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# The Importance of Basketball for High School Students. Part 2 (Utility Dimension Analysis)

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**Abstract:** *Background and Study Purpose. The use of basketball in curricular and extracurricular activities is common in most countries. The research aims to identify the opinions of high school students and the effects and usefulness of basketball on multiple levels: socialization, stress reduction, health and fitness optimization, personality formation, body harmony, etc. Material and Methods. A sample of 259 high school students (124 females and 135 males) from Gorj county, Romania, were included in a sociometric cross-sectional study in the first part of the 2023-2024 school year. All investigated participants partook in physical education lessons with basketball topics. The factor analysis of the applied questionnaire included 14 items within the usefulness dimension, with responses reported on a Likert scale with 5 levels of intensity of opinions. The independent Gender, Area variables and the interaction Gender *Area variables were defined and analysed. Results. Gender differences indicate higher values for males, but not statistically significant ($P > 0.05$). Only for flexibility is the opinion of females superior and statistically significant ($P < 0.05$). Differences between urban and rural are in favour or urban for most items, but still statistically insignificant ($P > 0.05$). The only items where F values are significant are those related to the role of basketball in the formation of fair-play attitude and the accessibility of basketball as a leisure activity ($P < 0.05$). The Gender *Area variables interaction indicates only 3 situations where significant differences of opinion are reported ($P < 0.05$): accessibility of basketball as a leisure activity, effect on effort capacity and fitness level, and effect of basketball on coordination. All these cases indicate higher values of urban males vs rural males and vice versa for females, where rural females score higher than urban females. Conclusions. For the utility dimension, we noted the majority of opinions in favour of basketball, through its various effects on students in adolescence. The most optimistic scores were for the benefits of coordination and speed (components of skill-related physical fitness). This is followed by beneficial effects on health, the formation of fair-play attitudes, physical development and body harmony, facilitating socialization, communication and group integration. The influence of basketball on stress reduction is also viewed with confidence. The effect on improving effort capacity and general level of physical fitness scores moderately. Weaker values are given for influences on intellectual abilities and level of segmental muscle strength. Students give the lowest confidence in the effects of basketball on flexibility and endurance levels. In contrast to the attractiveness factor, for the usefulness dimension, we found less significant differences in opinion between rural and urban females and males. This is an indicator of critical thinking ability and reflects a good level of understanding of the effects of playing basketball on multiple levels in the sample surveyed.*

**Keywords:** *questionnaire, beneficial effects, basketball, utility, high school level.*

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## Introduction

Basketball is a sport that can be played competitively or recreationally, with long-term benefits for young people, according to NBA experts. These mainly concern health, improved social interactions, moderate to high levels of physical activity, and relatively low incidence of injuries (DiFiori et al., 2018). The popularity of basketball also led to the implementation of derivative forms of the game. One variant is Walking Basketball, which targets people who are less active, inactive or recovering from injuries. The objectives pursued are related to the social, recreational and fun dimensions of the leisure version (Jenkin et al., 2018). The intensity of the efforts and the diversity of actions specific to basketball recommend it as a variant for maintaining mental and physical health, but also for optimizing the level of fitness for the Chinese population (Chen, 2022). Research on college students in China has confirmed the beneficial role of basketball as a form of leisure. It has been found that it ameliorates harmful lifestyle habits, reduces learning anxiety, improves physical and mental health (Yue, 2022). Differences between high school athletes (Wisconsin/USA) and basketball, tennis, volleyball or soccer teams are identified between suburban and rural high schools. Those from the suburbs play sports from a younger age and have more competitions and hours of physical activity monthly/yearly. They have higher rankings and chances to play in out-of-school leagues, but also higher risks of injury and overwork (D. R. Bell et al., 2018).

The existence of basketball courts and other facilities in playgrounds for children in the USA may be a solution to reduce sedentary lifestyles, with 50% falling into this category (Black et al., 2015). Participation in physical activity for youth in the Midwestern United States is dependent on several factors. Access to equipment and courts, physical and social safety, adult support, and peer behaviour are some of the requirements. The existence of courts and basketball hoops is important if they are not occupied by adults (Smith et al., 2015). For young people in Melbourne/Australia, involvement in physical activities in parks is also conditioned by the existence of sports features/facilities (especially for males). The presence of sports courts for basketball and other sports games is also mentioned in interviews (Rivera et al., 2021). For adolescents in Turkey (13-19 years/urban), the existence of green grass, soccer and basketball courts, and fitness equipment are associated with good physical health and participation in sports activities (Akpınar, 2019).

The beneficial effects of basketball on improving cardiorespiratory fitness, bone density, reducing body fat and improving cardiometabolic health are highlighted by (Rátgéber et al., 2019). It can thus be valued as a form of recreation, being the second most popular sports game worldwide (increasingly as a variant of streetball) after soccer. Research on obese subjects has shown that using basketball training for 8 weeks has beneficial effects on health. Decreases in body fat, reduced body mass, improved cardiorespiratory function and improved fitness levels have been identified (Liu & Kan, 2021).

Research on amateur high school basketball players and professional players in Russia has shown that optimal development of the cardiovascular system is a priority for health. This idea is supported by the fact that the sport does not exhibit strong endurance-related traits (Zakharova, 2017). The analysis of fitness levels for young female basketball players in Poland (15.5 years old) in the period 2006-2013 identified a decrease in performance on the International Physical Fitness Test. Other negative trends/BMI values indicating an increase in obesity are also identified (Karpowicz et al., 2015). The use of The Tactical Games Model (TGM) in teaching basketball in schools in the eastern USA revealed better levels of moderate-vigorous physical activity and vigorous physical activity. However, higher values of physical demand are reported for males compared to females at the same level of instruction (Harvey et al., 2016). The implementation of the Tactical Games Approach (TGA) in teaching basketball to Spanish students is effective. Stronger functional demands (mean heart rate), better physical fitness and higher levels of speed (Gamero et al., 2021). For the 3x3 version of basketball, different physical demands between males and females in international competitions were shown. These concern low and high-intensity/minute physical activities in matches and ball possession times (Ferioli et al., 2023).

