Paper : Football (Soccer)

The Influence of Short-term Intensive Dribbling Training on Ball Skill

—Training Intended for Eighth-grade Soccer Players—

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[Received March 15, 2010 ; Accepted October 19, 2011]

The purpose of this study was to clarify the influence of the short-term intensive dribbling training (DRI-TR) on ball skill. Subjects were 43 eighth-grade soccer players; 20 in a training (TR) group, and 23 in a control (CONT) group. The ball skill test, which consisted of a dribbling test, trapping test and passing test, was carried out before and after each group's training. The items measured in the dribbling test and trapping test were time, number of ball touches, and missed touches. The item measured in the passing test was the number of successful passes. The TR group performed DRI-TR for 14 weeks. Training took place three times per week for approximately 30 min after the usual two-hour team training started. After DRI-TR, the TR group followed their usual training program, which had individual, group, or team focus. The CONT group also followed their usual training with individual, group, or team emphases for two-hour per session approximately four times per week over 14 weeks. The results showed that after 14 weeks of training the time needed in the dribbling test and trapping test decreased significantly for the TR group ($p<0.05$), but did not decrease for the CONT group. The number of ball touches and missed touches in the dribbling test and the trapping test for the TR group also decreased ($p<0.05$) , while the number of successful passes in the passing test for both groups did not increase in spite of the 14 weeks of training. Consequently, this study clarified that DRI-TR intended for soccer players in the eighth grade caused improvement of dribbling and trapping skills, but hardly affect passing skill.

Keywords: Soccer, Motor learning

[Football Science Vol.9, 35-49, 2012]

1. Introduction

Soccer requires a combination of technique, tactics, physical fitness, mental strength, and teamwork (Tawa et al., 1974, pp.53-92). Ball skill is divided into dribbling, trapping, and kicking (Oishi & Yamanaka, 1983), and training is performed to improve these skills. The majority of studies on ball skill in soccer games focus on skill tests (Asami, 1970; Tajima, et al., 2000), and some studies focus on trapping and kicking skills (Togari, et. al., Aami, 1973; Anderson and Sidaway, 1994; Weigelt et al., 2000). Few studies, however, focus on dribbling skill and the effect of dribbling training.

Meanwhile, from the viewpoint of developmental growth and motor learning, the ages between nine and twelve, the last half of the junior age, and the golden age, in which children are capable of quick learning in general, is the best time for learning skills (Nishimura et al., 2010, pp.27-31; Ono, 1998, pp.18-21; Ono et al., 2007, pp. 32-33). However, ball skills should be learned during all ages, the pre-golden age, golden age, and the post-golden age (Nishimura et al., 2010, pp.27-31; Ono, 1998, pp.12-14; Ono et al., 2007, pp.26-31), and it is important to discuss the methods and effect of ball skill training in each age stage. Individuals in the first half of their junior youth age (ages 13-14), in particular, have significant hormone secretion that promotes the development of fast muscle fibers. Therefore, it is important to increase the opportunity for children to exercise the skills they develop in order that they may master

them more quickly (Nishimura et al., 2010, pp.39-45; Ono, 1998, pp.22-25; Ono et al., 2007, pp.26-31).

One of the issues that must be addressed in Japanese soccer is the need to increase individual player break-through skill (Nishimura et al., 2010, pp.32-36). Among ball skill training aimed at the cultivation of individual players, training in dribbling is important for the development of sensory perception that leads to improved ball handling, which is the basis for individual break-through skill (Nishimura et al., 2010, pp.27-45; Ono et al., 2007, pp.26-31); therefore, it is important to conduct such training in the first half of the junior youth age. Furthermore, because the first and last halves of the junior youth age are close, there is a great potential that more skills might be learned. Therefore, it is essential to examine the effect of dribbling training, etc. in this age range.

We, therefore, conducted intensive and short-term dribbling training (DRI-TR) targeting soccer players in the eighth grade, and compared the results of ball skill tests (dribbling, trapping, and passing tests) before and after training, to clarify the impact of DRI-TR on ball handling skills.

2. Methods

2.1. Subjects

Subjects of this study were 43 eighth-grade members of two soccer clubs in the same area exhibiting no statistically significant differences in physical constitution. The Training Group (TR Group) had 20 members from Club A, and the Control Group (CONT Group) had 23 members from Club B (**Table 1**).

2.2. Ball Skill Test

In this study, subjects in both groups were tested in three ball skills, namely dribbling, trapping, and passing, before and after training. We simplified ball skill tests developed in previous studies (Asami, 1970; Tajima et al., 2000) to allow application to players in the junior youth age, and use them in preliminary experiments. Furthermore, subjects in both groups underwent ball skill testing before and after training only; that is, no testing was conducted during training.

1) Dribbling Test

We modified dribbling tests developed by Asami (1970) and Tajima et al., (2000) to adjust the time (**Figure 1**). In the dribbling test, subjects dribbled a ball through 4 stages within a $15m^2$ square area. In Stage 1, subjects placed a ball at the starting line, started dribbling to a marker positioned 15m from the starting line. Time was measured from when the subject initially pushed the ball out. Subjects were instructed to make contact with the ball more than one time between the two markers in stage 1. In Stage 2, subjects dribbled a ball in a zig-zag pattern in between 10 cones placed along a line at 1m intervals. In Stage 3, subjects dribbled a ball in a zig-zag pattern between two rows of three cones placed on two parallel lines 2m apart at an interval of 4m. In Stage 4, subjects dribbled a ball in a zig-zag pattern between six cones placed on a line at 2m intervals. The time when the subjects' bodies passed the goal was measured. Times were measured twice for each subject, and the faster time was recorded for analysis.

The dribbling test included the following three items:

(1) Time required: Time required to finish all stages

(2) Number of ball contacts: Number of ball contacts required to finish all stages

Table 1 Physical Characteristics of Subjects

Group	n	Age Note)	Height (cm)		Weight (kg)		Years of Experience Playing Soccer Note) (months)
			PRE	POST	PRE	POST	
TR	20	13.4±0.5	159.7±7.8	162.7±7.2**	47.2±6.3	49.4±6.5 **	76.8±17.6
CONT	23	13.3±0.5	163.7±5.7	165.0±5.5**	49.4±5.7	51.3±5.8 **	87.4±27.5
Overall	43	13.4±0.5	161.8±7.0	163.9±6.4	48.4±6.0	50.4±6.1	82.5±23.8

Mean value ± Standard deviation

Note: Figures shown in Age and Years of Experience Playing Soccer are those before training in both groups. (*) shows significant difference for both groups before and after training (**: $p<0.01$).

