Rev Bras Cineantropom Desempenho Hum

ORIGINAL ARTICLE

https://doi.org/10.1590/1980-0037.2022v24e77265

Construction and validation of an observation tool of the imbalance pass in futsal

Construção e validação de uma ferramenta de análise do passe de desequilíbrio no futsal

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Abstract - This study aimed to construct a tool for observing the imbalance pass in futsal through Microsoft Excel® software and to establish its content validity and intra- and interobserver reliability based on the calculation of the content validity coefficient (CVC) and the intraclass correlation coefficient (ICC). For the construction of the tool, futsal specialists (n = 10) with an average age of 44.1 ± 12.34 years and 19 ± 7.21 years of experience in the field participated in the study. 60% of the specialists have international-level expertise and 50% are active in practice and in academic field (higher education professor). According to the methodology, 23 items were proposed to assess the imbalance pass in futsal. CVC was calculated based on language clarity, practical pertinence and theoretical relevance for each item of the instrument and for the instrument as a whole; ICC was calculated based on intra- and interobserver agreement. Language clarity, practical pertinence and theoretical relevance revealed a result of 0.92, 0.93 and 0.95, respectively, and the values for intra- and interobserver agreement reliability were excellent according to the literature (> 0.75). Thus, it is concluded that the items proposed in the tool obtained satisfactory psychometric properties.

Key words: Sports performance; Futsal; Reliability; Tool; Pass.

Resumo - *Este estudo teve como objetivo construir uma ferramenta de observação do passe de desiquilíbrio no futsal por meio do software Microsoft Excel® e estabelecer sua validade de conteúdo e confiabilidade intra e interobservador, a partir do cálculo do coeficiente de validade de conteúdo (CVC) e do coeficiente de correlação intraclasse (CCI). Para construção da ferramenta participaram do estudo especialistas de futsal (n=10) com média de idade de 44,1±12,34 anos de experiência na área de 19±7,21 anos, sendo 60% dos especialistas com nível internacional e 50% atuantes na prática e no ambiente acadêmico (professor do ensino superior). Propuseram-se 23 itens para avaliação do passe de rutura no futsal. Foi calculado o CVC, a partir da clareza da linguagem, da pertinência prática e da relevância teórica, para cada item do instrumento e para o instrumento como um todo, o ICC foi calculado a partir da concordância intra e interobservador. O resultado para clareza da linguagem foi de 0,92, para pertinência prática foi de 0,93 e para relevância teórica foi de 0,95, e os valores para confiabilidade da concordância intra e interobservador foram excelentes de acordo com a literatura (>0,75). Conclui-se que os itens propostos na ferramenta obtiveram propriedades psicométricas satisfatórias.*

Palavras-chave: *Desempenho esportivo; Futsal; Confiabilidade; Instrumento; Passe.*

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Received: September 21, 2020
Accepted: July 19, 2021

How to cite this article
Alves MAR, Graça DC, Travassos B. Construction and validation of an observation tool of the imbalance pass in futsal. Rev Bras Cineantropom Desempenho Hum 2022, 24:e77265. DOI: http://doi.org/10.1590/1980-0037.2022v24e77265

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INTRODUCTION

Futsal is a collective sport in which interactions between players are essential to continue the game. According to Travassos et al.[1], performance in a team sport is guided by the major sources of information about space and time that arise between attackers and defenders.

The space-time communication between the players allows reaching the momentary objective of the game (progression or possession of the ball), where it originates through the action of a pass. Therefore, interpersonal space-time coordination provides opportunities for players to act in order to achieve their performance goals[1]. Besides that, in the interception action, the way the defenders interact with each other is pivotal to increase their capacity to dominate the space and to prevent the creation of passes that promote defensive unbalances[2].

The pass is a collective action that requires tactical action adjusted to the context, based on the spatiotemporal relationship with the teammates and the projection of the ball into that space in view of the time available with the appropriate biomechanics[3]. However, in addition to the biomechanical aspects, the accuracy of the pass is essential to enhance relations with teammates considering the position of opponents[2-4]. In fact, in unpredictable sports, right and wrong depend on the context played at that time and the objective achieved. The same pass executed at different moments may have different consequences. Thus, a more accurate and robust analysis of the pass becomes relevant. Interestingly, a research performed by Oliveira et al.[5] reported 10795 passes in a single adult male futsal competition with 16 games, obtaining an average of 675 passes per game, hence revealing very expressive numbers to be treated with simplicity.