The impact of physical activities on different population groups during Covid-19 and post-Covid has multiple beneficial effects on the body (Puni et al., 2024; Vizitiu & Constantinescu, 2022). An experimental program to include basketball in physical education lessons for high school females (for 3 months) identified positive aspects. Indicators for agility, endurance, strength, and upper limb repetition speed increased (Gontarev, et al., 2015). Application of VIT/vigorous interval training through basketball-specific structures on obese French adolescents increases physical self-perceptions (PSP). The values obtained using basketball are better compared to those obtained using boxing or cycling (Rey et al., 2018). For talented young basketball players (national teams), power outputs in jumps and

accelerations are an important selection indicator for both sexes (Arede et al., 2019). The use of tests for coordination (determining lateral and semicircular agility) in women's youth basketball is supported by (Hadžović et al., 2023).

The use of basketball analytics as a variant of student improvement for STEM/Science, Technology, Engineering, and Mathematics is highlighted by (Drazan et al., 2017). Young people can collect and analyze data related to their own basketball performance, making STEM a viable option for improving their performance. Recent research supports the use of modern technologies in physical education lessons to increase their attractiveness (Pârvu, Szabo, et al., 2023; Pârvu, Ungurean, et al., 2023). The use of innovative technologies for teaching free throws in basketball can increase their efficiency and technical accuracy (Olteanu et al., 2023). Research on young Australians (basketball fans and practitioners) identifies their perceptions of gambling as everyday activity and that they have become normalised in sports (Nyemcsok et al., 2021).

Within basketball teams, the status of each player is determined by individual characteristics/values, but also by the group in which they are integrated. High-status players can benefit from positive group performance by improving status, but also from decreases if team performance is poor (Koster & Aven, 2018). Chinese students' participation in sports education in a basketball club increased their skills, level of involvement, knowledge of the sport, and enjoyment of basketball (Hastie et al., 2020). Other studies indicate cross-cultural communication within basketball teams (National Collegiate Athletic Association) to improve team performance and effectiveness (Bell & Riol, 2017). Research on Slovenian athletes (basketball and swimming) has identified differences between genders and sports. Basketball players perceive lower chances of pursuing sports and academic careers in parallel, for women social aspects are more important and they have better academic achievements (Tekavc et al., 2015). Emotional intelligence is an important factor in solving competitive tasks in basketball. Better values of emotional intelligence are highlighted for rural vs urban Indian basketball players (Dhananjay, 2016). Norwegian students' views on the contribution of physical education to mental health are reviewed by (Røset et al., 2020). This study also provides a remark related to basketball: "*When we play basketball, then I don't bother ... I can't stand basketball when it is together with the class.*"

*Purpose of the Study*. The research investigates the opinions of high school students about the usefulness and beneficial effects of basketball (in physical education lessons and as a leisure activity).

*Working hypotheses:*

1. The applied questionnaire meets the reliability criteria to measure the features of the utility dimension.
2. We estimate that there are significant differences for the independent variables Gender, Area variables, respectively Gender *Area between the mean values of the questionnaire items (utility factor).

## Materials and Methods

*Participants*. By random selection, 6 high schools from Gorj county, Romania, were selected, which had planned basketball topics in physical education lessons during the 2023-2024 school year. A total of 266 subjects responded favourably to the request to participate in this study and were questioned about the effects and usefulness of basketball in different directions. We only used data from students who completed the questionnaire items in full and the final batch of questionnaires without errors identified was 259. The selection aimed to ensure a relative numerical balance between females and males and between urban and rural. However, the number of rural respondents was lower than the number of urban respondents, especially for the female group. Data related to age and distribution of students by Gender and Area variables are summarised in Table 1.

**Table 1.** Average age-related values and number of cases for the samples analysed

| Gender | Area variables | Age/(Mean) | Std. Deviation | N |
|---|---|---|---|---|
| **Male** | urban | 17.1027 | .68497 | 75 |
| | rural | 16.9333 | .72548 | 60 |
| | Total | 17.0274 | .70567 | 135 |
| **Female** | urban | 16.8370 | .70983 | 81 |
| | rural | 17.0907 | .59314 | 43 |
| | Total | 16.9250 | .68010 | 124 |
| **Total** | urban | 16.9647 | .70837 | 156 |
| | rural | 16.9990 | .67483 | 103 |
| | Total | 16.9784 | .69410 | 259 |

*Research Design.* The study falls into the cross-sectional research category. The construction of the questionnaire was carried out between September and October 2023 by professors who are members of the Human Performance Research Center/Faculty of Physical Education and Sports that belongs to "Dunărea de Jos" University of Galaţi. After completion, it was sent for implementation in selected high schools in Gorj county (November 2023-January 2024). Physical education teachers from the selected high schools explained the meaning of each item to the students in the selected classes. The participants were told to select a single Likert scale score with 5 levels, according to their personal framing and perception of the intensity of the ratings. Students were informed about the research objectives and the confidentiality of data obtained from the investigations involving human subjects was ensured (Sandu, 2012; "World Medical Association Declaration of Helsinki," 2013). The University Ethics Committee issued consent for publishing the research results (77/CEU/27.02.2024).

*Statistical Analysis.* The responses expressed by the students were processed using SPSS Software (Statistical Package for the Social Sciences/IBM Vers.24 Chicago, IL, USA. The percentages of the answers chosen for each step of the Likert scale were listed in the tables. The mean values of the items (for the whole sample) and the mean values resulting from the interaction of the variables were represented using the Microsoft Excel software. From the multivariate and univariate analysis, we summarized the data for the F values, $\eta^2_p$, the differences between the mean values of the independent variables, with the significance thresholds of the data pairs. The confidence interval was set at 95% (Armstrong, 2014; Hair, 2009; Murariu & Munteanu, 2018; Opariuc, 2011; Sarma & Vardhan, 2018).