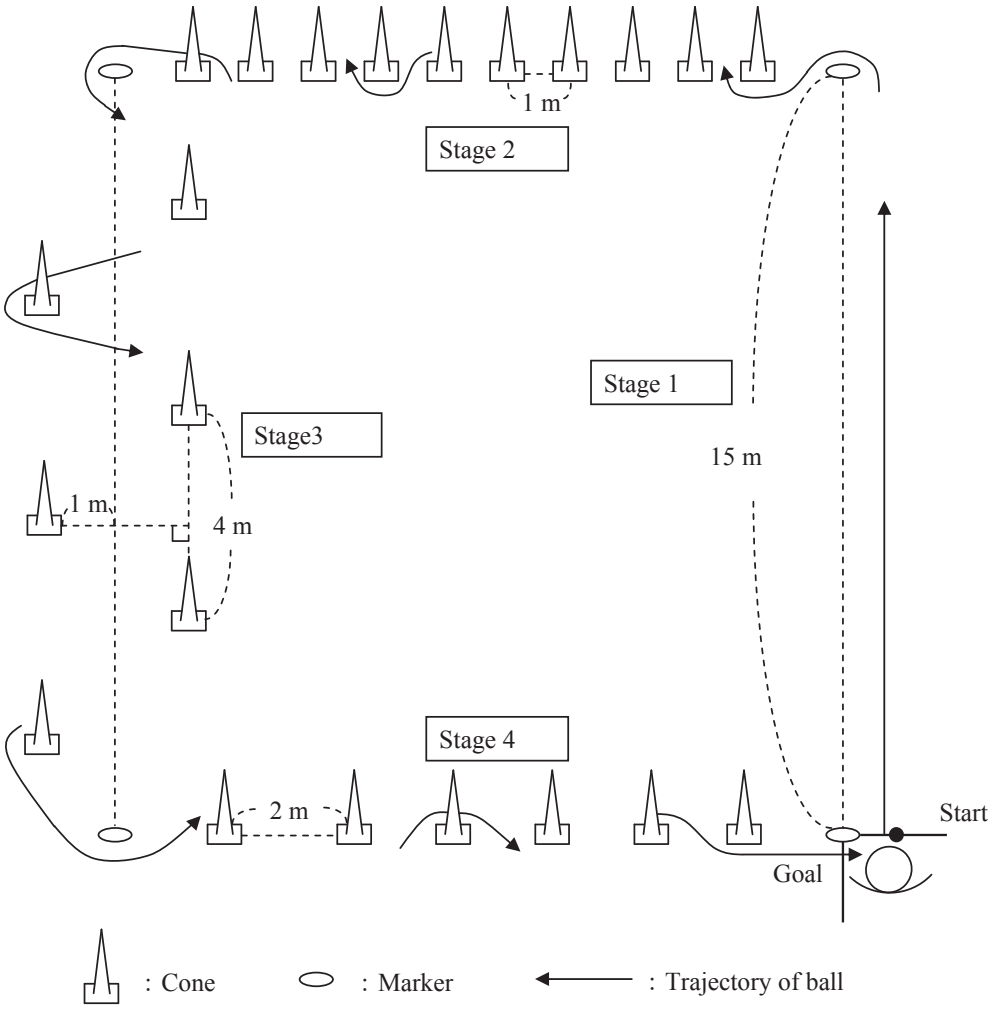

Figure 1 Dribbling Test
Subjects dribble through four different stages

(3) Number of mistakes: The total of the number of times a ball came into contact with a cone or a marker during all stages, and the number of times a subject stumbled due to loss of ball control or to kicking a ball out of bounds

2) Trapping Test

The trapping test used in this study was a modification of the tests created by Asami (1970), Isokawa et al., (1983), and Tajima et al., (2000) to adjust for age (**Figure 2**). In a trapping test, the examiner delivered the ball by grounder pass from 5m away from the subject to the middle of a $3m^2$ trapping area. The subject trapped the ball between two of three cones set 1m apart and 1.5m away from the trapping area to the left, right, and back, contacting the ball outside the line between markers placed 3m distance from one another to the back and between the cones. The subject performed the trapping test 12 times clockwise from right, back, left, to right. The time when the subject started kicking the ball to the examiner was set as the start of the test, and the time when the subject contacted the ball in the 12^{th} trial outside the line between the above-mentioned markers was set as the goal. The constraint conditions for the trapping test were as follows:

(1) If the ball is trapped outside the cones, the subject is to dribble between the cones.

(2) The speed of the ball kicked by the examiner was approx. 10m/sec. A soon as the subject returned to the middle of the $3m^2$ trapping area, the next pass would be delivered. The speed of the ball was checked by video digitizer system, and reproducibility was also confirmed before the test. The ball was also kicked to the middle of the trap area by the examiner.

(3) The foot and other body parts used for trapping were not prescribed. Each subject made an individual determination in order to perform the test as quick as possible. Times were measured twice for each subject and the better time was used for analysis.

