International Journal of
Disabilities Sports and Health Sciences
e-ISSN: 2645-9094

RESEARCH ARTICLE

The Influence of Imagery and Agility Training on Athletes Futsal Goalkeeper Reaction Time Metro City Senior High School

Erick BURHAEİN[1*] and Riyan Jaya SUMANTRI[2]

[1,2]Department of Sports Education, Faculty of Teacher Training and Education, Universitas Nahdlatul Ulama Kebumen, Indonesia
*Corresponding author: erick.burhaein@umnu.ac.id

Abstract
The purpose of this study is to determine: (1) Differences in the effects of image training methods using audiovisual and visual means on reaction time. (2) the difference between the effects of high agility and low response time; (3) Interaction between image and agility training model on reaction time of futsal goalkeepers. This study used experimental methods with a quantitative approach in a 2x2 factorial design and took a target sample, ie 24 students out of a total of 90 students. The data analysis method used was a two-way ANOVA test using the SPSS 23 program with a significance level of 5%. The results showed that: (1) There was a difference in the effect of image training methods using audiovisual media and visual media on reaction time, with a significance value of 0.001<0.05; (2) There is a difference between the effects of high mobility and short reaction time, with significant values of 0.018 < 0.05; (3) For reaction time of futsal goalkeepers, there is an interaction between imagination and agility training models with significant values of 0.373 > 0.05. The conclusions in this study are: (1) There is a difference in the effects of audiovisual imagery training and visual imagery training on the reaction time of goalkeepers in futsal players ; (2) Effects of high and low agility on goalkeeper reaction time in futsal athletes ; (3) Synergistic effects of imagination and agility training on goalkeeper reaction time in futsal players.

Keywords
Futsal, Goalkeeper, Imagery, Agility

INTRODUCTION

Each squad must have four field players and one goalie, with no limit on the number of substitutes. Futsal is distinguished by aggressive game intensity, rapid decision-making, high physiological loads, psychological stress, and heightened emotional states (Borges et al., 2021; Spyrou et al., 2020). Futsal in Indonesia has mushroomed so many investors have turned to futsal. This was also seen in the Futsal World Cup match held. Everyone is watching the game. The game of futsal is currently undergoing major changes, whether viewed from the technique of the game, regulations, organization, or from a publication point of view so that the development of futsal develops rapidly.

In the initial observations made by researchers on December 5, 2021 - January 23, 2022 at the Giga Futsal Arena in the framework of the Metro City Student Futsal League 2021, and from the results of initial observations using observation techniques, unstructured interviews and reaction tests using a whole body reaction, since and it is obtained that:

Received: 20 July.2023 ; Revised ;27 October 2023 ; **Accepted:** 06 December 2023; **Published:** 25 January 2024

How to cite this article: Burhaein, E., and Sumantri, R.J. (2024). The Influence of Imagery and Agility Training on Athletes Futsal Goalkeeper Reaction Time Metro City Senior High School. *Int J Disabil Sports Health Sci*;7(1):21-33. https://doi.org/10.33438/ijdshs.1330592

Table 1. Whole body reaction

No	Name	Reaction Tests			Category	School
		1	2	3		
1	KMS	0,39	0,35	0,31	Medium	MAN 1 Metro
2	RYN	0,32	0,37	0,39	Medium	SMK Muh. 2 Metro
3	FHM	0,36	0,38	0,38	Medium	SMKN 2 Metro
4	HFZ	0,42	0,44	0,42	Low	SMK Muh. 3 Metro
5	RVD	0,35	0,35	0,33	Medium	SMAN 3 Metro

Source: Primary Data

Agras et al., (2016) argues about factors such as strength, stamina, power and balance are important in futsal, but evaluation of futsal players must also rely on futsal-specific skills. Futsal is a game of time variable for achieving their aims with success, as innumerable human motor skills. For example, one may argue that the fundamental objective of the goalkeeper's motor skills is temporal coincidence. This is due to the fact that he or she must intercept a moving ball by hitting or holding it in order to prevent it from reaching its destination. Someone arrives at the ball trajectory before or after the goal, and so their attempt is unsuccessful. However, in order to obtain it, Goalkeeper must deal with two other essential temporal factors underpinning motor skill performance: time for anticipation and reaction (Schmidt & Wrisberg, 2010; Tani, 2016). To put it another way, the goalkeeper's search for a time correlation in connection to the movement of the ball in order to prevent the target may be anticipated by the subsequent processing of implicit information and currently known target information, respectively.

In a competition situation, in this case a futsal competition, individuals will face a match that will determine the individual's career and the fate of the team being defended will win or lose. Various factors such as demands of managers or coaches, demands of supporters, demands of management to achieve victory will be a heavy burden for athletes. The quality of the opponent who is considered great, makes athletes feel anxious or afraid of making mistakes, fear of not performing optimally, fear of losing in skills and cooperation with team opponents, until the biggest fear is defeat that has an impact on individual careers in a team.

If these conditions are not handled, it will lead to what is known as competition anxietyAnxiety over competing is a state of stress, restlessness, and unease caused by viewing competition as dangerous, and it is accompanied by physiological changes (Maulana & Khairani, 2017). Fear comes in two forms, features and conditions. Trait anxiety is thought to be a relatively stable trait that leads to similia reactions to stressful situation over time (Singh et al., 2017).

Pre-race anxiety is one of the most common feelings in high-performance athletes, and it is claimed to hinder cognitive, physiological, and physical performance. Because such anxiety can have positive as well as negative effects, being able to handle it is one of the most critical aspects of an athlete's preparation (Muñoz et al., 2017). Many gamers struggle with anxiety that can have a significant negative impact on their performance (Slimani & Nikolaidis, 2018). Physical state anxiety reflects the player's physical/physiological state, whereas cognitive state anxiety reflects the player's mental state (Singh et al., 2017; Slimani & Nikolaidis, 2018) . Psychological symptoms of anxiety are feelings of fear, sadness, insecurity and feelings of inadequacy. Physical symptoms are heart palpitations, cold sweats, the body feels stiff, and cognitively finds it difficult to concentrate (Nurwidawati, 2015).

