Original Article

The effects of practicing with a size-2 ball on the technical skills of young soccer players of a different level.

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Abstract.

The aim of the present study was to investigate the effects of practicing with a size-2 ball on the improvement of ‘passing’, ‘juggling’, ‘running with the ball’ & ‘turns with the ball’ in young soccer players of a different technical level. The study comprised 54 soccer players, aged 11±0.6 years old, weight 46,27±2,40kg and height 154,94±3,15cm, who were divided into two groups according to their initial technical level: the Competitive Group (CG) with a higher average performance (level 1) and the Control Group (CTG), Group 30 min (G30M) & Group 20 min (G20M) with lower performances (level 2). The intervention program was differentiated for the 3 experimental teams regarding the duration, ball contacts and way of training. For the statistical analysis, variance analysis One Way Anova with repeated measures was used, while for the differences between the groups in pairs we used Post Hoc – Multiple Comparisons: Turkey HSD Tests & LSD, at $\alpha = 0.05$ significance level. All groups had statistically significant improvements ($p < 0.05$). There were significant differences: in ‘juggling’ between the CG and the CTG ($p = 0.01$), and the G30M ($p = 0.004$) & the G20M ($p = 0.017$) respectively. In «Running with the ball» between the G30M & the CG ($p = 0.000$), the G20M & the CG ($p = 0.017$), the CG & the CTG ($p = 0.016$). In “turns with the ball”, between the CG & the G20M ($p = 0.036$). In ‘passing’ there was no statistical difference. Overall, training with a size-2 ball seems to improve more, as compared to a size-4 ball, sometimes significantly, some other times not significantly, young soccer players with a different level technical ability. These improvements seem to be affected by the young soccer players’ initial technical level, the number of contacts with the ball, the training time and the adaptation of exercises to the difficulty level according to the players’ level.

Key words: Ball size, technical skills, soccer.

Introduction

Technical ability constitutes one of the performance factors which lead to perfection. In ball sports, technical skills refer to ball handling and its effectiveness. According to Witt & Proffitt (2005), ‘when playing well, baseball players frequently say that the ball appears bigger, tennis players report that the ball looks huge, golfers say that the cup looks bigger, and basketball players say that the hoop looks enormous.’ So one of the ways in which researchers tried to train and improve athletes in ball sports was through practice with a different ball type (regarding weight and dimensions) from the one that was used in the official game. In basketball, there have been some studies (Isaacs & Karpman 1981; Satern, Messier & Keller-Mcnulty 1989; Chase, M. A. Ewing, M. E., Lirgg, C. D., George, T. R., 1994; Regimbal, C., Deller, J., Plimpton, C. 1992; Ferreira, A.P., Fernandes, O., Abrantes, J., 1996; Arias, J.L., Argudo, F. M., Alonso, J.I., 2009) aiming at improving shots and accuracy in free shots. In tennis, there have been studies (D.P.S. Andrew, J.W. Chow, D.V. Knudson, M.D. Tillman, 2003; Karl Cooke & Polly R. Davey, 2005) aiming at the development of technical and physiological performance. In football, there have been very few studies in the effect of using a different type of ball on the improvement of technical skills. Initially, Button, Bennett & Davids (1999), examined whether using an FDS ball instead of a size 5 one could assist 11-year-old soccer beginners in developing ball control. Examining the differences in dribbling and juggling skills, they observed that both groups significantly improved their performance in both these skills. However, the experimental group showed a greater improvement in juggling than the control group. Here, we must note that the children were beginners, so more research was necessary to determine whether these beneficial effects on ball control would also be observed on a coordination level. Later, Chapman, Bennet & Davids (2001), working with absolute beginners aged 8 – 11 years old, examined the effects of 3 different ball

types (FDS, size 3 & size 4) on the improvement of technical skills. After dividing the players into 3 equivalent groups, he observed that all three of them showed a significant improvement between the pre & post tests. Nevertheless, there were no statistically significant differences between the players who practiced with the FDS ball in comparison with the size 3 and size 4 balls. Finally, according to Araujo, Davids, Bennett, Button & Chapman (2003), an FDS ball is beneficial in improving skills especially at the control stage of learning, but not necessarily at the coordination stage.

However, the aforementioned studies did not examine any other skills apart from juggling and dribbling. Moreover, they did not investigate the effects of training with a size-2 ball on soccer players of a different level. Additionally, they did not modify the intervention program with regard to duration and ball contacts. Finally, there was no different intervention in accordance with the soccer players' technical ability level. The aim of the present study was to investigate the effect of training with a size-2 ball on improving «passing», «juggling», «running with the ball» & «turns with the ball» in young soccer players of a different level, along with the factors that can differentiate the results of such a training intervention program.

