are motivators – inspiring others to accomplish their objectives (Griffith & Dunham, 2015, p. 78), as agents of execution – they drive the team forward obtaining results and succeed in making things happen (Smart, 2010, p. 36).

Researchers proposed two wide types of sociometric criteria: emotional and reputational (Moreno, 1934, p. 20). Emotional criteria involved personal, subjective evaluations, while reputational criteria referred to the objective assessment of an individual’s behaviour or reputation (Smith...
& Hart, 2010, p. 324). Our approach was oriented in the direction of the study of the “task-specialist” features and also, towards trying to find an answer to the question: what intellectual abilities conspire to make an athlete popular versus rejected by the team? In our study we investigated the visual mental map (topographical representations without any kinesthetic data) which directly reflects the person’s experience in completing a track, the verbal and nonverbal intelligence. Specialists assert the importance of spatial memory in team sports based on the understanding/ awareness of the complex situation, reported to the athletes own action (Epuran, Holdevici & Toniţa, 2001, p. 83).

3. Research Questions/Aims of the research

The current study focused on exploring and identifying important intellectual abilities of the informal leaders in the case of handball teams. Knowing cognitive dimensions specific to athletes who score high for the preferential status index (PSI), after performing a sociometric assessment in terms of the sport-related competence, we could be able to intervene, facilitating the social integration of the rejected or neglected/ controversial athletes in sports teams. We hypothesized that preadolescent female handball players with high scores for PSI would achieve significantly better performances in the case of verbal and nonverbal intelligence and for topographical memory (forming a more accurate short-term visual mental map), compared to athletes which registered low scores for PSI.

4. Research Methods

4.1. Participants

A sample of 60 preadolescent female handball players, aged between 11-12 years old (mean age = 11.43 years, SD = .50 years) from four different Romanian handball teams have participated at the research. Each team comprised 15 athletes, legitimated at Scholar Sports Club No. 6, Bucharest, having a training experience comprised between 3 and 4 years and represented the „reference group“, within which status was determined. After the peer assessment of reputation (in terms of performance, competence and abilities) the athletes were sorted in three groups, according to the individual status scores: P (n = 25) - popular athletes, including the informal leaders from each team, NC (n = 16) - neglected and controversial and REJ (n = 19) - the rejected athletes.
4.2. Materials

The apparatus and the materials used in our study were: the computer – with a support role in computerized testing (enabled the participants to visualize the standardized instruction on the computer’s monitor); tests: the battery of verbal and nonverbal skills BIG and MT (topographical memory) test, belonging to the PSISELTEVA system, designed by the Romanian company RQ Plus.

The BIG test which can be applied to 11-12 years old participants was used for assessing the verbal and nonverbal intelligence of the athletes. From the eight tests that compose the battery of verbal and nonverbal skills BIG, we selected four paper-and-pencil tests. In order to investigate the verbal skills we used: “Opposite Words” (e.g. “Warm: Wet–Cold–Frozen–Mist–Mud”) and “Words Relations” (e.g. “Ignorance is for Learning what Poverty is for: Laziness–School–Wealt–Hope–Pity”) subtests. For the assessment of the nonverbal skills we used: “Opposite Figures” (the participants were asked to identify, from four figures, the one which differs most from the model) and “Geometric Differences” (athletes must choose from four figures, the one which is different from the rest) subtests. Each of the four subtests comprised 15 tasks that had to be completed in 4 minutes. The total time of the test was 16 minutes. The final result comprised the scores obtained at all 4 tests.

The MT (Topographical memory) test is elaborated in the form of a labyrinth itinerary, with many possible ways to move through the space between a starting point and an arrival point, situated in the extremities of the image. The image on the monitor, contains: an itinerary, marked with yellow arrows, the starting point located in the left upper side of the monitor (a red circle) and the arrival point, set in the bottom right side of the screen (a green circle). For a determined duration of time, one of the ramifications of the labyrinth itinerary appears marked by green arrows. The participant is solicited to release a response for the backtracking, forward and backwards of the itinerary from memory - we are talking about a short-term visual mental map. The response device consists of a desk on which there are three central buttons and a side button. The coefficients issued by the battery soft are: the topographical memory efficiency (it refers to the correctly issued answers and failed answers) and the topographical memory performance (a qualitative measure statistically calculated by reporting the topographical memory efficiency to the test time).
4.3. Procedure

