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# Investigating the Possibility of Implementing Kayak-canoe and Rowing Topics in the School Curriculum for the Danube Delta Area

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**Abstract:** *Rowing and kayak-canoeing are water sports that are not among the top preferences of young people in Romania and are not included in school programs, even if sports performances have been achieved in these disciplines on an international level. The purpose of the study is to question physical education teachers from the Danube Delta area, regarding the possibility of including these sports in the school curriculum. The work methodology is specific to cross-sectional studies, by applying a questionnaire structured on 3 dimensions (utility, accessibility and attractiveness). The study group consists of 50 teachers, at the level of which 3 independent variables were defined (gender, teaching degree and length of service). The results identify the following causes that can limit the implementation of these activities: problems related to the material base, the limited involvement of teachers in the promotion of these sports disciplines at the level of schools and local decision-makers, low participation of young people in kayaking-canoeing and rowing activities (as variants of active leisure). However, very good values are obtained regarding the favorable effects of these sports for the level of fitness, body harmony and the fulfillment of the skills in physical education programs, so they can be a viable alternative to other classic sports activities. We did not report significant differences between the opinions expressed by men and women. However, we note the superiority of the scores for the teachers of the Under 20 years career group, at the level of the items of all 3 factors, with some significant differences compared to the Over 20 years career group, so younger teachers are more confident and open to the implementation of kayak-canoeing and rowing in the school curriculum.*

**Keywords:** *teachers; physical education; water sports; rowing, kayak-canoe, questionnaire.*

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## Introduction

A synthesis of research that investigated the positive aspects and benefits of outdoor sports from countries on several continents also includes water sports (kayaking, sailing, surfing, rowing, canoeing, etc.). The following favorable directions are highlighted: reduction of anti-social behavior, physical and mental health, intense contact with nature, interpersonal development, lifelong learning, accessibility, sustained physical activity (Eigenschenk et al., 2019). Research on young people in New Zealand indicates that recreational physical activities and organized sport activities are factors that ensure wellbeing benefits. In the category of practiced sports activities are also included those related to water: canoeing or kayaking, rowing, sailing or yachting, scuba diving, surfing, swimming, water polo, water skiing (Wilson et al., 2022).

More and more research highlights the lower involvement of children in physical activities, the main barriers identified being: preference for passive leisure activities/screen time, gender limitations, insufficient financial resources, fear related to children's safety. Schools do, however, offer attractive and accessible opportunities to engage in physical activity (Lane et al., 2021). Research on young people from Cluj-Napoca/Romania identifies the fact that 32.4% spend more free time with sedentary activities involving the use of technology (phone, tablet, PC; TV), than being involved in sports activities (Gherman et al., 2020). For this reason, the involvement in physical activities decreases, and the number of medically exempt students is increasing (Pârvu et al., 2022; Silișteanu et al., 2022).

Outdoor physical activities must take into account the differences that manifest themselves between genders, the particularities in motor learning by age groups, the understanding of interests and motivations for physical effort, the level of cognitive development, etc. (Gilbertson et al., 2022). Another study highlights the usefulness of the inclusion and the use of AEA (Alternative Environment Activities) in physical education lessons for Canadian students (Hall et al., 2022). The integration of water activities (surfing) in physical education lessons indicates - after 6 weeks of application - provides beneficial effects, the activities being perceived as safe. Progress is noted regarding socialization, well-being, self-confidence, meeting new friends for adolescent groups (Silva et al., 2022).

The quality of the environment and the purity of the rivers (Śląskie Voivodeship/Poland) is the main factor requested by potential tourists who want to practice kayaking, the cultural factors of the respective areas being less important in choosing this option (Cholewa, 2020). Canoe racing is an

element of traditional sports culture, being used in the past to facilitate transport. These activities are integrated into local sports competitions (e.g. Kuantan Singingi Regency) and the government has a role in promoting and advertising these events (Afda'u et al., 2022). Canoe paddling is a sport often practiced in the Hawaiian Islands and Polynesia, with increasing popularity in other areas such as the USA and Australia. However, the specific requests generate the occurrence of musculoskeletal injuries dominantly for the shoulders, then the back, wrist/hand, elbow and the neck area (Haley & Nichols, 2009).

Concerns for the implementation of water sports (Province of Volhynia) in curricular activities in schools and within School Sports Circles and Clubs in educational institutions existed even from the interwar period (Drozdek-Malolepsza & Malolepszy, 2020). The particularities of the geographical area and traditions influence the types of physical activity in which young people engage. Investigations of girls and boys in Malayesia/Kerian district, Perak (13-16 years) revealed a preference for leisure-time physical activities related to walking and running. The lowest average scores are obtained for rowing or kayaking activities (Ali et al., 2020). School and community physical activities for primary and post primary school pupils in the Republic of Ireland and Northern Ireland indicate involvement in water sports (Swimming and Surfing), but rowing and kayaking are not included. One explanation would be the too young age of the students to be involved in these sports (Woods et al., 2019). The assessment of physical activities for Czech children does not include rowing/canoeing variants, due to the low involvement in these water sports, according to (Cuberek et al., 2021). For teenagers in Pakistan (13 years old), there is a low involvement in the practice of certain sports branches and events (rowing/canoeing, baseball, vigorous swimming, alpine skiing, yoga, fishing from river bank, etc.). However, other variants are preferred by young people: karate, taekwondo, throw ball, table tennis, cricket, squash, etc. (Naseer et al., 2020). A study of families in the North East of England identified children's low involvement in physical activities such as kayaking and canoeing. Kayaking is present for one family, for the mid-middle-class children group (Saturday), and Rowing is also included for one family, for the upper-middle-class children group (Tuesday). In both situations the activities are organized outside the school program/Non-school provider (Wheeler et al., 2019). Investigations on children from rural areas (Rural Yamhill County/USA) revealed that curricular activities in physical education lessons are based dominantly on jogging/running, baseball, tag, softball, football, soccer, volleyball, basketball, dance, etc. However,

rowing/canoeing are part of the leisure sports activities, along with skateboarding, street hockey, cycling, swimming, skating, cross country skiing, aerobics, ice hockey, etc. (Shaheed, 2019).

The implementation of Watersports Inclusion Games for children and families with disabilities ensures progress in terms of mental health and confidence for this category of children. The pleasure of experiencing new sports activities in a new and controlled environment, strong involvement in activities, meeting other people with similar challenges are noted (Salgado et al., 2021). Another research indicates the option of offering rowing and canoeing for young people (10-18 years old) with physical conditions that can generate the manifestation of various disabilities over time. In this way, personal development is ensured within an inclusive environment, with the intervention and supervision of an interdisciplinary team (psychologist, social worker, physical therapist, physical educator) (Laurentino et al., 2022). The implementation of outdoor sports activities (sailing, kayaking, hiking, biking, etc.) for young people in the USA with visual impairment (9-19 years) is beneficial through the positive effects found: relationships; enjoyment and independence (Lieberman et al., 2023). The use of thalassotherapy also has beneficial effects on physical and mental indicators (Munteanu & Munteanu, 2019). Another study identifies the possibility of implementing water sports by boat (kayaking, rowing, and canoeing) as physical activities for people with poor vision or blindness. The authors propose Assistive Technology and surveillance technologies, for the safe deployment of these variants (Baldwin et al., 2019). The demanding specific efforts for young rowers (11-12 years old) from Ukraine require body recovery. For this purpose, non-traditional variants are also proposed, which ensure improved performance and improving the functional status. The use of balm in medicinal herbs and Shilajeet has toning and regeneration effects on the body (KOZINA et al., 2019).

In Romania, among the water sports, only swimming is included in school programs (only as an alternative sports discipline), but the Aqua Gym and Aqua Jogging options are increasingly being promoted in fitness centers or as options for medical recovery (Bădău et al., 2015; Badau & Badau, 2016; Vizitiu et al., 2022; Vizitiu & Constantinescu, 2022).

All this information led us to investigate (by questioning specialist teachers) the possibility of implementing rowing and kayak-canoeing in physical education lessons in schools from the Danube Delta/Tulcea County, where the geographical conditions and natural environment are favorable for these physical activities.

*Research hypotheses:*

H1: The instrument for measuring opinions related to the practice of water sports meets the conditions related to validity and reliability for the investigated traits.