Harsono (2015) argues that "there are four aspects of training that athletes must carefully consider and practice: (a) physical training, (b) technical training, (c) tactical training, and (d) mental training". Physical exercise is one of the most important aspects without neglecting other aspects. Strength, endurance, explosive power, speed, flexibility, agility, balance, coordination, precision, and kinesthetic sense are all components of physical condition. The primary physical conditions in futsal include endurance, speed, strength, agility, and explosive power (Redita, 2021).

Currently, the program has a lot of training, especially for the younger generation of goalkeepers who are trained and nurtured in terms of technique and physicality. However, there are many obstacles that can be seen in the implementation of the exercise, there is no play approach that has been applied to the reaction exercise. Constraints that occur in the construction of goalkeepers, especially in the reaction training program. Positions in soccer and futsal are special positions that require even quicker and more accurate reactions. Reaction speed in futsal limits a goalkeeper's athletic ability. In addition to the reaction speed, it is also important to **(Montesano, 2016)** Emphasis on explosive power. Point out all the speed characteristics in futsal, not just reaction speed. In their opinion, these are all key factors that limit game performance **(Dragijský et al., 2016; Smpokos et al., 2018)**.

Otte et al., **(2019)** I agree with this claim. They emphasize quick attack building, constant reaction to newly created game situations, diving and saving shots, reflexive shots and diving shots from close range using hands and feet, characterized taking the cross as the goalkeeper's most important game activity. In many studies (**Birren & Schaie, 2021; Chang et al., 2011; Der & Deary, 2006; Hagovská & Nagyová, 2017; Jevas & Yan, 2001; Obetko et al., 2020**). Age has been proven to be the main factor that depends on a player's reaction time. Disjunctive reaction times shorten in adolescence, peak in adulthood, and begin to lengthen with age. This is a natural trend that futsal players can influence. However, as the demand for play continues to increase, researchers are looking for ways to influence these motor skills to some extent as well (**Obetko et al., 2020**).

A goalkeeper will have a hard time reacting to the ball he's aiming at if he doesn't have responsiveness and speed. The ability to react quickly is a valuable asset for a goalkeeper. Imagine the need for high reflexes as shots towards the goal are often shot from close range (**Scheunemann, 2012**). In addition, exercise is not enough to be done only motorly (with movement), but must be accompanied by non-motor training methods (without movement) such as seeing pictures or films about the movement to be performed, it can also be done by imagining or visualizing, or image the movement to be studied or specifically referred to as imagery. Imagery is translated into the sense of imagining". Imagery is one of the special techniques related to psychological skills by involving imagination.

Imagery training is a method of learning that involves remembering how to do the correct motions, repeating new actions, correcting less-than-perfect movements, assisting athletes in improving their skills, and assisting athletes in improving their performance in the face of various obstacles (**Sabilla et al., 2022**). Imagery is a valuable and vital strategy for mental management, which has an effect on self-confidence and has an impact on the athlete's performance **(Akbar et al., 2019)**. Imagery has been shown to improve athletes' performance and psychological skills in a variety of sports, including basketball **(Akbar et al., 2019)**, gymnastics **(Firmansyah, 2011)**, volleyball (**Sukar et al., 2019**), soccer **(Sartono et al., 2020; Sufriyanto & Putra, 2019)**, and others. The most effective use of image preparation for cognitive tasks and advanced athletes to provide more benefits to novices appears to be most effective when physical activity is prioritized.

The use of audiovisual imagery training in futsal games has been shown to improve the reaction time of futsal goalkeepers, players who do agility ladder training, and players who have low levels of anxiety in futsal players, particularly goalkeepers.

MATERIALS AND METHODS

Study design and population

The method used in this study is a factorial design method based on a quantitative approach. Quantitative approaches start with collecting data, interpreting data, presenting results, and many numbers are used. In this study, researchers used therapeutic image training using audiovisual and visual methods by comparing the mobility level of each sample to that of the experimental group. Sampling is done by selecting targets based on specific objectives based on factorial design as well as strata, random numbers, and areas (**Sugiyono, 2017**), in short: in this design, all groups were randomly selected and each group underwent a pretest. Groups in the study were declared good if they had the same pretest score.

It was deemed valid for study based on letter Number: 068/POR/A/III/2023 regarding assessing the validity of research data on physical fitness of Student Activity Unit participants in the field of

sports. Before participating in the study, research subjects supplied detailed, informed, and voluntary consent. Researchers must ensure that research subjects completely understand the objectives, procedures, risks, and benefits of research done in conformity with the Helsinki Declaration.

Measuring methods

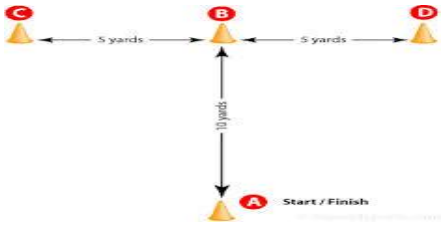
After scoring low and high on an agility test, the sample is divided into two training techniques and then divided into an exercise group. The outcomes are interpreted as high and low. Obtaining a high components group and a low component group, the samples used as research subjects were students who took part in Metro City Student Futsal League aged 16-18 years. In the training process visual exercises are performed on the futsal pitch using audiovisual aids. The procedure is for the student to watch a training video created by the coach as it is carried out on his pitch in futsal.

Inclusion requirements are standards that need subjects for research to act as study participants that meet the criteria **(Notoatmodjo, 2012)**. This study's inclusion criteria include: 1) Between the ages of 16 and 18. 2) A high school athlete who participates in Metro City student futsal leagues. 3) Serves as a guard, and 4) is male. Exclusion criteria are conditions where research participants cannot represent the sample because they do not match the requirements as a research sample, such as ethical barriers, refusal to be a respondent, or a scenario that makes research impossible (**Notoatmodjo, 2012**). In this study, the exclusion criteria were as follows: 1) age between 16 and 18 years; 2) high school athletes that do not play in student futsal leagues metro city throughout the year, metro city; 3) flanking, pivoting, and anchoring positions.

The data collection technique used in this research includes four activities: 1) data collection: population data collection from each high school futsal extracurricular in Metro City; 2) knowing the players' high and low agility by collecting data using instruments; 3) after understanding the high and low agility findings that will be handled, form groups based on each imagery criterion; 4) test the goalkeeper's reaction using the Whole Body Reaction Time Test.