## Results

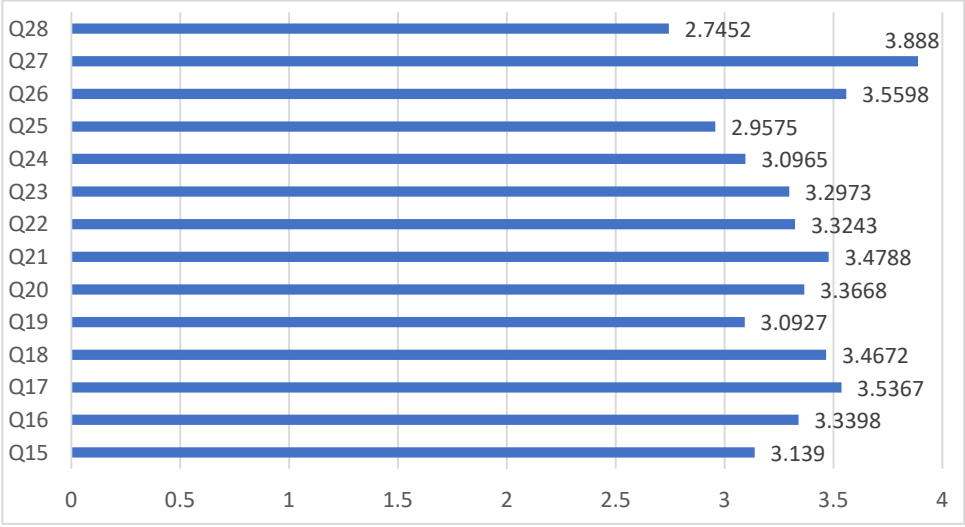
The values of the reliability coefficient and the test of equality of the averages for the answers to the items at the Utility factor are summarised in Table 2. Also for this factor, Cronbach's Alpha value is very good and exceeds the accepted threshold limit. This indicates that the items included in this dimension provide a high reliability of measurement of students' opinions about the usefulness of the game of basketball. Students' responses are varied/diverse for this factor, which is supported by Hotelling's T-Squared Test value and the significant threshold associated with this indicator. These values indicate that the first working hypothesis is confirmed.

**Table 2.** Cronbach's Alpha and Hotelling's T-Squared Test values for factor 2/Utility

| Factors | Reliability Statistics | | Hotelling's T-Squared Test | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Cronbach's Alpha | Cronbach's Alpha Standardized Items | N of items | Hotelling's T-Squared | F | df1 | df2 | Sig. |
| **F2/ Utility** | 0.952 | 0.952 | 14 | 918.583 | 67.374 | 13 | 246 | 0.000 |

The mean values for the Utility factor items (Fig. 1) indicate the highest scores for Q27 (effect of basketball on coordination) and Q26 (effect of basketball on speed). Next in the ranking are Q17 (contribution of basketball to the formation of fair-play attitude), Q21 (role of basketball in optimizing health), and Q18 (contribution of basketball to body development and harmony). Higher values are also obtained by Q16 (role of basketball in socialisation and group integration) and Q22 (role of basketball in recreation and stress reduction). The lowest mean scores are recorded for items Q28 (effect of basketball on flexibility) and Q25 (effect of basketball on strength/endurance). Lower scores are also obtained for Q19 (role of basketball in increasing problem-solving ability) and Q24 (effect of basketball on muscle strength).

**Fig.1.** Mean values of the ***Utility*** factor items for the whole sample studied (N=259)




The items of the Utility factor, the Likert scale values, with the related response variants/ratings and the resulting percentages at each level are summarised in Table 3. In contrast to the percentage distribution shown

for the Attractiveness factor, for the Utility factor, we note the high percentages allocated to levels 4/5 for most items. The highest scores are identified for Q27 (role of basketball in the development of coordination), with 73.8% indicating a strong and very strong effect. Q26 (the role of basketball in developing speed) has 58.7% of responses assigned to 4/5 values. Very high confidence scores are obtained for Q17 (role of basketball in forming fair-play attitudes) with 56.4%. For Q18 (the influence of basketball on growth and body harmony) students indicate 51.4% high confidence responses. The accessibility and usefulness of basketball as a leisure activity (Q20) indicate a 43.6% rating for 4/5 scores. A higher score is also obtained by Q21 (effect of basketball on health) with 47.5% for a strong and very strong effect. The role of basketball in reducing stress (Q22) also scores very high (47.5%). For Q16 (training socialisation and group integration skills) a value of 47.9% is obtained for levels 4/5. The influence of basketball on fitness level (Q23) also indicates an orientation of the students towards the higher values of the Likert scale (40.5%). However, we also noted two items where the lower scores have obviously higher percentage values than the higher ones. For example, for Q28 (effect on flexibility) 43.3% of students indicated no or low effects. For Q25 (effect on endurance) 27.5% indicate ratings related to 1/2 levels.

**Table 3.** Percentage distribution of responses for Likert scale levels for the factor Utility

| Item | 5 | 4 | 3 | 2 | 1 |
|---|---|---|---|---|---|
| **Q15** | *How useful do you think the game of basketball is in shapping your personality?* | | | | |
| | Very useful (9.3%) | Useful (29.3%) | Quite useful (35.9%) | A little useful (17%) | Useless (18.5%) |
| **Q16** | *By playing basketball, do you think can you develop skills related to socialization, communication and group integration?* | | | | |
| | With certainty (12%) | To a large extent (35.9%) | Moderate (32%) | To a small extent (14.3%) | No (5.8%) |
| **Q17** | *Does learning and respecting the rules of basketball help form a fair play attitude?* | | | | |
| | With certainty (17%) | To a large extent (39.4%) | Moderate (26.3%) | To a small extent (15.1%) | No (2.3%) |
| **Q18** | *How much do you believe that basketball could influence your physical development and body harmony?* | | | | |
| | Very strong (20.1%) | Strong (31.3%) | Moderate (28.2%) | Reduced (16.2%) | No influence (4.2%) |
| **Q19** | *Could basketball improve intellectual skills and problem-solving ability?* | | | | |
| | With certainty (9.7%) | To a large extent (22.8%) | Moderate (41.3%) | To a small extent (19.7%) | No (6.6%) |
| **Q20** | *As a leisure activity do you think basketball is accessible for children and young people:* | | | | |
| | Very accessible and useful (10.8%) | Accessible and useful (32.8%) | Medium accessible and useful (42.1%) | Less accessible and useful (10.8%) | Inaccessible and useless (3.5%) |
| **Q21** | *Could playing basketball help optimise your health?* | | | | |
| | Very much (15.1%) | A lot (32.4%) | Moderate (38.6%) | Less (13.1%) | Not at all (0.8%) |
| **Q22** | *Do you think basketball provides stress relief after intellectual demands?* | | | | |
| | With certainty (10.4%) | To a large extent (37.1%) | Moderate (30.5%) | To a small extent (18.5%) | No (3.5%) |
| **Q23** | *Select the effect of basketball on your effort capacity and fitness level:* | | | | |
| | Very strong (6.9%) | Strong (33.6%) | Moderate (44%) | Reduced (13.1%) | No effect (2.3%) |
| **Q24** | *Select the effect of basketball on the muscle strength of the main body segments:* | | | | |
| | Very strong (2.7%) | Strong (26.6%) | Moderate (49.8%) | Reduced (19.3%) | No effect (1.5%) |
| **Q25** | *Select the effect of basketball on stamina/endurance:* | | | | |
| | Very strong (2.3%) | Strong (22.4%) | Moderate (47.9%) | Reduced (23.6%) | No effect (3.9%) |
| **Q26** | *Select the effect of basketball on speed:* | | | | |
| | Very strong (14.7%) | Strong (44%) | Moderate (26.6%) | Reduced (12%) | No effect (2.7%) |
| **Q27** | *Select the effect of basketball on the coordination skills:* | | | | |
| | Very strong (23.2%) | Strong (50.6%) | Moderate (19.7%) | Reduced (5%) | No effect (1.5%) |
| **Q28** | *Identify the influence of basketball topics on flexibility (joint mobility and muscle elasticity):* | | | | |
| | Very strong (0%) | Strong (17.4%) | Moderate (49.4%) | Reduced (23.6%) | No effect (9.7%) |