The research was performed with groups of 15 handball players at a time, from the same team, in a similar order, at approximately same time of the day (in the afternoon) and being in a repaus state (without previously attending any physical activity). Throughout the entire research process, the compliance of ethical guidelines was ensured (Denscombe, 2014, p. 218): athletes participated voluntarily, without any constraints; all were informed that, at any moment, they could decide to withdraw from the study; the participants remain anonymous and data has been treated confidentially. We specify that in the case of preadolescent handball players written informed consent from the children’s parents was obtained, before starting the procedure. In order to establish the informal leaders, we used the peer nominations procedure, which is the oldest sociometric technique. It supposes presenting the participants a series of questions and asking them to nominate someone from their peer group who they think fits best the specific question (Whitcomb & Merrell, 2013, p. 197). The sociometric test was applied following these methodological conditions: sports groups are homogeneous for at least one year (members know each other well enough, not responding randomly); choices and rejections are circumscribed to a concrete situation in which athletes can develop their option (the questions were not vague); in order to express their preference to each other, the athletes could see (along with the answer sheet) the entire group’s members on a board to avoid the risk of omission; in order to create a trustworthy environment for the participants and to have higher guarantees regarding the sincerity of the answers, the response sheet (individual) was not signed by the athletes, ensuring anonymity (the identification of the athletes was made by dividing the sheets in a certain order to allow their subsequent recognition) (Şerban, 1987, p. 115). The questions used in our study were: “Who would you like to have on your team?” and “Who you wouldn’t like to have on your team?” (both in case of handball competition). We mention that, in studies conducted among preadolescents and adolescents, general nominations are considered more appropriate, due to the fact that youth better understand the concept of “liking” (Poulin & Dishion, 2008). Moreover, in the light of a meta-analysis, authors state that the wording of the sociometric questions do not affect the stability of sociometric scores (Jiang & Cillessen, 2011). The investigated criteria was reputational, the athletes were required to assess through peer nomination: the performance, competence and abilities, indicating in this way the sport „task-specialists“ and „non-specialists“ (Daft & Marcic, 2011, p. 479). Before the participants completed the sociometric test, they were given the following instructions...
(the same for each team): “You are all members of a sport team. We would like you to answer the next questions: Who would you like to have on your team in a handball competition? [Who you wouldn’t like to have on your team in a handball competition?] For each question please nominate three teammates: first place – very strong preference (respectively rejection), second place – strong preference (respectively rejection) and third place – preference (respectively rejection). There are no right or wrong answers; the answers are anonymous and confidentially. We are interested in your honest opinions”. For each question, the athletes were asked to nominate three teammates – a weighted coefficient (or a number of points) has been awarded for each answer, depending on the position held by the athletes (for the first-placed athlete 3 points were given, for the second place 2 points and 1 point for the third place). Based on the matrix of sociometric choices within each team was possible to calculate the preferential status index: \( \text{PSI} = \frac{E - R}{N - 1} \), whereas \( E \) represents valued elections, \( R \) represents valued rejections and \( N \) stands for the sample size (Predoiu, 2016, p. 151). For example, if an athlete is elected 4 times, within which once in first place, twice in second, and once in third place, he will gather a total of four elections and a number of 8 points or valued elections (the same in the case of valued rejections). Thus, we established the informal leaders (the athletes with the higher scores of the PSI). The groups that were created in this manner were: „popular“ (in which we included the participants with positive values of the ISP), „neglected and controversial“ (this group comprised the athletes with the value 0 for the ISP; „neglected“ meaning that they weren’t nominated at any question, and „controversial“ meaning that they received the same moderate number of positive and negative nominations by their peers) and „rejected“ (in this category being included the athletes which registered negative values for the PSI). We mention that the sociometric assessment was conducted within the Scholar Sports Club No. 6, Bucharest (from December 2016 to January 2017), whereas the MT test (topographical memory) and the battery for verbal and nonverbal intelligence BIG were applied in the Psychology and Psychomotricity Laboratory of the National University of Physical Education and Sports (N.U.P.E.S.), Bucharest, from October 2016 to February 2017.

4.4. Experimental design

In the case of the preadolescent handball players, the affiliation in one of the three groups: “popular”, “neglected/controversial” and “rejected” had the role of the dependent variable, while the results registered by the athletes at the MT (topographical memory) and BIG (verbal and nonverbal intelligence) tests had the role of the independent variables.
5. Findings

This chapter presents the results, in a structured manner. Data investigation revealed that, in the case of the results obtained by the athletes (preadolescents) at BIG and MT, there were no outliers found (which can negatively influence the study results). Descriptive statistics are provided in Table 1.