While the pass without precision can cause numerous losses for the team, including the stealing of the ball by the opponent, promoting a progression against the goal to be defended, the pass with an accurate and correct execution can generate a break in the opposing defensive organization, thereby enabling several advantages, such as the numerical superiority, progression of the attack and/or a clear chance of goal.

Notwithstanding that, in order to promote significant advances and unbalances, it is necessary to overcome defensive lines to cause defensive readjustments and even space-time unbalances in defense in relation to the attack, and according to Santos et al.[4], which directly contributes to a finalization situation, thus facilitating a goal-scoring opportunity. This type of pass is known as the imbalance pass (a pass that leaves the defense partially or totally destabilized/unbalanced, which contribute directly to a finishing situation, numerical advantage in the construction process, spatial advantage in a 1x1 situation, and may facilitate the chance of scoring a goal), being an indicator of the performance of elite athletes[4].

In turn, the pass is not a pre-determined action of the game, which can be trained in isolation, but it responds to effective concerns of the game based on the space-time relations between teammates and opponents. For this reason, the pass is more than a simple action performed several times in a futsal game. The interactions of the pass between the players result in different adjustments in space and time, thus implying that each pass is different from the previous one and resulting in constant adaptations that the ball carrier makes about his context of action based on the communication established with the players. For this purpose, the pass requires constant decision and action, and the variability

and adaptability in the actions of the player is key to this process, in addition to a high cognitive demand[6].

Decision making in futsal involves the assessment of a dynamic and complex scenario, in order to identify solutions that lead to the desired result[7]. According to the same author, futsal can be characterized as a problem to be solved, because the desired result does not have a single solution. In fact, there are various solutions to the same problem and changes in these solutions are unforeseen. Additionally, decision making for a pass does not depend only on the passer, but also on the relationship established with the receiver who creates a pass line according to the position of the marker[8]. Therefore, studies regarding the pass are needed to provide a comprehensive understanding of the complexity of the action in the context of the futsal game.

In a parallel context, there is a great advance in the interest in analyzing futsal games to predict in advance the actions on court, including the accuracy of the pass[4]. Thus, technical commissions are reinventing themselves to adapt and to achieve such information[5]. One of the strategies is to hire another professional - known as performance analyst - and to invest in a software that allows a more reliable contribution through the data collections performed by this professional.

However, the licensing cost of software programs is expensive and when the tool allows a free trial, it is a basic version, and the use requires specific knowledge. Furthermore, these software programs are not able to perform the procedures covered in this research, as they can only be performed by a Database system, where they are controlled by a database management system (DBMS), which justifies the pertinence of the development of alternative tools with the intention of carrying out automatic and robust pass analysis.

In this context, the aim of the present study was to build and validate an observation tool of the imbalance pass - in elite adult men's futsal, using Microsoft Excel® software through its content validation and intra- and interobserver reliability.

METHOD

Initially a bibliographic survey was performed on the concepts that contextualize the basics of the pass in futsal. The result of this survey is depicted in Chart 1, which explains each variable described in the newest tool. With this, the tool intends to evaluate the pass, not any pass, but that one that promotes an unbalance in the opponent's defense.

Evidence based on content

Then, the variables were submitted to a content analysis, where the concept chart (Chart 1) was sent electronically to specialists in the area to assess the items and specifications of the content. Importantly, specialists with theoretical and practical recognition in the field of futsal were included in the evaluation of the items. According to adherence in relation to the area, 10 specialists were chosen, with an average age of 44.1 ± 12.34 years and an average time of experience in futsal field of 19 ± 7.21 years. Importantly, 60% of the specialists have international-level expertise and 50% are active in practice and in the academic field (higher education professor).

Chart 1. Concepts of tool items for calculating the content validity coefficient.