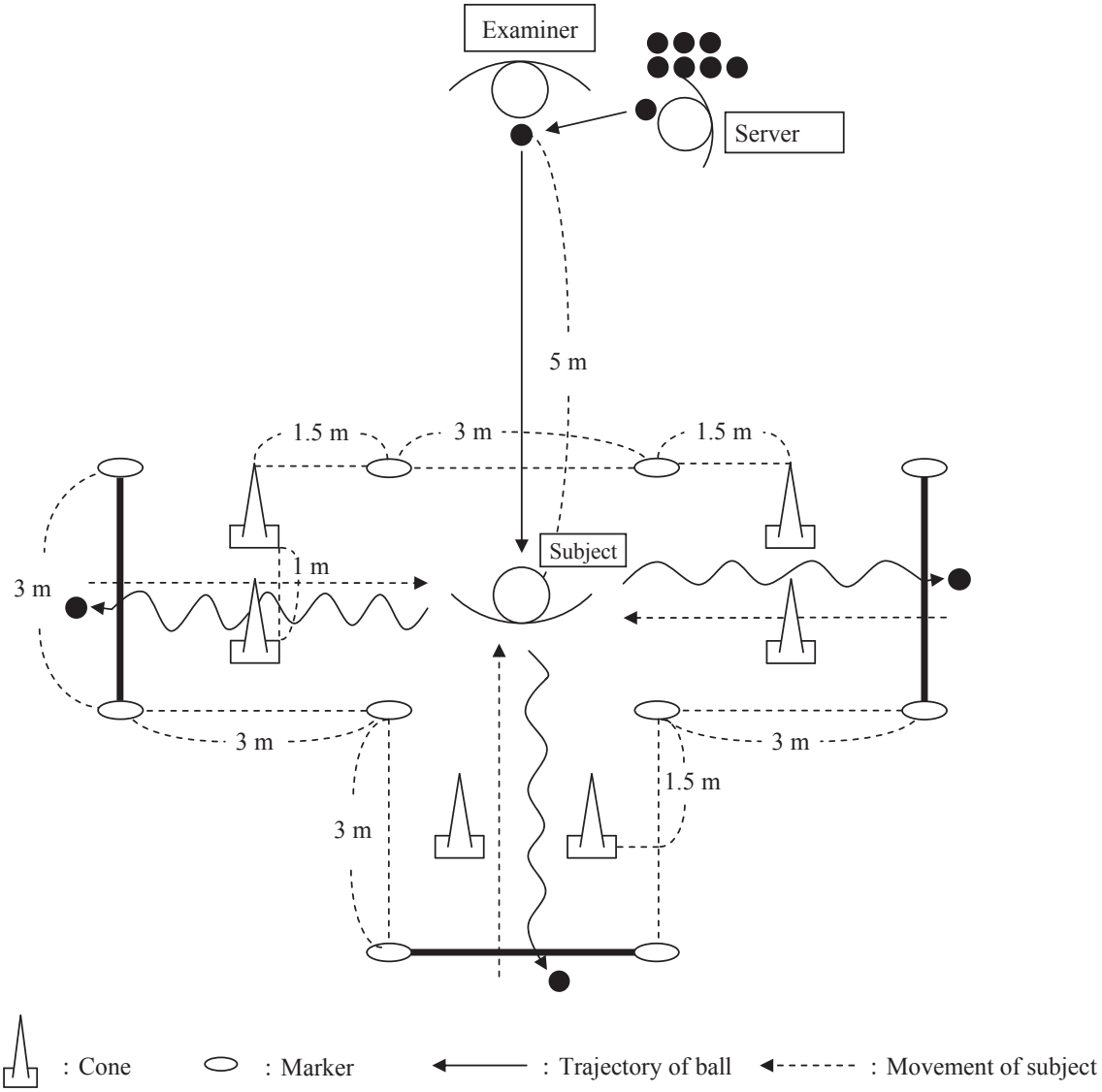

Figure 2 Trapping Test

The subject traps a ball provided by an examiner to pass through cones, and contacts the ball outside the line between the markers in the back. The subject performs a total of 12 trials from the right → back → left → right.

The trapping test included the three items listed below:

(1) Time required (Time): Time required to finish all 12 trials

(2) Number of ball contacts: Number of ball contacts required to finish all 12 trials

(3) Number of mistakes: The total of the number of times of a ball came into contact with a cone or marker during all stages, and the number of times a subject controlled a ball delivered by the examiner to the level of the subject's knee or higher, and the number of times a subject made contact with a ball 1m or more outside of the line of the above-mentioned markers.

Although the possibility exists that the trapping test included elements of the skill measured by dribbling test, the trapping test employed in this study simply asked subjects to move a ball received from an examiner a short linear distance, which is different from the skill measured in the dribbling test; namely, moving a ball while changing its direction. Therefore, the dribbling and trapping tests used in this study measured different skills. In addition, the factors that had a potential impact on time in the trapping test were the speed and timing of the ball kicked by the examiner. However, the same examiner conducted all trapping tests in this study, and this was considered to have ensured the reliability required for use of these two items in measurement.

3) Passing Test

The passing test used in this study was a modification of the tests created by Asami (1970) and Isokawa et al. (1979) to adjust for age (**Figure 3**). In the passing test, subjects kicked 10 balls delivered from a left server and 10 balls delivered from a right server. The balls were kicked between two cones set 1m apart at a distance of 18m from the subjects. Balls kicked with the subject's dominant foot were sent to the cone on the side of the dominant foot, and balls kicked with the subject's non-dominant foot were sent to cones on the side of the non-dominant foot. The first ten balls were provided to the subject's dominant side, and the remaining 10 balls were provided to the subject's non-dominant side. The distance between the server and the kick area was set at 1m, the speed of the ball provided by the server was set at approximately 2m/sec, and when the subjects were ready, they received a ball thrown by hand to the place requested. In addition, the examiner provided a ball from a point located 1m from the end of the line in front of the kicking area. We counted the number of balls that passed between the two cones as successful. Each subject conducted the test twice and the higher score was used for the analysis. The speed of the ball delivered by the server was checked by video digitizer system, and the reproducibility was also confirmed before the test. The constraint conditions for the passing test were as follows:

(1) There is no limitation on the number of balls touched by subjects. However, in order to reproduce the pass skills often seen in soccer games, subjects were not allowed to stop a ball provided by the server with the bottom of the foot or kick a stopped ball. In other words, the subjects needed to kick moving balls.

(2) Subjects were allowed to kick the ball within the $2m^2$ kicking area. Balls kicked outside the kicking area were deemed invalid.

(3) Subjects were required to kick the ball within four seconds after the server delivered the ball. Balls kicked after four seconds were deemed invalid. In order to produce mental pressure for subjects, this study set the time from receipt of the ball to kicking at a maximum of three seconds. However, because it took approximately one second for the subjects to receive the ball from the server, subjects had four second between the time the server provided the ball and the time subjects kicked the ball.

In order to examine the equality of the TR and CONT Groups in this study, we compared the times recorded for the dribbling and trapping tests before training as well as the number of successful passes in

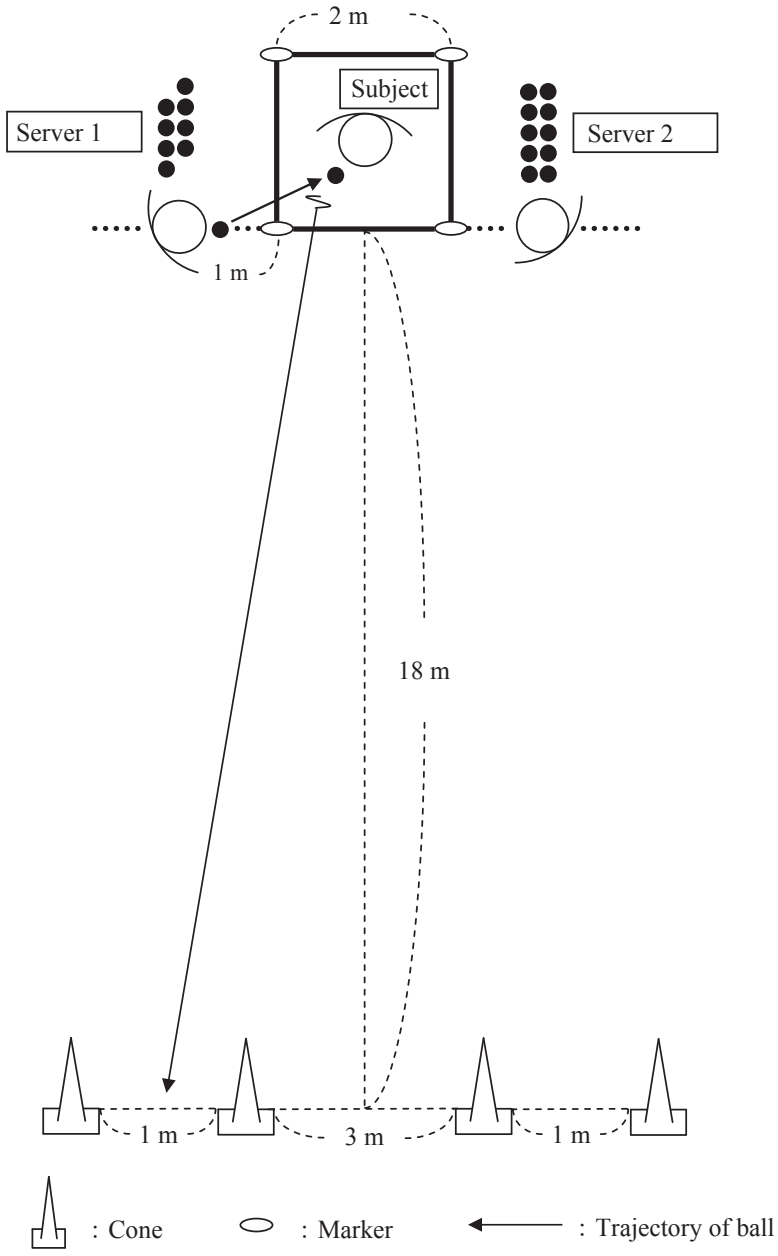

Figure 3 Passing Test

A subject kicks 10 balls delivered by servers positioned on the left and right sides (20 balls in total) with the dominant foot aiming to shoot between the cones on the dominant foot side, and with the non-dominant foot aiming to shoot between the cones on the non-dominant foot side.

the passing test as pre-tests. Student t test (unpaired) showed no statistically significant differences.