The results obtained by multivariate/MANOVA analysis for the Utility factor (Table 4) show statistically significant effects of the two independent variables and their interaction on the responses to the items of this dimension of the questionnaire. All F values correspond to statistically significant thresholds (Sig. < 0.05), however, the size effect/$\eta^2_p$ results show that the influence of the independent variables is still smaller than for the Attractiveness dimension. The Gender variable explains 19.7% of the variance at item level and the Area variables explain only 10.2% of the variance. The interaction of Gender *Area variables determines 12.5% of the variance in the response values for the Utility dimension. These values are supported by the smaller number of significant differences between the pairs of data determined at the level of each variable which are detailed in the following tables.

**Table 4.** Multivariate tests [a] /MANOVA results for the Utility factor.

| Effect | λ | F | Hypothesis df | Error df | Sig. | $\eta^2_p$ | Observed Power |
|---|---|---|---|---|---|---|---|
| Gender | 0.803 | 4.242[b] | 14.000 | 242.000 | 0.000 | 0.197 | 1.000 |
| Area variables | 0.898 | 1.956[b] | 14.000 | 242.000 | 0.022 | 0.102 | .940 |
| Gender *Area variables | 0.875 | 2.466[b] | 14.000 | 242.000 | 0.003 | 0.125 | .982 |

a. Design: Gender + Area variables + Gender *Area variables

b. Exact statistics

λ-Wilk's lambda; F-Fisher test; df-degrees of freedom; Sig.-level of probability; $\eta^2_p$-partial eta squared

The mean values for the gender variable and the differences between them for the Utility factor items are summarised in Table 5. We observe a balance between the opinions by gender, with most of the differences statistically insignificant (P > 0.05). The only exception is for item Q28 (influence of basketball on flexibility), where females' opinion is significantly better than males' (P < 0.05). Males score higher than females for Q15 (influence on character and personality), Q16 (formation of social skills), Q17 (formation of fair-play attitude), Q18 (influence on body harmony), and Q19 (improvement of problem-solving ability). Other items where they noted the superiority of males' values were Q24 (effect of basketball on muscle strength), Q25 (effect on endurance) and Q26 (effect on speed development). Females have higher mean scores for Q20 (leisure variant), Q21 (effect on optimising health), Q22 (reducing stress) and Q27 (effect on coordination).

**Table 5**. Results of analysis of variance/ANOVA and pairwise differences for the independent variables *Gender* (male=135, female=124) for the *Utility* factor

| Item | Group | Mean | Std. Deviation | Std. Error | a-b | F(1, 257) | Sig[b]. | $\eta^2_p$ | Observed Power |
|---|---|---|---|---|---|---|---|---|---|
| Q15 | a. Male | 3.200 | 1.070 | 0.093 | 0.127 | 0.905 | 0.342 | 0.004 | 0.158 |
| | b. Female | 3.072 | 1.083 | 0.097 | | | | | |
| Q16 | a. Male | 3.407 | 0.987 | 0.090 | 0.141 | 1.172 | 0.280 | 0.005 | 0.190 |
| | b. Female | 3.266 | 1.112 | 0.094 | | | | | |
| Q17 | a. Male | 3.614 | 0.938 | 0.087 | 0.163 | 1.672 | 0.197 | 0.006 | 0.251 |
| | b. Female | 3.451 | 1.092 | 0.091 | | | | | |
| Q18 | a. Male | 3.481 | 1.170 | 0.096 | 0.030 | 0.047 | 0.829 | 0.000 | 0.055 |
| | b. Female | 3.451 | 1.046 | 0.100 | | | | | |
| Q19 | a. Male | 3.207 | 1.079 | 0.089 | 0.240 | 3.507 | 0.062 | 0.013 | 0.463 |
| | b. Female | 2.967 | 0.970 | 0.092 | | | | | |
| Q20 | a. Male | 3.340 | 1.023 | 0.081 | -0.054 | 0.218 | 0.641 | 0.001 | 0.075 |
| | b. Female | 3.395 | 0.834 | 0.084 | | | | | |
| Q21 | a. Male | 3.466 | 1.020 | 0.080 | -0.025 | 0.048 | 0.827 | 0.000 | 0.055 |
| | b. Female | 3.491 | 0.821 | 0.084 | | | | | |
| Q22 | a. Male | 3.266 | 1.045 | 0.087 | -0.120 | 0.927 | 0.336 | 0.004 | 0.160 |
| | b. Female | 3.387 | 0.960 | 0.090 | | | | | |
| Q23 | a. Male | 3.296 | 0.898 | 0.075 | -0.002 | 0.000 | 0.985 | 0.000 | 0.050 |
| | b. Female | 3.298 | 0.835 | 0.078 | | | | | |
| Q24 | a. Male | 3.118 | 0.773 | 0.068 | 0.046 | 0.218 | 0.641 | 0.001 | 0.075 |
| | b. Female | 3.072 | 0.808 | 0.071 | | | | | |
| Q25 | a. Male | 3.044 | 0.790 | 0.072 | 0.182 | 3.035 | 0.083 | 0.012 | 0.411 |
| | b. Female | 2.862 | 0.886 | 0.075 | | | | | |
| Q26 | a. Male | 3.044 | 0.790 | 0.084 | 0.053 | 0.191 | 0.662 | 0.001 | 0.072 |
| | b. Female | 2.862 | 0.886 | 0.087 | | | | | |
| Q27 | a. Male | 3.881 | 0.864 | 0.075 | -0.014 | 0.016 | 0.900 | 0.000 | 0.052 |
| | b. Female | 3.895 | 0.881 | 0.078 | | | | | |
| Q28 | a. Male | 2.622 | 0.896 | 0.073 | -0.257* | 5.924 | 0.016 | 0.023 | 0.679 |
| | b. Female | 2.879 | 0.792 | 0.076 | | | | | |