H2: There are statistically significant differences between the opinions of the participating teachers, depending on gender, experience/longevity in the activity and teaching degree held.

## Methodology

*Organization of the research*: The variant of investigation adopted corresponds to the type of cross-sectional study, through a survey based on a questionnaire. The design of the questionnaire was carried out within the Research Center for Human Performance, belonging to the Faculty of Physical Education and Sport in Galati, after discussions with teachers from Tulcea County. Closed-ended response items were designed using a 5-point Likert scale. Examples of qualifiers associated with each score: 5 (very strong/ constant/ definitely/ very important), 4 (strong/ frequent/ to a large extent/ important), 3 (medium influence/ moderate/ to a moderate extent/ quite important), 2 (weak influence/ rarely/ to a small extent/ low importance), 1 (lack of influence/ never/ I don't think/ irrelevant). The application of the questionnaire structured on 3 factors (usefulness/8 items, accessibility/6 items and attractiveness/4 items) was carried out between March 1$^{st}$ and April 15$^{th}$, 2023, by sending it by email.

*Participants*: The invitation to participate in the study was sent to all teachers (138 subjects) who teach physical education in pre-university education in Tulcea County. They were informed about the purpose of the research and trained on how to complete the questionnaire. 53 teachers responded favorably, and after receiving the questionnaires, 50 subjects (47.46 ±9.10 years) remained in the study for data processing, 3 cases being eliminated due to not completing all items in the questionnaire. Within the evaluated group, 3 independent variables were defined: gender (men=22 and women=28), teaching degree (beginner/definitive=13 and degree 2/degree 1=37), seniority/experience in the activity (under 20 years career=27 , over 20 years career=23). The rules of deontology of scientific research involving human subjects, regarding the confidentiality of personal data, in accordance with the declaration of Helsinki have been respected (Sandu, 2012; "World Medical Association Declaration of Helsinki," 2013). The consent to publish in scientific journals for the collected data was issued by the Ethics Committee of the University (426/CEU/31.08.2023).

*The Statistical Analysis of Data:*

SPSS Software (IBM Vers.24 Chicago, IL, USA) was used for the definition, the entry of variables and the statistical calculation. Mean values for the items of each factor were calculated and represented graphically or in tables. The validity of the questionnaire for the items of each factor was determined by Pearson correlation coefficients between the total items of each factor and each item separately. The normality of the data distribution was verified by the Shapiro-Wilk test, in order to be able to use parametric statistical procedures. We used factor analysis with Principal Component Analysis/PCA and Varimax rotation, with Kaiser-Meyer-Olkin/KMO determination and Bartlett's Test of Sphericity (The large number of data resulting from the factor analysis required their presentation in the Appendix). Cronbach's Alpha coefficients were determined to identify the degree of reliability/internal consistency, as well as Hotelling's T-Squared Test scores, as an indicator of the variability of item responses. Multivariate and Univariate test with the Bonferoni correction factor was used to investigate the influence of each independent variable on the responses to the questionnaire, as well as to assess the interaction between the independent variables. The confidence interval used was 95% ($p<0.05$) (Mukhallafi, 2020; Murariu & Munteanu, 2018; Opariuc, 2011; Osborne, 2019; Sarma & Vardhan, 2018).

## Results

The results of the validity of the questionnaire through the Pearson correlations between each item and the total items are summarized in table 1. It is observed that the values of r are positive and correspond in most situations to medium (0.4-0.6) and strong correlations (0.6-0.8), being able also to signal very strong associations ($r>0.8$), at the level of items F3.1 and F.3.2. The only weakly correlated item is F1.7 ($r<0.4$). The significance thresholds related to the correlation coefficients are all statistically significant ($p<0.01$). Thus, we consider that the validity of the questionnaire's internal consistency is acceptable for the analyzed items.

**Table 1.** Data related to the validity of the applied questionnaire (values of Pearson correlation coefficients)

| Item/Dependent variable | r | Sig. |
|---|---|---|
| F1.1 The role of rowing and kayak-canoe in solving curricular competences | .529** | .000 |
| F1.2 The proposal of rowing and kayak-canoe lessons to the school inspectorate/management | .607** | .000 |
| F1.3 The role of themes from rowing and kayak-canoe in harmonious physical development | 550** | .000 |
| F1.4 The influence of rowing and kayak-canoe lessons on the development of speed | .503** | .000 |
| F1.5 The influence of rowing and kayak-canoe lessons on the development of coordination | .610** | .000 |
| F1.6 The influence of rowing and kayak-canoe lessons on the development of strength | 491** | .000 |
| F1.7 The influence of rowing and kayak-canoe lessons on the development of endurance | 383** | .000 |
| F1.8 The influence of rowing and kayak-canoe lessons on the development of flexibility | 540** | .000 |
| F2.1 The level of physical development and effort capacity of students for rowing | 581** | .000 |
| F2.2 The existence of boats/logistics in school or sports clubs | 637** | .000 |
| F2.3 Helping sports clubs and institutions to use water gloss | .570** | .000 |
| F2.4 Accessibility of water gloss/proximity to school | .597** | .000 |
| F2.5 Knowledge of swimming techniques for students to prevent drowning/accidents | .499** | .000 |
| F2.6 The existence of students practicing kayak-canoeing in their free time | .699** | .000 |
| F3.1 The interest of kayaking and canoeing lessons compared to sports games | 814** | .000 |
| F3.2 The interest of kayaking and canoeing lessons compared to individual sports | .804** | .000 |
| F3.3 The originality/novelty of the kayak and canoe lessons | .569** | .000 |
| F3.4 The students' reaction to the proposal of kayaking and canoeing lessons | 663** | .000 |
| Correlation is significant at the 0.01 level (2-tailed) ** | | |

The values of the internal consistency coefficients (Cronbach's Alpha) at the level of each dimension or factor of the questionnaire, as well as for all items, are presented in table 2. All these values are >0.6, considered the minimum threshold accepted in social and human sciences, so the questionnaire measures precisely enough (with an acceptable level of reliability) the 3 defined dimensions. For these reasons, working hypothesis

1 of the research is confirmed. All Hotelling's T-Squared Test scores correspond to thresholds ($p<0.01$), this aspect confirming the diversity in the choice of answers by the participants, these are not equal.

**Table 2.** The values of the reliability coefficient (Cronbach's Alpha) and the test of equality of the averages for the answers to the items of the 3 factors of the questionnaire / N = 50

| | Reliability Statistics | | | Hotelling's T-Squared Test | | | | |
|---|---|---|---|---|---|---|---|---|
| **Factors** | **Cronbach's Alpha** | **Cronbach's Alpha Standardized Items** | **N of items** | **Hotelling's T-Squared** | **F** | **df1** | **df2** | **Sig.** |
| **F1/Utility** | .627 | .633 | 8 | 399.400 | 50.071 | 7 | 43 | .000 |
| **F2/Accessibility** | .638 | .640 | 6 | 173.367 | 31.843 | 5 | 45 | .000 |
| **F3/Attractiveness** | .654 | .679 | 4 | 60.812 | 19.443 | 3 | 47 | .000 |
| **Total items** | .784 | .786 | 18 | 871.175 | 34.512 | 17 | 33 | .000 |

The average values of the items related to the 3 factors (at the level of the whole lot) are represented graphically in figures 1-3.

The highest mean scores for factor1/utility are obtained by items F1.7 and F1.8, indicating the strong influence of rowing and kayaking on endurance and strength, followed by F1.5 (related to favorable effects on coordination) and F1. 8 (related to effects on flexibility). Scores above the average values of the Likert scale are also obtained for F1.1 (related to solving skills from the specialized curriculum), respectively F1.3 (indicating the effects on harmonious physical development), as well as F1.4 (effects on speed). The lowest score is obtained in item F1.2, where it is clear that most teachers have no initiative in promoting water sports at the level of the inspectorate, school management and local authorities (fig.1).