2.3. Training Content

1) TR Group

The TR Group performed approximately 30-minute DRI-TR at the beginning of 2-hour daily training sessions. In DRI-TR individual subjects perform ball contact and dribbling drills in combination with cone dribbling according to the purpose of the training. For example, if the training is mainly dribbling for holding, the subject performed cone dribbling, and then short-distance ball contact drills. If the training is mainly dribbling for break-through, the subject performed cone dribbling, and then long-distance dribbling drills. After DRI-TR, subjects trained to improve individual, group, or team skills within the TR Group. Training for the TR Group was conducted approximately three times per week for 14 weeks in accordance with the relevant club schedule for a total of 44 times. During the training, subjects had 13 games against teams with similar age, area, and level profiles.

(i) Cone Dribbling

Cone dribbling is performed to enhance the quickness and accuracy of ball handling, and to decrease physical response time. The drill involves dribbling in a zig-zag pattern between eight cones placed in a line at 50cm intervals. Eight cone dribbling skills were performed and each skill required two complete runs (**Table 2**).

(ii) Ball Contact Drill

Ball contact dribbling drills are designed to enhance ankle and knee flexibility and ball handling speed as well as to develop sensory perception by contacting the ball with various parts of the foot. Subjects repeated dribbling between the starting line and goal line, which was located 18m from the starting line. Ball contact drills included 25 different skills. Each skill required one complete run between the starting and goal lines (**Table 3**). Although there were some differences among individuals, subjects were required to perform the skill being practiced 10 to 15 times per run.

(iii) Dribbling drill

The dribbling drill is performed to develop quick ball control at top speed and the ability to outwit opponents with a wide range of fake-outs. Subjects repeated dribbling drills between the starting and goal lines over a distance of approximately 60m. Eight different skills were practiced in the dribbling drill. Each skill required one complete run between starting and goal lines (**Table 4**). Although there were some differences among individuals, subjects were required to perform the skill being practiced approximately 10 times per run.

DRI-TR allowed individuals to touch the ball with various parts of the foot to develop the sensory perception at different speeds and directions in a variety of situations. In this study, we utilized 41 skills mentioned above.

2) CONT Group

Subjects performed training to improve individual,

Table 2 Cone Dribbling Skills

No.	Skill	Foot to be Used	Number of Runs
1	Inside 2 times → Outside 2 times	Dominant foot	2
2	Inside 2 times → Outside 2 times	Non-dominant foot	2
3	Outside 1 time → Inside 1 times	Both feet	2
4	Inside 2 times → Outside 1 time	Dominant foot	2
5	Inside 2 times → Outside 1 time	Non-dominant foot	2
6	Outside 2 times → Inside 1 time	Dominant foot	2
7	Outside 2 times → Inside 1 time	Non-dominant foot	2
8	Outside 2 times → Outside 2 times	Both feet	2

Note: “Both feet” in No. 3 means that the subject repeatedly kicks the ball with the dominant foot, and kicks the ball with the non-dominant foot. “Both feet” in No. 8 means that the subject repeatedly performs the skill shown on the left of the arrow with the dominant foot, and performs the skill shown on the right of the arrow with the non-dominant foot.

Table 3 Ball Feeling Drill Skills

No.	Skill	Direction
1	Contact with bottom of foot	Forward
2	Contact with bottom of foot	Backward
3	Contact with bottom of foot (Move the ball to the left and right)	Backward
4	Contact with bottom of foot 3 times → Scissors 2 times	Forward
5	Contact with bottom of foot 3 times → Scissors 2 times	Backward
6	Rolling with bottom of foot (Left & right)	Sideway
7	Rolling with bottom of foot & fake (Left & right)	Sideway
8	Instep roll (Left & right)	Sideway
9	Inside roll	Forward
10	Behind the pivot foot	Forward
11	Behind the pivot foot	Backward
12	Behind the pivot foot → Instep stop	Backward
13	Heel → Inside	Forward
14	Outside → Inside	Forward
15	Instep push → Stop with bottom of foot	Forward
16	Outside push → Stop	Forward
17	Inside push → Stop with bottom of foot	Forward
18	Scissors with opposite foot[1)] → Inside push → Stop with bottom of foot (Left & right)	Forward
19	Heel push → Stop with bottom of foot	Backward
20	Instep push → Stop with opposite foot (Left & right)	Forward
21	Roll with bottom of the foot → Scissors	Forward
22	Roll with bottom of the foot → Scissors with opposite foot	Forward
23	Roll with bottom of the foot → Scissors with opposite foot → Rabona[2)] (Air) → Stop with bottom of opposite foot	Forward
24	Inside push → Stop with bottom of opposite foot (3 times consecutively)	Forward
25	Contact with bottom of foot → Pulling with bottom of foot (Left & right)	Turning

Note 1: “Scissors” is to swing the inside foot around the ball to outside, or outside foot to inside without touching the ball.
Note 2: “Rabona” is to kick the soccer ball with the opposite foot from the back of the pivot foot.

group, or team skills within the CONT Group. Training for the CONT Group was conducted two hours per day, approximately four times per week for 14 weeks in accordance with the relevant club schedule for a total of 55 times. During the training, similar to the TR Group, subjects had 15 games against teams with age, area, and level profiles.

Table 5 shows the training composition for both

groups, and Table 6 shows training content and schedules for the 14-week period. Other than DRI-TR, the training composition for both groups consisted of "Technical Training" involving pairs using one ball each, "Tactic Training" for multiple groups, and "Game Form Training." "Tactic" and "Game Form" training after "Technical Training," which was conducted for the first 45 minutes, consisted of content appropriate for the skill development that each group required. Therefore, only "Technical Training" had a different composition.

2.4. Statistical Analysis

All the statistics are shown as mean value ± standard deviation. A two-factor analysis of variance (mixed-effects model) was applied for comparison of height, weight, and each measurement item in ball skill test in both groups after the training. If the interaction was significant, Bonferroni's test of simple main effect was given. In addition, correlation among measurement items in ball skill test for both groups after the training was examined using Pearson's correlation coefficient.