*. The mean difference is significant at the .05 level.
The F tests the effect of gender. / This test is based on the linearly independent pairwise comparisons among the estimated marginal means.
b. *Adjustment* for multiple comparisons: Bonferroni.

The mean scores and differences between urban and rural students are shown in Table 6. We identified only two significant differences, with higher scores for urban students ($P < 0.05$). These are for Q17 (role in forming fair-play attitude) and Q20 (basketball as a leisure option). Urban students obtain higher mean scores for most items, but statistically insignificant ($P > 0.05$) for Q15 (usefulness in personality and character formation), Q16 (socialisation and group integration), and Q18 (harmonious physical development). Other items for which the urban group of students

has higher scores are Q19 (problem-solving ability), Q21 (optimizing health), Q25 (effect on endurance), and Q28 (effect on flexibility). However, there are also a few items where the rural group of students has higher mean scores: Q22 (stress reduction), Q24 (effect on muscle strength) and Q26 (effect on speed), but still statistically insignificant.

**Table 6**. Results of analysis of variance/ANOVA and pairwise differences for the indpendent variable *Area variables* (urban=156, rural=103) at the *Utility* factor level

| Item | Group | Mean | Std. Deviation | Std. Error | a-b | F(1, 257) | Sig[b]. | $\eta^2_p$ | Observed Power |
|---|---|---|---|---|---|---|---|---|---|
| Q15 | a. Urban | 3.2179 | 1.14325 | .086 | 0.199 | 2.119 | 0.147 | 0.008 | 0.305 |
| | b. Rural | 3.0194 | .95979 | .106 | | | | | |
| Q16 | a. Urban | 3.4295 | 1.01671 | .084 | 0.226 | 2.888 | 0.090 | 0.011 | 0.395 |
| | b. Rural | 3.2039 | 1.08789 | .103 | | | | | |
| Q17 | a. Urban | 3.6410 | 1.02201 | .081 | 0.262* | 4.188 | 0.042 | 0.016 | 0.531 |
| | b. Rural | 3.3786 | .99130 | .100 | | | | | |
| Q18 | a. Urban | 3.5513 | 1.09128 | .089 | 0.211 | 2.259 | 0.134 | 0.009 | 0.322 |
| | b. Rural | 3.3398 | 1.13374 | .109 | | | | | |
| Q19 | a. Urban | 3.1282 | 1.05168 | .083 | 0.089 | 0.463 | 0.497 | 0.002 | 0.104 |
| | b. Rural | 3.0388 | 1.00900 | .102 | | | | | |
| Q20 | a. Urban | 3.4872 | .91219 | .074 | 0.303* | 6.627 | 0.011 | 0.025 | 0.727 |
| | b. Rural | 3.1845 | .94711 | .091 | | | | | |
| Q21 | a. Urban | 3.5064 | .95375 | .074 | 0.070 | 0.347 | 0.557 | 0.001 | 0.090 |
| | b. Rural | 3.4369 | .89300 | .092 | | | | | |
| Q22 | a. Urban | 3.3205 | 1.02225 | .081 | -0.010 | 0.006 | 0.940 | 0.000 | 0.051 |
| | b. Rural | 3.3301 | .98407 | .099 | | | | | |
| Q23 | a. Urban | 3.3077 | .86967 | .070 | 0.026 | 0.056 | 0.813 | 0.000 | 0.056 |
| | b. Rural | 3.2816 | .86792 | .086 | | | | | |
| Q24 | a. Urban | 3.0897 | .71276 | .063 | -0.017 | 0.029 | 0.865 | 0.000 | 0.053 |
| | b. Rural | 3.1068 | .89566 | .078 | | | | | |
| Q25 | a. Urban | 2.9808 | .79896 | .067 | 0.058 | 0.299 | 0.585 | 0.001 | 0.085 |
| | b. Rural | 2.9223 | .90412 | .083 | | | | | |
| Q26 | a. Urban | 3.5192 | 1.03781 | .078 | -0.102 | 0.684 | 0.409 | 0.003 | 0.131 |
| | b. Rural | 3.6214 | .86451 | .096 | | | | | |
| Q27 | a. Urban | 3.9038 | .83302 | .070 | 0.040 | 0.129 | 0.720 | 0.001 | 0.065 |
| | b. Rural | 3.8641 | .92935 | .086 | | | | | |
| Q28 | a. Urban | 2.8077 | .82003 | .068 | 0.157 | 2.100 | 0.149 | 0.008 | 0.303 |
| | b. Rural | 2.6505 | .90433 | .084 | | | | | |

*. The mean difference is significant at the .05 level.
The F tests the effect of gender. / This test is based on the linearly independent pairwise comparisons among the estimated marginal means.
b. *Adjustment* for multiple comparisons: Bonferroni.