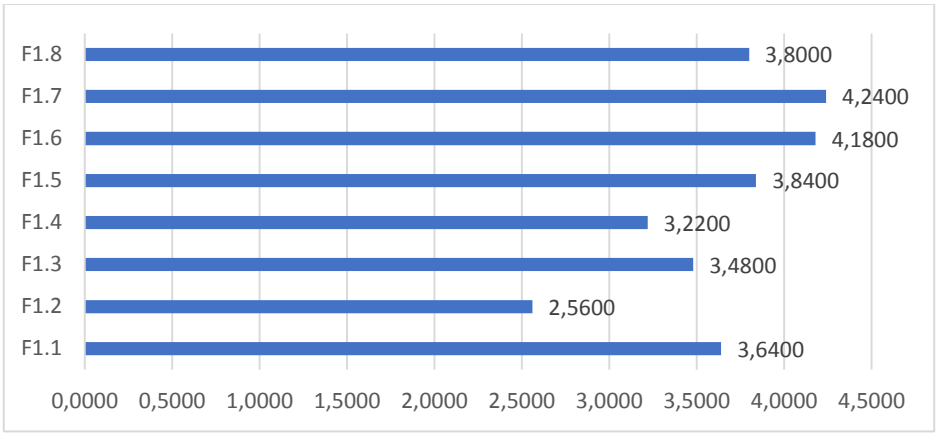



**Figure 1.** Average responses to the items of factor 1/Utility for the entire group

For the accessibility factor, the highest scores are recorded at the level of items F2.3 (relating to the help of clubs and other institutions to use the water gloss and boats), F2.1 (related to the level of physical development and effort capacity of students), F2.4 (related to the accessibility/proximity of the water gloss to the school). Scores below the mean of the Likert scale and which identify the problems that teachers can face are for F2.2 (the existence of boats/logistics in the school or at sports clubs), respectively F2.6 (which indicates a low involvement of students and implicitly a limited experience in the practice of rowing and kayak-canoeing, even if there are favorable natural conditions for these sports) (fig.2).

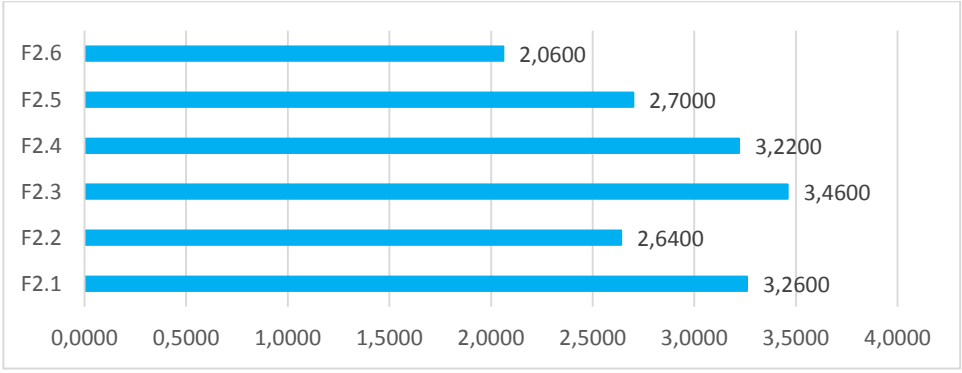



**Figure 2.** Average responses to the items of factor 2/Accessibility for the entire group

For factor 3/attractiveness the highest average value is obtained by item F3.3 (which identifies the originality/novelty of kayak-canoe lessons). Scores above the average of the Likert scale were also identified for F3.2

(which identifies students' interest in water sports by referring to individual sports), respectively F3.4 (which identifies the favorable reaction to the proposal of these topics). The lowest mean value is obtained for item F3.1 (which demonstrates that the attractiveness of sports games is high and can be an impediment to the implementation of water sports, especially if they should replace sports games) (fig.3).

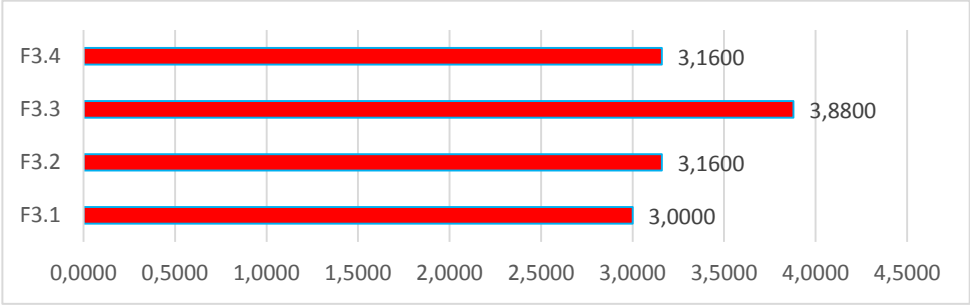



**Figure 3.** Average responses to the items of factor 3/Attractiveness for the entire group

The data provided by the multivariate test in relation to the interaction of the 3 independent variables did not generate statistically significant results, for this reason only the average values of the entire batch are presented, for each item (according to graphs 1-3), as well as the separate influence of each variable independently on the answers for the items of each factor of the questionnaire (Univariate test, according to tables 3-11).

The differences between genders for the items of factor 1 (utility) are statistically insignificant ($p>0.05$) for all 8 items. The average values of the two genders are relatively close, which explains this aspect, and the $\eta^2_p$ scores indicate weak values of the size effect, so the gender does not generate differences of opinion regarding the usefulness of the kayak-canoe and rowing lessons (Table 3).

**Table 3.** Univariate test results (ANOVA) and pairwise comparison (Male=22, Female=28) of the average values for factor 1 (utility)

| Dependent variable | Group | Mean | Std. Error | a-b | F(1, 43) | Sig[b]. | $\eta^2_p$ | Observed Power |
|---|---|---|---|---|---|---|---|---|
| F1.1 The role of rowing and kayak-canoe in solving curricular competences | a. M | 3.503 | .123 | -.104[a] | .260 | .613 | .006 | .079 |
| | b. F | 3.607 | .164 | | | | | |
| F1.2 The proposal of rowing and kayak-canoe lessons to the school inspectorate/ management | a. M | 2.569 | .141 | .104[a] | .197 | .660 | .005 | .072 |
| | b. F | 2.464 | .188 | | | | | |
| F1.3 The role of themes from rowing and kayak-canoe in harmonious physical development | a. M | 3.406 | .142 | -.058[a] | .059 | .809 | .001 | .057 |
| | b. F | 3.464 | .190 | | | | | |
| F1.4 The influence of rowing and kayak-canoe lessons on the development of speed | a. M | 3.219 | .150 | .035[a] | .020 | .890 | .000 | .052 |
| | b. F | 3.185 | .200 | | | | | |
| F1.5 The influence of rowing and kayak-canoe lessons on the development of coordination | a. M | 3.921 | .093 | -.001[a] | .000 | .993 | .000 | .050 |
| | b. F | 3.923 | .125 | | | | | |
| F1.6 The influence of rowing and kayak-canoe lessons on the development of strength | a. M | 4.249 | .096 | .166[a] | 1.062 | .308 | .024 | .172 |
| | b. F | 4.083 | .129 | | | | | |
| F1.7 The influence of rowing and kayak-canoe lessons on the development of endurance | a. M | 4.382 | .090 | .234[a] | 2.416 | .127 | .053 | .330 |
| | b. F | 4.149 | .120 | | | | | |
| F1.8 The influence of rowing and kayak-canoe lessons on the development of flexibility | a. M | 3.946 | .120 | -.113[a] | .319 | .575 | .007 | .086 |
| | b. F | 4.060 | .160 | | | | | |

*. The mean difference is significant at the .05 level.
a. Based on modified population marginal mean
b. *Adjustment* for multiple comparisons: Bonferroni.

And in the case of the seniority variable, for all the items of the utility factor we observe that there are no significant differences of opinion between the two groups. However, we note that those in the first half of their teaching career (Under 20 years career) are more optimistic about the usefulness of rowing and kayak-canoe lessons, having higher average scores for most items, less at the F1.8 level, where the Over 20 years career group has a better average score (Table 4).