**Table 1.** Means and standard deviations in the case of preadolescents (P, NC, REJ) for verbal and nonverbal intelligence (VNInte), topographical memory efficiency (TME) and topographical memory performance (TMP)

<table>
<thead>
<tr>
<th>Variables</th>
<th>P group M (SD)</th>
<th>NC group M (SD)</th>
<th>REJ group M (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>VNInte</td>
<td>40.8 (3.7)</td>
<td>37.6 (2.2)</td>
<td>38.0 (2.7)</td>
</tr>
<tr>
<td>TME</td>
<td>81.4 (5.1)</td>
<td>76.2 (5.9)</td>
<td>75.8 (6.5)</td>
</tr>
<tr>
<td>TMP</td>
<td>150.6 (49.9)</td>
<td>137.1 (55.5)</td>
<td>142.6 (53.1)</td>
</tr>
</tbody>
</table>

*Note.* P: preteens popular group; NC: preteens neglected and controversial group; REJ: preteens rejected group.

In the case of preadolescents athletes, one-way ANOVA revealed significant differences between P, NC and REJ groups, considering the investigated cognitive skills (see Table 2). We mention that the necessary conditions for one-way ANOVA are fulfilled: there is only one dependent variable which is quantitative; there is only one independent variable, which is nominal and has at least three levels/stages; dependent variable is normally distributed (Shapiro-Wilk test, $p > .05$); variances of the dependent variable are relatively equal for each of the groups under comparison (Levene test, $p > .05$).

We tested the hypothesis that preadolescent female handball players with high scores for PSI would achieve significantly better performances in the case of topographical memory, verbal and nonverbal intelligence, compared to athletes who score low for PSI.
Table 2. ANOVA Multiple Comparisons – results of the preadolescent athletes (P, NC, REJ) for verbal and nonverbal intelligence (VNInte), topographical memory efficiency (TME) and topographical memory performance (TMP)

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>P</th>
<th>95% Confidence Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Lower Bound</td>
</tr>
<tr>
<td>P group</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NC</td>
<td>.007</td>
<td>.73</td>
</tr>
<tr>
<td>REJ</td>
<td>.015</td>
<td>.43</td>
</tr>
<tr>
<td>NC group</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P</td>
<td>.007</td>
<td>-5.62</td>
</tr>
<tr>
<td>REJ</td>
<td>1.00</td>
<td>-3.01</td>
</tr>
<tr>
<td>REJ group</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NC</td>
<td>1.00</td>
<td>-2.16</td>
</tr>
<tr>
<td>P</td>
<td>.024</td>
<td>.52</td>
</tr>
<tr>
<td>NC</td>
<td>.009</td>
<td>1.16</td>
</tr>
<tr>
<td>P group</td>
<td></td>
<td></td>
</tr>
<tr>
<td>REJ</td>
<td>.024</td>
<td>-9.78</td>
</tr>
<tr>
<td>P</td>
<td>1.00</td>
<td>-4.50</td>
</tr>
<tr>
<td>REJ</td>
<td>.009</td>
<td>-9.96</td>
</tr>
<tr>
<td>REJ group</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NC</td>
<td>1.00</td>
<td>-5.31</td>
</tr>
<tr>
<td>P</td>
<td>1.00</td>
<td>-28.05</td>
</tr>
<tr>
<td>NC</td>
<td>1.00</td>
<td>-31.45</td>
</tr>
<tr>
<td>P</td>
<td>1.00</td>
<td>-54.88</td>
</tr>
<tr>
<td>REJ</td>
<td>1.00</td>
<td>-49.39</td>
</tr>
<tr>
<td>NC</td>
<td>1.00</td>
<td>-47.39</td>
</tr>
<tr>
<td>REJ</td>
<td>1.00</td>
<td>-38.50</td>
</tr>
</tbody>
</table>

Note. Degrees of freedom = 59 in all comparisons. P: preteens popular group; NC: preteens neglected and controversial group; REJ: preteens rejected group.

Using one-way ANOVA significant differences concerning the verbal and nonverbal intelligence (VNInte), $F(2, 57) = 6.69, p = .002$ and topographical memory efficiency (TME), $F(2, 57) = 6.14, p = .004$, were revealed. Thus, the hypothesis was supported. The differences observed are between the following groups: popular - neglected/controversial and popular - rejected. Bonferroni $t$ values were calculated: Bonferroni $t = 3.20$ (VNInte; P vs. NC); Bonferroni $t = 2.91$ (VNInte; P vs. REJ); Bonferroni $t = 2.74$ (TME; P vs. NC) and Bonferroni $t = 3.11$ (TME; P vs. REJ). The effect size index $f = 1.25$ (VNInte), respectively $f = 1.15$ (TME). We can say that there are very strong associations between the performances acquired for verbal and nonverbal intelligence, topographical memory and the affiliation in one of the three groups: P, NC and REJ.
6. Discussions