Topic	Item		Description
1- Start of action	1.1	Balanced opponent defense	The opponent's defense is stable with players posted correctly according to the attack and the ball in play before the pass occurs.
	1.2	Unbalanced opponent defense	The opponent's defense is unstable with players reorganizing in a defensive return even before the pass occurs.
	1.3	Counterattack	The attack starts quickly after the ball is recovered.
	1.4	1vs1	The attacker wins in the individual duel with another opposing player.
2 - Types of passes	2.1	Pass to pivot	Pass executed with the player posted as an attack reference.
	2.2	Pass to effective pivot	Pass executed to an attacking reference player, followed by a finalization.
	2.3	Progression of attack	Pass that characterizes an advance of the attack towards the opponent's goal, without finalization (kick).
	2.4	Progression of effective attack	Pass that characterizes an advance of the attack towards the opponent's goal with finalization (kick).
	2.5	Progression of attack and clear chance of goal	Pass that characterizes an advance of the attack towards the goal and then a second pass that allows a clear chance of goal.
	2.6	Clear chance of goal	Pass that characterizes clear chance of goal.
3- Situation created	3.1	No numerical superiority	Situation in which there was no numerical superiority of the attack in regard to the defense or the player receives an advantage but does not face the opponent.
	3.2	3X2	Three attacking players with two defensive players in play
	3.3	3X1	Three attacking players against one defensive player in play
	3.4	2x2	Two attacking players against two defensive players in play
	3.5	2x1	Two attacking players against one defensive player in play
	3.6	2xG	Two attacking players against the opposing goalkeeper
	3.7	1x1	One attacking player against one defensive player in play
	3.8	1xG	One attacking player against the opposing goalkeeper
4- Finalization of the play	4.1	Wrong kick	Kick out of the goal or in the crossbar
	4.2	Right kick	Kick with goalkeeper defense
	4.3	Goal	Kick winning the goalkeeper and score for the team
	4.4	Improper decision or execution	Clear goal chance situation, the player makes the wrong decision or execution and the attack is not effective
	4.5	Others	Loss of ball, wrong pass, disarm, blocked kick and maintenance of ball possession.

The evaluation criteria were language clarity (refers to the structure of the items and the terms used, as well as whether they were written in such a way that the concept is understandable and expresses adequately what is expected to be measured), practical pertinence (evaluates if the items really reflect the concepts involved, and if they are adequate to achieve the proposed objectives) and theoretical relevance (analysis of how much the items are associated with their respective topics [Start of action, Types of passes, Situation created, Finalization of the play[9], presented on a five-point Likert-type scale, ranging from 1 to 5, with 1 representing "completely disagree" and 5 "completely agree". If the specialist disagreed with any item and/or attributed values below 3, the experts were instructed to suggest changes and improvements to the tool[10]. Content validity was calculated using the Content Validity Coefficient as it is an ordinal scale.

The concepts were created to facilitate the interpretation of users of the tool. With the satisfactory CVC values, the present study has the possibility to calculate the intraobserver and interobserver reliability.

Evidence based on internal structure – Reliability

To test the reliability of the tool, the intra- and interobserver agreement values were calculated, in which the evaluators were based on the same items using the same tool and under the same observation conditions, as the tool will have to be able to reproduce values close.

Two experienced analysts were submitted to two matches, the matches chosen to carry out this study were two international friendlies on a FIFA date, played between Portugal and Brazil in 2019. To ensure a high level of data collection, two elite teams were chosen, as suggested in studies by Fortes et al.[11] and Liu et al.[12]. The analysts evaluated all passes that promoted defensive unbalance in the opposing team through the tool proposed in the present study, in order to calculate the consistency between analysts and also the consistency of the tool with a total of 23 items. Thus, for the calculation of interobserver reliability, both games were examined simultaneously by the two analysts, on two independent computers. Regarding the calculation of intraobserver reliability, the same two

Statistical analysis

The statistical analysis used to calculate the experts' agreement was the Content Validity Coefficient (CVC) proposed by Hernández-Nieto[13] and used by Morales et al.[14], where the average of the specialists' CVC, the CVC of each item (CVCi), the error of each item (Pei) and the total CVC (CVCt) of language clarity, practical pertinence and theoretical relevance were calculated. For this study, a minimum agreement of 0.80 was adopted, a value that according to Grant and Davis[15] is appropriate to verify the validity of new instruments in general.

Content validation does not eliminate the need for an analysis of the tool's intra- and interobserver reliability. In this way, the intraclass correlation coefficient (ICC), which is the best reliability measure for continuous data16 was calculated. The value close to 1 for the ICC indicates a high reliability, while the value close to 0 indicates no reproducibility. In this study, it was used great values above 0.75 as proposed by Matos[16].