The agility ability test uses the T Drill Test with a test form sourced from (**Widiastutik, 2015**). After testing the agility ability test instrument which was carried out on futsal extracurricular students at SMA Negeri Sport Metro, it had a validity value of (0.98) and a reliability of (0.89) as follows:

Figure 1. *'T' Drill Test*



Source : Mackenzie, 2008

Table 2. Norms *'T' Drill Test*

Ranking	Males (Scconds)
Excellent	<9.50
Good	9.51-10.50
Averaga	10.51-11.50
Poor	>11.50

source : Mackenzie, 2008

In collecting data, a measurement tool is needed, so that by using this tool data will be obtained which is the result of the measurement. (**Nurhasan. & Hasanudin., 2014**) explains that: "A test is a tool or procedure for measuring something in an atmosphere using predetermined methods and rules." In research, measurements are

carried out twice, namely at the beginning and end of the research or before and after the treatment is given. The type of instrument used to measure the goalkeeper's reaction speed ability in this study was the whole body reaction test with reliability and validity coefficients of 0.93 and 0.607.

Figure 2. Wholebody reaction time

Source : Miyatake, 2012

Table 3. Norms *wholebody reaction time test*

No	Category	Time (seconds)
1	Special	0.001 – 0.100
2	Very good	0.101 – 0.200
3	Good	0.201 – 0.300
4	Moderate	0.301 – 0.400
5	Less	0.401 – 0.500
6	Less than once	0.501– upwards

Source : Miyatake, 2012

Statistical analyses

Sampling The method was a directed sampling technique, with a sample of 24 students drawn from a total student population of 90. The data analysis technique uses the Analysis of Variance (ANAVA) test with a 2 x 2 factorial plan at α = 0.05 (**Siswandari, 2009**). To fulfill the assumptions in the ANOVA technique, a normality test and Homegeneity of Variance test were carried out with Leverne's test (**Budiyono, 2009**). To test the hypothesis using Analysis of Variance (ANAVA 2 x 2). If data analysis shows that there is an interaction effect between the methods, continue with the Tukey test. A summary of this study is as follows:

Table 4. Factorial Research Design

Agility \ ***Imagery***	Audiovisual A1	Visual A2
High	A1B1	A2B1
Low	A1B2	A2B2

RESULTS

To test the research hypothesis that was carried out using the analysis technique on the 2x2 factorial Anava, the summary can be seen in the following table:

Table 6. 2x2 Factorial analytical results (2 Way Variance Analysis)

Dependent Variable: post				
Source	df	F	Sig.	Info
Model	1	16.603	.001	There is a significant influence
Agility	1	6.968	.018	There is a significant influence
a. R Squared = .688 (Adjusted R Squared = .552)				
Info: There is a significant effect if the sig. < 0.05				

Source: Primary Data

From the results of the analysis above, it can be concluded that testing the main effect hypothesis as a comparison, there is a significant effect if the sig value is <0.05 and there is an interaction if the sig value is > 0.05.

Imagery Exercise

Based on the results of the 2x2 factorial analysis of variance (ANAVA) at a significant level of α 0.05, a significance value of 0.001 was obtained, thus sig0 < sigt, so that H0 was rejected because the calculated sig is smaller than the sig value at a significance level of α 0.05 (Sig0 < Sigt,) and F 16,603 where F calculated is greater than F table 3.10 at a significance level of α 0.05 (F0 > Ft,) can be accepted or said there is a significant effect. Based on the amount of influence that imagery training has on the reaction time of the futsal goalkeeper, it is 16,603 at level F. From this, it can be concluded that there is a large difference in the effect between visual and audiovisual imagery training on the reaction time of futsal goalkeepers.

Table 7. Imagery results

Variable	F	F Table	Sig.	Sig_t	Info
Imagery Exercise	16.603	3.10	0.001	0.05	There is a significant influence

Source: Primary Data

Figure 3. Imegary Diagram

Agility

Based on the results of the 2x2 factorial analysis of variance (ANAVA) at a significant level of α 0.05, a significance value of 0.018 was obtained, thus sig0 < sigt, so that H0 was rejected because the calculated sig is smaller than the sig value at a significance level of α 0.05 (Sig0 < Sigt,) and F 6.968 where F calculated is greater than F table 3.10 at a significance level of α 0.05 (F0 > Ft,) can be accepted or said there is a significant effect. Based on the impact of agility on a goalie's reaction time 6,968 at the level. So it can be concluded that there is a significant difference between high agility and low agility on the reaction ability of futsal goalkeepers.

Table 8. Agility results

Variable	F	F Table	Sig.	Sig_t	Info
Agility	6.968	3.10	0.018	0.05	There is a significant influence

Source: Primary Data

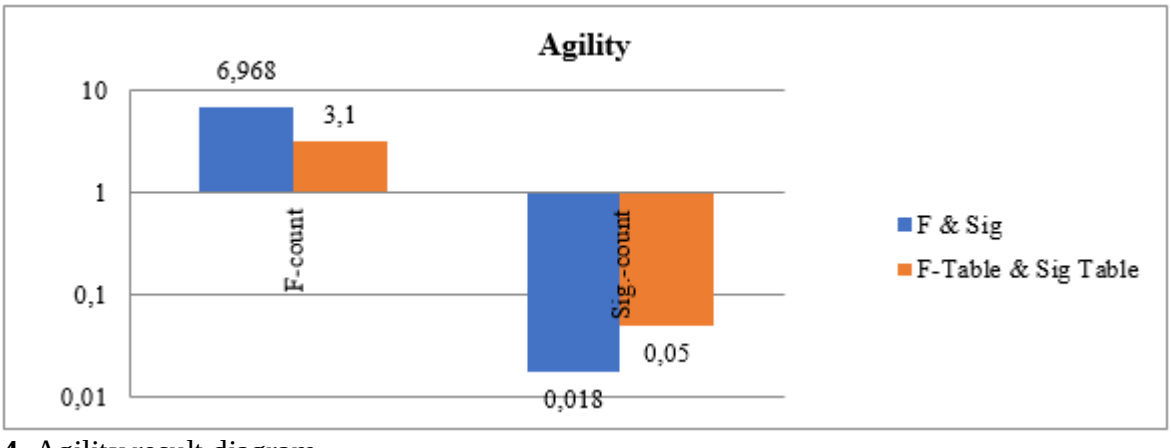


Figure 4. Agility result diagram

Imagery X Agility Exercise

Data analysis of image-trained reaction time agility of futsal goalkeepers. This is demonstrated by simple impact test results, which are shown in Table 9 and Figure 5 below:

