

Universidade de Trás-os-Montes e Alto Douro

**The effects of differential learning approach on technical skills in
youth soccer players**

Dissertação de Mestrado Internacional em Análise da Performance
Desportiva

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Orientador: Professor Doutor Nuno Miguel Correia Leite

Coorientador: Professora Sara Diana Leal dos Santos



Vila Real, 2018

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Vila Real, 2018

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Designação do Mestrado: Mestrado Internacional em Análise da Performance Desportiva

Título da dissertação: *The effects of differential learning approach on technical skills in youth soccer players (2018)*

Orientador: Professor Doutor Nuno Miguel Correia Leite

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Ano de Conclusão: 2018

Declaro que esta dissertação de mestrado é o resultado de uma pesquisa e trabalho pessoal efetuada por mim e orientada pelo meu supervisor. O seu conteúdo é original e todas as fontes consultadas estão devidamente citadas no texto e mencionadas na bibliografia final. Declaro ainda que este trabalho não foi apresentado em nenhuma outra instituição para a obtenção de qualquer grau académico.

“Only you can build your ladder for success”

Alex Morgan

Agradecimentos

Ao meu orientador, o Professor Doutor Nuno Leite, pela sua disponibilidade e pela oportunidade que me proporcionou de ingressar neste mestrado e percorrer este caminho nos últimos dois anos.

À minha coorientadora, Sara Santos, por toda a sua disponibilidade, tempo e paciência. Foi uma grande ajuda para concluir este estudo.

À minha mãe, que fez o possível e o impossível para me dar tudo o que eu precisava e que sempre me apoiou nesta jornada sem nunca questionar aquilo que eu queria.

Ao resto da minha família que por muito que me chamassem “maluca” por andar de país em país sempre me apoiaram.

Ao Tiago, ao José Barbosa e ao José Gomes que foram nesta aventura comigo desde o início, formando assim a Portuguese Delegation. Venha a próxima aventura!

To my IMPAS family for these two amazing years. It was an awesome experience spend this time with all of you and for sure we collected memories for the rest of our lives.

Aos que estão lá desde o início, desde o secundário, embora não tenham interferido na minha vida académica sempre me apoiaram em tudo. Por tudo o que já passamos e pelo que está para vir.

Às melhores pessoas que a UTAD me podia dar, quer as que estiveram desde do início, quer aquelas que apareceram já na parte final desta aventura, sem vocês isto seria muito mais complicado. Obrigado pela paciência e por me darem sempre cabo da cabeça para acabar a tese. Continuem assim.

Por fim, mas não menos importante um obrigado á Francisca, que embora só tenha conhecido nesta fase final de mestrado, sempre me soube motivar em relação a esta dissertação. Vais ter um futuro brilhante miúda.

Abstract

The aim of this study is to verify if differential learning can improve technical skill pass more than the traditional training in youth football and futsal players. The sample was composed by 27 young Portuguese football players from Under 11 age group (U11: n=27, age: 10.0 ± 0.39) and 17 young Portuguese futsal players (U11: n=17, age: 9.27 ± 1.03). Each team was divided into 2 groups (control group and experimental group), in total 4 groups were made, two control and two experimental groups. The intervention time was around 2 months, and only experimental groups had an interventional program based on differential learning. The intervention was founded on analytic exercises and a small-side-games. Both groups performed the Loughborough Football Passing Test and the Creative Behaviour Assessment in Team Sports (CBATS) to assess the pass skills.

The results of the Loughborough Football Passing Test showed that all 4 groups improved from the pre to the post test, however, a higher improve was presented in the experimental groups in football (-1,7; $\pm 1,3$, possibly -ive) and socfutsal (-0,4; $\pm 1,2$, likely) teams when comparing with the control groups. Regarding to game related creative behaviour the results showed that the experimental group of the socfutsal team improves more in the versatility (0,6; $\pm 0,6$, likely + ive) and in the fails (0,5; $\pm 0,5$, likely – ive), on the other hand the fluency was stressed in the football team (0,5; $\pm 0,9$, possibly + ive). Comparing the two teams, the training intervention seems to be more effective in the football team. This study demonstrated that a differential learning intervention can provide an improvement in the performance of the pass technique in football and futsal players.

Keywords: football, futsal, pass technique, differential learning

Resumo

O objetivo deste estudo foi verificar se a aprendizagem diferencial pode melhorar a capacidade técnica do passe quando comparado a um modelo de aprendizagem mais tradicional em jovens jogadores de futebol e futsal. A amostra era composta por 27 jovens jogadores portugueses de futebol no escalão sub-11 (Sub11: n=27, idade: 10.0 ± 0.39) e 17 jovens jogadores portugueses de futsal (Sub11: n=17, idade: 9.27 ± 1.03). cada equipa foi dividida em dois grupos, formando assim o grupo controlo e o grupo experimental.

A intervenção foi de cerca de 2 meses e apenas os grupos experimentais participavam no programa de intervenção. O programa era baseado em na aprendizagem diferencial, utilizando exercícios analíticos e jogo reduzido. Toda a amostra executou o mesmo teste para avaliar o passe, o Loughborough Football Passing Test e um jogo reduzido para avaliar a criatividade.

Os resultados do Loughborough Football Passing Test demonstram que todos os grupos melhoraram, tendo melhor resultados o grupo experimental de futebol ($-1,7; \pm 1,3$, possibly-ive) e socfutsal ($-0,4; \pm 1,2$, likely) quando comparado com os grupos de controlo do pré para o pós-teste. Relativamente á criatividade os resultados mostram que o grupo experimental melhora mais na versatilidade na equipa de futsal ($0,6; \pm 0,6$, likely +ive) e nas falhas ($-0,5; \pm 0,5$, likely -ive) e fluência ($0,5; \pm 0,9$, possibly +ive) na equipa de futebol. Mostrando assim que o programa de treino ajuda no aumento da performance. No LSPT ambos os grupos experimentais (futebol e futsal) melhoraram comparativamente aos grupos de controlo. Comparando as duas equipas, o programa de treino parece ser mais efetivo na equipa de futebol.

Este estudo demonstra que a aprendizagem diferencial pode providenciar um aumento na performance relacionada á técnica do passe em jogadores de futebol e futsal.