The ANOVA results for the interaction between the independent variables on the Utility dimension are shown in Table 7. In contrast to the situation in the Attractiveness dimension, for this factor, we obtained

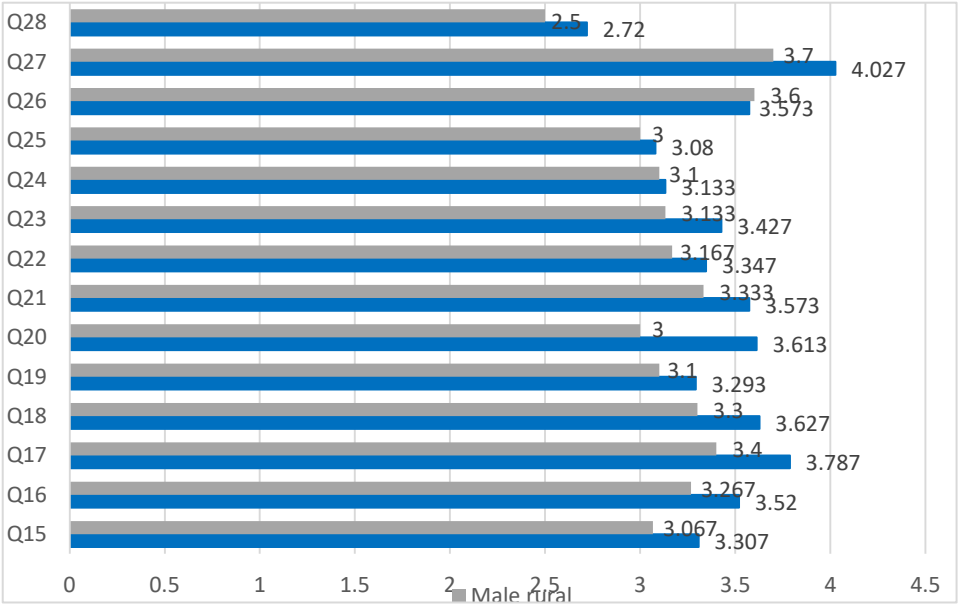
statistically insignificant F values (P > 0.05). This means that the Gender *Area does not have a strong influence on students' opinion for the items of the Utility factor. However, we also identified 3 exceptions, where F has significant values (P < 0.05). These are for Q20 (usefulness as a leisure variant), Q23 (effect on effort capacity and fitness level) and Q27 (effect on coordinative abilities).

**Table 7.** Results of analysis of variance/ANOVA for the interaction between Gender and Area variables on the *Utility* factor

| Item | Interaction | Mean Square | F (1, 255) | Sig[b]. | $\eta^2_p$ | Noncent. Parameter | Observed Power |
|---|---|---|---|---|---|---|---|
| Q15 | Gender *Area variables | 0.051 | 0.044 | 0.834 | 0.000 | 0.044 | 0.055 |
| Q16 | Gender *Area variables | 0.009 | 0.008 | 0.929 | 0.000 | 0.008 | 0.051 |
| Q17 | Gender *Area variables | 0.802 | 0.789 | 0.375 | 0.003 | 0.789 | 0.143 |
| Q18 | Gender *Area variables | 0.882 | 0.715 | 0.399 | 0.003 | 0.715 | 0.134 |
| Q19 | Gender *Area variables | 0.448 | 0.422 | 0.516 | 0.002 | 0.422 | 0.099 |
| Q20 | Gender *Area variables | 7.149 | 8.547 | 0.004 | 0.032 | 8.547 | 0.830 |
| Q21 | Gender *Area variables | 2.166 | 2.509 | 0.114 | 0.010 | 2.509 | 0.351 |
| Q22 | Gender *Area variables | 2.976 | 2.955 | 0.087 | 0.011 | 2.955 | 0.402 |
| Q23 | Gender *Area variables | 5.202 | 7.024 | 0.009 | 0.027 | 7.024 | 0.752 |
| Q24 | Gender *Area variables | 0.153 | 0.244 | 0.622 | 0.001 | 0.244 | 0.078 |
| Q25 | Gender *Area variables | 0.000 | 0.001 | 0.981 | 0.000 | 0.001 | 0.050 |
| Q26 | Gender *Area variables | 0.368 | 0.387 | 0.535 | 0.002 | 0.387 | 0.095 |
| Q27 | Gender *Area variables | 6.042 | 8.126 | 0.005 | 0.031 | 8.126 | 0.811 |
| Q28 | Gender *Area variables | 0.559 | 0.778 | 0.378 | 0.003 | 0.778 | 0.142 |

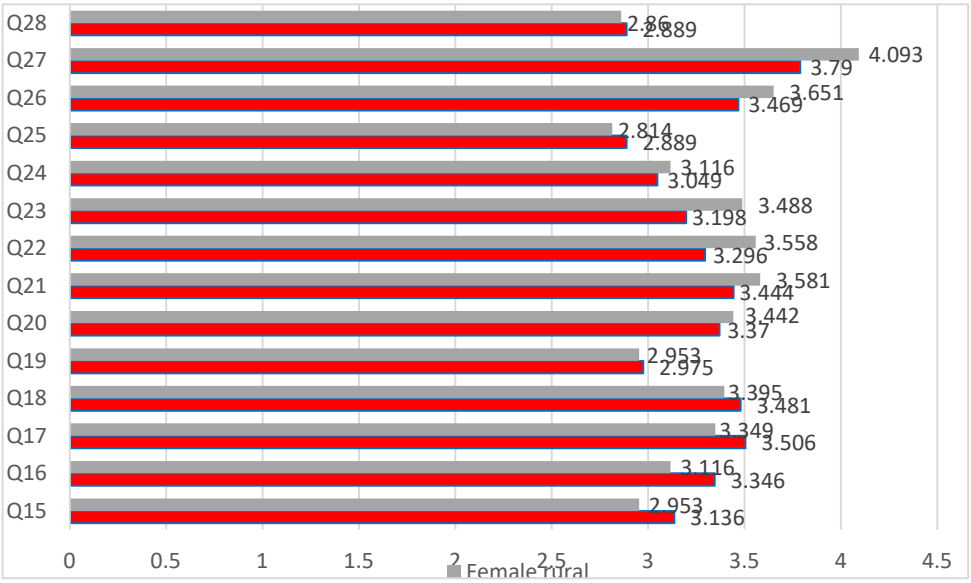
Graphical representations of the mean values for urban males and rural males on the Utility dimension are shown in Figure 2. For most of the items we have identified the superiority of the scores for urban males, but it should be noted that the differences between the two groups are not as large as for the Attractiveness dimension. The only item where the rural male scores better is Q26 (effect of basketball on speed). The highest mean scores for urban males are found in Q27 (effect on coordination), Q17 (role in forming fair-play attitude), and Q18 (role in influencing harmonious physical development). Higher values are also obtained for Q20 (usefulness and accessibility as a leisure activity) where the greatest difference between groups is recorded, Q21 (effect of basketball on health) and Q1 (contribution to socialisation and group integration). Both groups obtain the lowest mean score for Q28 (effect of basketball on flexibility).