Material and methods.

Participants

The present study comprised 54 soccer players, aged 11±0.6 years old, weight 46.27±2.40kg and height 154.94±3.15cm.

Research planning.

At first, the players' level was determined by means of a technical skills test assessment. Based on their performance on that sole criterion, the teams were divided into 4 groups throughout the training intervention. The Competitive Group (CG), which was characterized as 'level 1', was made up of soccer players whose average performance was the highest in all 4 tested skills. The remaining groups were made up of children whose performances were lower (level 2), and were randomly divided into Control Group (CTG), Group 30 Min (G30M) & Group 20 Min (G20M).

Training intervention characteristics.

In the training intervention program, there were different characteristics for each group so as to examine how they affected the final performance. The exercises were different in the CG group and the other groups. CG athletes executed more difficult exercises (coordination and real game conditions), while the other groups executed simpler exercises (learning stage). The CTG group executed the same routine as the G20M, only with a size-4 ball. Ball contacts in CTG, G20M, G30M were recorded, as was the mean of the CG players' contacts for each skill. At the end of the intervention program, all the participants were re-assessed by means of the technical skills assessment test. The intervention program characteristics are shown in tables 1 & 2 below.

GROUPS	Number of players (N)	Ball size	level	Training time / training unit	Number of trainings / routines
CTG	12	4	2	20 min	12
CG	15	2	1	30 min	12
G20M	13	2	2	20 min	12
G30M	14	2	2	30 min	12

Table 1: Ball size, technical level, training time and number of routines in the intervention program for each group.

GROUPS	Running with the ball (contacts)	Pass (number)	Juggling (contacts)	Turns with the ball (number)
CTG	1060	130	300	320
G30M	2120	260	600	400
G20M	1060	130	300	320
CG	1010	810	1340	430

Table 2: Number of contacts for each skill in each group.

Assessment test.

The athletes were assessed in passing, juggling, running with the ball and turns with a size-4 ball.

Passing: (Rosch, D., Hodgson, R., Peterson, L., Graf-Baumann, T., Junge, A., Chomiak, J., & Dvorak, J., 2000). This test allows the assessment of the precision and coordination in passing a moving ball. The athletes run with the ball in a 2-meter-long square till they reach the line and pass the ball in a small goal which is 11 meters away. Running with the ball and passing are continuous actions. The researcher calculates the points accumulated by the athlete after 5 consecutive attempts. If the ball gets into the goal, passing is worth 3 points, if it hits on the goalpost, 1 point, and if it gets out, there are 0 points. The goal is 1 meter long.

Juggling: (Vale, P., Ramos, A., Salgado, B., Correia, P., Martins, P., Brito, J., Oliveira, E., Seabra A., and Rebelo, A., 2009). The athlete leaves the ball from his hand and tries to juggle it using any part of his body. Each athlete has 2 attempts with a maximum score of 200 points (100 for each attempt). If the ball hits the ground during the first 2 contacts, then the attempt is repeated.

Running with the ball: (Russel 1991) The athlete runs with the ball in a lane (27 meters in length by 1.5 meters in width) which is divided into 3, 9-meter zones. The time starts when the ball enters the first zone and stops when the ball exits the last one. The athlete is allowed to pass the ball or cross the final line with it. If he passes the ball, he must do so after having entered the final zone. If the ball does not cross the final line, if the athlete stumbles or passes the ball sooner, then the test is repeated. Each athlete is allowed 2 attempts, and the better one is assessed. If both attempts are unsuccessful, then the athlete receives 0 points.

Turns: (Russel 1991): The athletes turn the ball in a 4.5-meter square. In total, they perform 9 turns with their feet. Each athlete is allowed 2 attempts. The better time is assessed.

Statistical analysis – Results.

For the statistical analysis, One Way Anova with repeated measures was used. For the differences between the teams in pairs, we used Post Hoc – Multiple Comparisons: Tukey HSD Tests και LSD. Significance level was set at $\alpha = 0.05$. The means for all skills are shown in table 2, while the improvement percentage and the statistically significant differences are briefly shown in table 3.