Palavras-chave: futebol, futsal, técnica do passe, aprendizagem diferencial

Index

1-Introduction	1
2-Methods	5
2.1-Participants	5
2.2-Instruments	7
2.2.1-Categorisation of sports experiences	7
2.2.2-Loughborough Football Passing Test.....	7
2.3-Training intervention.....	9
2.4-Procedures.....	11
3-Statistical Analysis	12
4-Results	12
5-Discussion	17
6-Conclusion.....	19
7-Practical Implications.....	19
8-References.....	19
9-Attachments	23

Table Index

Table 1 - Number of sports practiced during the football and futsal youth career.....	6
Figure 1 - Time of structured and non-structured practice.	6
Figure 2- Loughborough Football Passing Test	8
Table 2- Differences in the two types of training	11
Table 3 - Descriptive (mean \pm SD) and inferential (Cohen's $d \pm$ 90% confidence limit) analysis for the Loughborough Football Passing Test	13
Figure 3- Analysis for the Loughborough Football Passing Test	13
Table 4 – Descriptive (mean \pm SD) and inferential (Cohen's $d \pm$ 90% confidence limit) analysis for the creative of the pass, with comparisons between the control and experimental groups in the football and socfutsal teams.....	13
Figure 4- Analysis for the creative of the pass, with comparisons between the control and experimental groups in the football and socfutsal teams.....	15
Figure 5- Network of football team.....	16
Figure 6- Network of socfutsal team	17

Abbreviation Index

DL – Differential Learning

SSG - Small-side-game

LSPT - Loughborough Football Passing Test

CBATS - Creativity Behaviour Assessment in Team Sports

GK – Goalkeeper

LCB – Left Central Back

RCB – Right Central Back

MD – Middle fielder

LW – Left Winger

RW – Right Winger

1-Introduction

As a team sport, football is one of the most chaotic sports, taking into consideration the complex, dynamic and unpredictable environment that requires a constant adaptation to different contexts (Sampaio & Maçãs, 2012). When we think about the wide range of situations and diversity of actions, which can occur during the 90 minutes, the football game is simply unsettled. When comparing sports, futsal and football are very similar since they are based in the same game structure (Mohr, Krusturp, & Bangsbo, 2003; Castagna, D'Ottavio, Vera, & Álvarez, 2009). Indeed, all the individual and collective tactical actions and behaviours are context-dependent (Sampaio, Lago, Gonçalves, Maçãs, & Leite, 2014; Travassos, Bourbousson, Esteves, Marcelino, Pacheco, & Davids, 2016). Futsal is a 5-a-side game played indoor in a 40m x 20m playing area. It is an anaerobic sport with extremely high levels of variability of intensity, which requires constant changes of direction, accelerations and decelerations, quick and accurate tactical and technical behaviours with and without the ball to successfully perform the previous mentioned individual and collective actions (Castagna, et al. 2009). Founded on the number of opportunities for action, ecological dynamics, suggests that futsal can help football players to explore local affordances in different perspectives (Davids, Gullich, Shuttleworth, & Araújo, 2017). In fact, it seems that in some countries, such as Brazil, the coaches have been highlighted the futsal among football players by introducing the futsal practice once per week in their schedules.

Researches presented that the expert athletes tended to practice several sports throughout their sport career (Côté, Baker, & Abernethy, 2007). Indeed, the diversified practice during the early years promotes a sustainable sport background when comparing with early specialization that is an early investment in one sport and is strictly related with the deliberate practice (Santos, Mateus, Sampaio & Leite, 2017; Coutinho, Mesquita, & Fonseca, 2016). Subsequently, diversified practice requires the participation in a wide variety of sports with high levels of deliberate play and low levels of deliberate practice (Santos, Mateus, Sampaio & Leite, 2017). Considering football as representative example, it has been shown that the development of skills and expertise also can be achieved through the experience and practice of different activities under a variety of task and environmental constraints. Related to practice different activities, it has been proposed that some sports can act as a “donor sports”, which can benefit a transitioning phase between diversification and improved specialization (Travassos, Araújo, & Davids, 2018). Practice in donor sports could simplify the transfer of athletic abilities, based on how action can lead to perception, and how this can guide action towards the goal of the main sport (Travassos, et al. 2018). Thus, experience and practice in

futsal, play an important role in the development of skills in football, just like football can contribute to the performance development in futsal as well (Travassos, et al. 2018).

As previously mentioned, the performance in football and futsal is influenced by similar technical, tactical and physical variables and have the same goal (Castagna et al. 2009; Mohr, Krustup et al. 2003). Due to the number of players involved, space and time available for practicing, futsal require not only precise technical and tactical actions with the ball, as also without it. In contrast, football requires high intensity activities, but with more time and space to perform such actions in comparison with futsal (Travassos, et al. 2018). The fact that futsal is played in a reduced space and used less players, has a lot of variations in offensive and defensive collective playing systems, that is also an opportunity for the player to improve technical and tactical behaviours (Travassos et al., 2012). Also provide more frequent opportunities to perform skills with the ball compared to football (Davids et al., 2013). Considering the following assumptions, futsal practice during the early years possibly can promote an improvement in the skills of the youth players since they spend more time and interact more with the ball comparing to football.

In all sports, the players' performance is influenced by a higher number of variables (Torres-Ronda, Gonçalves, Marcelino, Torrents, Vicente, & Sampaio, 2015). Comparing with the tactical and physical demands, the technical actions have received considerable attention to be determinant for the team success during the early ages (Casamichana, Castellano & Castagna, 2012; Russell, Rees & Kingsley, 2013; Bush, Barnes, Archer, Hogg & Bradley, 2015). One of the most important periods of technical development for children, also known as opportunity windows, occur between the ages of 9 to 12 (Balyi & Hamilton 2004). In this time children are developmentally ready to acquire general overall sports skills that are the cornerstones of all athletic development (Balyi & Hamilton 2004). The main skill and the one that is most used in football and futsal is the pass technique, allowing players to interact with each other. This skill establishes a wider amount of inter personal relationships within the team and their opponents (Maçãs & Brito, 2000). Besides it, is the technique that can have more diversification throughout the game, being the overall technique divided in short, medium and long pass, low or high, and using different parts of body (e.g. foot, head, knee) (Frisselli & Mantovani, 1999.). The pass is the most used action in the game, whereas in some games each team make more than 200 passes and none of those are made in the same environmental conditions. This led us to the key role of creativity that is a valued disposition in sport performance (Memmert, D., 2015) and can be defined as the capacity of the players to solve specific game problems in an unexpected, different and original way (Santos, Memmert et al. 2016). Sport science literature frequently suggests that both game intelligence and

tactical creativity are important for successful athletes in different kinds of sports (Memmert, D.,2011). In team sports the creative behaviour is a higher-order disposition, and several studies have confirmed that creativity is trainable (Furley & Memmert, 2015). Consequently, have creative players it is important so, since creativity is trainable, the variability in the training is beneficial for the development of the creativity behaviour. Creative behaviour can assume two different indicators, the P-creativity (personal) that prevails during the early years since is internal to the player and related to the exploration of new behaviours (Santos, Coutinho, Gonçalves, Schöllhorn, Sampaio, & Leite, 2018) and the H-creativity, which is recognized as an innovation that no player has never executed before (Hristovski, Davids, Araujo,& Passos, 2011). Creativity has several components such as attempts, fluency, versatility, and originality. Attempts are recognized as any effort to perform different actions even if non-effective. Fluency or efficacy is the ability to execute as many effective movement actions as possible. Versatility or flexibility is the ability to produce different actions (Santos, Memmert, Sampaio & Leite, 2016).