**Table 4.** The results of univariate tests (ANOVA) and the pairwise comparison (Under 20 years career=27, Over 20 years career=23) of the average values for factor 1 (utility)

| Dependent variable | Group | Mean | Std. Error | a-b | F(1, 43) | Sig[b]. | $\eta^2_p$ | Observed Power |
|---|---|---|---|---|---|---|---|---|
| F1.1 The role of rowing and kayak-canoe in solving curricular competences | a. <20 | 3.694 | .110 | .307[a] | 1.764 | .191 | .039 | .255 |
| | b. >20 | 3.387 | .203 | | | | | |
| F1.2 The proposal of rowing and kayak-canoe lessons to the school inspectorate/ management | a. <20 | 2.614 | .126 | .245[a] | .851 | .361 | .019 | .147 |
| | b. >20 | 2.369 | .234 | | | | | |
| F1.3 The role of themes from rowing and kayak-canoe in harmonious physical development | a. <20 | 3.586 | .127 | .342[a] | 1.627 | .209 | .036 | .239 |
| | b. >20 | 3.244 | .236 | | | | | |
| F1.4 The influence of rowing and kayak-canoe lessons on the development of speed | a. <20 | 3.282 | .134 | .193[a] | .467 | .498 | .011 | .103 |
| | b. >20 | 3.089 | .248 | | | | | |
| F1.5 The influence of rowing and kayak-canoe lessons on the development of coordination | a. <20 | 4.038 | .084 | .270[a] | 2.356 | .132 | .052 | .323 |
| | b. >20 | 3.768 | .155 | | | | | |
| F1.6 The influence of rowing and kayak-canoe lessons on the development of strength | a. <20 | 4.185 | .086 | .072[a] | .158 | .693 | .004 | .068 |
| | b. >20 | 4.113 | .160 | | | | | |
| F1.7 The influence of rowing and kayak-canoe lessons on the development of endurance | a. <20 | 4.369 | .081 | .279[a] | 2.712 | .107 | .059 | .363 |
| | b. >20 | 4.089 | .149 | | | | | |
| F1.8 The influence of rowing and kayak-canoe lessons on the development of flexibility | a. <20 | 3.975 | .107 | -.085[a] | .141 | .709 | .003 | .066 |
| | b. >20 | 4.060 | .199 | | | | | |

*. The mean difference is significant at the .05 level.
a. Based on modified population marginal mean
b. *Adjustment* for multiple comparisons: Bonferroni.

The teaching degree variable indicates the first significant differences ($p<0.05$) for the items of the utility factor, in favor of the beginners/definitive group (which has less teaching experience) for items F1.5 and F1.8 (which indicate the influence of kayak-canoe on coordination and flexibility). It should be noted that for all the items of this factor the beginners/definitive group obtains average values higher than those with degrees 1 and 2. The $\eta^2_p$ values indicate a strong value of size effect only for item F1.8, where 20.3% of the variance of the answers is influenced by the teacher degree held (Table 5).

**Table 5.** Univariate test results (ANOVA) and pairwise comparison (beginner/definitive=13, grade2/grade1 =37) of mean values for factor 1 (utility)

| Dependent variable | Group | Mean | Std. Error | a-b | F(1, 43) | Sig[b]. | $\eta^2_p$ | Observed Power |
|---|---|---|---|---|---|---|---|---|
| F1.1 The role of rowing and kayak-canoe in solving curricular competences | a. debutant | 3.648 | .216 | .149[a] | .399 | .531 | .009 | .095 |
| | b. grad 2/1 | 3.499 | .096 | | | | | |
| F1.2 The proposal of rowing and kayak-canoe lessons to the school inspectorate/ management | a. debutant | 2.467 | .247 | -.074[a] | .075 | .786 | .002 | .058 |
| | b. grad 2/1 | 2.541 | .110 | | | | | |
| F1.3 The role of themes from rowing and kayak-canoe in harmonious physical development | a. debutant | 3.467 | .250 | 048[a] | .030 | .863 | .001 | .053 |
| | b. grad 2/1 | 3.419 | .111 | | | | | |
| F1.4 The influence of rowing and kayak-canoe lessons on the development of speed | a. debutant | 3.210 | .263 | .018[a] | .004 | .952 | .000 | .050 |
| | b. grad 2/1 | 3.192 | .117 | | | | | |
| F1.5 The influence of rowing and kayak-canoe lessons on the development of coordination | a. debutant | 4.143 | .164 | .386[a*] | 4.638 | .037 | .097 | .558 |
| | b. grad 2/1 | 3.756 | .073 | | | | | |
| F1.6 The influence of rowing and kayak-canoe lessons on the development of strength | a. debutant | 4.229 | .169 | .130[a] | .491 | .487 | .011 | .105 |
| | b. grad 2/1 | 4.099 | .075 | | | | | |
| F1.7 The influence of rowing and kayak-canoe lessons on the development of endurance | a. debutant | 4.362 | .158 | .198[a] | 1.304 | .260 | .029 | .201 |
| | b. grad 2/1 | 4.164 | .070 | | | | | |
| F1.8 The influence of rowing and kayak-canoe lessons on the development of flexibility | a. debutant | 4.448 | .211 | .764[a*] | 10.960 | .002 | .203 | .899 |
| | b. grad 2/1 | 3.684 | .094 | | | | | |

*. The mean difference is significant at the .05 level.
a. Based on modified population marginal mean
b. *Adjustment* for multiple comparisons: Bonferroni.

The influence of gender on factor 2/accessibility indicates favorable opinions, with better mean scores for the male group for all 6 items. They are more confident in the physical potential of the students, in the ability to use logistics and collaboration with the authorities, etc. However, we report only one statistically significant difference between genders ($p<0.05$), for item F2.2, and value of $\eta^2_p$ indicating 13.1% influence of gender on the opinion expressed on this item (Table 6).

**Table 6.** Univariate test results (ANOVA) and pairwise comparison (Male=22, Female=28) of mean values for factor 2 (accessibility)

| Dependent variable | Group | Mean | Std. Error | a-b | F(1, 43) | Sig[b]. | $\eta^2_p$ | Observed Power |
|---|---|---|---|---|---|---|---|---|
| F2.1 The level of physical development and effort capacity of students for rowing | a. M | 3.054 | .139 | -.047[a] | .042 | .839 | .001 | .055 |
| | b. F | 3.101 | .186 | | | | | |
| F2.2 The existence of boats/logistics in school or sports clubs | a. M | 2.826 | .140 | .594[a*] | 6.509 | .014 | .131 | .703 |
| | b. F | 2.232 | .186 | | | | | |
| F2.3 Helping sports clubs and institutions to use water gloss | a. M | 3.466 | .154 | .484[a] | 3.527 | .067 | .076 | .451 |
| | b. F | 2.982 | .206 | | | | | |
| F2.4 Accessibility of water gloss/proximity to school | a. M | 3.320 | .196 | .160[a] | .238 | .628 | .005 | .076 |
| | b. F | 3.161 | .262 | | | | | |
| F2.5 Knowledge of swimming techniques for students to prevent drowning/accidents | a. M | 2.786 | .149 | .250[a] | 1.011 | .320 | .023 | .166 |
| | b. F | 2.536 | .199 | | | | | |
| F2.6 The existence of students practicing kayak-canoeing in their free time | a. M | 2.158 | .188 | .337[a] | 1.155 | .289 | .026 | .183 |
| | b. F | 1.821 | .251 | | | | | |

*. The mean difference is significant at the .05 level.

a. Based on modified population marginal mean

b. *Adjustment* for multiple comparisons: Bonferroni.

The situation is similar for the analysis of the differences according to the length of time in education for all the items of the accessibility factor, where all the average scores of the Under 20 group are higher than those of the Over 20 group. However, significant differences ($p<0.05$) are only reported for the F2.2 items and F2.3, with values of $\eta^2_p$ that indicate that 21.2%, respectively 22.6% of the variance of the answers to these items is explained by the variable seniority in education (Table 7).