GROUP	PRE_JUGGL	PRE_PASS	PRE_RUN	PRE_TURN
CONTROL GROUP	12,70±7,45	6,33±3,44	5,55±0,59	18,23±2,88
COMPETITIVE GROUP	27,30±22,59	7,26±3,01	4,97±0,47	17,28±1,28
GROUP 30 MIN	8,85±8,07	5,14±4,22	6,11±0,65	18,51±1,93
GROUP 20 MIN	7,42±3,63	5,38±2,87	5,47±0,44	19,29±2,41
GROUP	POST_JUGGL	POST_PASS	POST_RUN	POST_TURN
CONTROL GROUP	13,37±7,55	7,66±2,46	5,41±0,54	17,89±17,89
COMPETITIVE GROUP	38,20±30,80	9,73±3,78	4,79±0,38	16,15±16,15
GROUP 30 MIN	15,03±17,45	8,00±2,93	5,46±0,60	17,84±17,84
GROUP 20 MIN	11,92±9,38	7,46±3,75	5,22±0,38	18,45±18,45

Table 2: Descriptive Statistics – Means for all skills.

Results.

Passing.

There were statistically significant improvements in passing for all groups ($F = 21.630$, $p = 0.000 < 0.05$). More specifically, for the CTG group, the improvement in passing was 21.05%, for the competitive group (CG) 33.94%, for the G30M group 55.56%, and for the G20M group 38.57%. No statistically significant difference was found among the groups.

Graph 1: Group improvements in “Passing.”

Juggling

There were statistically significant improvements in juggling for all groups ($F = 11.950$, $p = 0.001 < 0.05$). More specifically, for the CTG group the improvement in juggling was 5.25%, 39.93% for the CG group, 69.76% for the G30M group, and 60.62% for the G20M group. There were also statistically significant differences between the following groups: CTG vs CG ($p=0.01$), CG vs G30M ($p=0.004$), CG vs G20M ($p=0.017$)

Graph 2: Group improvements in "Juggling."

Running with the ball.

There were statistically significant improvements in running with the ball for all groups ($F = 53.903$, $p = 0.000 < 0.05$). More analytically, for the CTG group, the improvement reached 2.46%, for the CG group, it was 3.64%, 10.71% for the G30M group, and 4.50% for the G20M group. There were statistically significant differences between CTG vs CG ($p = 0.016 < 0.05$), CG vs G30M ($p = 0.000 < 0.05$), and if we take into consideration the LSD test, there is a statistically significant difference between CG vs G20M ($p = 0.017 < 0.05$).

Graph 3: Group improvements in "Running with the ball."

Turns with the ball.

There were statistically significant improvements in 'turns with the ball' for all groups ($F = 42.027$, $p = 0.000 < 0.05$). More analytically, for the CTG group, the improvement was 1.9%, for the CG one, it was 6.55%, for the G30M group, it was 3.65%, and for the G20M group, it was 4.32%. there was a statistically significant difference between CG vs G20 M ($p = 0.036 < 0.05$).

Graph 4: Group improvements in "Turns with the ball"

	Juggling	Passing	Running with the ball	Turns with the ball
CTG	5,25%	21,05%,	2,46%	1,9%
CG	39,93%,	33,94%,	3,64%	6,55%
G30M	69,76%	55,56%	10,71%	3,65%
G20M	60,62%	38,57%.	4,50%.	4,32%.
Statistically significant differences between groups	CG ~ CTG CG~ G30M CG~ G20M	none	CG ~ CTG CG~ G30M CG~ G20M	CG~ G20M

Table 3: Improvements and statistically significant differences between the groups.

Discussion:

Juggling

As far as comparisons among the groups are concerned, it seems that for juggling, CG showed (statistically) the greatest improvement among the other groups. It is therefore obvious that on a higher level, the effectiveness of training can be greater when this training is more demanding (speed and frequency of exercises, competitiveness and complexity). However, it is also possible that the results are further affected by the number of contacts / player in the intervention program for juggling (for the CG group, the number of contacts / player was 1340, while for the G30M, it was 600, and 320 for the G20M and CTG respectively). This could be a decisive factor. In agreement with Button et al (1999), it seems that this specific training led to greater activation of the movement coordination and proprioception mechanisms in CG as compared to the other groups. This finding is probably related to the big difference in the initial performance between the CG group and the other groups. Additionally, it could be attributable to the better balance and proprioception levels typical of high-level soccer players (Paillard T, Noé F, Rivière T, Marion V, Montoya R, Dupui P., 2006; Bekris E., Kahrimanis G., Anagnostakos K., I. Gissis, C. Papadopoulos, Sotiropoulos A. , 2012).

It seems that using a size-2 ball in juggling leads to positive results in the other groups too (level 2) (69,76% in G30M & 60,62% in G20M). These groups showed similar initial performances. The biggest improvement, which was observed in the G30M group, is probably due to more training time and more contacts with the ball. Thus, the 'number-of-ball-contacts' factor tends to influence the results among technically equivalent groups which used a size-2 ball.