3. Results

3.1. Dribbling Test before and after the Training

According to two-factor analysis of variance (mixed effects model) for the time, number of ball contacts, and number of mistakes in dribbling test, the interaction between the groups (TR and CONT Group) and measurement time (before and after the training) was significant. According to the test of simple main effects, the simple main effects of measurement time was significant for time, number of ball contacts, and number of mistakes in the TR Group. In addition, simple main effects of groups were significant for time, number of ball contacts, and number of mistakes after the training. Therefore, time ($p<0.01$), number of ball contacts ($p<0.05$), and number of mistakes ($p<0.01$) in dribbling test in the TR Group after DRI-TR significantly decreased, while those in CONT Group did not decrease (**Figure 4**). Furthermore, significant differences were observed among time ($p<0.01$), number of ball contacts ($p<0.05$), and number of mistakes ($p<0.01$) in dribbling test in both groups after the training.

3.2. Trapping Test before and after the Training

According to two-factor analysis of variance (mixed-effects model) for time, number of ball contacts, and number of mistakes in trapping test, interaction between the groups and measurement times was significant. According to the simple main effect test, simple main effect of the measurement time was significant for time, number of ball contacts, and number of mistakes after the training. Therefore, time, number of ball contacts, and number of mistakes in dribbling test in the TR Group after DRI-TR significantly decreased ($p<0.01$), while those in CONT Group did not (**Figure 5**). Furthermore, significant differences were observed among time

Table 4 Dribbling Drill Skills

No.	Skill
1	Roll with bottom of foot → Inside kick with opposite foot
2	Inside → Roll with opposite foot → Behind the pivot foot
3	Double roll with bottom of both feet → Outside push
4	Roll with bottom of foot → Scissors with opposite foot → Inside push
5	Stop → Fake (Outside push, Inside push, Behind the pivot foot, etc.)
6	Roulette*
7	Kick faint → Heel kick
8	High-speed scissors

Note: "Roulette" is to pull the soccer ball with the bottom of the foot to your side, and turn your body holding the ball with the opposite foot.

Table 5 Training Compositions of Both Groups

group / time	TR Group	CONT Group
0 min.	DRI-TR	Running & Stretch
15 min.		Technical Training
30 min.	Technical Training	
45 min.	Tactical Training	Tactical Training
75 min.	Game Form Training	Game Form Training
120 min.		

($p<0.01$), number of ball contacts ($p<0.05$), and number of mistakes ($p<0.05$) in trapping test in both groups after the training. A slightly high correlation ($p<0.01$) was observed between the times of dribbling test and trapping test in the TR and CONT Groups before and after the training (**Figure 6**).

3.3. Passing Test before and after the Training

According to two-factor analysis of variance (mixed-effects model) on the successful passes in the passing test, there was no significance in the interaction between groups and measurement times. According to the main effect test, the number of successful passes in the passing test was not significant either. Therefore, the number of successful passes in the passing test after DRI-TR did not significantly increase in either the TR or CONT Groups (**Figure 7**). In addition, time in the dribbling test and number of successful passes in the passing test in TR and CONT Groups before and after the training did not show significant correlation (**Figure 8**).

4. Discussion

With the exclusion of DRI-TR, the training status and number of games for both groups did not match completely (**Table 5** & **6**). As investigators, however, we are not ethically allowed to prevent the practice and development of learners. As a field study, however, the conditions of this study were considered to be within the allowable range of control conditions. Compared with the impact of intensive DRI-TR, the difference was considered to be relatively small.

4.1. Impact of DRI-TR on Dribbling Skills

The significant reduction of the time in dribbling test in TR Group after DRI-TR is thought to have been the result of the decrease in the number of ball contacts and mistakes (**Figure 4**). The reduction in the number of ball contacts and mistakes in the dribbling test in the TR Group after DRI-TR is thought to have been the result of improvement in the dribbling skills of the TR Group by DRI-TR. Generally, the motor learning process starts from the cognitive linguistic stage, shifts to the movement associative stage, and ends at the automatic stage (Schmidt, 1991, pp.175-177). In the cognitive-linguistic stage, the first issue for a learner is language and cognition for tasks, and improvement in learning is quick in this stage (Schmidt, 1991, pp. 175-177). Furthermore, Schmidt (1991, pp. 175-177) notes that the learner solves most cognitive problems in the movement associative stage, and starts developing specific exercise programs for activities, which rapidly increases the consistency of movements. In addition, a feel for the ball can be developed through the repetition of practice; therefore, repetitive drills are important for skill development (Yamanaka, 1980; Ericsson et al., 1993). After practice, the learner gradually enters the automatic stage (Schmidt, 1991, p.176). Automation means that new movements will develop to meet a purpose unconsciously with the improvement of skill (Meinl, 1981). Furthermore, Watanabe (1990) suggested that automation can be achieved only through training and repetitive exercise of the same motor process, and that the more the exercise is

Table 6 Content and Schedules for Both Groups (14 weeks)

group / training	TR Group	CONT Group
	・DRI-TR (30 min.×44 days)	・Running & Stretch (15 min. ×55 days)
Technical Training	・Pass & Control (15 min. ×30 days) ・Heading (15 min. ×14 days)	・Pass & Control (15 min. ×55 days) ・Heading (15 min. ×24 days) ・Lifting (15 min. ×23 days) ・Figure eight dribbling (15 min. ×8 days)
Tactical Training	・1 on 1 (30 min. ×13 days) ・8 on 8 ball keep (30 min. ×12 days) ・10 on 10 ball keep (30 min.×13 days) ・Passing around among 5 (30 min.×6 days)	・1 on 1 (30 min.×18 days) ・2 on 2 (30 min. ×15 days) ・3 on 3 (30 min.×12 days) ・4 on 2 ball keep (30 min.×10 days)
Game Form Training	・4 on 4 game (45 min. ×21 days) ・5 on 5 game (45 min. ×23 days)	・4 on 4 game (45 min. ×18 days) ・5 on 5 game (45 min. ×17 days) ・8 on 8 game (45 min. ×20 days)

repeated, the stronger the tendency for automatic movement becomes.

The change in the number of ball contacts and mistakes in dribbling test before and after the training in this study is one index for the evaluation of dribbling skill improvement. In ball skill training it is generally considered that a smaller number of ball contacts and mistakes mean higher skill. Therefore, the decrease in the number of ball contacts and mistakes in the dribbling test in the TR Group after DRI-TR suggests an increase in dribbling skills. Although it was difficult to determine whether the decrease in the number of ball contacts led to a reduction in the number of mistakes, or the decrease in the number of mistakes led to a reduction in the number of ball contacts, it is thought that the reduction of the number of ball contacts and mistakes were mutually related.

In addition, the TR Group conducted DRI-TR three times per week for 14 weeks; therefore, it was possible that the 14-week ball contact activity in DRI-TR shifted the dribbling skills of the TR Group into the movement associative or cognitive linguistic stage, suggesting that the improvement of the dribbling skills of TR Group was the result of repetitive dribbling drills through the 14-week DRI-TR. One of the major reasons for the results was assumed to be the high amount of ball contact.