**Table 7.** The results of univariate tests (ANOVA) and the pairwise comparison (Under 20 years career=27, Over 20 years career=23) of the mean values for factor 2 (accessibility)

| Dependent variable | Group | Mean | Std. Error | a-b | F(1, 43) | Sig[b]. | $\eta^2_p$ | Observed Power |
|---|---|---|---|---|---|---|---|---|
| F2.1 The level of physical development and effort capacity of students for rowing | a. <20 | 3.240 | .124 | 371[a] | 2.004 | .164 | .045 | .283 |
| | b. >20 | 2.869 | .230 | | | | | |
| F2.2 The existence of boats/logistics in school or sports clubs | a. <20 | 2.869 | .125 | .893[a*] | 11.559 | .001 | .212 | .914 |
| | b. >20 | 1.976 | .231 | | | | | |
| F2.3 Helping sports clubs and institutions to use water gloss | a. <20 | 3.631 | .138 | 1.029[a*] | 12.539 | .001 | .226 | .933 |
| | b. >20 | 2.601 | .256 | | | | | |
| F2.4 Accessibility of water gloss/proximity to school | a. <20 | 3.321 | .176 | 213[a] | .333 | .567 | .008 | .087 |
| | b. >20 | 3.107 | .325 | | | | | |
| F2.5 Knowledge of swimming techniques for students to prevent drowning/accidents | a. <20 | 2.773 | .134 | .302[a] | 1.157 | .288 | .026 | .183 |
| | b. >20 | 2.470 | .247 | | | | | |
| F2.6 The existence of students practicing kayak-canoeing in their free time | a. <20 | 2.239 | .168 | .638[a] | 3.251 | .078 | .070 | .422 |
| | b. >20 | 1.601 | .311 | | | | | |

*. The mean difference is significant at the .05 level.

a. Based on modified population marginal mean

b. *Adjustment* for multiple comparisons: Bonferroni.

However, we did not identify significant differences for the comparisons between the average scores of the didactic degrees ($p>0.05$), for the first 3 items, those with the 2nd/1st degree having higher values, and for the last 3 items the beginners/definitely having more optimistic opinions for this factor (Table 8).

**Table 8.** The results of univariate tests (ANOVA) and the pairwise comparison (beginner/definitive=13, grade 2/grade 1 = 37) of the mean values for factor 2 (accessibility)

| Dependent variable | Group | Mean | Std. Error | a-b | F(1, 43) | Sig[b]. | $\eta^2_p$ | Observed Power |
|---|---|---|---|---|---|---|---|---|
| F2.1 The level of physical development and effort capacity of students for rowing | a. debutant | 2.838 | .244 | -.425[a] | 2.528 | .119 | .056 | .343 |
| | b. grad 2/1 | 3.263 | .109 | | | | | |
| F2.2 The existence of boats/logistics in school or sports clubs | a. debutant | 2.400 | .245 | -.152[a] | .320 | .575 | .007 | .086 |
| | b. grad 2/1 | 2.552 | .109 | | | | | |
| F2.3 Helping sports clubs and institutions to use water gloss | a. debutant | 2.933 | .271 | -.448[a] | 2.282 | .138 | .050 | .315 |
| | b. grad 2/1 | 3.381 | .121 | | | | | |
| F2.4 Accessibility of water gloss/proximity to school | a. debutant | 3.390 | .345 | .282[a] | .560 | .458 | .013 | .113 |
| | b. grad 2/1 | 3.108 | .154 | | | | | |
| F2.5 Knowledge of swimming techniques for students to prevent drowning/accidents | a. debutant | 2.752 | .262 | .191[a] | .445 | .508 | .010 | .100 |
| | b. grad 2/1 | 2.561 | .117 | | | | | |
| F2.6 The existence of students practicing kayak-canoeing in their free time | a. debutant | 2.152 | .330 | .326[a] | .817 | .371 | .019 | .143 |
| | b. grad 2/1 | 1.826 | .147 | | | | | |

*. The mean difference is significant at the .05 level.
a. Based on modified population marginal mean
b. *Adjustment* for multiple comparisons: Bonferroni.

For the attractiveness factor, we note the higher average scores of men for all 4 items, but without the differences between the average opinions being significant ($p>0.05$), according to Table 9.

**Table 9.** Univariate test results (ANOVA) and pairwise comparison (Male=22, Female=28) of mean values for factor 3 (attractiveness)

| Dependent variable | Group | Mean | Std. Error | a-b | F(1, 43) | Sig[b]. | $\eta^2_p$ | Observed Power |
|---|---|---|---|---|---|---|---|---|
| F3.1 The interest of kayaking and canoeing lessons compared to sports games | a. M | 3.212 | .128 | .295[a] | 1.928 | .172 | .043 | .274 |
| | b. F | 2.917 | .170 | | | | | |
| F3.2 The interest of kayaking and canoeing lessons compared to individual sports | a. M | 3.080 | .130 | .258[a] | 1.416 | .241 | .032 | .214 |
| | b. F | 2.821 | .174 | | | | | |
| F3.3 The originality/novelty of the kayak and canoe lessons | a. M | 3.905 | .148 | .482[a] | 3.794 | .058 | .081 | .478 |
| | b. F | 3.423 | .198 | | | | | |
| F3.4 The students' reaction to the proposal of kayaking and canoeing lessons | a. M | 3.205 | .166 | .252[a] | .831 | .367 | .019 | .145 |
| | b. F | 2.952 | .221 | | | | | |

*. The mean difference is significant at the .05 level.
a. Based on modified population marginal mean
b. *Adjustment* for multiple comparisons: Bonferroni.

However, the situation changes for the variable length of time in education, where we identify significant differences ($p<0.05$) for the first 3 of the 4 items of the attractiveness factor, in favor of the Under 20 group. They perceive kayaking-canoeing and rowing as more attractive, compared to those in sports games and individual sports, they see them as original and found a favorable reaction of the students to the proposal of these themes. The size effect values reinforce this idea, with 10.7%, 15.7%, respectively 11.3% of the variance of the answers to these items, explained by the influence of the independent variable seniority in education (Table 10).

**Table 10.** The results of univariate tests (ANOVA) and the pairwise comparison (Under 20 years career=27, Over 20 years career=23) of the mean values for factor 3 (attractiveness)

| Dependent variable | Group | Mean | Std. Error | a-b | F(1, 43) | Sig[b]. | $\eta^2_p$ | Observed Power |
|---|---|---|---|---|---|---|---|---|
| F3.1 The interest of kayaking and canoeing lessons compared to sports games | a. <20 | 3.277 | .114 | .544[a*] | 5.140 | .028 | .107 | .601 |
| | b. >20 | 2.732 | .211 | | | | | |
| F3.2 The interest of kayaking and canoeing lessons compared to individual sports | a. <20 | 3.229 | .116 | .694[a*,] | 8.023 | .007 | .157 | .791 |
| | b. >20 | 2.536 | .215 | | | | | |
| F3.3 The originality/novelty of the kayak and canoe lessons | a. <20 | 3.909 | .133 | .653[a*,] | 5.467 | .024 | .113 | .628 |
| | b. >20 | 3.256 | .246 | | | | | |
| F3.4 The students' reaction to the proposal of kayaking and canoeing lessons | a. <20 | 3.307 | .148 | .575[a] | 3.383 | .073 | .073 | .436 |
| | b. >20 | 2.732 | .275 | | | | | |

*. The mean difference is significant at the .05 level.
a. Based on modified population marginal mean
b. *Adjustment* for multiple comparisons: Bonferroni.

The average scores attributed to the didactic degree indicate a balance between the opinions of the 2 groups, even if slightly higher values are found for the group with degree 2/1 for items F3.1, F3.3 and F3.4, however only statistically insignificant differences are identified ($p>0.05$) (Table 11).

**Table 11.** Univariate test results (ANOVA) and pairwise comparison (beginner/definitive=13, grade 2/grade 1 = 37) of mean values for factor 3 (attractiveness)

| Dependent variable | Group | Mean | Std. Error | a-b | F(1, 43) | Sig[b]. | $\eta^2_p$ | Observed Power |
|---|---|---|---|---|---|---|---|---|
| F3.1 The interest of kayaking and canoeing lessons compared to sports games | a. debutant | 2.943 | .224 | -.176[a] | .514 | .477 | .012 | .108 |
| | b. grad 2/1 | 3.119 | .100 | | | | | |
| F3.2 The interest of kayaking and canoeing lessons compared to individual sports | a. debutant | 3.010 | .228 | .136[a] | .294 | .590 | .007 | .083 |
| | b. grad 2/1 | 2.874 | .102 | | | | | |
| F3.3 The originality/novelty of the kayak and canoe lessons | a. debutant | 3.305 | .260 | -.568[a] | 3.966 | .053 | .084 | .495 |
| | b. grad 2/1 | 3.873 | .116 | | | | | |
| F3.4 The students' reaction to the proposal of kayaking and canoeing lessons | a. debutant | 3.057 | .291 | -.006[a] | .000 | .985 | .000 | .050 |
| | b. grad 2/1 | 3.063 | .130 | | | | | |

*. The mean difference is significant at the .05 level.
a. Based on modified population marginal mean
b. *Adjustment* for multiple comparisons: Bonferroni.