The results of our research provided some useful insight with respect to the investigated intellectual abilities of the established informal leaders. In the case of preadolescent athletes, statistical analysis has indicated that there are significant differences between the “popular” group and the other two groups: “neglected, controversial” and “rejected”, regarding topographical memory efficiency, verbal and nonverbal intelligence. It means that preadolescent female handball players with high scores for the PSI obtained: significantly more correctly issued answers and less failed answers in tasks demanding topographical memory (forming a visual mental map) and better performances for verbal and nonverbal intelligence – skills which call for proficiency in perceiving, manipulating, analogical reasoning with words and skills involving nonlanguage functions, such as visual attention, picture memory, spatial visualization and figural reasoning. We argue that in the case of topographical memory performance, calculated by reporting the topographical memory efficiency to the test time (the speed of updating the mental map), no significant differences were found, between the “popular” group and other groups involved in the research. For the same investigated cognitive dimensions we didn’t find significant differences between the “neglected and controversial” group and “rejected” group. Therefore, in the case of preadolescent handball players, it is possible to assert that topographical memory, verbal and nonverbal abilities are cognitive dimensions that may condition the affiliation to a specific group. Consequently, the research results disclose important intellectual abilities of the informal leader (the “task-specialist”) in the case of preadolescent female handball players, represented by topographical memory efficiency, verbal and nonverbal intelligence. Previous research indicates that the most consistent characteristic of athlete leaders pertains to sport-related competence. Athletic ability is positively associated with ratings of athlete leadership (Eklund & Tenenbaum, 2014, p. 272). According to our study, the topographical memory training is important not only for better results in sport competitions (Tüdös, Predoiu & Predoiu, 2015), but also, for a successful social integration of the athletes in the team. Beside the special role in the psychomotor, mental organization, in organizing the external and internal space (along with the movement memory), it can facilitate the affiliation of an athlete to a specific group. In consonance with our study findings, it becomes essential in the preparation process performing tasks requiring the formation of visual mental maps. These spatial representations are linked to visualization of routes, game schemes, influencing the positioning of the athletes on the field. Therefore, the stimulation of...
topographical memory, verbal and nonverbal intelligence (knowing that nonverbal intelligence is not entirely independent of experience, innate), ensure the premises for personal development, the effects contributing to the acquiring of the informal leader status (the “task-specialist”). The paper results complete the data of a previously personal research, where we highlighted the following features of the informal leaders in the case of preadolescent handball players: attention efficiency, increased vigilance, a better reaction time (simple reaction time) than the peers and higher performances in the case of the resistance to disruptive factors in tasks requiring interlimb coordination (Grigore, Predoiu, Predoiu & Mitrache, 2017).

Although these findings are interesting, they provide only a limited understanding of how intellectual skills contribute to social integration of an athlete in a sport group. Specifically, we evaluated only some cognitive dimensions in a certain context (Romanian preadolescent female handball players). This setting is particularly important, given the main purpose of our investigation – exploring and identifying cognitive abilities of the informal leaders in the case of handball teams.

We admit that the limits of our research were represented by: the sample of athletes - the biggest weakness of this study (with respect to the number, gender, the age, the competitive experience), the physical and mental state of the participants at the specific time of the testing (fatigue, affective-motivational factors - observation and conversation as research methods support the value of our study), the cultural differences, the social environment and the distinct properties of the examined sport branch. Thereby the findings should be interpreted with some caution, the generalizability of results being limited. There were, also, measurement or data limitations of note. In the case of the sociometric assessment in terms of the sport-related competence one must not forget that the preferences have a rich and complex content. This content, under no circumstances can be fully reflected by the sociometric test (Mihu, 1967, p. 268). Improving research on this issue should not follow only the multiplication of the criteria used, but also should follow other ways, such as observing athletes' reactions in various situations (e.g., in training and in competition), reporting the preferences expressed in the test to the attitudes manifested in real situations etc. The present research may be considered as a starting point for future research regarding intellectual abilities and their role in acquiring the informal leader status. These studies results offer helpful information to coaches for scientifically conducting the sports training and the sport psychologist can conceive stimulation programs for the characteristics:

verbal and nonverbal intelligence and topographical memory efficiency, specific to the popular members of the group and therefore important in order to facilitate a successful social integration of the rejected or neglected and controversial athletes in the sports group.

6. Conclusions

The present study explored the hypothesis that, when preadolescent female handball players obtain high scores for the preferential status index, they should demonstrate better performances (in a significant manner) for the verbal and nonverbal intelligence and in the case of topographical memory, compared to athletes obtaining low scores concerning the PSI. Consistent with this hypothesis, popular individuals (compared to rejected, neglected and controversial individuals) registered superior performances in tasks requiring the formation of visual mental maps, as well in tasks demanding verbal and nonverbal intelligence.

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All authors have equally contributed to this article.

References


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