Furthermore, because the motor schema is believed to be based on a regression line from many data points, there are hypotheses suggesting the efficacy of practice that applies a wide range of activities (variability of practice) similar to the standard (Newell and Shapiro, 1987; Moxley, 1979).

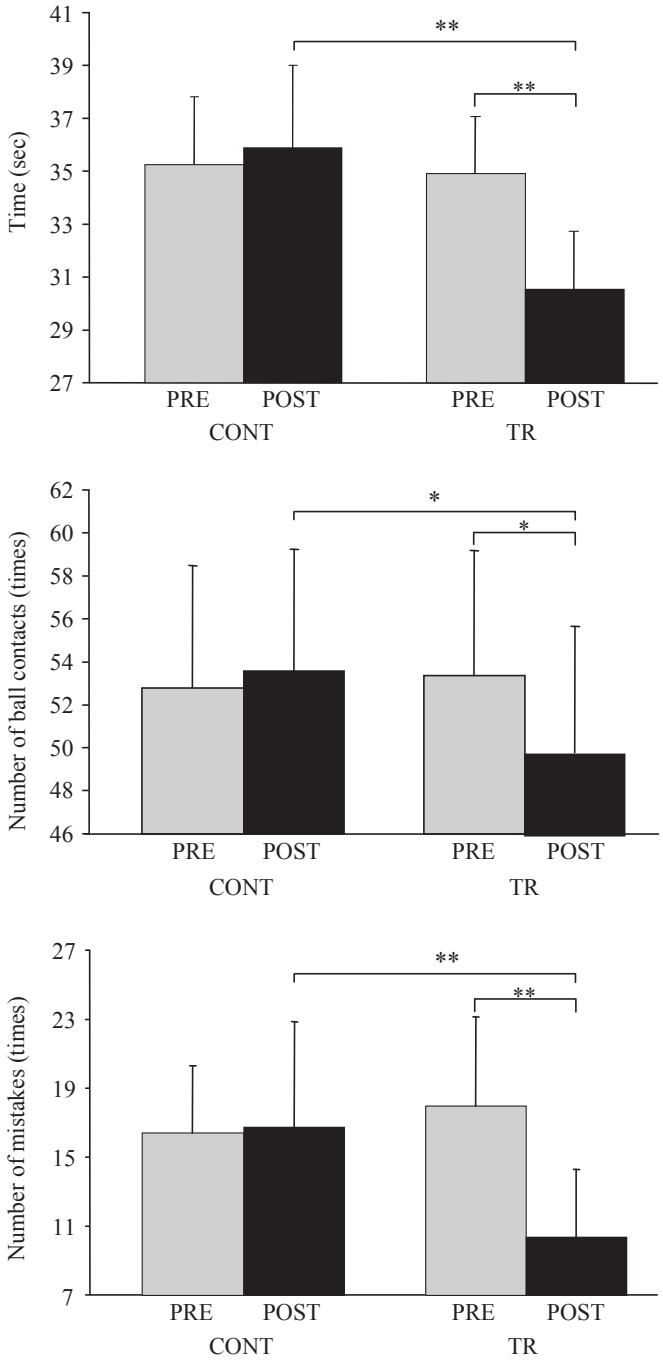

Figure 4 Comparison of Dribbling Test of Both Groups before and after Training
(*: p<0.05, **: p<0.01).

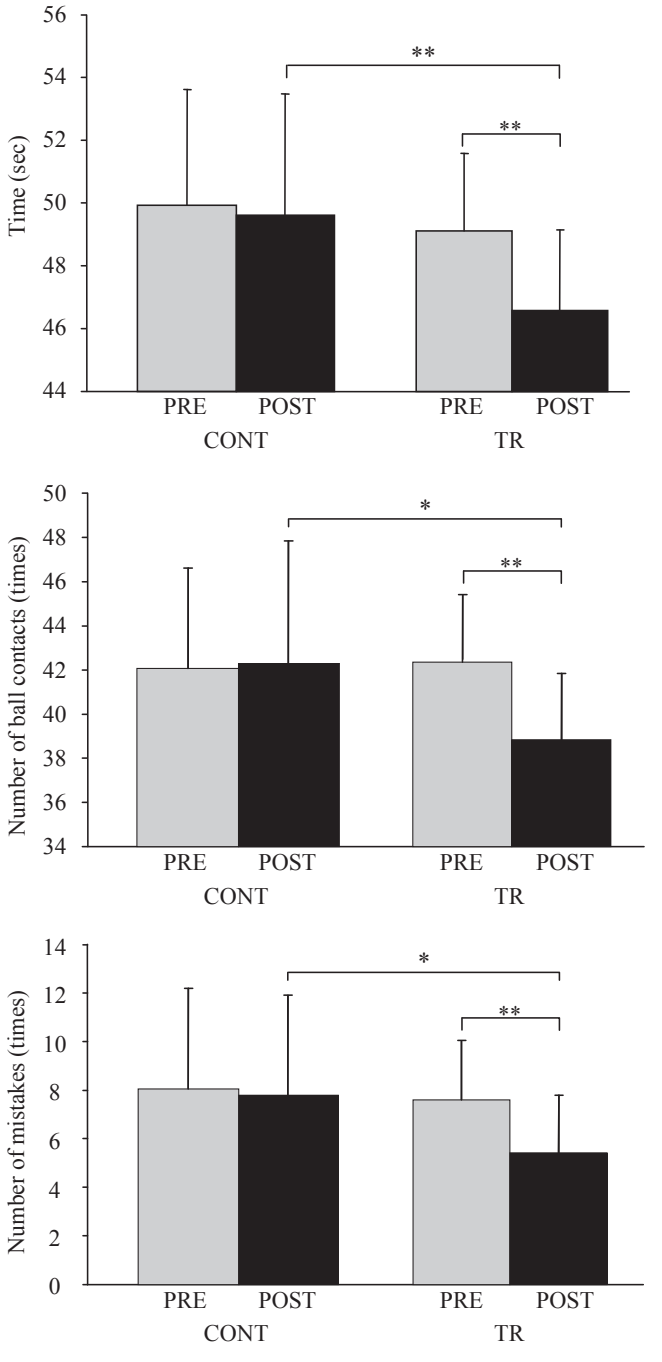

Figure 5 Comparison of Trapping Test of Both Groups before and after Training
(*: p<0.05, **: p<0.01).