## Limits and discussions

Through this study we tried to investigate the possibility of implementing the themes from water sports (kayak-canoe and rowing) in physical education lessons, for school units in the Danube Delta area. The small number of teachers who responded favorably to the invitation to get involved in research (only 36.23% of the total number of teachers who teach physical education) means that these results cannot be generalized. The usefulness of the study results from the fact that sports activities that are less publicized nationally and internationally are proposed, but for which there are optimal natural conditions. They can thus constitute a substitute for the classic sports options in the school curriculum, focused dominantly on sports games, athletic tests and gymnastics. The opinions expressed by the surveyed group were compared with other similar studies, in order to identify common points and possible differences.

The involvement of young people and the training of specialists in water sports disciplines (rowing, kayaking, canoeing, swimming) is

conditioned by favorable environmental conditions. This aspect is successfully fulfilled for Lambung Mangkurat University/Indonesia (located in wetland area) although only rowing is practiced and properly developed (Basuki, 2020). The opinion of the group investigated by us is favorable regarding the proximity and accessibility of areas with water gloss, the reported problems being related in particular to the lack of boats in school units.

A comparison of the affordability of elite academic programs for National Collegiate Athletic Association (NCAA) Division I athletes revealed that there are differences between rowing and track & field athletes. Rowing is more selective, involving superior financial resources and targeting especially young people from white and elite communities. Track & field is instead more accessible, offering opportunities for the university environment, especially for young people from disadvantaged/marginalized communities (Hextrum, 2019). The analysis of sports activity preferences for young people with physical disabilities (13-21 years) in Slovenia shows interesting results for water sports. Kayaking and canoeing practitioners are only 2.2%, those who would like to practice 25.7%, and those not interested dominate, with 72.1%. For rowing only 5.1% practice, 25% want to practice, 69.9% are not interested in this sport. However, a very good score is obtained by Swimming, with 34.6% active practitioners (Vute & Urnaut, 2009). In Canada, the Active & Safe Central online platform provides important and accessible information related to sports activities and related injuries for youth (6-19 years) and adults. As a sports destination, according to the number of impressions/page Rowing ranks 9th out of 10 sports disciplines. Out of 257 views for recreational sports activities, only 8 are Canoe/Kayaking oriented, according to (Pike et al., 2018). Our study also identifies this problem of the low involvement of young people in the practice of water sports, as a variant of sports leisure.

Compared to swimming, the recreational sports activities of kayak-canoeing and rowing are safer and subject to lower risks of Water ingestion, as a result of limited contact with water. This aspect was confirmed by a study completed at the level of Chicago area surface waters (Dorevitch et al., 2011). Another study points to the importance of developing brave attitudes for canoeists (Hacıcaferoğlu et al., 2023). Water sports (kayaking, rowing, canoeing, dragon boating) are increasingly popular among young people as leisure activities. However, these variants also present risks of injury, especially in the upper part of the body, mainly due to poor paddling technique and the lack of muscle strength of the practitioners. Shoulder injury and muscle cramps are the most common problems that occur in

these activities (Abadi et al., 2022). Our research achieves an average score for children's knowledge of swimming techniques as a mean of avoiding accidents.

Water sports (Canoe and Kayak) are optimal options used in Erasmus programs/projects between countries, which ensure socialization, communication and observational learning using workshops. Children were involved who were initiated into outdoor games, water sports and various physical activities on the beach (MAMUTI et al., 2022). A longitudinal research (4 years, with a weekly activity) aimed at the implementation of water sports (canoeing, surfing, rowing, sailing) in blue areas (within the School Nautical Activities / Viana do Castelo/(Portugal)) revealed only beneficial effects. Progress for the groups involved regarding the well-being, education, mental health, environmental awareness, social behavior. These are arguments for the inclusion of water sports in physical education school curricula (Rocher et al., 2020). Outdoor Education for young people in Malaysia offers challenging activities and contributes to good interaction with nature and appreciation of the environment. Aquatic sports activities (Kayaking, Water rafting, Rowing, Jet Skiing, etc.) get very good scores regarding the enjoyment dimension, following the survey of the subjects included in the study (Mohamed et al., 2021). The integration of activities based on Nautical Sports (Rowing, Sailing, and Canoeing) in Extended School Time projects for Portuguese children (11.2 years) have a role in improving social activities and academic performance. Progress in respect of rules, level of autonomy, awareness of the environment and mutual help is highlighted for the studied students (Cabral et al., 2021). Our results indicate a high confidence given by teachers to rowing and kayak-canoeing, as activities that facilitate the achievement of general and specific competencies related to school programs in the discipline of physical education.

Recent studies insist on the assessment of psychophysiological characteristics for rowers. The high functional indicators complement the data related to the body structure required by the specifics of the competition tests. Criteria such as body length and physical/motor qualities (explosive power and coordination processes) are mentioned. The high level of mobility of nerve processes is important for short distances, and a lower level of nerve processes is defining for long-distance competitions (Fatullobekovich & Ugli, 2023). Rowing is included in the category of sports activities based on the manifestation of continuous and repetitive skills in nature (Coker, 2021). The survey of professional coaches (Indonesia) indicated the main qualities/traits that kayak athletes (14-16 years) must possess. These are related to 5 basic components of talent: anthropometry,

biomechanics, psychology, special endurance, and skills. They are identified as defining: the body mass and height, ability to focus and self-confidence, aerobic and anaerobic endurance, strength and endurance, pull-push and catch technique (Yasin et al., 2020). Studies on young Ukrainian girls (9-12 years old) kayaking and canoeing practitioners identify differences and anthropometric peculiarities, which must be taken into account in the selection process. For slalom canoes, athletes with taller stature and with a longer body are recommended. For female kayakers, the existence of a higher ratio between the height of the body and the length of the lower and upper limbs is sought. For canoeing, a higher ratio between the length of the lower limbs and the height of the body, respectively the length of the upper limbs and the height of the body is sought (OKUN et al., 2020). Similar studies on pubertal boys (13-14 years) from Ukraine indicate average and above-average morphological development in this age category. To specialize in canoe slalom, young people with taller stature, larger shoulder girth and smaller thigh girth are preferred. The execution speed of the specific rowing techniques and physical abilities are other important criteria in the selection (OKUN et al., 2022). For rowing athletes (17-18 years), 3 different types of athletes are identified, which involve different physical and functional demands. Power type requires speed and muscle power, and endurance type is highlighted by better values related to stamina, where aerobic capacity is the most important. The All-round type is also highlighted, where a balanced development of skills related to speed-power, speed and endurance is noted. For this last pattern, the programming of complex requests is recommended: working capacity, strength, endurance, muscular power, coordination and flexibility (Huang & Rusanova, 2022). The responses of our group also indicate the importance and confidence given to the influences of these sports activities, on anthropometric dimensions and implicitly on physical development. In terms of fitness components we scored high for potentially favorable effects especially for strength, endurance and even flexibility, but with lower values assigned to speed. However, we believe that for the short-distance trials there are room for improvement in speed and explosive power as well.

The functional demands on kayakers and canoeists can be higher than other sports. There are studies that indicate certain parameters related to Heart rate variability (HRV), at a higher level than those obtained for runners and cyclists (Kiss et al., 2016). A research on young people from Romania (8-12 years old) highlights the beneficial effects of Canoeing in terms of accumulations on the following levels: main motor skills, gross motor skills, fine motor skills, improving muscle toning upper body and the

lower body. The involvement of students in practicing canoeing and standup paddle on smooth waters ensures the involvement and relaxation of students, motor expression skills, given that sedentary activities are more often preferred by children (Alecu et al., 2021). Investigating different parameters for young water sports practitioners (rowers/Ukraine) in the 13-14 years age group is important for an optimal control of the training process. Assessments related to functional assessment, coordination of movements, muscular-articular sensitivity, respiratory muscles, qualitative determination of physical abilities, sensorimotor reactions, etc. (Bogush et al., 2019). Rowing sports (primarily kayaking and canoeing) strongly require the manifestation of static and dynamic balance, the complex movements performed in the boat constantly requiring actions to rebalance the body. Training devices allow a better localization/distribution of body parts, facilitate the development of rhythm, speed and amplitude of movements in rowing and thus ensure the maintenance of balance (Khoshimovich, 2023). Another study indicates the effectiveness of using the KAYAKPRO rowing machine, for improving the technique of rowing on a kayak. There are improvements in technical skills regarding: maintaining balance, correct position of the body in the boat and the paddle in the hands, stroke technique and indicator of the turn of the body (Matnazarov et al., 2022). Our research also indicates superior values for the effects of rowing and kayaking on balance and other elements related to segmental and inter-segmental coordination processes.