The 95% confidence interval for each ICC value was calculated[17]. The statistical programs SPSS® (version 24) and Microsoft Excel® were used for calculations and tabulation of data.

RESULTS

The Table 1 depicts the values of language clarity. Accordingly, the instrument reported a CVCt = 0.92, value above the minimum proposed score. Considering the 23 items, the item 4.4 exhibited a CVC below the cutoff point (0.75). In this sense, Hernández-Nieto[13] suggests that, for language clarity, items with a CVC below the established minimum score should be reformulated and sent again to be evaluated by specialists. Although the recommendation, this procedure was not adopted because the experts were unanimous in their suggestions,

altering the proposed item in the initial tool "Error: situation of clear chance of goal, the player makes the wrong decision and the attack is not concluded", for "Improper decision or execution: situation of clear chance of goal, the player makes the wrong decision or execution and the attack is not effective".

Table 1. CVC calculation for Language Clarity of the tool.

	Average	CVCi	Pei	CVCt
1.1	4.33	.86	.26x10-8	0.92
1.2	4.67	.92	.26x10-8	
1.3	4.44	.88	.26x10-8	
1.4	4.78	.96	.26x10-8	
2.1	4.67	.94	.26x10-8	
2.2	4.00	.82	.26x10-8	
2.3	4.33	.88	.26x10-8	
2.4	4.78	.96	.26x10-8	
2.5	4.44	.90	.26x10-8	
2.6	4.22	.86	.26x10-8	
3.1	4.44	.90	.26x10-8	
3.2	4.67	.90	.26x10-8	
3.3	4.89	.98	.26x10-8	
3.4	4.67	.94	.26x10-8	
3.5	4.78	.96	.26x10-8	
3.6	5.00	1	.26x10-8	
3.7	4.78	.96	.26x10-8	
3.8	4.78	.96	.26x10-8	
4.1	4.78	.96	.26x10-8	
4.2	4.78	.96	.26x10-8	
4.3	4.89	.98	.26x10-8	
4.4	3.67	.75	.26x10-8	
4.5	4.56	.92	.26x10-8	

Regarding practical pertinence (Table 2), the tool demonstrated a CVCt of 0.93, a value above the established score. The item 4.4 revealed a value below the established (0.80) in the language clarity, but reported a CVCi of 0.86 in practical relevance, a better evaluated result when compared to the language clarity. Remarkably, these findings reinforce the importance of maintaining the experts' suggestions in relation to the item 4.4 (Improper decision or execution: situation of clear chance of goal, the player makes the wrong decision and the attack is not effective).

Regarding Theoretical Relevance (Table 3), the tool revealed a CVCt of 0.95, a value above the established score. According to the findings, it is the best CVC evaluated, ensuring that all items were well designated in relation to their topics: 1- Start of action (1.1, 1.2, 1.3, 1.4); 2- Types of passes (2.1, 2.2, 2.3, 2.4, 2.5, 2.6); 3- Situation created (3.1, 3.2, 3.3, 3.4, 3.5, 3.6, 3.7, 3.8) and 4- Finalization of the play (4.1, 4.2, 4.3, 4.4, 4.5). Moreover, the result showed a high level of agreement among experts.

After CVC calculations, the only adjustment proposed by experts unanimously in regard to item 4.4 was readjusted, thus determining a total of 23 items to compose the initial version of the tool (Chart 1).

The interobserver reliability values were 0.963 for game 1 and 0.985 for game 2, values higher than recommended by the literature (> 0.75), considered excellent. After seven days, both games were retested by the same analysts, as already mentioned. The intraobserver reliability values were between 0.951 to

Table 2. CVC calculation for Practical Pertinence of the tool.

