



## IMAGERY AND AGILITY TRAINING: HOW DO THEY AFFECT THE REACTION ABILITY OF FUTSAL GOALKEEPERS?

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### Abstract

**Study purpose.** Goalkeepers in futsal require fast movements to anticipate the ball that is heading toward the goal. Therefore, the reaction of the goalkeeper is very necessary to improve the quality in the game.

**Materials and methods.** This research is experimental research conducted using factorial design research using a quantitative approach. In this research, the researchers use treatment with imagery exercises, with audiovisual and visual methods, with measuring the level of ability and agility of each sample in a group experiment. The type of instrument used to measure the ability of the goalkeeper's reaction speed in this study is the whole-body reaction test. The population in this study was high school (SMA) students who played futsal goalkeepers throughout the city of Metro, with the number of participants being 90 students of 9 high schools throughout the city of Metro. Purposive sampling technique was used so that a sample of 24 students was obtained.

**Results.** The results of the study prove that the significance value of imagery training is  $0.001 < 0.05$  which means "Ha is accepted", then there is an effect of Imagery training on the goalkeeper's reaction time. Next, the significance value of Agility training is  $0.018 < 0.05$ , which means "Ha is accepted", then there is an effect of agility training on the goalkeeper's reaction time. There is a significant difference between imagery training using audiovisual, high agility, and imagery training using audiovisual, low agility, with a significance value of 0.016. While there is no significant difference between imagery exercises using visuals, high agility and imagery exercises using visuals, low agility with a significance value of 0.395.

**Conclusions.** Based on the results, it can be concluded that imagery and agility exercises have a significant effect on the reaction time of goalkeepers in futsal.

**Keywords:** imagery training, agility training, goalkeeper reaction, futsal, sports.

### Introduction

Intermittent game sport (Costa Miranda, Santos Cerqueira, & Bouzas Marins, 2020), considering that every time it is necessary to reduce the duration with high intensity. In addition, a futsal player must have high competence in terms of endurance (Naser, Ali, & Macadam, 2017a; Wibisana, 2020), and requires tactics (Miftachurochmah et al., 2021),

technique, and excellent physical condition (Litardiansyah & Hariyanto, 2022). Where the intermittent nature of exercise requires the use of aerobic and anaerobic energy during training and competition (Dwi Juniarsyah, Safei, Bahri, Resmana, & Fahmi Hasan, 2021; Suryadi & Rubiyatno, 2022). In team sports, such as futsal which dominates overt motor skills, it is necessary that players constantly adapt their actions to the movements of opponents and teammates to ensure functional collective behavior (Chow, Davids, & Button, 2016), and can increase the number of needs physics and its importance (Mancha-Triguero, Martín-Encinas, & Ibáñez, 2020).

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Futsal is also considered a fast-growing game sport in the world (Lopes, Oliveira, & Ribeiro, 2020), and is becoming a popular team sport (Spyrou, Freitas, Marin-Cascales, & Alcaraz, 2020). Furthermore, in Malaysia, futsal has become one of the main sports at sports parties (Ahmad-Shushami & Abdul-Karim, 2020), not far behind in Indonesia, futsal has developed and is well known (Rayawang, SP, & Basuki, 2017; Yuniva, Andriansah, & Ikhsan, 2020; Zein et al., 2020), and are loved by almost all circles of society (Purwanto, Nugraha, Prayogha, & Syahputra, 2021; Salahuddin, Haluti, & Nurhikmah, 2021). This statement provides evidence that the game of futsal is currently undergoing major changes, this can be seen during the futsal world cup match that took place. All eyes are on the match, and of course the game technique, rules, The sport of Futsal is played by 5 players, one of which is a goalkeeper (Naser, Ali, & Macadam, 2017b), where this sport has a high intensity and intermittent, but also has a high risk of injury (Ahmad-Shushami & Abdul-Karim, 2020), and tends to cause dehydration (Zein et al., 2020). Although factors such as strength, endurance, power and balance are important in futsal (Agras, Ferragut, & Abalde, 2016), the assessment of a futsal player must also depend on his special futsal skills such as goalkeeper. Where the position of the goalkeeper in the game of futsal is a certain position and the demands placed on quick and precise reactions are even greater. This statement is in line with (Fadi & Sutresna, 2019) who said that the futsal goalkeeper really needs a reaction in anticipation so that the ball does not go into the goal. In addition to reaction speed, explosive power (Montesano, 2016), and all speed skills in the game are also very necessary (Dragijsky et al., 2016) (Smpokos, Mourikis, & Linardakis, 2018).