## Conclusions

The study identified the main inhibiting factors in the possibility of implementing rowing and kayak-canoeing activities in physical education lessons, through the low scores obtained following the application of the questionnaire: lack of initiative or low involvement of teachers in promoting water sports at the level of school management and local authorities, but also the logistics/deficient material base in the schools. Another sensitive point is the fact that these types of physical activities are not practiced en masse by students in the Danube Delta as free time activities, even if the natural environment offers excellent conditions, an aspect confirmed by the good scores related to the accessibility of water. A positive aspect is the fact that teachers indicate possible strong effects in solving the skills of the school curriculum, beneficial influences on the harmonious physical development and on the level of fitness (mainly for endurance, strength and coordination), so these options can be an alternative to classic sports contents from school programs.

Differences between the pairs defined by the 3 independent variables are reported, but these are rarely significant, so working hypothesis 2 is only partially confirmed. We noted the higher average scores of the male group, for the items of the accessibility and attractiveness factors, but the differences compared to the values expressed by women are in most cases insignificant. The Under 20 years career group is the most optimistic through the scores obtained for all 3 factors, even if in the items of the utility dimension all the differences are insignificant compared to the Over 20 years career group. Instead, significant differences are obtained for the accessibility factor (related to the material base and help from various sports clubs and institutions), as well as for the attractiveness factor (related to the originality of the themes in rowing and kayak-canoeing, respectively the attractiveness of sports games and individual sports). The novice/definitive group is more confident only on the utility factor items than the grade 2/1 group, with significant differences related to improved coordination and flexibility. From these results we can conclude that younger teachers and those in the first part of their teaching career are more optimistic and more open to the novelty related to the implementation of water sports in the schools where they teach.

*Limitations of the study*. The relatively small number of participants is the main limitation of our research, which investigated the opinions of physical education teachers belonging to a geographical area with a small area and specific peculiarities and which do not allow an expansion of the study on a national level, most areas do not offer favorable conditions for studying the impact these water sports. Comparing our results to other similar researches internationally identifies similar aspects related to a lower media coverage and popularity of these sports activities for physical education lessons or leisure options (sport games and specific activities in fitness centers being dominant). However, the implementation of kayak-canoe and rowing lessons in physical education lessons in the Danube Delta area is a challenge and an alternative that can be sustainable.

*Future research directions*. The study carried out and the scientific literature consulted also outlined other research topics, with a complementary character, such as: the use of rowing and kayak-canoeing as variants of active/sports leisure, the use of these activities in recovery/rehabilitation processes for people with different disabilities, or investigating ways to implement rafting on mountain river courses and studying its benefits, etc.

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## Appendix

In this appendix, the relevant information related to the results of the application of the factor analysis (exploratory and confirmatory) for the 3 dimensions of the applied questionnaire are summarized. Tables 1, 4 and 7 show the KMO (Kaiser-Meyer-Olkin) and Bartlett's Test of Sphericity test values. Tables 2, 5 and 8 indicate the resulting principal components and the percentage of variance of each component in the total variance. Tables 3, 6, and 9 contain item loadings on each of the identified principal components.

At the level of the utility factor (table 1), the value of KMO=0.551 is above the minimum threshold of 0.5, and Bartlett's Test of Sphericity indicates $\chi 2$ =49.095, with Sig.=0.008, a significant value and indicating that the analyzed items are strongly correlated, so there are common factors and the factor reduction/PCA procedure can be applied.

**Table 1.** KMO and Bartlett's Test / the utility factor

| | | |
|---|---|---|
| Kaiser-Meyer-Olkin Measure of Sampling Adequacy. | | .551 |
| Bartlett's Test of Sphericity | Approx. Chi-Square ($\chi^2$) | 49.095 |
| | df | 28 |
| | Sig. | .008 |

three components are identified for the utility factor (eigenvalue ≥1), which explains 56.535% of the total variance: component 1 with 20.177%, component 2 with 19.867% and component 3 with 16.491%, according to table 2.

**Table 2.** Total Variance Explained / the utility factor

| Component | Initial Eigenvalues | | | Extraction Sums of Squared Loadings | | | **Rotation Sums of Squared Loadings** | | |
|---|---|---|---|---|---|---|---|---|---|
| | Total | % of Variance | Cumulative % | Total | % of Variance | Cumulative % | Total | % of Variance | Cumulative % |
| 1 | 2.276 | 28.456 | 28.456 | 2.276 | 28.456 | 28.456 | 1.614 | 20.177 | 20.177 |
| 2 | 1.215 | 15.182 | 43.637 | 1.215 | 15.182 | 43.637 | 1.589 | 19.867 | 40.044 |
| 3 | 1.032 | 12.898 | 56.535 | 1.032 | 12.898 | 56.535 | 1.319 | 16.491 | 56.535 |
| 4 | .920 | 11.498 | 68.034 | | | | | | |
| 5 | .880 | 10.997 | 79.031 | | | | | | |
| 6 | .756 | 9.444 | 88.475 | | | | | | |
| 7 | .594 | 7.423 | 95.898 | | | | | | |
| 8 | .328 | 4.102 | 100.000 | | | | | | |
| Extraction Method: Principal Component Analysis. | | | | | | | | | |

The matrix of the components after applying the rotation (table 3/ the utility factor) indicates for component 1 a strong loading (>0.6) based on items F1.1 and F1.2 (resolving program competencies through Kayak-canoe themes and teachers' involvement in promoting these homework at the level of the inspectorate and school management). Component 2 loads strongly and moderately on items F1.6, F1.8, F1.5, F1.4, and F1.4 (all referring to effects on fitness level). Component 3 loads strongly on the basis of item F1.3 (influence on bodily harmony) and secondarily on item F1.5 (effects on coordination).

**Table 3.** Rotated Component Matrix[a] / the utility factor

| | Component | | |
|---|---|---|---|
| | 1 | 2 | 3 |
| F1.1 The role of rowing and kayak-canoe in solving the competencies of the program | .837 | -.086 | .027 |
| F1.2 Proposal of rowing and kayak-canoe lessons to the inspectorate/school management | .727 | .156 | .098 |
| F1.6 The influence of rowing and kayak-canoe lessons on strength development | .420 | .325 | .138 |
| F1.8 The influence of rowing and kayak-canoe lessons on the development of flexibility | .105 | .729 | -.038 |
| F1.5 The influence of rowing and kayak-canoe lessons on the development of coordination | .059 | .624 | .566 |
| F1.4 The influence of rowing and kayak-canoe lessons on speed development | .028 | .555 | .119 |
| F1.7 The influence of rowing and kayak-canoe lessons on the development of resistance | .379 | .460 | -.424 |
| F1.3 The role of rowing and kayak-canoe lessons in harmonious physical development | .224 | .106 | .880 |
| Extraction Method: Principal Component Analysis.<br>Rotation Method: Varimax with Kaiser Normalization. | | | |
| a. Rotation converged in 6 iterations. | | | |