Table 9. Imagery X agility results

Variabel	F	F Table	Sig.	Sig.	Info
Imagery X *Agility*	0.838	3.10	0.372	0.05	There is a significant interaction

Source: Primary Data

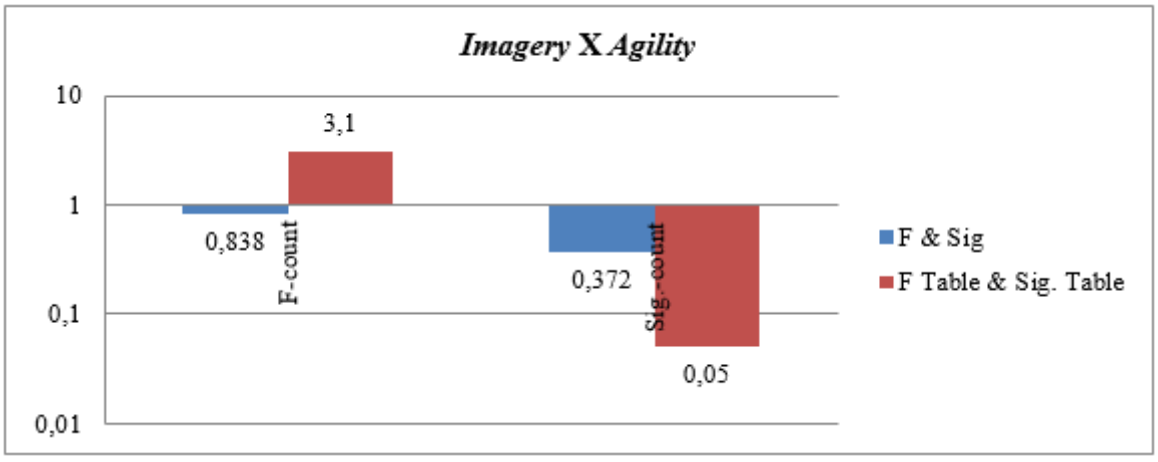


Figure 5. Imagery X agility result diagram

It can be seen that there is a 2x2 factorial anava table at a significant level of α 0.05, a significance value of 0.373 is obtained, thus sig0 > sigt, so that H0 is rejected because the calculated sig is greater than the sig value at a significance level of α 0.05 (Sig0 > Sigt,) and F 0.838 where F count is smaller than F table 3.10 at a significance level of α 0.05 (F0 < Ft,) can be accepted or said there is an interaction. Based on the degree of interaction imagery and agility training had on futsal goalie reactivity, it was 0.838 at level F. This suggests an interaction in futsal goalkeeper reactivity between imagery and agility training.

DISCUSSION

Imagery Exercise

In futsal, the reaction and anticipation of a goalkeeper is needed more because of the difference in the size of the field between football and futsal. In futsal, the goalkeeper will often receive attacks from other teams. Researchers who have repeatedly been the organizers of futsal matches, both regional and national levels, often see how a goalkeeper who doesn't have good reaction and anticipation will be the butt of the opposing players. Meanwhile, goalkeepers who have good reaction and anticipation will be able to secure all kicks that lead to their goal. Further, if goalkeepers are distracted penalty takers this also results in better goalkeeping performance (**Furley et al., 2017**). The skills acquired are a prerequisite for athletes to participate in activities outside of futsal training to improve basic futsal technical skills and improve basic techniques that are still lacking (**Sumantri & Anggara, 2022; Widiyono & Mudiono, 2021**). By creating the right sensory information that contributes to the successful execution of the correct behavior skill for a given situation, you will strengthen the blueprint so that it becomes more likely that you are serious about raising your standard of performance. and tactics. Research on the functional equivalence has shown that imagery and execution share similar although not the same neural networks (**Hardwick et al., 2018; Hetu et al., 2013; Zabicki et al., 2017**).

Furthermore, imagery training leads to more elaborate and more functional representation of structures in motor memory (**Frank et al., 2014, 2018**). Researchers have suggested that increased blood flow in brain regions indicates that the mental stimulus of movement activates some of the central nervous structures required for physical movement (**Kosslyn et al., 2001**). **Frank et al.**, (**2021**)Use image exercises during breaks between exercises helps and enhances higher motor skill abilities. While these covert adaptations as induced by mental types of practice do not necessarily transfer immediately to improvements in motor performance, they come into effect after task execution (**Frank et al., 2018**). In this study, two suitable training methods were applied, namely the imagery training method using audiovisuals and Imagery training methods use visual elements to find out which method gives the goalie a longer reaction time. Both of these training methods have the same goal, namely to improve the goalkeeper's reaction ability. However, each of these training methods has differences in terms of results with the amount of influence that Imagery training affects goalkeeper reaction time of 0.001 and an F value of 16.603, so it can be said that imagery training using audiovisual is better than imagery training using visuals. Based on the discussion of

the research results, it can be recommended that the imagery training method using audiovisual is more suitable to be applied in increasing the goalkeeper's reaction time because it has a better average than the imagery training method using visuals.

Agility

A physical fitness training program must be planned properly and systematically, aiming to improve physical fitness and the functioning of the body's systems so that athletes can perform better (**Mudayat, 2022; Sumantri et al., 2023**). Knowing when to apply the right training stimuli during an athlete's long-term development is critical to effectively programming and improving an athlete's performance (**Hammami et al., 2018; Lloyd et al., 2013; McNarry & Jones, 2014**). During the field training process, where players with different levels of agility receive solid instruction with imagery instruction using multimedia and visual, it produces satisfactory results, as evidenced by the improvements that result from the test results presented at the end of this research. However, players with great agility outperform individuals with low agility when the therapy is administered.