The athletes are developed through different paths, some is based on early specialisation and others in late specialisation. Both ways can lead to elite performance. Previous studies discussed positive implications of a diversified path such as the transference of patterns between related sports (Abernethy, Baker, & Côté, 2005), due to the different environments and stimuli experienced through different contexts. Furthermore, this transfer could benefit players' performance in their main sport (Baker, Côté, & Abernethy, 2003). These high variabilities of sports allowed players to create new ways to respond and make adaptive changes in their movement patterns to overcome game challenges is an important aspect of their training process (Chow, Davids, Button, & Renshaw, 2015).

Network is the analysis that has been used in football to describe the interactions established between players during the game (Gama, Passos, Davids, Relvas, Ribeiro, Vaz, & Dias, 2014). Notational analysis has showed to be an important resource to gather valid and reliable information of teams and/or athletes (Carling, Reilly & Williams 2009) (Hughes & Franks 2007). This approach allows the coach to get feedback on the trend of collective behaviour in the game and during the season (Yamamoto & Yokoyama, 2011; Grund, 2012;). In this way the notational analysis of the game actions was performed, considering the number of passes and therefore creating the networks referring to each team. In the case of this study, the networks are just for illustration and see if there are different behaviours from Pre-test to Post-test.

There are different methods to learn skills, the most used is based on improving the skill by execute it in a repetitive way. Opposed to this method and related to the increase of

the importance of the creative behaviour, a new approach emerged, known as the differential learning (DL). This approach is proposed by Professor Wolfgang Schöllhorn and it is characterized by taking advantage, for learning of fluctuations that occur, without movement repetitions and without corrections during the skill acquisition process (Schöllhorn, Mayer-Kress, Newell & Michelbrink, 2009). This theory is an alternative strategy to the motor learning process due to the addition of the variability in movements and randomly in skills acquisition phase (Schöllhorn, et al., 2009). Variability has seen as an essential component of training and such premise is reinforced in the differential learning assumptions (Schöllhorn, 1999). DL approach takes advantage of fluctuations in a complex system by increasing them through 'no repetition' and 'constantly changing movement tasks', which adds stochastic perturbations (Schöllhorn, Hegen & Davids, 2012). Several studies have shown higher skill acquisition through the differential learning approach when compared with the repetitive linear approaches (Schöllhorn 1999, Wagner & Muller 2008).

Recently, to reinforce the previous assumptions, several studies have been conducted. A 10-weeks interventional study was applied to identify the effects of a complementary training program based on DL approach in the physical, technical, creative and positioning performance of youth football attackers. The variables studied encompassed: motor, creative (fluency, attempts, versatility) and positioning-related variables. Each training program intervention consisted on the following components: 10 minutes of physical literacy combined with differential learning approach exercises and 15 minutes of SSGs with additional DL. The results show that in the U15 team, an improvement in fluency and versatility was verified in the experimental group from pre to post test. The U17 team did not show any significant value (Santos et al. 2018). Moreover, in a 4-week study in U15 football team where DL was implemented based on technical improvement exercises. In this study, the Mor-Christian football passing test, German Football Association agility/dribbling test, and feet-juggling test were applied. The Differential Group trained according to the DL approach, performing target-passing, dribbling with the ball, and feet-juggling techniques with blocked order in one training session. The results showed that the experimental group improved the performance in all tests from pre to post-test compared to control group in the pass evaluation (Bozkurt, 2018). Additionally, other studies, in U13 and U15 football players were done during a 5-month training program based on DL underpinned in small-side-game (SSG) situations. The U13 experimental group in the analysis showed a decrease on passes in fails it means that from the Pre-test to Post-test the players failed less pass, increase in attempts they tried more non-standardized passes in the Post-test and an increase in the versatility used more differently types of passes. The U15 experimental group showed also decrease in the fails from Pre to Post-test, a higher performance in attempts and an increase in versatility (Santos, S. et al.

2018). This suggests that, both U13 and U15 experimental groups followed the same line of results, getting better results with the DL training.

Considering the previous assumptions, urge to explore the influence of DL in the pass technique in football and futsal players. Therefore, this is a pioneer study that involve differential learning in football and futsal in youth. The purpose of this study is to investigate the effects of the differential learning training in the pass technique in youth football and futsal players. Taking in account the theoretical background and previous studies that have been done with the DL approach, it is hypothesizes a benefit to the performance in the Loughborough Football Passing Test (LSPT) and in the SSG analyse will be observer after the intervention. It is hypothesized that the groups with the differential learning intervention will show an increase in the performance compared to the groups without the intervention. Possibly, the players will display better results relates with the execution of the Loughborough Football Passing Test, increasing the number of fluency and versatility and at the same time decrease the number of fails during the games. Additionally, it is assumed that the futsal group will improve more than the football group in the SSG since the players are more accustomed to play in reduced spaces.

2-Methods

2.1-Participants

The participants included 27 young male Portuguese football players from Under 11 age group (U11: n=27, age: 10.0 ± 0.39 , mass: 33.82 ± 3.69 , height: $142,11 \pm 5.93$) and 17 young male Portuguese futsal players (U11: n=17, age: 9.27 ± 1.03 , mass: 32.13 ± 4.84 , height: 140.2 ± 7.60). The football players trained 3 times per week, with each session lasting 70-90 minutes and played an official game during the weekend with 50 minutes' duration. This However, the futsal players trained 4 times per week with each session lasting 60-90 minutes, this team practice one-time football and 3 times futsal and usually played two official games (1 futsal and 1 football), during the weekend with duration of 40 and 50 minutes, respectively. So, this group practice the two modalities. Since the futsal players also training football this group is called "socfutsal". The experimental sessions took place throughout the season on their normally scheduled training days, substituting the regularly planned training session. Club administrators, coaches, players and parents were fully informed of the aims and procedures of the study and signed an informed and written consent form to participate. All participants were notified that they could withdraw from the study at any time. The study protocol followed

the guidelines and was approved by the Local Ethics Committee and conformed to the recommendations of the Declaration of Helsinki.