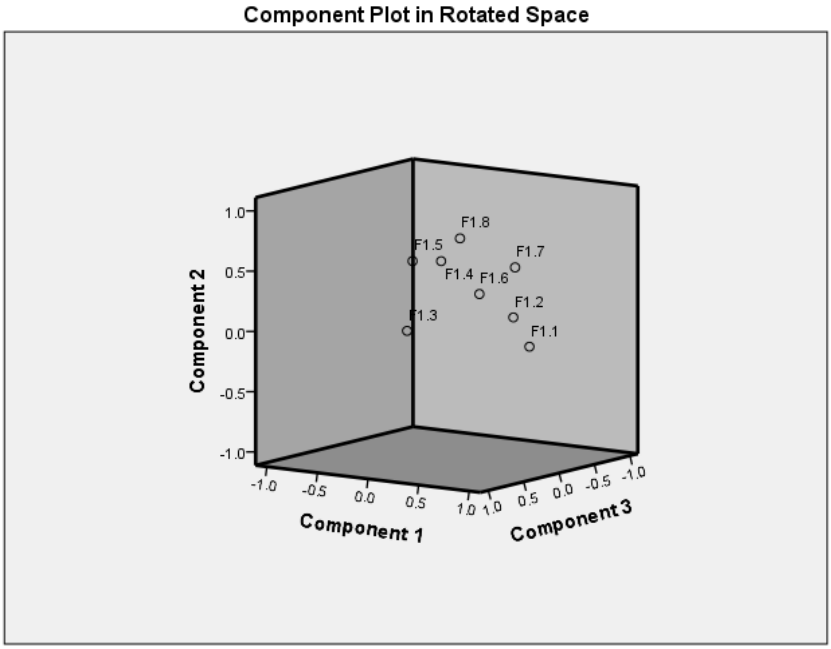



**Figure 1.** The loading graph of the 8 items of the utility factor on the 3 components in the system of axes/Varimax rotation

At the level of the accessibility factor (table 4), the value of KMO=0.541 is above the minimum threshold of 0.05, and Bartlett's Test of Sphericity indicates $\chi 2 = 46.346$, with Sig.=0.000, a significant value that also indicates strong correlations between the dependent variables in this case /items, so the factorial reduction/PCA procedure can be applied.

**Table 4.** KMO and Bartlett's Test / the accessibility factor

| Kaiser-Meyer-Olkin Measure of Sampling Adequacy. | | .541 |
|---|---|---|
| Bartlett's Test of Sphericity | Approx. Chi-Square ($\chi^2$) | 46.346 |
| | df | 15 |
| | Sig. | .000 |

Three components are also identified for the accessibility factor (eigenvalue ≥1), which explains 72.191% of the total variance: component 1 with 28.131%, component 2 with 25.169% and component 3 with 18.890%, according to table 5.

**Table 5.** Total Variance Explained / the accessibility factor

| Component | Initial Eigenvalues | | | Extraction Sums of Squared Loadings | | | **Rotation Sums of Squared Loadings** | | |
|---|---|---|---|---|---|---|---|---|---|
| | Total | % of Variance | Cumulative % | Total | % of Variance | Cumulative % | Total | % of Variance | Cumulative % |
| 1 | 2.175 | 36.256 | 36.256 | 2.175 | 36.256 | 36.256 | 1.688 | 28.131 | 28.131 |
| 2 | 1.131 | 18.849 | 55.105 | 1.131 | 18.849 | 55.105 | 1.510 | 25.169 | 53.300 |
| 3 | 1.025 | 17.086 | 72.191 | 1.025 | 17.086 | 72.191 | 1.133 | 18.890 | 72.191 |
| 4 | .812 | 13.532 | 85.723 | | | | | | |
| 5 | .495 | 8.256 | 93.979 | | | | | | |
| 6 | .361 | 6.021 | 100.000 | | | | | | |
| Extraction Method: Principal Component Analysis. | | | | | | | | | |

The component matrix after applying the rotation (table 6/ the accessibility factor) indicates for component 1 a strong loading (>0.6) based on items F2.1, F2.4 and F2.6 (estimated effort capacity of students, practicing water sports in free time and proximity to water shine). Component 2 loads strongly on items F2.3 and F2.2 (help provided by sports clubs and existence of boats). Component 3 loads strongly only on item F 2.5 (knowledge of swimming techniques) and secondarily on item F2.4 (accessibility of water gloss).

**Table 6.** Rotated Component Matrix[a] / the accessibility factor

| | Component | | |
|---|---|---|---|
| | 1 | 2 | 3 |
| F2.1 The level of physical development and effort capacity of students for rowing | .865 | .056 | -.160 |
| F2.6 Existence of students practicing kayak-canoeing in their free time | .671 | .250 | .207 |
| F2.4 Accessibility of water gloss/proximity to school | .607 | .017 | .323 |
| F2.3 Helping sports clubs and institutions to use water sheen | -.042 | .880 | .215 |
| F2.2 Existence of boats/logistics in school or sports clubs | .321 | .816 | -.126 |
| F2.5 Knowledge of swimming techniques for students, to prevent drowning/accidents | .124 | .073 | .948 |
| Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization. | | | |
| a. Rotation converged in 4 iterations. | | | |

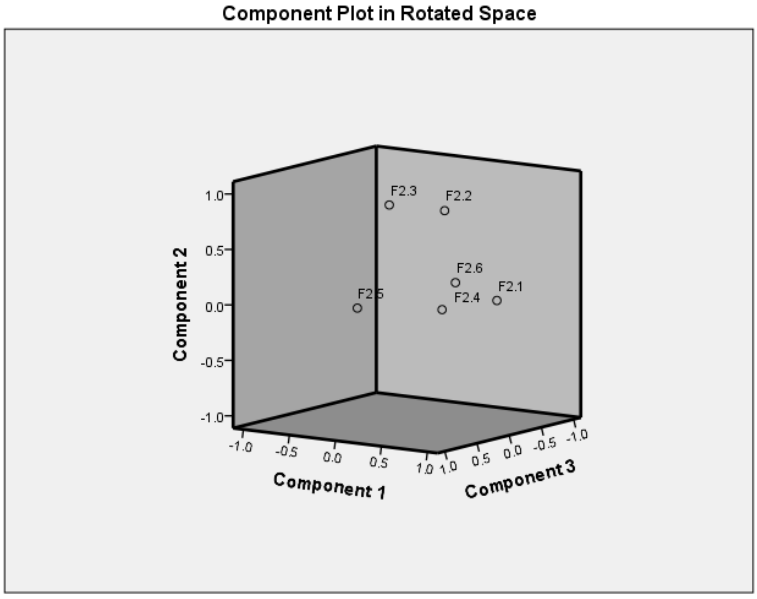



**Figure 2.** The graph of the loading of the 6 items of the accessibility factor on the 3 components in the system of axes/Varimax rotation

At the level of the attractiveness factor (table 7), the value of KMO=0.632 is above the minimum threshold of 0.5, and Bartlett's Test of Sphericity indicates $\chi 2 = 48.467$, with Sig.=0.000, a value that is significant, so the analyzed items are strongly correlated and it can be apply the factorial reduction/PCA procedure.

**Table 7.** KMO and Bartlett's Test / the attractiveness factor

| | | |
|---|---|---|
| Kaiser-Meyer-Olkin Measure of Sampling Adequacy. | | .632 |
| Bartlett's Test of Sphericity | Approx. Chi-Square ($\chi^2$) | 48.467 |
| | df | 6 |
| | Sig. | .000 |

Only one component is identified for the attractiveness factor (eigenvalue ≥1), which explains 53.178% of the total variance, according to table 8.

| **Table 8.** Total Variance Explained / the attractiveness factor | | | | | | |
|---|---|---|---|---|---|---|
| Component | Initial Eigenvalues | | | Extraction Sums of Squared Loadings | | |
| | Total | % of Variance | Cumulative % | Total | % of Variance | Cumulative % |
| 1 | 2.127 | 53.178 | 53.178 | 2.127 | 53.178 | 53.178 |
| 2 | .977 | 24.426 | 77.604 | | | |
| 3 | .620 | 15.506 | 93.110 | | | |
| 4 | .276 | 6.890 | 100.000 | | | |
| Extraction Method: Principal Component Analysis. | | | | | | |

For the component matrix (table 9 / the attractiveness factor), the Rotation Method/Varimax with Kaiser Normalization was no longer applied, due to the existence of only one component. A strong loading (>0.6) is found based on items F3.1, F3.2 and F3.4 (the interest in water sports compared to sports games and individual sports, respectively the students' reaction to the proposal of Kayak-canoe homework) and a moderate loading for item F3.3 (originality of Kayak-Canoe themes).

| **Table 9.** Component Matrix[a] / the attractiveness factor | |
|---|---|
| | Component |
| | 1 |
| F3.1 The interest of kayak-canoe homework compared to sports games | .888 |
| F3.2 The interest of kayak-canoe homework compared to individual sports | .868 |
| F3.4 Pupils' reaction to the proposed kayak-canoe homework | .620 |
| F3.3 Originality/novelty of kayak-canoe themes | .449 |
| Extraction Method: Principal Component Analysis. | |
| a. 1 components extracted. | |