The statement made by the players after carrying out the treatment was that before doing this imagery exercise we could not imagine what to do on the field in the process of facing an opponent either one on one or when the opposing player attacked our team's goal, seen from the treatment given during the first meeting and secondly, at the third and subsequent meetings we understand that there will be imagery training that focuses on an imagination that will be carried out during the match and the calm that we see has a very good impact so that the physical condition factor increases in this case the agility of the futsal goalkeeper.

Combining imagery and physical exercise was more effective than physical exercise alone, indicating different effects of imagery and physical exercise. The same pattern of results was found for the performance results **(Simonsmeier et al., 2021**). First, all previous meta-analyses have provided evidence for the effectiveness of mental practice to improve performance. However, it has been hypothesized that imaging not only performs as described in various imaging models, but is effective in enhancing various outcomes such as psychological performance **(Cumming & Williams, 2013; Guillot & Collet, 2008; Martin et al., 1999**).

As expressed by **Irawadi** (**2011**) that "agility is one of the elements of special physical conditions, which is a combination of elements of strength, speed and flexibility". These three combinations will produce agility. The agility component in the structure of the trainer's training program places it in a special preparation phase, meaning that the agility component is influenced by the physical components of endurance, strength, flexibility, and coordination, all of which have been trained during the general preparation phase (**Mashud et al., 2019**). So it can be said that to train the agility component it is expected to pay attention to the supporting physical components, namely endurance, strength, flexibility and coordination because it can be said that these components are prerequisite components for the formation of agility in an athlete. Students with high agility skills did better than those with low agility. There is a significant interaction between training methods (series of games and series of sports) and agility (high and low) of futsal games, especially for goalkeepers, when documented by the prices of $p=0.000<0.05$. **Muhajir** (**2004**), "agility is the ability of a person to be able to change direction quickly and precisely when moving without losing balance". An athlete with good agility is not only able to perform a skill perfectly, but also can easily and quickly perform skills that are new to him.

Based on the results of the study, the magnitude of the influence that agility has on the results of the goalkeeping ability is 0.018 and for the F value is 6.968 at the sig level of 0.05. So it can be concluded that there is a significant difference in effect between high agility and low agility on the results Metro City Senior High School Goalkeeper Responsiveness. Therefore it can be recommended that high agility is more suitable for use in this study because it can improve the results of the goalkeeper's reaction ability futsal better and maximally.

Imagery X Agility Exercise

In this group where the results obtained after carrying out the final test carried out in the field were the interaction of the imagery training group with the player's agility getting better, then with imagery training the players practiced to be

implemented in matches through imagination in the minds of each player, making players more so that it impacts results better. Performance analysis through close video analysis showed that the successful pass rate increased significantly in the group (**Seif-Barghi et al., 2012**). Mobility performance depends on the complexity of cognitive demands. There is an interference effect between motor and cognitive performance, which can slow us down as environmental information becomes more complex (**Büchel et al., 2022**). Consider the cognitive challenges team athletes face during competition (**Huijgen et al., 2015**), A drawback of current agility testing is that it often relies on a simple think-time paradigm (**Pojskic et al., 2018; Sekulic et al., 2019; Spasic et al., 2015**) It merely represents lower cognitive functions such as processing speed **(Morral-Yepes et al., 2022). Darojat & Hariadi (2019)** Improved athlete mobility makes difficult movements easier, avoids injuries during training and competition, moves smoothly in different directions, and responds quickly to opponents' balls.

In long-term athlete development, knowing when to apply the right training stimulus is critical to effectively programming and improving athletic performance (**Hammami et al., 2018; Lloyd et al., 2013; McNarry & Jones, 2014**). Differences in the timing and pace of physical development in young people should therefore be considered when introducing specific training stimuli **(Sariati et al., 2021**). Several studies have shown that visual performance, like physical performance, is influenced by neurological activation and psychological demands (task difficulty, timing regularity, programming rules) **(Guillot et al., 2012; Jeannerod, 2006**). Additionally, images can be difficult to use when performing turnaround tasks, as they must be used to anticipate specific scenarios (**Jones-Wyatt et al., 2013**). Creating mental images of unpredictable actions is somewhat contradictory, as images lack environment-specific variability. In fact, an individual must create or manifest an image of their own volition **(Lindsay et al., 2019; McNeil et al., 2021**). The lack of overall improvement in reaction performance may indicate that imagery training is not effective for all components of perceptual motor performance. Discrepancies in performance change seem to indicate that participants may not be generating unpredictable stimuli during image acquisition **(McNeil et al., 2021**).

Research **Büchel et al., (2022**) have shown that agility performance depends on the complexity of cognitive requirements. Interference effects can occur between motor and cognitive performance, leading to a slower rate and increased complexity in receiving environmental information. The agility ability of a futsal player, especially a goalkeeper, is needed in every match to produce comfort and calm for other futsal players and the level of agility of a futsal player reflects the ability to move in various levels of difficulty quickly, precisely, and efficiently. Based on the above explanation, the results for shot accuracy on goal showed a significant interaction between imagery training method and agility, yielding significant values of 0.373 and 0.838 at the F level. From this, it can be concluded that there is a correlation between imaginative training and agility in futsal goalie reaction time outcomes.

Conclusion

Difference in effect of audiovisual imagery training & visual imagery training the reaction time of goalkeepers in metro city high school futsal players. There are differential effects of high and low agility on the reaction time of futsal goalkeepers in metro city high schools. At Metro City High School, there is an interaction between imagination and agility training for futsal players' goalie reaction times. To the researchers, the research objectives were limited to the influence of two levels of image training methods, two levels of dexterity training and as a follow-up to this study it was suggested to study various other variables and attributes that affect the reaction time of futsal goalkeepers.

Acknowledgment

The author would like to express his deepest gratitude to Universitas Ma'arif Nahdlatul Ulama Kebumen as affiliates of the authors. Deep gratitude was also conveyed to all parties involved in this study.

Conflict of Interest

We declare that this article we wrote has no involvement in any particular conflict of interest and the Declaration of Helsinki.