Table 1 - Number of sports practiced during the football and futsal youth career.

Football CG (n=13)		Football EG (n=13)		Futsal CG (n=8)		Futsal EG (n=9)	
Sport	n	Sport	N	Sport	n	Sport	n
Swimming	1	Swimming	1	Swimming	1	Swimming	5
Gymnastics	1	Gymnastics	3	Gymnastics	0	Gymnastics	2
Golf	0	Golf	1	Golf	0	Golf	0
Karate	0	Karate	0	Karate	0	Karate	1
Crossfit	0	Crossfit	0	Crossfit	1	Crossfit	0
Acrobatic	1	Acrobatic	0	Acrobatic	0	Acrobatic	0
Volleyball	0	Volleyball	0	Volleyball	1	Volleyball	0
Total	3	Total	5	Total	3	Total	8

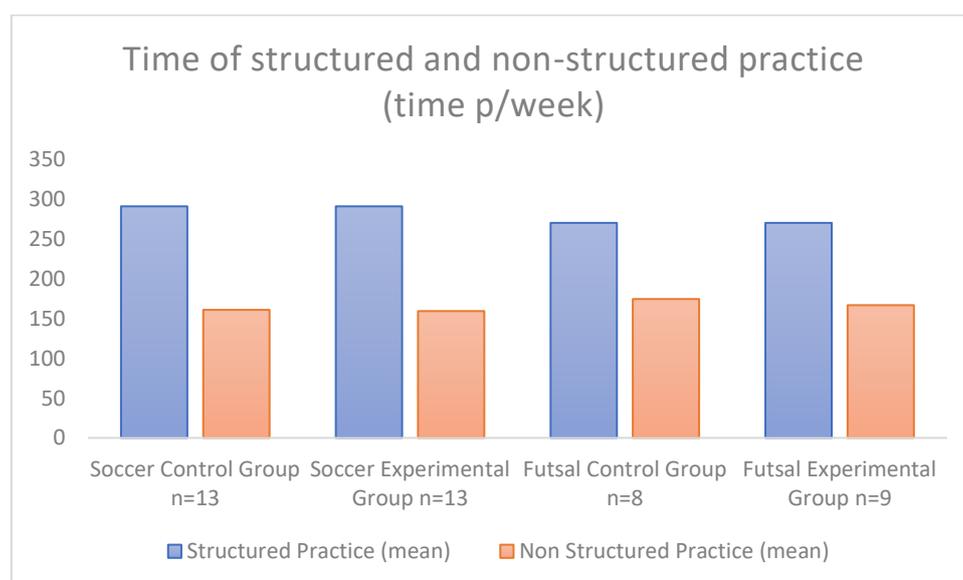


Figure 1 - Time of structured and non-structured practice.

2.2-Instruments

2.2.1-Categorisation of sports experiences

The gathered of previous experiences took place before the pre-test session. Thus, each participant completed a questionnaire designed to obtain detailed information about their sport path, regarding the structured and non-structured activities. This procedure provided quantitative and qualitative information about sports activities that participants had performed throughout their sporting career. The researchers presented a brief explanation of the questionnaire, which was then completed and delivered in the next session. The first section of the questionnaire was dedicated to establishing a demographic characterization of the participant's sporting career, year by year, including the age at which they started practicing football /futsal and the time per week spent in it, The second section of the questionnaire explored the number of sports and the amount of time spent on sports activities in a year-by-year description, as well as the partial and total number of hours spent in those activities. In this description, free practice included the time spent in unstructured activities (Côté, Baker, & Abernethy, 2003).

2.2.2-Loughborough Football Passing Test

The Loughborough Football Passing Test (LSPT) is a reliable and valid test, which assesses the multifaceted aspects of football skill including passing, control, and decision making (Ali, 2011). The figure 4 illustrates the LSPT. Four benches rebound boards were placed as shown on each of the 4 lines marking. Before placement, 4 coloured target areas (red, blue, green, and yellow) were attached in the middle of each board. In addition, a blue piece was placed in the middle of the target areas. Coloured cones were used to distinguish the different zones. Participants started with the football ball by the central cone, and the examiner started timing the test from the moment the ball was played out of the inner rectangle. The specific colour was called out just before the participant completed the current pass. The test consists in 16 passes for the 4 different targets, the score is based on the time needed to complete the 16 passes and had some rules that can add or reduce the total time of the test. Participants were informed that passes could only be executed from within the passing area.

Furthermore, the players were informed that for the best performance on the LSPT, they would have to perform the test as quickly as possible while making the fewest mistakes. The time was recorded when the last pass was completed. A further role of the examiner was to record penalty time points accrued during the trials. Thus, the examiner stood in such a position that all 4 target areas could be viewed. For both teams was used the same distances for the test execution.

Penalty time was awarded for the following errors:

- Added 5s for missing the bench completely or passing for the wrong target
- Added 3s for missing the target area (0.6 x 0.3 m)
- Added 3s for handling the ball
- Added 2s for passing the ball from outside of the designated area
- Added 1s for every second taken over the allocated 43s to complete the test
- 1s was reduced from the total time if the ball hit the 10 cm strip in the middle of the target

The sequence of targets was randomizing for each athlete to avoid that they remember the sequence from the athlete before.