Variability of practice is to practice many variations of one activity, which enhances the response to movement in all dimensions through changes in tasks (Schmidt, 1991, pp.210-212). The efficiency of such variability of practice has been supported by other studies (Shea and Kohl, 1991; Kudo, 1994). Tsutsui & Sugihara (1986) suggested the possibility of producing efficacy of variability of practice between different movement programs. DRI-TR in this study consisted of eight types of cone dribbling, 25 types ball sensory perception drills, and eight dribbling drills, for a total of 41 types of training. The movements, moving speed, and distance in each type of training were different, which can be considered variability of practice. Because there was no control group for variability of practice in this study, it is impossible to discuss the efficiency of the variable practice; however, the improvement of the dribbling skills in TR Group may be associated with the variability of practice. Therefore, it is possible that

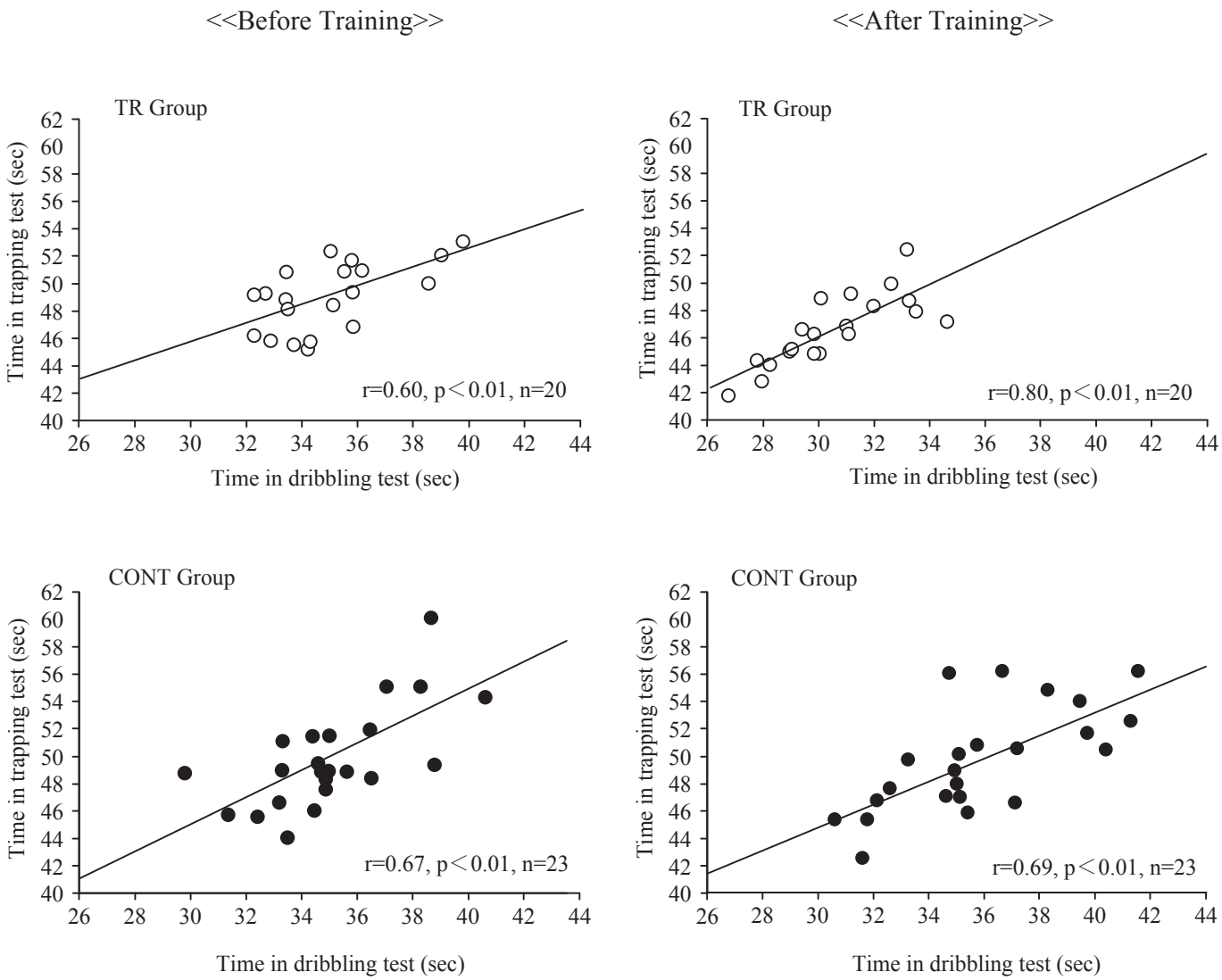

Figure 6 Relationship between the Time in Dribbling and Trapping Tests of Both Groups before and after Training

the 14-week DRI-TR improved the dribbling skills, which decreased the number of ball contacts and mistakes in the dribbling test of the TR Group, and reduced times.

4.2. Impact of DRI-TR on Trapping Skills

It is suggested that time in the trapping test of the TR Group after DRI-TR was reduced significantly because of the decrease of the number of ball contacts and mistakes in the trapping test of the TR Group after DRI-TR (**Figure 5**). It is also suggested that the number of ball contacts and mistakes in the trapping test of the TR Group after DRI-TR was reduced because of improvement of the trapping skills through the high amount of ball contact during the 14-week DRI-TR.

Sasaki et al. (1963, pp. 64-69) and Takeuchi & Seto (1968) considered dribbling as a series of trapping movements because dribbling focuses on keeping the ball around the feet and controlling it. In other words, holding a ball and pushing it in the intended direction is one form of trapping (Sasaki et al., 1963, pp.64-69). Tawa et al. (1974) stated that when dribbling, the ball should be placed within the play of the holder in preparation for kicking, and trapping is a technique similar to dribbling for controlling the ball within play. Therefore, dribbling and trapping skills are similar as means of controlling a ball within the range of the player. In addition, there was a high correlation (0.6 and 0.8) between TR and CONT Group dribbling and trapping test times before and after training ($p<0.01$) (**Figure 6**), suggesting a relationship between the dribbling and trapping skills in this study. It is well known that transference tends to occur when there is a resemblance between two learning tasks, such as common elements or component force (Holding, 1976; Byer, 1993). Weigelt et al. (2000) reported that

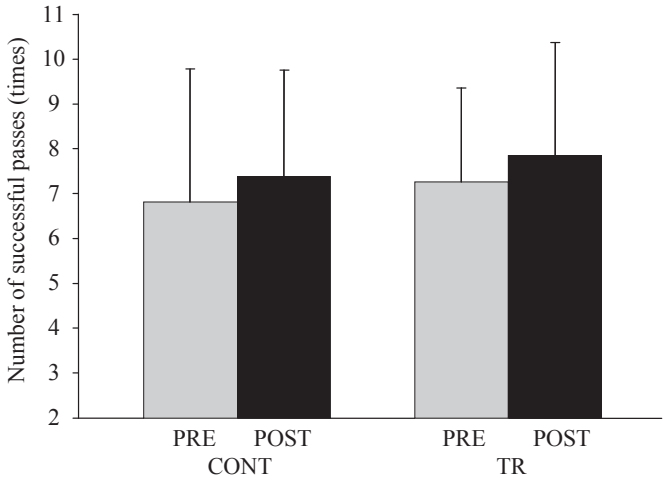

Figure 7 Comparison of the Number of Successful Passes in Passing Test before and after Training

transference occurred in improved kicking accuracy through ball lifting training. Accordingly, it is thought that dribbling skills improved through DRI-TR in this study led to improved trapping skills.

Similar to the dribbling skills, changes in the number of ball contacts and mistakes in the trapping test after the training were considered to be one index for evaluating trapping skill improvement. Therefore, the decrease in the number of ball contacts and mistakes in the trapping test of the TR Group after DRI-TR was thought to suggest improvement of trapping skills in terms of the decrease in unnecessary ball contacts and technical mistakes.