**Fig. 2.** Comparative mean values for *males* (urban/N=75 and rural/N=60) for the *Utility* factor




The graphical representations of the mean values for urban females and rural females in the Utility dimension are shown in Figure 3. Unlike the male groups, the graph shows a balance in the superiority of the mean scores for the items represented between the two groups, so the perception of the usefulness of basketball is relatively the same for urban females and rural females. Urban females have higher values for Q15 (usefulness in character and personality formation), Q16 (communication and socialization skills), Q17 (formation of fair-play attitude), and Q18 (influence on harmonious physical development). The rural female group has better mean values for Q20 (basketball as a leisure activity), Q21 (role on improving health), Q22 (reducing stress), Q23 (increasing fitness level), and Q24 (effect on muscle strength). The highest scores on this factor are also obtained by rural females, for Q27 (effect on coordination) and Q26 (effect on speed). Both groups have the lowest scores for Q25 (effect on endurance) and Q19 (effect on intellectual skills and problem solving).

**Fig. 3.** Comparative mean values for *females* (urban/N=81 and rural/N=43) for the *Utility* factor




## Discussion

The interactions in basketball training (city Leeds) involve cooperative action, social order and creativity. Collaboration and working together are necessary to achieve planned goals (Callaghan et al., 2018). Prosocial Behavior and interpersonal relationships are improved by engaging young people in various sports activities (including basketball and Mini basketball training program), according to (Li & Shao, 2022). Using basketball for 12 weeks for Chinese children (Zhenjiang City) has positive effects on social adjustment, quality of interpersonal relationships and self-identity (Haoran et al., 2023). Japanese girls (13-16 years old) who are members of a high school basketball club have the advantage of social interactions and experiencing interpersonal relationships within a team. They enjoy the feeling of total commitment to the team and positive experiences on a social level (Light, 2016). In our research about 48% of the students give high scores to the effect of basketball on socialization and group integration, and only 20% are skeptical about it. Males are more optimistic than females about socialization effects, and urban more optimistic than rural, but without statistically significant differences.

The importance of basketball results from the fact that it is included in physical education programmes at all age levels. Its effects are diversified: mental acquisition, volitional demands, influences on fitness levels, creativity, moral acquisition, and speed in decision-making (Shao et al., 2022). The use of basketball for students in physical education lessons facilitated the increase of perceived competence (in single-gender game play) for females. The level of engagement in physical activity is at a high level in both variants (single and mix), according to (Slingerland et al., 2014). The implementation of basketball variations (streetball, ringball, netball, rezball, korfball etc.) in physical education lessons for Ukrainian students has positive effects. The following are found: better motor participation/involvement, understanding the purposes of physical culture, improvement of functional indicators, and increased enthusiasm for physical activities (Anheliuk & Naumchuk, 2023). The role of games sports (basketball and volleyball) in the formation of psychophysical qualities, personality development and promotion of a healthy lifestyle for young people in Russia is analysed by (Shebalina et al., 2020). Almost 40% of the students in our group have favorable opinions about the influence of basketball on personality. However, 35.% identify little or no role related to personality formation. Males score higher than females, and urban males score higher than rural males, with no significant differences.

For competitive basketball players (males/high school level), performance anxiety and mood impairment during competitions are identified (HOOVER et al., 2017). Students in Kosovo prefer sports games as physical activities. However, basketball is indicated as the sport that generates the highest level of anxiety among all team sports (Mehmeti et al., 2018). Our results related to the reduction of stress levels through basketball indicate favourable opinions for this aspect (38%), with those indicating little or no effects being fewer (22%). Females and rural respondents have slightly better mean scores than males and urban respondents but without significant differences.

Intermittent high-intensity physical activity (basketball for 60 minutes for adolescents) has positive effects on cognitive function. Improvements in scores (working memory scanning speed) on various cognitive tests have been found after participation in these activities (Cooper et al., 2018). The use of tactical games for teaching basketball in high school (Turkey) is effective in students' acquisition on multiple levels: psychomotor, affective and cognitive. This variant is a good alternative to classical teaching methods (Güneş & Yilmaz, 2019). An experiment on Japanese high school students demonstrates the effectiveness of using CLIL (Content and

Language Integrated Learning) in English basketball lessons. The students better understood the terminology and strategy of the game in English, they learned the content of the lesson. Teamwork and collaboration with the teacher were optimized, according to (Ito, 2019). Using the basketball context facilitates the improvement of numeracy skills and math problem-solving for Indonesian students. It is easier to understand the purpose of the problem and students' active involvement in the discussion is better (Jannah et al., 2018). Our results indicate that about 33% of students have favourable opinions about the influence of basketball on cognitive skills, while most (41%) give moderate scores and only a quarter think the effects are weak or none. Males and urban students are more confident than females and rural students about the effect on intellectual development, but the differences are not significant.

Research on elite female basketball players explored the importance of body appearance in emphasising femininity. Desired aesthetic changes are geared towards a standard lean and toned female body (Bennett et al., 2017). For our study, we identified that more than half of the students have a positive opinion of the role of basketball in body harmony, with only 20% being skeptical. The mean values between genders are almost equal, with urban giving higher scores than rural, but with insignificant differences.

The use of street basketball for 3 months for a group of untrained males had positive effects on functional indicators and health. Improvements related to VO2max, bone mineral density, body fat percentage, blood lactate, heart rate and arterial pressure are highlighted (Randers et al., 2018). Repetitive sprint-based demands with agility movements generate strong demands for young basketball players compared to straight sprinting. Fatigue is stronger for short, high-frequency sprints (Paulauskas et al., 2020). Intense physical effort and overwork can, however, produce myofascial, myotendinous or muscular injuries (Musat et al., 2023). Research on senior Brazilian basketball players has identified positive associations between physical activity level and health-related quality of life (HRQoL). However, a high prevalence of lower limb injuries is also reported (Moreira et al., 2016). Health and fitness levels of young people are positively influenced by playing basketball. Improvements in muscle strength, cardiorespiratory endurance and flexibility, decreases in BMI, body fat, and increases in vital capacity and muscle tissue are reported (Liao, 2023). For the Japanese population, playing basketball provides health benefits. Better values of bone mineral density at the femoral neck are found in the elderly for both genders (Otsuka et al., 2023). In our research, we observed that 47.5% of the students have favourable opinions on the

beneficial influence of playing basketball on health, with only 14% believing that the effects are small or none. Females are more optimistic than males, and urban more than rural, but without significant differences.