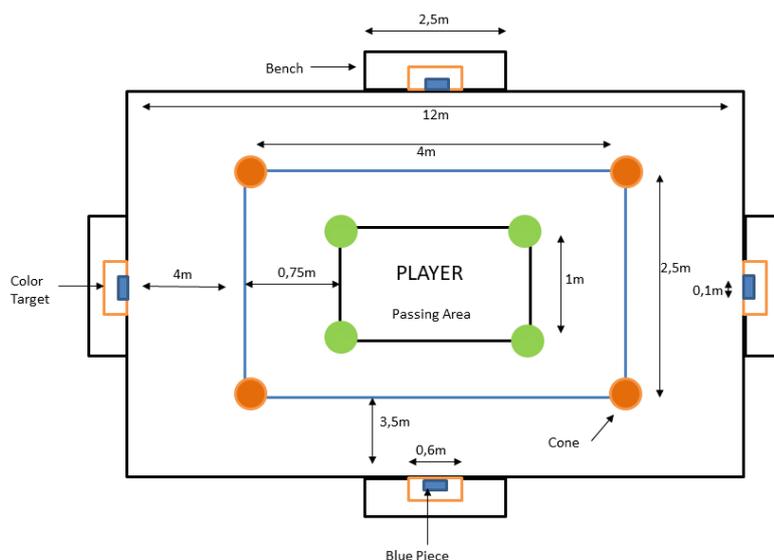


Figure 2- Loughborough Football Passing Test

2.2.3- Creative game behaviour - CBATS

The second task was an SSG, GK + 5-v-5 + GK in football, played on an artificial-turf pitch measuring 40m x 30 m (length x width) using 7-v-7 goals. For the socfutsal group was a GK + 3-v-3 + GK SSG played in indoor pitch measuring 20m x 20m using 5-v-5 goals. The SSG was composed by two parts of 6 minutes with 3 minutes passive recovery for both groups. The small-sided games were recorded using one digital camera Sony HDR-CX240EB. Then, the individual creative behaviour was assessed through a notational analysis and all data was organized in a excel spreadsheet-. This analyse was based on the Creativity Behaviour Assessment in Team Sports (CBATS), that was developed to measure creativity in ball possession during game performance (Santos, Mateus, Sampaio, & Leite, 2017). Measurements of CBATS include pass, dribble and shot, in this study only the pass was assessed, and the examination of actions is divided in successful and unsuccessful (Liu H, Gomez, Goncalves, & Sampaio, 2016) Thus, attempts and fails is related to unsuccessful actions and fluency and versatility to successful actions. The CBATS, is divided in different variables such as fails that is defined as a standardized pass that does not reach the teammate, attempts where the players try to reach a teammate in a non-standardized way but fails, fluency where player intentionally plays the ball from one player to a teammate but in a standardized way and versatility where when the pass reaches the receiver but in a non-standardized way. The CBATS enabled us to automatically carry out the calculations of the individual technical-tactical variables (attempts, fluency, and versatility) to determine a final score. Therefore, the sum of fluent actions for the pass result in the total score of fluency and the same process was occurred with attempts and versatility.

2.3-Training intervention

The session started with the warm-up consisted in approximately 10 minutes run and after 5 minutes stretching. After completing the warm-up, the players were split in the two groups (control and experimental), the control group participated in the normal training session prepared by the coach of the team and the experimental group follow the program intervention.

The control group normally did two exercises per session. The first one was based in technical skills where, in groups of 2/3 players they trained pass, reception, dribbling and shooting in a repetitive way. The second exercise was an SSG (5-v-5) or a formal game (7-v7)

with normal ball, goals and rules. So, the control group had the two different ways of training, the repetitive way and based on SSG.

The experimental group had two different exercises in the plan intervention (in attachment). The first exercise consisted in groups of 3 players in a determinate space (3 different spaces), in each space two groups (6 players) practice the exercise at same time. Each space had his own priority, for example, in the space 1 they only can make pass with the dominate foot.

All the players passed by the 3 different spaces, spending 5 minutes in each one. The goal was to created variability in the type of pass used. The plan intervention is in attachment.

- Space 1: only can use the dominant foot
- Space 2: only can use the non-dominant foot
- Space 3: can use both feet but played with different balls.

Then the rules were the same for each space:

1. Winning points for doing pass between the doors that exist in the field
2. Cannot pass to the player from who he received the ball
3. Always need to chance the type of pass that used (external foot, internal foot, etc.)

The second exercise consisted in an SSG 3x3 with two pop-up goals for each team. To score goal the ball needs to pass for all payers and shoot need to be in one touch, otherwise did not count. This task takes usually 10 minutes, 5 minutes each part. In total the players spend about 25 to 30 minutes in the intervention training. Both execices guides the athletes to think and execute faster when they have to toucht the ball.

Table 2- Differences in the two types of training

Game-based variables		Typical Training (control group)	Differential-learning Training (experimental group)
Ball	Size	Medium	Small, medium, large
	Type	Football ball	Tennis, football, rugby, handball
Targets		7v7	7v7, small targets (pop-up)
Body Constraints		None	Play with nondominant foot, in each ball contact improvise different types of technical skills
Games Rules		Normal rules	Finishing must be at the first touch, they always must finish differently; To score a goal the ball must pass through all the players
Feedback		Prescriptive Feedback by the coach	None

2.4-Procedures

All participants took part in a familiarization session 1 week before the testing sessions and completed a questionnaire designed to obtain detailed information about their sport path. Afterwards, the players were divided into two groups (control group and experimental group), where each group performed two testing sessions, one for the pre-test and another for the post test. Before each testing session, there was a standardized 10 minutes warm-up based on running, stretching and flexibility.

A Loughborough Football Passing Test was executing two times in the football and socfutsal teams to assess the pass accuracy. An SSG was done to assess creativity of the players. Individual values of fluency, versatility, attempts and fails were assessed during a Gk + 5-v-5 + GK in football, the SSG was played on an artificial-turf pitch measuring 40m x 30 m (length x width) using 7-v-7 goals. For the socfutsal group the same individual values were assessed during a GK + 3-v-3 + GK SSG played in indoor pitch measuring 20m x 20m using 5-v-5 goals. The SSG was composed by two parts of 6 minutes with 3 minutes passive recovery. Each player played each SSG according their usual playing position role. All the SSG were performed as much as possible with the official game's rules, except the offside rule, which was not applied. No feedback was allowed during the game. For both teams, all the players (27 for the football team and 17 for the socfutsal team) executed the Loughborough Football Passing Test but for the SSG not all participated since some of them missed the day

of the Pre-test, so they were excluded in this test. In the next training sessions, during approximately two months (17 sessions), the control group in each training did the intervention protocol (in attachment) and the control group the training programmed by the coach of the team, these training (give by the coach) was based on individual technical skills. In each session all players did the warm-up together, gave by the coach, and after the groups were separated for the exercises. When the exercises of the intervention were done the athletes continued the training with the rest of the team. In the differential learning protocol, the aim was to provide the most variability possible in the pass performance during the exercises. The intervention was about 2 months, and after this period the Post-test was made.

3-Statistical Analysis

The baseline and the post-test values were all compared between the groups via standardized mean differences, which were computed via pooled variance and respective 90% confidence intervals (CI) through a specific pre-post Parallel Groups Trial spreadsheet (Hopkins, 2007). The thresholds for the effect size statistics were as follows; 0.2 = trivial, 0.6 = small, 1.2 = moderate, 2.0 = large, and >2.0 = very large (Batterham & G Hopkins, 2006). The effects were reported as unclear if the confidence limits overlapped the thresholds for the smallest worthwhile changes, which were computed from the standardized unites multiplied by 0.2. In a clear interpretation, the following probabilistic terms were adopted: <0.5% = most unlikely, 0.5-5% = very unlikely, 5-25% = unlikely, 25-75% = possible, 75-95% = possible, 95-99.5% = very likely, and >99.5% = most likely (Batterham & G Hopkins 2006).