Because of the above, it is thought that the improved dribbling skills of the TR Group during 14-week DRI-TR improved trapping skills, which decreased the number of ball contacts and mistakes in the trapping test, and was one factors in reducing the time. This suggests that dribbling training had the potential to improve trapping skills.

4.3. Impact of DRI-TR on Passing Skills

The reason that the number of successful passes of the TR Group after DRI-TR did not significantly increase (**Figure 7**) was thought to be that DRI-TR did not have a favorable impact on improvement of passing skills. While dribbling and trapping are similar as means of controlling the ball within the range of play of the ball holder (Sasaki et al., 1963, pp.64-69; Tawa et al., 1974, pp.224-225, 245), passing is technically different from dribbling or trapping in that it involves kicking the ball outside the range of the play of the ball holder. In addition, the speed of each joint on the kicking foot during trapping and passing, and the mechanics of movement during ball contact are different (Isokawa, 1987; Asai et al., 1990; Nunome, 1999; Kinoyo et al., 2006). Further, the action potential level of muscles of the kicking foot during trapping and passing is also different (Takagi et al., 1961; Goto et al., 1998). Therefore, there is a low resemblance between dribbling and passing from the viewpoint of the action potential of muscles. No significant difference in the number of successful passes after training was observed in the groups; however, the number of successful passes tended to increase. Test forms used in this study focused on the basic elements, which may help to increase the skills under conditions different from testing; however, the details are lacking. These factors suggest a low possibility for favorable impact between dribbling and passing skills. Therefore, it is important to design independent training to improve both skills.

This study showed the efficacy of training for improving dribbling and trapping skills through 14-week DRI-TR. It is necessary to further investigate the association between dribbling and trapping skills to confirm the transference. In addition, the dribbling skills in this study focused on dribbling against obstacles (motionless objects) such as cones and markers; therefore, examination of the effects of DRI-TR on dribbling skills against other players is an important future research theme.

5. Summary

This study was conducted to clarify the impact of the short-term intensive DRI-TR on junior youth ball handling skills. Fourteen-week DRI-TR was provided to soccer players in the eighth grade and a comparative examination of dribbling, trapping, and passing tests before and after DRI-TR was conducted. The results were as follows:

1) While the TR Group showed significantly decreased dribbling test times after the 14-week training, CONT Group test times showed no decrease. The TR Group also showed a significant decrease in the number of ball contacts and mistakes in the dribbling test after DRI-TR.

2) While TR Group showed significantly decreased trapping test times after the 14-week training, the CONT Group did not. The TR Group also showed a significant decrease in the number of ball contacts and mistakes in the trapping test after DRI-TR.

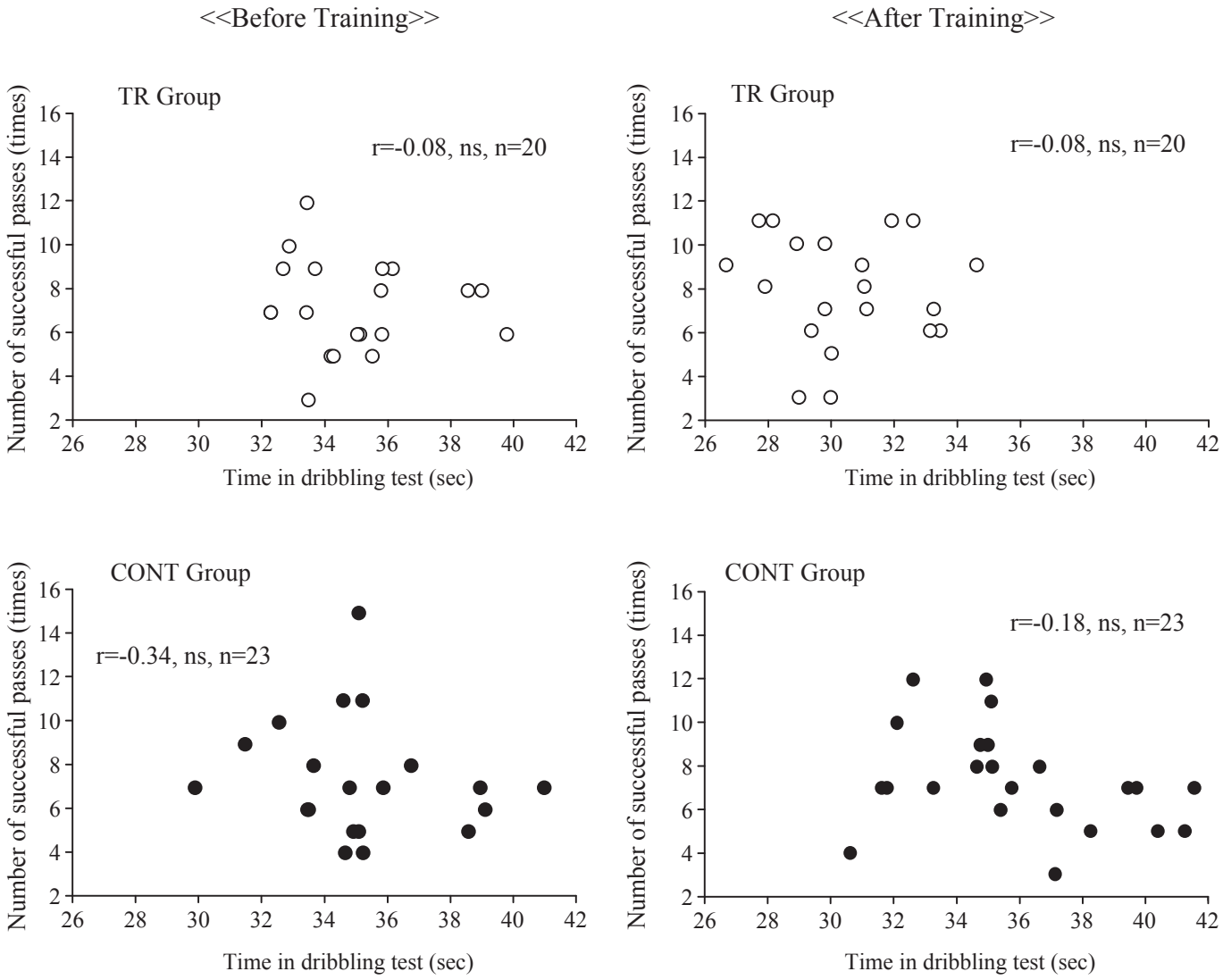

Figure 8 Relationship between the Time in Dribbling Test and the Number of Successful Passes in Passing Test of Both Groups before and after Training

3) The number of successful passes in the passing test did not increase in either the TR or the CONT Group.
4) Fourteen-week DRI-TR improved the dribbling and trapping skills of soccer players in the eighth grade. It is necessary to conduct a more detailed examination of the potential and limitations of dribbling and trapping skills in the shifting of learning stages.
5) Fourteen-week DRI-TR targeting soccer players in the eighth grade had almost no impact on passing skills.

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