Ethics Statement

This study was performed by adhering to the Helsinki Declaration. Ethical approval of the study was obtained from Universitas ma'Nahdkatual Ulama Kebumen Ethics Committee at the board

meeting dated 20.03.2023 and numbered 17-06-2023 Ref. 0617079003, 2023

Authors Contribution

Study Design, EB; Data Collection, EB and RJS; Statistical Analysis, EB and RJS; Data Interpretation, EB and RJS; Manuscript Preparation, EB and RJS; Literature Search, EB and RJS. All authors have read and agreed to the published version of the manuscript.

REFERENCES

Agras, H., Ferragut, C., & Abraldes, J.A. (2016). Match analysis in futsal: a systematic review. *International Journal of Performance Analysis in Sport*, *16*(2), 652–686. [CrossRef]

Akbar, M. F., Priambodo, A., & Jannah, M. (2019). Pengaruh Latihan Imagery Dan Tingkat Konsentrasi Terhadap Peningkatan Keterampilan Lay Up Shoot Bola Basket Sman 1 Menganti Gresik. *Jp.jok (Jurnal Pendidikan Jasmani, Olahraga dan Kesehatan)*, *2*(2), 1–13. [CrossRef]

Birren, J. E., & Schaie, K. (2021). *Handbook of the psychology of aging. 6thedition*. Elsevier Academic Press.ISBN.

Borges, L., Dermargos, A., Gorjão, R., Cury-Boaventura, M. F., Hirabara, S.M., & Abad, C.C. (2021). Updating futsal physiology, immune system, and performance. *Res Sports Med. In*, *press:1–18*, 1–18. [PubMed]

Büchel, D., Gokeler, A., Heuvelmans, P., & Baumeister, J. (2022). Increased Cognitive Demands Affect Agility Performance in Female Athletes - Implications for Testing and Training of Agility in Team Ball Sports. *Perceptual and Motor Skills*, *129*(4), 1074–1088. [PubMed]

Budiyono. (2009). *Statistika Untuk Penelitian*. UNS press.

Chang, Y. K., Pan, C. Y., Chen, F. T., Tsai, C. L., & Huang, C. C. (2011). Effect of resistance-exercise training on cognitive function in healthy older adults: A review. *Journal of Aging and Physical Activity*, 497–517. [PubMed]

Cumming, J., & Williams, S. E. (2013). Introducing the revised applied model of deliberate imagery use for sport, dance, exercise, and rehabilitation. *Movement & Sport Sciences*, *82*(4), 69–81. [CrossRef]

Darojat, F. A., & Hariadi, I. (2019). Pengaruh Latihan Speed Ladder Terhadap Peningkatan Kelincahan pada Peserta Ekstrakurikuler Tenis Meja. *Indonesia Performance Journal*, *3*(1).https://doi.org/10.17977/um077v3i12019p33-38

Der, G., & Deary, D. J. (2006). Age and sex differences in reaction time in adulthood. *Results from the United Kingdom Health and Lifestyle Survey.Psychology And*, *Aging,21(1*, 62–73. [PubMed]

Dragijský, M., Malý, T., Bujnovský, D., Zahálka, F., Hank, M., & Malá, L. (2016). Level and differences of sprint acceleration among soccer players in three different age categories.Journal of. *Journal of Physical Education and Sport*, *16*(2), 522–526. [CrossRef]

Firmansyah, H. (2011). Perbedaan Pengaruh Latihan Imagery Dan Tanpa Latihan Imagery Terhadap Keterampilan Senam Dan Kepercayaan Diri Atlet. *JORPRES*, *7*(7), 1–10.https://doi.org/10.21831/jorpres.v7i7.10271

Frank, C., Bekemeier, K., & Menze-Sonneck, A. (2021). Imagery training in school-based physical education improves the performance and the mental representation of a complex action in comprehensive school students. *Psychology of Sport and Exercise*, *56*, 101972. [CrossRef]

Frank, C., Land, W. M., Popp, C., & Schack, T. (2014). Mental representation and mental practice: Experimental investigation on the functional links between motor memory and motor imagery. *PloS One*, *9*, *Article*. [PubMed]

Frank, C., Linstromberg, G.-L., Hennig, L., Heinen, T., & Schack, T. (2018). Team action imagery: Imagery of game situations and required team actions promotes a functional structure in players' representations of team-level tactics. *Journal of Sport & Exercise Psychology*, *40*, 20–30. [PubMed]

Furley, P., Noël, B., & Memmert, D. (2017). Attention towards the goalkeeper and distraction during penalty shootouts in association football: A retrospective analysis of penalty shootouts from 1984 to 2012. *Journal of Sports Sciences*, *35*(9), 873–879. [PubMed]

Guillot, A., & Collet, C. (2008). Construction of

the motor imagery integrative model in sport: A review and theoretical investigations of motor imagery use. *International Review of Sport and Exercise Psychology*, *1*(1), 31–44. [CrossRef]

Guillot, A., Rienzo, F., & Collet, C. (2012). The neurofunctional architecture of mental imagery. In T. D. Papageorgious, G. I. Christopoulos, & S. M (Eds.), *Advanced Brain Neuroimaging Topics in Health and Disease – Methods and Applications*.

Hagovská, M., & Nagyová, I. (2017). The transfer of skills from cognitive and physical training to activities of daily living. *A Randomized Controlled Study.European Journal Of*, *Ageing,14(*, 133–142. [PubMed]

Hammami, R., Sekulic, D., Selmi, M. A., Fadhloun, M., Spasic, M., & Uljevic, O. (2018). Maturity status as a determinant of the relationships between conditioning qualities and preplanned agility in young handball athletes. *J. Strength Cond*. [PubMed]

Hardwick, R. M., Caspers, S., Eickhoff, S. B., & Swinnen, S. P. (2018). Neural correlates of action: Comparing meta-analyses of imagery, observation, and execution. *Neuroscience and Biobehavioral Reviews*, *94*, 31–44. [PubMed]

Harsono. (2015). *Kepelatihan olahraga. (teori dan metodologi). Bandung: Remaja Rosdakarya*. 100.