A study conducted by (Hülsdünker, Strüder, & Mierau, 2018) proves that athletes have better reaction times than non-athletes, where the ability to see and hear has a relationship with reaction time test results (Atan & Akyol, 2014). There is a relationship between reaction time, movement speed and agility with fitness (Moradi & Esmaeilzadeh, 2015), because poor fitness will affect the activities to be carried out (Suryadi, 2022; Suryadi & Rubiyatno, 2022; Suryadi, Samodra, & Purnomo, 2021). A goalkeeper in a match, the reaction will be formed when making a save shot (Otte, Millar, & Klatt, 2020). Several studies have shown that reaction time and age are the main factors influencing skills (Birren & Schaie, 2005; Chang, Pan, Chen, Tsai, & Huang, 2012; Der & Deary, 2006). Furthermore, it is proven by (Moradi & Esmaeilzadeh, 2015) that the measurement of reaction time is closer to the agility variable.

Bompa & Buzzichelli (2019, 2021) say agility is a person's ability to change direction quickly, and this is a very important factor in many sports. Another study that proved reaction time in karate athletes gave accurate results with agility tests within 0.8 meters (Zemková, 2016). Research has shown that reaction time is also influenced by sleep deprivation (M. Jarraya, Jarraya, Chtourou, Souissi, & Chamari, 2013; S. Jarraya, Jarraya, Chtourou, & Souissi, 2014), fasting conditions for 14 hours and exercise (Cherif et al., 2018), and anxiety (Singh, Prakash, Punia, & Kulandaivelan, 2017). Based on this review, this illustrates that in order to get it, a goalkeeper needs to deal with two other important temporal dimensions that underlie motor skill performance including anticipation and reaction time. (Schmidt & Wrisberg,

2010; Tani, 2016). Based on this problem, the temporal coincidence that the goalkeeper is looking for in relation to the ball moving towards the goal can be preceded, so as to be able to defend the goal from attacks. A kick towards the goal that is fired from close range so that high reflex skills are needed (Scheunemann, 2012).

Various attempts were made to increase reaction time, one of which was by increasing agility and speed through high-intensity interval training (Fauzi, Wiriawan, & Khamidi, 2020), drill leader (Fantiro, 2018; Puriana, 2017). There are four aspects that need to be considered and trained including physical exercise, technical training, tactical training, and mental training (Harsono, 2015). According to (Muhammad Muhyi Faruq, 2014) physical exercise is one very important aspect, in which the physical components and classifications in men's football are strength, muscle endurance, speed, agility, flexibility, power and cardiopulmonary endurance. Next, there is a relationship between reaction speed, agility and confidence with penalty kick anticipation (Lubis, 2014). A goalkeeper will have difficulty responding to a directed ball if he does not have reaction and speed, a goalkeeper who has the ability to react quickly is an expensive plus. Reaction time is one of the important supporting elements that need to be tested for measurement (Eckner et al., 2015), especially for goalkeepers who really need a reaction (Fadi & Sutresna, 2019). Therefore, effective training is needed to increase the goalkeeper's reaction time, so this is an important point to do. Based on this statement, this study aims to prove the effect of imagery and agility training on the reaction ability of futsal goalkeepers.

## Materials and methods

### Participant

This study involved high school (SMA) students in the position of futsal goalkeepers in Metro City with 90 students participating, consisting of 9 High Schools in Metro City who participated in the Student Futsal League. In this study using purposive sampling technique with criteria for age 16-18 years, goalkeeper position, male students and players who have an agility ladder and agility hurdle, so that a sample of 24 students is obtained.