4-Results

The results of the pre-test and post-test of the differential learning training approach is displayed in the tables 3 and 4 and figures 2 and 3.

Table 3 - Descriptive (mean ± SD) and inferential (Cohen's *d* ± 90% confidence limit) analysis for the Loughborough Football Passing Test

Team	Control Group		Experimental Group		Difference in means (raw dif; ±90% CL)	Standardized (Cohen's <i>d</i>) differences
	Pre test	Post test	Pre test	Post test		
Football	48±4,5	45,4±3,6	47,2±6,7	44,2±5,2	-1,7; ±1,3 possibly -ive	-0,19 [-0,33 to -0,04] (trivial)
Socfutsal	53,8±10,1	52,1±9,5	54,1±6,6	50,7±5,6	-0,4; ±1,2 likely -ive	-0,06 [-0,27 to 0,14] (trivial)

Regards to the Loughborough Football Passing Test in the football team, the results revealed that the differential learning approach provoked a possibly decrease in the time (difference in means, raw dif.; ±90% confidence limits: -1,7; ±1,3, possibly). This means that from the Pre-test to the Post-test these group improve their performance. Additional in the socfutsal team the experimental group showed a likely decrease in the time, (-0,4; ±1,2, possibly). This group followed the same line as the football experimental group and improved its performance. The standardized differences for both cases showed trivial, however in the football team the value is almost small (0,19) and higher than the value in the socfutsal team (0,06).

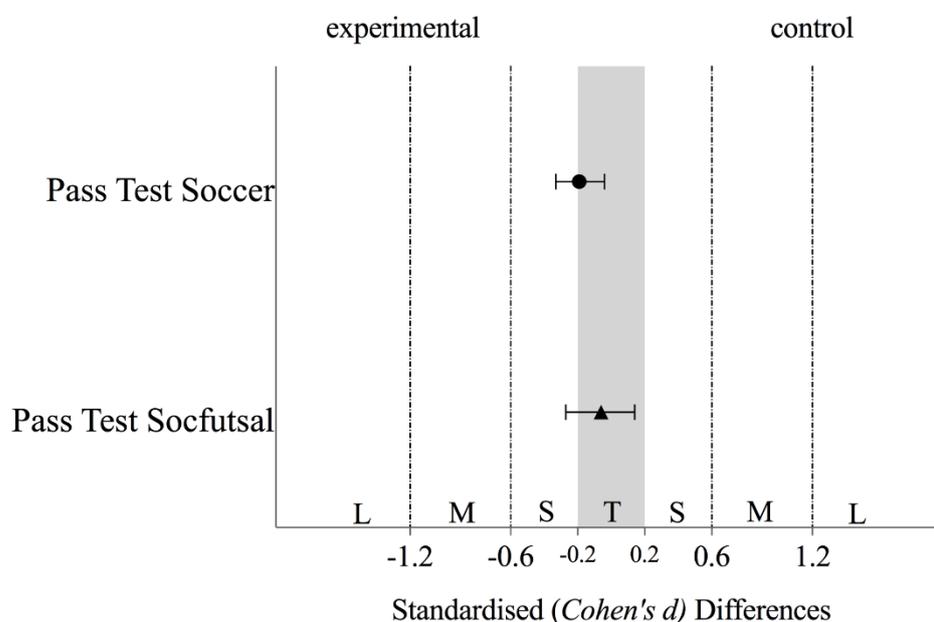


Figure 3- Analysis for the Loughborough Football Passing Test

Table 4 – Descriptive (mean \pm SD) and inferential (Cohen's $d \pm 90\%$ confidence limit) analysis for the creative of the pass, with comparisons between the control and experimental groups in the football and socfutsal teams.

Team	Variables	Control Group		Experimental Group		Difference in means (raw dif; $\pm 90\%$ CL) Pratical inference	Standerdized (Cohen's) differences
		Pre test	Post test	Pre test	Post test		
Football	Fluency	2,5 \pm 1	2,5 \pm 1,2	4,3 \pm 2,2	4,8 \pm 2,6	0,5; \pm 0,9 possibly +ive	0,25 [-0,19 to 0,69] (small)
	Versality	0,2 \pm 0,4	0,4 \pm 0,6	0,6 \pm 0,9	1 \pm 0,9	0,1; \pm 0,4 unclear; get more data	0,17 [-0,35 to 0,69] (trivial)
	Attempts	0 \pm 0,2	0,2 \pm 0,4	0,5 \pm 0,8	0,5 \pm 0,8	-0,2; \pm 0,3 unclear; get more data	-0,31 [-0,81 to 0,19] (small)
	Fails	1,2 \pm 0,8	1 \pm 0,8	2,3 \pm 1,3	1,6 \pm 1	-0,5; \pm 0,5 likely -ive	-0,38 [-0,8 to 0,05] (small)
Socfutsal	Fluency	3,3 \pm 1,3	3,4 \pm 1,6	2,4 \pm 1,1	2,6 \pm 1,3	0,1; \pm 1 unclear; get more data	0,08 [-0,65 to 0,8] (trivial)
	Versality	0,4 \pm 0,6	0,4 \pm 0,8	0,1 \pm 0,3	0,6 \pm 0,7	0,6; \pm 0,6 likely +ive	1,06 [-0,07 to 2,18] (small)
	Attempts	0,3 \pm 0,5	0,4 \pm 0,5	0,1 \pm 0,3	0,3 \pm 0,4	0,1; \pm 0,3 unclear; get more data	0,29 [-0,4 to 0,98] (small)
	Fails	1,7 \pm 1,2	1,9 \pm 1,4	1,4 \pm 1	1 \pm 0,8	-0,6; \pm 1,1 unclear; get more data	-0,52 [-1,48 to 0,45] (small)

Concerning the in-game creative behaviour in football, the fails exposed a decrease from the pre-test to the post-test higher in the experimental group when comparing with the control group (-0,5; \pm 0,5, likely -ive). Also, in the fluency showed a better performance from the pre to the post-test comparing to the control group (0,5; \pm 0,9, possibly +ive). In the other

two variables there is no trend that we can aboard. In the socfutsal team, the versality is the one that offerings a difference in all variables. It showed us that the EG increases is number from Pre to Post test and in a large way comparing with the CG (0,6; $\pm 0,6$, likely +ive) and present a large standardized difference. The other variables have mentioned before do not present significant differences.