	Average	CVCi	Pe	CVCi
1.1	4.56	.90	.26x10-8	0.93
1.2	4.33	.88	.26x10-8	
1.3	4.67	.94	.26x10-8	
1.4	4.78	.94	.26x10-8	
2.1	4.56	.92	.26x10-8	
2.2	4.33	.88	.26x10-8	
2.3	4.78	.94	.26x10-8	
2.4	4.89	.98	.26x10-8	
2.5	4.56	.92	.26x10-8	
2.6	4.33	.88	.26x10-8	
3.1	4.22	.86	.26x10-8	
3.2	4.89	.94	.26x10-8	
3.3	4.78	.96	.26x10-8	
3.4	4.78	.94	.26x10-8	
3.5	5.00	1	.26x10-8	
3.6	5.00	1	.26x10-8	
3.7	4.67	.94	.26x10-8	
3.8	4.78	.96	.26x10-8	
4.1	4.78	.96	.26x10-8	
4.2	4.89	.98	.26x10-8	
4.3	4.89	.98	.26x10-8	
4.4	4.22	.86	.26x10-8	
4.5	4.67	.94	.26x10-8	

Table 3. CVC calculation for Theoretical Relevance of the tool.

	Average	CVCi	Pe	CVCi
1.1	4.78	.94	.26x10-8	0.95
1.2	4.67	.94	.26x10-8	
1.3	4.44	.90	.26x10-8	
1.4	4.78	.94	.26x10-8	
2.1	4.78	.96	.26x10-8	
2.2	4.22	.86	.26x10-8	
2.3	5.00	1	.26x10-8	
2.4	4.89	.98	.26x10-8	
2.5	4.67	.94	.26x10-8	
2.6	4.33	.88	.26x10-8	
3.1	4.78	.96	.26x10-8	
3.2	4.78	.92	.26x10-8	
3.3	4.67	.94	.26x10-8	
3.4	4.78	.94	.26x10-8	
3.5	4.89	.98	.26x10-8	
3.6	5.00	1	.26x10-8	
3.7	4.89	.98	.26x10-8	
3.8	4.78	.96	.26x10-8	
4.1	4.67	.94	.26x10-8	
4.2	4.78	.96	.26x10-8	
4.3	4.89	.98	.26x10-8	
4.4	4.44	.90	.26x10-8	
4.5	4.78	.96	.26x10-8	

0.986, also unveiling results above the values recommended by the literature (> 0.75) (Table 4).

Table 4. Reliability interobserver and intraobserver.

	Mean±SD	Intraobserver 1		Intraobserver 2		Interobserver		p=value
		ICC	95% CI	ICC	95% CI	ICC	95% CI	
Game 1	1.75±2.25	0.979	0.951-0.991	0.951	0.883-0.979	0.963	0.930-0.983	>0.000
Game 2	4.52±4.60	0.986	0.967-0.994	0.981	0.955-0.992	0.985	0.971-0.993	>0.000

Note. ICC = intraclass correlation coefficient; CI = confidence interval

DISCUSSION

The aim of this study was to buil and validate an observation tool of the imbalance pass in futsal using Microsoft Excel® software through its content validation and intra- and interobserver reliability. The validation of this tool allows the performance analyst to collect and interpret the data in more detail, thereby enabling better decision making for the team.

In general, the tool reported satisfactory values for CVC (Chart 1). It is noteworthy that only item 4.4 (Table 1) revealed an individual CVC of 0.75 and, as the experts were unanimous in their suggestions, the authors decided to make the change directly in Chart 1, altering the concept of the item 4.4 as follows: "Improper decision or execution: situation of clear chance of goal, the player makes the wrong decision and the attack is not effective".

The CVC values calculated in this research for language clarity, practical pertinence and theoretical relevance, as well as inter- and intraobserver reliability are within the parameters accepted15 and previously described in the literature[18-21].

In the study by Morales et al.10, the CVC values calculated for clarity of language in the procedural tactical knowledge test for basketball (TCTP-Bb) was 0.94 and for practical relevance it was 0.91. In the study by Valentini et al.[19] the CVC values calculated for clarity of the language of the Test of Gross Motor Development (TDMG-2) was 0.96 and for practical relevance it was 0.96. Besides that, in the study by Aburachid and Greco17, the CVC values calculated for clarity of the tactical knowledge test language for tennis was 0.89, for practical relevance it was 0.91 and for image representativeness in relation to the game it was 0, 98. In the study by Morales et al.[18], where applied the scale for assessment procedural tactical knowledge in collective invasion sports games for futsal, it resulted in a CVC of 0.81 for language clarity and 0.87 for practical relevance.