The CTG group, which followed the same routine as the G20M one, and had the same number of contacts, albeit with a size-4 ball, improved only by 5.25%. This goes to show the positive effect of using a size-2 ball in improving juggling. These results concur with Button et al (1999), who used an FDS ball in the experimental group, and found that this group improved significantly more than the control group, who used a size-5 ball in juggling. Conversely, in a research by Chapman et al (2001) into 3 equivalent groups that used an FDS ball, a size-3 ball and a size-4 ball, while all groups had statistically significant improvements, there were no significant differences among them. The results are probably differentiated according to the players' initial technical level in this specific skill, since the researches describe them as 'absolute novices'. On such a low level, the players could not adapt, nor could they respond to the difficulties of training through the change in ball size.

Running with the ball.

Concerning 'running with the ball', the G30M group shows the greatest improvement (10.71%), followed by the G20M group (4.50%). These two groups showed statistically greater improvements than the CG group ($p = 0.000$ & $p = 0.017$ respectively), which improved by only 3.64%. The results seem to be more favorable in level 2 (experimental groups) than in level 1, most probably because of the different effect of the two different ways of training on the different soccer players' levels. This is probably attributable to the greater number of contacts in G30M (2120) as compared to the G20M (1060) and the CG (101). It may also be attributable to the G30M and G20M players' initial level, which was much lower than the CG players' level, so the former had more room for improvement. On the other hand, the training the CG group underwent may not have been adequately adapted to the group's technical level in this skill. Nevertheless, the CG group showed more significant improvements ($p = 0.016 < 0.05$) than the CTG group, who improved by only 2.46%. According to the results, training with a size-2 ball can improve 'running with the ball' more than training with a size-4 ball, irrespective of player level and training mode (under real game conditions or not).

Passing

Regarding 'passing', the G30M group shows the greatest improvement (55.56%), followed by the G20M group (38.57%), the CG group (33.94%), and finally the CTG group (21.05%). The players' technical level was not very different in the groups. This fact most probably affected the results. In other words, for that specific ability level in passing, the most appropriate routine was that of the G30M group. This is why the 810 passes in the CG group, although far outnumbering those in the G30M (260) and the G20M (130) groups, did not have the desired result. As shown in the equivalent groups G30M and G20M, the former's longer training time, which also led to more contacts with the ball, affected the improvement levels more positively. Nevertheless, it is clear that the use of a smaller ball further improved passing in any case. This can be seen in the improvement differences between the G20M (38.57%) and the CTG (21.05%) groups, although the training duration and the number of passes were the same in both groups. Yet, this trend does not translate into statistically significant differences.

Turns with the ball.

The CG group improved more (6.55%) than the other groups, including the G30M one with which it had the same training duration and similar contacts. It is also characteristic that it shows a statistically significant difference with the G20M group that had the second best performance (4.32%). This shows that training under real game conditions had a very positive effect in relation with CG group players' initial level. Additionally, it is noteworthy that training with simple exercises helped more the group with the lowest initial level, namely, it helped the G20M group more than the G30M (3.65%) one. It seems that training with a size-2 ball, in some skills like 'turns with the ball' that do not require a high level of balance can help improve lower ability levels. Moreover, all experimental groups improved more than the CTG group (1.9%).

Conclusions.

According to the results, all groups had a statistically significant improvement in all skills. This means that the intervention programs we implemented affected technical improvement positively, regardless of the players' technical level, the way the programs were implemented (learning or coordination stage) and the size of the ball. Consequently, the time of the intervention (12 training units with at least 20 minutes of exercise (and the corresponding contacts) with size -2 and size-4 balls was enough to deliver favorable results.

Training with a size-2 ball can improve young soccer players' ability in 'juggling', 'turns with the ball', 'running with the ball' and 'pass' more than training with a size-4 ball can.

On a similar player level (level 2) and for the same time and ball contacts (that is CTG and G20M groups), it seems that the players who used a small ball (size 2) improved more in all skills, although the improvements were not statistically significant.

On a similar level (level 2), with the use of a size-2 ball (that is G20M and G30M groups), it seems that the longer time and the big difference in the number of ball contacts deliver better results.

On a higher level (level 1), training with a size-2 ball under real-game conditions can significantly improve the players' technical ability. These improvements are always greater than those of the CG group, and sometimes they are significantly greater in comparison with lower level groups that used a size-2 ball.

6. The differences in improvements probably depend on the players' initial technical level in each skill, the range in the differences of the initial performances among the groups for each skill, the number of ball contacts / player, the training time and the adaptation of the exercises to a difficulty level that correspond to the players' level. Finally, according to the present research, the appropriate management of the players' different technical level, and the appropriate use of a size-2 ball in training under real-game conditions or not (increased / decreased difficulty) can contribute to the improvement of young soccer players' technical skills.

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