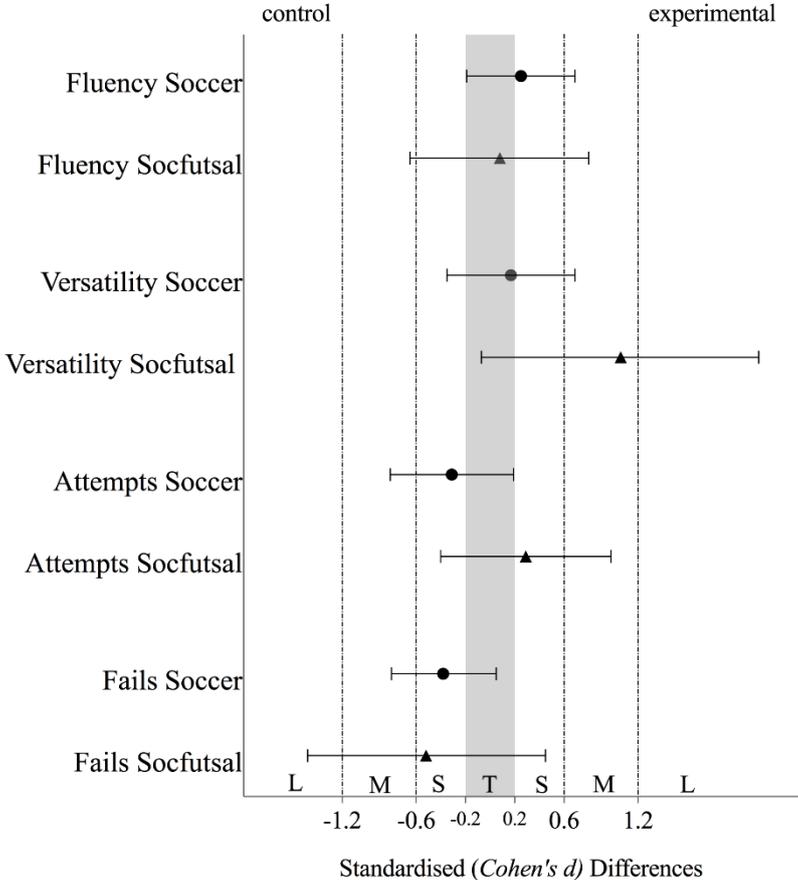


Figure 4- Analysis for the creative of the pass, with comparisons between the control and experimental groups in the football and socfutsal teams

The follow figures (5 and 6) illustrate the networks of the SSG that was done in the Pre-test and Post-test of each group (control and experimental) and team (football and socfutsal). Consequently, shows the behaviour of each group in each team. The circles represent the players and the circle increase when the number of passes (done and received increase) and

the arrow represent the interaction between players, the wider is the arrow more passes done to that player.

In the football team (figure 5), both groups showed the same pattern, where the players in the middle (LCB, RCB and MD) are the ones that did and received more passes. Also, both groups, follow the same line where increase the number of passes made from Pre to Post-test. So, in this case there is no different collective behaviour in the two groups.

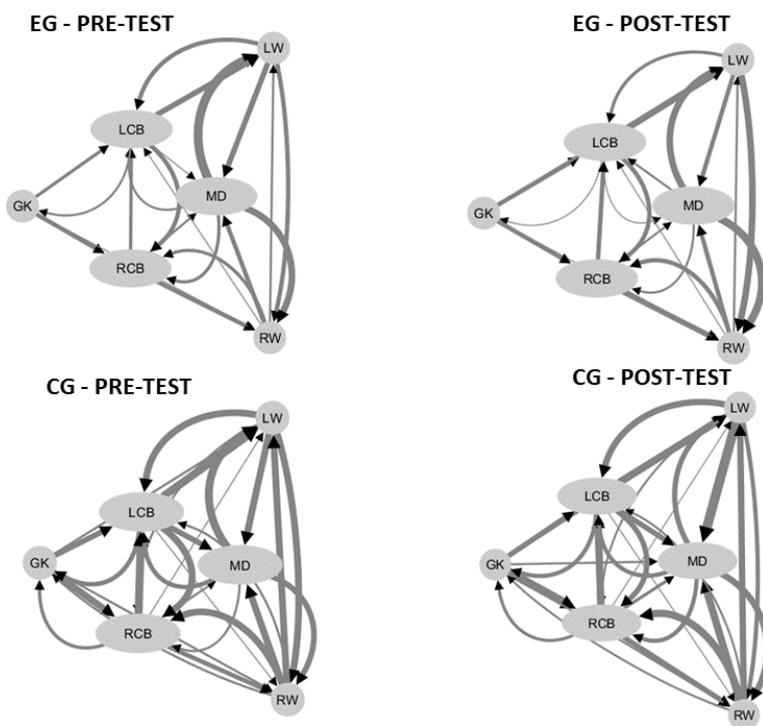


Figure 5- Network of football team

In the socfutsal team (figure 6) there is a balance between all the players when looked to the relation of done and received passes. The interaction between players in higher between the fixo and the players in the wings. Followed the same results that the football team, both groups get more passes and an interaction stronger in the Post-test comparing with the Pre-test.

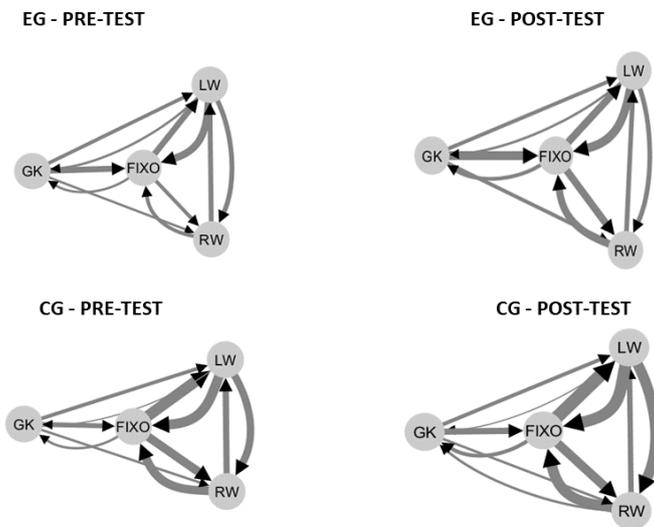


Figure 6- Network of socfutsal team

5-Discussion

The aim of this study is to investigate the effects of the differential learning training in the pass technique in football and futsal players. Current literature has shown several findings related to the benefits of differential learning on skill acquisition in team sports. The results of this intervention provide support for the benefices of differential learning training over a training process based not only in the traditional training approaches but also in SSG. This study was unique since not only presented the effects of differential learning in football but also in futsal. The findings of this study are in line with that of Schollhorn et al. (2012; 2006), who determined that differential learning resulted in superior performance of technical performance variables of football such the pass.