### Data Collection Techniques and Instruments

The type of instrument used to measure the ability of the goalkeeper's reaction speed in this study was the whole body reaction test with reliability and validity coefficients of 0.93 and 0.607 according to Nurhasan (Nurhasan, 2008). To perform the whole body reaction time test, the researcher used the whole body reaction time test. This test is carried out to determine the level of whole body reaction time from all samples. This type of test consists of two types: 1) visual, namely doing tests using the sense of sight and 2) Audio, namely doing tests using the sense of hearing (Miyatake, 2012).

### Procedure

Experimental research conducted using a factorial design research design using a quantitative approach, the

approach Quantitative data uses a lot of numbers, starting from data collection, interpretation to the data, as well as appearance of the results (Sugiyono, 2019). In research this researchers use treatment (treatment) with imagery exercises with audiovisual and visual methods with level ability agility each sample to group experiment. The process of training carried out on the futsal field, imagery training using audiovisual with the procedure of students seeing training videos that have been prepared by the coach to be implemented in the field, as well as the imagery training process using visuals, students seeing pictures of exercises that have been prepared by the coach to be implemented in the futsal field.

**Table 1.** 2x2. Factorial Research Design

Imagery Agility	Audio visual A1	V visual A2
Tall B1	A1B1	A2B1
Low B2	A1B2	A2B2

Agility test after high and low results are grouped in both training methods, then grouped into groups exercise method. The results are taken high and low. The procedure for obtaining a high component group and a low component group in the two training methods is 27% of the total score of each group, then an order is taken from the highest score to the number of samples required and an order is taken from the lowest score to the number of samples required., the score midway between the highest and lowest scores is omitted. If the test takers are large enough, then the division of the upper and lower groups, is taken 27% of students who have high-high scores as the upper group and 27% of students who have low-low scores as the lower group.

### Data Analysis

The data analysis technique used in this study is the ANOVA test, before the ANOVA test is carried out, the analysis requirements test is carried out, namely the Normality Test; and Homogeneity Test assisted using the SPSS version 23 application program and a significance level of 5%, The analysis was continued with the Least Significance Difference (LSD) test.

### Result

Based on the results of the normality test, the significance value shows  $0.971$  and  $0.946 > 0.05$ , thus it can be concluded that the sample comes from a normally distributed population. The results can be seen in table 2.

**Table 2.** Normality Test One-Sample Kolmogorov-Smirnov Test

	AV	V
N	12	12
Kolmogorov-Smirnov Z	0.488	0.525
asympt. Sig. (2-tailed)	0.971	0.946

The research hypothesis test was carried out using analytical techniques on 2x2 factorial ANOVA, the summary of which can be seen in table 3.

**Table 3.** 2x2 Factorial Anava Results (2 Way Analysis of Variance)

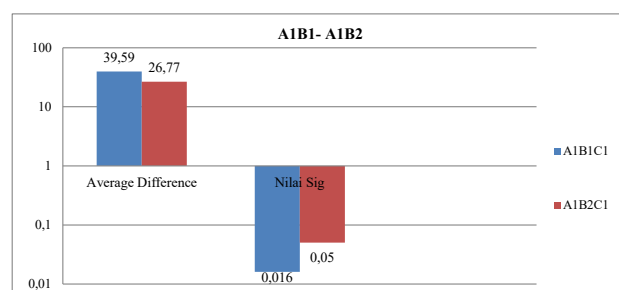
Source	Dependent Variable: post			Note:
	df	F	Sig.	
Imagery Practice	1	16.603	0.001	There is a significant influence
Agility	1	6.968	0.018	There is a significant influence

Based on the results in table 3, it is known that the significance value of imagery training is  $0.001 < 0.05$  which means "Ha is accepted" then there is an effect of Imagery training on the goalkeeper's reaction time. Next, the significance value of Agility training is  $0.018 < 0.05$ , which means "Ha is accepted", then there is an effect of agility training on the goalkeeper's reaction time.

Based on the results of the main effect above and shows the influence of the interaction between factors or treatment of imagery training and agility then tested the simple effect with the LSD difference test statistic in table 3.