Research on Chinese adolescents (15-20 years old) has identified the favourable role of basketball in optimizing health and elevating Physical Fitness for the studied groups (Shao & Sun, 2022). Involvement of Australian girls in short youth basketball programs has positive effects on the Physical Activism Level (VPA) and good motivation for the studied groups (Guagliano et al., 2015). Our investigation indicates favourable judgments about the effect of basketball on fitness levels (for over 40% of students), with only 15% indicating little or no effects. The mean values of rural and urban females and males indicate similar opinions, with no significant differences. Urban males and rural females give more confidence to basketball in terms of optimising fitness levels, the interaction of these variables being significant in this case.

For Indonesian children, significant differences in motor coordination skills are identified in favour of urban children. One explanation would be appropriate equipment and facilities in schools and city areas, which help activities that allow for these differences (Marta et al., 2023). Agility/ability to change direction and speed (element of coordination) are strongly manifested in the game of basketball for students in physical education lessons (ANASTASIU et al., 2023). The favourable influence of using basketball for physical fitness and coordination abilities is highlighted by studies on Ukrainian pubertal children playing this sport (Andrieieva et al., 2020). Research on young female basketball players (17-19 years old) highlights the major importance of coordination in basketball. Spatial orientation, kinesthetic discrimination, rapid combination of movements, and complex reactions influence the quality of technical procedures in basketball (Boichuk et al., 2018). Learning using games in physical education for basketball techniques (high school level/Indonesia) has favourable effects on self-esteem and basketball playing skills. In both cases, males have higher mean scores than females (Hamidi et al., 2019). Basketball is a dynamic and spectacular game that involves actions performed at speed, and requires technical precision and superior coordination in the execution of specific skills. Its use in the school curriculum facilitates these acquisitions (Savu & Pehoiu, 2018). Our study identifies highly favourable opinions on the development of coordination through the use of basketball, with almost 75% of students indicating this aspect, and only 6.5% choosing the options of no or low effects. Those in urban areas give a higher average score than those in rural areas, but not

statistically significant, with the opinions of females and males being similar. Significant differences appear in the interaction between variables for coordination: urban males score higher than rural males and rural females higher than urban females.

A comparison of the health, fitness levels and skills of young Sri Lankan basketball and soccer players revealed differences between the batches. Basketball players had superior indicators related to balance, coordination, explosive power, upper body endurance, running speed, jumping power, grip strength and body fat (Kariyawasam et al., 2019). The use of Teaching Games for Understanding for Chinese high school students provides better moderate-to-vigorous physical activity values. Males were better engaged in the lesson than females. Motor skill competence was assessed by technical basketball structures (passing and dribbling). This aspect indicates the strong demands of basketball for agility, coordination, explosive power, speed and balance (Wang & Wang, 2018). The importance of endurance speed and strength characteristic of the speed for the lower limbs is highlighted for female university basketball players in Iraq. The development of these motor skills is achieved through the use of a training curriculum (Fattah & Ali, 2023). For basketball players, reaction speed and peripheral vision play a major role in-game actions. For both genders, better values and progress are found in reaction times for bilateral visual stimuli (30 s), compared to similar handball and volleyball groups (Badau et al., 2023). Our results on the influenc of basketball on speed indicate a positive rating for almost 60% of those surveyed, with only 15% indicating the opposite. Males and rural students are more optimistic about favourable effects on speed but without significant differences compared to females and urban students.

A survey of interscholastic coaches for basketball, softball, baseball, volleyball, soccer and football teams in Texas and Wisconsin indicated the need for strength training. The workouts are similar for both genders, with bodyweight exercises, dumbbell presses, back and front squats commonly used, according to (Shurley et al., 2020). Individual load dosing in basketball is important, depending on the position of the games. Tests on young female players showed higher load power values for wingers and center players (Kozina et al., 2017). Environment and material conditions influence the involvement of young people in sports. For Serbian young people, there is a higher participation of urban young people in physical activities, and they also have better motor skills than rural young people. Playing basketball and volleyball have strong effects on agility and explosive strength (Ilic et al., 2023). The use of various training programs for high school basketball

players (strength, plyometrics and COD/change of direction) provides an increase in performance for Physical Fitness. Improvements are found in agility tests, short-distance acceleration, vertical jump and flexibility (Sáez de Villarreal et al., 2021). Basketball training-specific demands for high school athletes favourably influence muscle strength and the athlete's jump shot ability (Sofyan & Budiman, 2022). The opinions of our students indicate that half of them believe that basketball has a moderate effect on muscle strength and power, almost 30% however indicate a strong effect and only 20% have little or no effect. The average values expressed by males are higher than those expressed by females, and those from rural areas higher than those from urban areas, but without showing significant differences.

## Conclusions

For the utility dimension, we noted the majority of opinions in favour of basketball, through its various effects on students in adolescence. The most optimistic scores were for the benefits of coordination and speed (components of skill-related physical fitness). This is followed by beneficial effects on health, the formation of fair-play attitudes, physical development and body harmony, facilitating socialization, communication and group integration. The influence of basketball on stress reduction is also viewed with confidence. The effect on improving effort capacity and general level of physical fitness scores moderately. Weaker values are given for influences on intellectual abilities and level of segmental muscle strength. Students give the lowest confidence in the effects of basketball on flexibility and endurance levels. In contrast to the attractiveness factor, for the utility dimension, we found less significant differences in opinion between rural and urban females and males. This is an indicator of critical thinking ability and reflects a good level of understanding of the effects of playing basketball on multiple levels in the surveyed sample.

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## Conflict of interest

No potential conflict of interest that is of any relevance to this study was reported by the authors.

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