Hetu, S., Gregoire, M., Saimpont, A., Coll, M., Eugene, F., Michon, P., & Jackson, P. L. (2013). The neural network of motor imagery: An ALE meta-analysis. *Neuroscience and Biobehavioral Reviews*, *37*, 930–949. [PubMed]

Huijgen, B. C., Leemhuis, S., Kok, N. M., Verburgh, L., Oosterlaan, J., Elferink-Gemser, M. T., & Visscher, C. (2015). Cognitive functions in elite and sub-elite youth soccer players aged 13 to 17 years. *Plos One*, *10*(12). [PubMed]

Irawadi, H. (2011). Kondisi Fisik dan Pengukurannya. In *Kondisi Fisik dan Pengukurannya*. FIK UNP.

Jeannerod, M. (2006). *Motor Cognition: What Actions Tell the Self*. Oxford University Press. [CrossRef]

Jevas, S., & Yan, J. H. (2001). The effect of aging on cognitive function: A preliminary quantitative review. *Research Quarterly for Exercise and Sport*, *Sport,72(4*, 38–40. [PubMed]

Jones-Wyatt, E., Domercant, J. C., & Mavris, D. N. (2013). A reliability-based measurement of interoperability for systems of systems. *2013 IEEE International Systems Conference (SysCon)*, 408–413. [CrossRef]

Kosslyn, S. M., Thompson, W. L., Wraga, M., & Alpert, N. M. (2001). Imagining rotation by endogenous versus exogenous forces: Distinct neural mechanisms. *NeuroReport*, *12*(11), 2519–2525. [PubMed]

Lindsay, R., Spittle, M., & Larkin, P. (2019). The effect of mental imagery on skill performance in sport: A systematic review. *Journal of Science and Medicine in Sport*, *22*(S2), S92. [CrossRef]

Lloyd, R. S., Read, P., Oliver, J. L., Meyers, R. W., Nimphius, S., & I, J. (2013). Considerations for the development of agility during childhood and adolescence. *Strength Cond. J*, *35*, 2–11. [CrossRef]

Mackenzie, B. (2008). *101 Performance Evaluation Tests*. Electric Word plc.

Martin, K. A., Moritz, S. E., & Hall, C. R. (1999). Imagery Use in Sport: A Literature Review and Applied Model. *The Sport Psychologist*, *13*(3), 245–268. [CrossRef]

Mashud, M., Hamid, A., & Abdillah, S. (2019). Pengaruh Komponen Fisik Dominan Olahraga Futsal Terhadap Teknik Dasar Permainan Futsal. *Gladi : Jurnal Ilmu Keolahragaan*, *10*(1), 28–38. [CrossRef]

Maulana, Z., & Khairani, M. (2017). Kecemasan Bertanding Pada Atlet PON Aceh berdasarkan Jenis Aktivitas Olahraga. *Jurnal Ilmiah Psikologi Terapan*, *5*(1), 97–106. https://doi.org/10.22219/jipt.v5i1.3814

McNarry, M., & Jones, A. (2014). The influence of training status on the aerobic and anaerobic responses to exercise in children: A review. *Eur. J. Sport Sci*, 14,57–68. [PubMed]

McNeil, D. G., Spittle, M., & Mesagno, C. (2021). Imagery training for reactive agility: Performance improvements for decision time but not overall reactive agility. *International Journal of Sport and Exercise Psychology*, *19*(3), 429–445. [CrossRef]

Miyatake, N. (2012). *Evaluation of whole body reaction time and one leg with*. [CrossRef]

Montesano, P. (2016). *Goalkeeper in soccer:*

Performance and explosive strength.Journal of Physical Education and Sport. *16*(ue 1), 230–233. [CrossRef]

Morral-Yepes, M., Moras, G., Bishop, C., & Gonzalo-Skok, O. (2022). Assessing the Reliability and Validity of Agility Testing in Team Sports: A Systematic Review. *Journal of Strength and Conditioning Research*, *36*(7), 2035–2049. [PubMed]

Mudayat. (2022). Penyuluhan Pentingnya Peningkatan Vo2max Guna Meningkatkan Kondisi Fisik Pemain Sepakbola. *MULIA Jurnal Pengabdian Kepada Masyarakat*, *1*(1).

Muhajir. (2004). *Pendidikan Jasmani, Olahraga dan Kesehatan Jilid1*. Erlangga. [CrossRef]

Muñoz, A.S., Cayetano, A.R., Calle, R.C., Blanco, J.M.F., Ramos, J.M.D.M., & Vicente, R.A. (2017). Female Spanish athletes face precompetition anxiety at the highest levels of competition. *Rev. Psicol. Deporte*, *26*, 39–44. https://www.redalyc.org/pdf/2351/235152047008.pdf

Notoatmodjo. (2012). *Metode Penelitian Kesehatan*. Rineka Cipta.

Nurhasan., H.D., & Hasanudin., D.D. (2014). Tes Dan Pengukuran Keolahragaan. In *Tes dan Pengukuran Keolahragaan* (p. 214). UPI.

Nurwidawati, W. (2015). Hubungan Antara Kecemasan Bertanding Dan Dukungan Sosial Dengan Motivasi Berprestasi Pada Atlet Pencak Silat Perguruan Pencak Organisasi Sidoarjo. *Character: Jurnal Penelitian Psikologi*, *3*(2). https://ejournal.unesa.ac.id/index.php/character/article/view/10946

Obetko, M., Peráček, P., Mıkulıč, M., & BABIC, M. (2020). Effect of selected types of warm-up on disjunctive reaction time of soccer goalkeepers. *Journal of Physical Education and Sport (JPES)*, *20*(4), 257 1903–1908. [CrossRef]

Otte, F. W., Millar, S. K., & Hutterman, S. (2019). How does the modern football goalkeeper train?An exploration ofexpert goalkeeper coachces‘ skill training approaches. *Journal of Sports Sciences*, 1–9 0264–0414. [PubMed]

Pojskic, H., Åslin, E., Krolo, A., Jukic, I., Uljevic, O., Spasic, M., & Sekulic, D. (2018). Importance of Reactive Agility and Change of Direction Speed in Differentiating Performance Levels in Junior Soccer Players: Reliability and Validity of Newly Developed Soccer-Specific Tests. *Frontiers in Physiology*, *9*(May), 506–511. [PubMed]

Redita, B. I. L. (2021). *Tingkat Kondisi Fisik Pada Pemain Futsal Puteri Accasia Kota Pekanbaru*. Universitas Islam Riau.