**Table 4.** Simple Effect Calculation Results with LSD Difference Test Statistics

Group	Average Difference	Sig	Sig	Conclusion
A1B1-A1B2	39.59 26.77	0.016	0.05	There is a significant influence
A2B1-A2B2	28.94 19.42	0.395	0.05	No significant effect



**Fig. 1.** Result Chart A1B1 - A1B2

The difference shows that in imagery exercises using audiovisual, high agility is obtained on average is  $X = 39.59$  while imagery exercises using audiovisual, low agility obtained the average is  $X = 26.77$ . Where from the results of significance  $0.016 < 0.05$  so it can be concluded that there is a significant difference between imagery training using audiovisual, high agility and imagery training using audiovisual, low agility (fig. 1).

Imagery practice using visual, high agility the average obtained is  $X = 28.94$  while the imagery exercise using visual, low agility is obtained on average is  $X = 19.42$ . Where from the results of significance  $0.395 > 0.05$  so it can be concluded that there is no significant difference between imagery

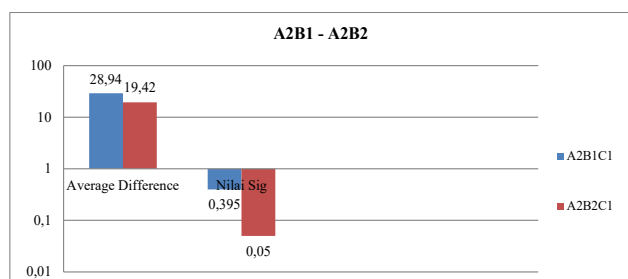


Fig. 2. Result Chart A2B1 – A2B2

training using visuals, high agility and imagery training using visuals, low agility (fig. 2).

## Discussion

This study aims to prove the effect of imagery training and agility training on the reaction ability of goalkeepers in futsal, so that they can be used as training activities to increase the reaction time of goalkeepers. The results of the 2x2 factorial ANOVA test show that imagery and agility training on the goalkeeper's reaction time  $t$  count is greater than  $t$  table. In addition, the results of the significance test show that the effect is significant. Based on these results, it can be concluded that imagery and agility exercises have a significant effect on the reaction time of goalkeepers in futsal. Relevant research in basketball games proves that imagery training with a low concentration level and a high concentration level has an effect on students' lay-up abilities (Akbar, Priambodo, & Jannah, 2019), and is able to increase players' reaction time (Hariyanto, Prakosa, & Sholikhah, 2021).

Recent research has shown that by doing imagery exercises for eight weeks using video, it can significantly increase the total RMST time of soccer players, reactive agility time, passing time, and passing accuracy (Majlesi, 2021). Imagery exercise combined with physical exercise turned out to give more effective results than physical exercise alone, these results indicate a difference in the effect given (Simonsmeier, Andronie, Buecker, & Frank, 2021). This statement is also reinforced by several previous studies that suggest doing imagery exercises because they are considered effective for improving psychological skills (Cumming & Williams, 2013; Guillot & Collet, 2008). Another study was conducted on futsal goalkeepers that the speed of reaction time can be increased by using the 8-point star drill method (Fadi & Sutresna, 2019). In addition, understanding the application of providing training stimuli is also very important to improve athlete performance (Hammami et al., 2018; Lloyd et al., 2013; McNarry & Jones, 2014). Research conducted by (Frank, Bekemeier, & Menze-Sonneck, 2021) using imagery exercises during breaks between exercises turned out to provide a positive increase in the ability of higher motor skills.

Subsequent studies where doing agility exercises has an effect on foot coordination ability (Sumarsono, 2019; Sumarsono & Ramadana, 2019), dribbling results (Irfan & Umansyah, 2019; Nasuki, Kharisma, & Effendy, 2021), and has an influence on kick skills sickle using agility leader and cone drill (Dwi Lestoyono, 2020). It turns out that agility

training also increases agility in the game (Anjasmara, 2021; Haryono, Amiq, & Fitriady, 2021; Wihantono, Pradipta, & Widiyatmoko, 2020). The better the athlete's agility level, the easier it is for athletes to make difficult movements, avoid injury when practicing or competing, and easy to move in various directions and quickly in anticipating the ball from the opponent (Darojat & Hariadi, 2019). The results presented by (Büchel, Gokeler, Heuvelmans, & Baumeister, 2022) show that agility performance is closely related to cognitive demands. Therefore, with the ever-increasing demands of the game, researchers are looking for ways and means, which at some level will have an impact on these motor skills as well (Obetko, Peracek, Miculic, & Babica, 2020).