The researchers Aburachid and Greco[20] examined the interobserver and intraobserver agreement of the tactical knowledge test for tennis, with values of 0.96 and 0.99, respectively, in order to calculate the reliability of the test. In the study by García-de-Alcaraz et al.[21] examined the profile of the technical-tactical performance of the service in volleyball, the interobserver and intraobserver agreement was 0.93 and 0.83, respectively. As in studies by Fortes et al.[11], in which they examined the interobserver and intraobserver agreement of the VideObserver software, they obtained a coefficient variation between 1 to 0.76. And, in the study by Liu et al.[12] in which they examined the OPTA SportsData, obtained coefficients between 0.88 to 1.

Therefore, the CVC values calculated in this study for language clarity, practical relevance and theoretical relevance, as well as for inter and intra-observer reliability are within accepted parameters and described by the literature.

Due to the increased interest of professionals in evaluating futsal games in order to predict in advance the actions on court, including the accuracy of the pass[4], the sports context has been reinventing itself to develop means that enable the reliable search for such information[5]. The creation and validation of the present observation tool will enable professionals to make more reliable observations about the imbalance passing actions in a futsal game, in which the return will be the following items for discussion: 1) goals through unbalance passes, item resulting from the goals scored by the team; 2) unbalance passes, item resulting from the sum of the types of passes; 3) situations of numerical superiority, item resulting from the sum of the game situations 3x2 / 3x1 / 2x2 / 2x1 / 2xG / 1x1 / 1xG; 4) effective attacks, item resulting from the sum of the pass to the effective pivot and progression of effective attack; 5) clear chances of goal, item resulting from the sum of the progression of attack and clear chance of goal; 6) finalization of attack through unbalance passes, item resulting from the sum of the wrong kick, right kick and goal; 7) waste of chances, item resulting from inadequate decision/execution; 8) efficiency, percentage of actions that were transformed into correct finalizations and 9) effectiveness, percentage of actions that were transformed into goals. In line with recent research[22], such analysis will contribute to improve the potential of data analysis in futsal, helping coaches to understand the key moments and game environments that sustain the success and unsuccessful team performance.

Despite the findings described here, the present study found limitations in its construction. The non-use of a pilot test in a sample of games, testing the tool in different scenarios, can be mentioned as a restriction. The use of only two observers to calculate the ICC represents another limitation. Therefore, we suggest for future research to apply the tool in populations of different sexes and different competitive levels in order to generalize the use of the instrument.

The tool allows the analyst to perform interpretations of the imbalance passing actions (a pass that leaves the defense partially or totally destabilized/unbalanced, which contribute directly to a finishing situation, numerical advantage in the construction process, spatial advantage in a 1x1 situation, and may facilitate the chance of scoring a goal). It is worthwhile noting the practical implications of this tool for futsal professionals, as it enables a better interpretation of the context of the pass action, once it promotes real information from the team on court. Thus, the technical commission will have reliable data to improve the decision making process, hence leading to more appropriate decisions. Training can be shaped based on data generated by the tool. For example, if the team obtained high score in the item "clear chances of goal" and at the same time low score in "waste of chances", this means that the players did not know how to take advantage of the opportunity created to convert into goal, thus suggesting that the coach needs to adjust specific training to reduce this variance between items.

The tool built in Microsoft Excel can be downloaded from the https://www.futsalonair.com.br/archives/156-planilha-passes-desequilibrio-pt (portuguese) or https://www.futsalonair.com.br/archives/155-planilha-passes-desequilibrio-en (english) website, where the analyst can download it on his computer and use it whenever necessary.

CONCLUSION

The calculated CVC values in the present manuscript for language clarity, practical pertinence and theoretical relevance are within the parameters accepted by the literature. The high intra- and interobserver reliability found in this study was owing to the easy handling of the tool. However, it is important to highlight that the tool created and described here is presented evidence of content validity and reliability.

Finally, the present investigation explored the availability of the tool built in Microsoft Excel® software to analyze the key pass in its context, and also the availability of the framework of concepts around the situation.

COMPLIANCE WITH ETHICAL STANDARDS

Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors. This study was funded by the authors.

Ethical approval

This research is in accordance with the standards set by the Declaration of Helsinki.

Conflict of interest statement

The authors have no conflict of interests to declare.

Author Contributions

Conceived and designed the experiments: DCG, MARA. Performed the experiments: MARA. Analyzed the data: MARA, BT. Contributed reagents/materials/analysis tools: DCG. Wrote the paper: MARA, DCG, BT.

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