Concerning the Loughborough Football Passing Test, where the pass technique and accuracy were evaluated, both teams, football and socfutsal, improved with the interventional plan following the results presented by Bozkurt (2018) where the experimental group showed better results than the control group. When comparing the two different approaches, the differential learning approach afford more unpredictable number of actions then the traditional training, by inserting noise into the training environment, the players need to overcome to new situations with a reduced response time, as differential learning supposes that it can expose the player to an infinite amount of unpredictable movement scenarios. (Schollhorn et al., 2006).

Associated to the SSG, were the CBATS was assessed to measure the creative behaviour related to the pass, in football team the experimental groups showed significant results in fluency and fails. In the socfutsal team, the results are a little different from the football team, the only significant difference was in the versatility where the EG improved their performance comparing with the CG. These results are not in line with several studies, because only the versatility showed significant difference. These studies suggested that differential learning is more beneficial because it provokes stresses that players explore a variety of new movement configurations (Frank et al., 2008; Henz & Schöllhorn, 2016; Schöllhorn Et al.,2006, 2012; Wagner & Muller, 2008). However, in these studies not only these two variables showed significative difference. Additionally, the functional variability and adaptation demands provided by the differential learning assumptions support the growth of creative components and inspire players to release their creativity (Memmert, D. 2015). The previous increase in creative components might be a consequence of the pronounced intertrial variability provided by differential learning (Schöllhorn et al., 2012).

Nonetheless, the differential learning training program promoted different results in the socfutsal group and the football group, but the training program it seems to be beneficial for the football group. When we observe the literature, we can verify a lack of research regarding DL in futsal when comparing with football. The fact that the futsal players are accustomed to play in more reduce spaces then the football players and, since they are less in the game, spend more time in interaction with the ball (Travassos et al. 2012) can increase their versatility since they have less time and space to execute actions. Looking to the results of the football team, they increase the number of correct passes done in a standardized way and decrease the number of passes failed. The unpredictable and dynamic situations provided by the differential learning and seem to enhance the players' ability to find successful performances under constantly changing boundary conditions (Schöllhorn et al., 2012). Usually, in the youth, the players have a higher disposition for search behaviour (Kim, 2011; Santos, S. et al., 2016) so in these ages the players will improve their capabilities when trying to find answers to solve the problems of the task. Looking for the previous experience in other sport, those that practiced more sports are the ones that had the best improve, not only in the football team but also in the socfutsal team. In both cases, when comparing the CG with the EG, the EG was the one where they tried more sports and is the one with the best results.

Overall, the results support the assumption that a differential learning training program simplifies the development of creativity components, such as attempts, versatility, and fluency of movement actions. In other hand, there was a decrease in fails during the game, and it seems that these is promoted by the differential-learning approach and this approach ideal to the creative behaviour compared with the typical SSG formats. Schöllhorn defended that

confronting youth players with different movement variations, motor system adaptation is kept constantly active and unlocks a whole range of behaviours that are potentially available to the players. Different studies suggested that the differential learning approach resulted in better skill acquisition and better learning rates in participants (Wagner and Müller, 2008; Schöllhorn et al., 2009) and this one follows this trend.

6-Conclusion

In summary, this study demonstrated that a differential learning intervention can provide an improvement in the performance of the pass technique in football and futsal players. Considering the theoretical constructs of differential learning and evaluating the practical results, there is further evidence to support the claim that differential learning training can be incorporated into the regular training schedules of athletes. Yet future studies should be made to search for a deep knowledge, mainly in futsal.

7-Practical Implications

The information provided from this study has applications that can be useful to players and coaches. It is recommended, where possible, the implementation of differential learning training procedures during a team's practice schedule, since there are performance benefits that can be a consequence from this type of training.

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9-Attachments

A- Questionnaire

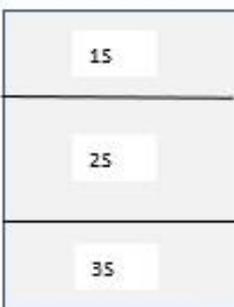
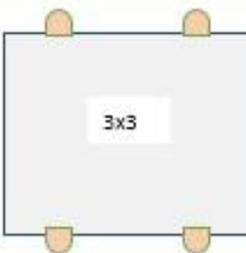
Questionário – Experiências Desportivas									
Nome:		Altura (cm):			Experiência no futebol (meses):				
Data Nascimento:		Peso (kg):							
Idades	Treino Futebol (por semana)		Jogar futebol no parque/rua (por semana)		Jogar futebol na escola (por semana)		Prática de outras modalidades (por semana)		
	Nº treinos semanas	Duração de cada treino	Nº de vezes que joga	Tempo que joga	Nº de vezes que joga	Tempo que joga	Modalidade	Nº de vezes que pratica	Duração do treino
Exemplo: 5 anos	2	90 minutos	3	30 minutos	2	20 minutos	Andebol	2	60 minutos

Nota: Só pode escrever no questionário se tiver praticado uma modalidade no mínimo durante 4 meses.

B- Intervention Plan

Intervention Plan

Under 11 soccer/futsal players
Number of exercises: 2
Material: balls (cones, pop-up goals, vests)
General goal: improve the capacity of the pass

Time	Organization	Scheme	Description/Goal
3x5'	<p>Groups of 3 players</p> <p>3 Different spaces: 1° Dominant foot 2° Non-dominant foot 3° Different balls</p> <p>In each space stay 2 groups at the same time</p> <p>Space: 15x20m</p>		<ul style="list-style-type: none"> - Make passes between them, gaining points whenever they pass between the doors. - Can not make the same type of pass twice in a row or use the same one of the colleague who passed the ball to you. - The goal is for the players find a pass solution beyond the most used pass (inside of the foot)
2'	Pause for change exercise and drink water		
2x4'	<p>SSG 3x3</p> <p>Space 20x20m</p> <p>Two pop-up goals for each team</p>		<ul style="list-style-type: none"> - To score a goal the ball must pass through all the players - Finishing has to be at the first touch - They always have to finished differently - Forcing athletes to think and execute faster when they have to put the ball in the goal.