Mańkowska, Poliszczuk, Poliszczuk, and John (2015) say the ability to perceive in basketball games affects the ability to anticipate. A study proves that the reaction of futsal goalkeepers is influenced by bouncing tennis balls against the wall (Herlambang, Rahmat, Suharto, Aprillyaningrum, & Sari, 2021), with the reaction training method, this will provide an effective increase in goalkeeper performance in a match (Hidayat, Permadi, & Hermawan, 2022). The results of this study provide evidence that the reaction of the goalkeeper is needed to improve the quality of the game. So this result also illustrates the importance of doing the right exercises so that the goalkeeper's reaction increases. In addition, by doing exercise through sports activities it makes a positive contribution to physical, emotional, and psychological well-being (Hughes et al., 2020), and can also improve health (Meo et al., 2021).

## Conclusion

The results of the research above have a strong foundation regarding imagery and ability training on goalkeeper reactions, on the basis of references from previous studies that have been carried out which are listed in the discussion of results and discussion. Therefore, it can be concluded that imagery and agility exercises have a significant effect on the reaction time of goalkeepers in futsal. The results also prove that there is a significant difference between imagery training using audiovisual, high agility and imagery training using audiovisual, low agility. While there is no significant difference between imagery training using visuals, high agility and imagery training using visuals, low agility. The weakness in this study is only limited to the effect of two levels of imagery training methods, two levels of agility training, as a follow-up to this research it is advisable to examine various variables and other attribute variables that affect the reaction ability of futsal goalkeepers.

## Conflict of interest

There is no conflicts of interest to declare.

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## ТРЕНУВАННЯ УЯВИ ТА СПРИТНОСТІ: ЯК ВОНИ ВПЛИВАЮТЬ НА ЗДАТНІСТЬ РЕАГУВАТИ ФУТЗАЛЬНИХ ВОРОТАРІВ?

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Авторський вклад: А – дизайн дослідження; В – збір даних; С – статаналіз; D – підготовка рукопису; E – збір коштів

Реферат. Стаття: 8 с., 4 табл., 2 рис., 78 джерел.

**Мета дослідження.** Воротарі у футзалі потребують швидких рухів, щоб передбачити м'яч, який прямує до воріт. Тому реакція воротаря дуже необхідна для підвищення якості гри.

**Матеріали та методи.** Це експериментальне дослідження, проведене за факторним планом із використанням кількісного підходу. У цьому дослідженні дослідники використовують режим застосування вправ на розвиток уяви, аудіовізуальних і візуальних методів, з вимірюванням рівня здатності та спритності кожної вибірки в груповому експерименті. Тип інструменту, який використовували для вимірювання здатності швидкості реакції воротаря в цьому дослідженні, це тест реакції всього тіла. Популяцію в цьому дослідженні склали учні середньої школи, які грали футзальними воротарями по всьому місту Метро; кількість учасників становила 90 учнів із 9 середніх шкіл по всьому місту Метро. Використовували метод цілеспрямованої вибірки, щоб отримати вибірку з 24 учнів.

**Результати.** Результати дослідження доводять, що величина значущості тренування уяви становить  $0,001 < 0,05$ , що означає «Альтернативну гіпотезу прийнято», тобто існує вплив тренувань уяви на час реакції воротаря. Далі значення значущості тренування спритності становить  $0,018 < 0,05$ , що означає «Альтернативну гіпотезу прийнято», тобто є вплив тренування спритності на час реакції воротаря. Існує статистично значуща різниця між тренуванням уяви з використанням аудіовізуальних засобів, високою гнучкістю, та тренуванням уяви з використанням аудіовізуальних засобів, низькою гнучкістю, із показником значущості 0,016. При цьому немає статистично значущої різниці між вправами на розвиток уяви з використанням візуальних засобів, висока спритність, і вправами на розвиток уяви з використанням візуальних засобів, низька спритність, із показником значущості 0,395.

**Висновки.** На підставі одержаних результатів можна зробити висновок, що вправи на розвиток уяви та спритності мають значний вплив на час реакції воротарів у футзалі.

**Ключові слова:** тренування уяви, тренування спритності, реакція воротаря, футзал, спорт.

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