Sabilla, N. P., Rahayuni, K., Hanief, Y., & N. (2022). Pengembangan Latihan Imagery untuk Meningkatkan Kepercayaan Diri pada Atlet Renang Usia Remaja di Garuda Aquatic Swimming Club. *Journal Of Sport Education (JOPE)*, *5*(1), 69–80. https://doi.org/10.31258/jope.2.2.69-80

Sariati, D., Hammami, R., Zouhal, H., Clark, C. C. T., Nebigh, A., Chtara, M., Chortane, S. G., Hackney, A. C., Souissi, N., Granacher, U., & Ounis, O. Ben. (2021). Improvement of Physical Performance Following a 6 Week Change-of-Direction Training Program in Elite Youth Soccer Players of Different Maturity Levels. *Frontiers in Physiology*, *12*(652). [PubMed]

Sartono, S., Suryaman, O., Hadiana, O., & ... (2020). Hipnoterapi untuk kecemasan: sebuah uji coba pada pemain sepakbola. *Jurnal Sportif*. [CrossRef]

Scheunemann, T. (2012). Kurikulum dan pedoman dasar sepakbola Indonesia. *Jakarta: PSSI*.

Schmidt, R. A., & Wrisberg, C. A. (2010). *Aprendizagem e performance motora: Uma aprendizagem baseada em situação*. Artmed.

Seif-Barghi, T., Kordi, R., Memari, A. H., Mansournia, M. A., & Jalali-Ghomi, M. (2012). The effect of an ecological imagery program on soccer performance of elite players. *Asian Journal of Sports Medicine*, *3*(2), 81–89. [PubMed]

Sekulic, D., Foretic, N., Gilic, B., Esco, M. R., Hammami, R., Uljevic, O., Versic, S., & Spasic, M. (2019). Importance of Agility Performance in Professional Futsal Players; Reliability and Applicability of Newly Developed Testing Protocols. *International Journal of Environmental Research and Public Health*, *16*(18), 3246. [PubMed]

Simonsmeier, B. A., Andronie, M., Buecker, S., & Frank, C. (2021). The effects of imagery interventions in sports: a meta-analysis. *International Review of Sport and Exercise Psychology*, *14*(1), 186–207. [CrossRef]

Singh, V., Prakash, S., Punia, S., & Kulandaivelan, S. (2017). Relationship between pre-competition anxiety and performance lev-els

in inter-university women football teams. *J Phys Educ*, *4*(5), 135–138. **https://doi.org/10.1016/j.psychsport**

Siswandari. (2009). *Statistika Computer Based*. LPP UNS Dan UNS Press.

Slimani, M., & Nikolaidis, P. T. (2018). Anthropometric and physiological characteristics of male soccer players according to their competitive level, playing position and age group: a systematic review. *The Journal of Sports Medicine and Physical Fitness*, *59*(1). [**PubMed**]

Smpokos, E., Linardakis, M., & Mourikis, C. (2018). Differences in motor activities of Greek professional football players who play most of the season (2016/17). *Journal of Physical Education and Sport*, *18*(ue Suppl. 1), 490–496. [**CrossRef**]

Spasic, M., Krolo, A., Zenic, N., Delextrat, A., & Sekulic, D. (2015). Reactive Agility Performance in Handball; Development and Evaluation of a Sport-Specific Measurement Protocol. *J Sports Sci Med*, *14*(3), 501–506. [**PubMed**]

Spyrou, K., Freitas, T. T., Marín-Cascales, E., & Alcaraz, P. E. (2020). Physical and physiological match-play demands and player characteristics in futsal: A systematic review. *Front Psychol*, *11*(569897). [**PubMed**]

Sufriyanto, A., & Putra, Y. Y. (2019). Pengaruh Latihan Imagery Mental Terhadap Kepercayaan Diri Pada Atlet Sepakbola Kabupaten Kerinci. *Jurnal Riset Psikologi*, *3*. **https://doi.org/10.24036/jrp.v2019i3.6108**

Sugiyono P.D. (2017). Metode Penelitian Pendidikan (Pendekatan Kuwantitatif, Kuwalitatif, R&D). In *Alfabbeta Pres* (p. 277). Alfabeta.

Sukar, N., Priambodo, A., & Nurkholis, N. (2019). Pengaruh Latihan Imagery dan Self Talk Terhadap Percaya Diri dan Konsentrasi Pada Siswa Ekstrakurikuler Bola Voli SMP N 51 Surabaya. *Jendela Olahraga*, *4*(1). [**CrossRef**]

Sumantri, R. J., & Anggara, M. (2022). The Effect of Circuit Training on Increasing Physical Fitness of Class VIII Students of SMPN 1 Metro. *International Conference on Science, Education, and Technology*, *8*, 1106–1110. **https://proceeding.unnes.ac.id/ISET/article/view/1901**

Sumantri, R. J., Soegiyanto, S., Rumini, R., Setyawati, H., Suryadi, D., & Suganda, M. A. (2023). PNF stretching and static stretching exercises: Efforts to increase the flexibility of the hamstring muscles in futsal players. *Fizjoterapia Polska*, *23*(2), 96–103. [**CrossRef**]

Tani, G. (2016). *Arte e ciência da habilidade de não ser fintado* (G. Tani & E. G. Koogan (eds.).

Widiastutik. (2015). *Tes dan Pengukuran Olahraga*. PT Raja Grafindo Persada. Jakarta.

Widiyono, I. P., & Mudiono. (2021). Keterampilan Dasar Futsal Peserta Ektrakurikuler di SMK Ma'arif 1 Kebumen Tahun Ajaran. *Jumora: Jurnal Moderası Olahraga*, *01*(01).

Zabicki, A., de Haas, B., Zentgraf, K., Stark, R., Munzert, J., & Krüger, B. (2017). Imagined and Executed Actions in the Human Motor System: Testing Neural Similarity Between Execution and Imagery of Actions with a Multivariate Approach. *Cerebral Cortex (New York, N.Y. : 1991)*, *27*(9), 4523–4536. [**PubMed**]