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Multimodel Cognitive Training to Improve Athletes' Decision-Making Ability in Open-Skill Sports

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Abstract

Decision-making is one of the basic skills needed by athletes to determine actions in a situation. Especially in the open-skill category of sports, where a player must be able to determine the action to be taken quickly and precisely, accompanied by unpredictable environmental conditions. This study aims to determine the effect of multimodel cognitive training on the decision-making of athletes in the open-skill category of sports. The method used in this study is an experimental method with a pretest-posttest control group design. The sample used in this study was 28 athletes in open-skill sports. Sampling was done by random selection, then divided into two groups, namely the experimental group with multimodel cognitive training and the control group with physical activity games. In measuring the level of decision-making athletes use the research instrument The Decision Style Questionnaire at the time of pre-test and post-test. Multimodel cognitive training and physical activity games have a significant effect on improving the decision-making of athletes in the open-skill category. However, Multimodel cognitive training shows better results in improving the decision-making of athletes in open-skill sports. This study concludes that multi-model cognitive training and physical activity games can improve the decision-making of athletes in the open-skill category, but multi-model cognitive training has a more significant effect.

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INTRODUCTION

Decision-making is one of the basic skills needed by athletes to decide on actions in a game. Kaya (2014) explains that decision-making is a fundamental element in every sport. Decision-making is the entire process of athletes preparing information, processing information, and taking action in sports situations (Yu & Li, 2020). Often athletes face challenges that cause difficulty in making decisions, for example in basketball when in high-pressure situations, athletes often make mistakes in making decisions that lead to turnover (players who make mistakes, either losing the ball or passing wrong). Previous studies have explained that when a person is unable to reduce negative thoughts triggered by a lack of control, it will result in difficulty in processing important information for making decisions (Kinrade et al., 2015).

Decision-making is an important aspect of sports performance, especially in open, fast, dynamic sports such as volleyball, soccer, rugby, and basketball (Kaya, 2014). A player must read the game and decide on a fast and appropriate action in an unpredictable dynamic environment as well as an ever-changing situation with complex time constraints (van Maarseveen et al., 2018), and decide to take an action to achieve certain goals (Sakselin, 2018). 2020). The sport in question is an open-skill sport or an open-skill category which is defined as a sport in which players are required to react to dynamic, unpredictable changes and an external environment (e.g. basketball, volleyball, tennis, etc.) (Wang et al. al., 2013). In the open-skill category, sports can develop several cognitive functions, especially visual attention, decision-making, or action execution (Pacesová et al., 2020).

Based on observations, the authors see that it is rare for open-skilled sports teams to carry out special psychological training programs to train athletes' mentality, especially to train this decision-making. As the author has noticed, several sports teams in the open-skill category only apply conventional (general/traditional) psychological training in the form of motivational words and match tests. Even though psychology is very important for athletes because it is included in the determining component of achieving an achievement, there have been many studies that show how important the role of psychology is to improve an athlete's ability to face a match (Effendi, 2016). With psychological training, athletes can improve cognitive function in sports performance, one of which is decision-making, of course, this is very necessary for athletes in the open-skill category of sports requiring coordination of complex body movements and adaptation to changing task demands (Pacesová et al., 2020). In training the psychology of athletes to be responsible for decision-making, the coach must encourage athletes to make decisions by evaluating options and being allowed to make mistakes, then checking for these mistakes so they don't happen in the next game (Kaya, 2014).

Psychological training to improve cognitive function, one of which is decision-making, is very important for athletes in the open-skill category. Therefore, it is necessary to have a special program to improve mental skills in decision-making. In this study, psychological training to improve decision-making uses Multimodel Cognitive Training. Based on a study conducted by (Bamidis et al., 2014) explains that the Multimodel Cognitive Training exercise is very useful for improving the psychological abilities of athletes because research has shown hope in changing cognition positively when complementing cognitive training with physical exercise.

Multimodel Cognitive Training is a multimodel approach or several models (more than one) to train the brain (Ward et al., 2017), which based on research has proven that multimodel influences improve decision-making (Zwilling, 2019). Lutz developed a multimodel training, namely Life Kinetik that combines coordinating, cognitive, and visual tasks through physical exercise so that participants are cognitively challenged at the same time (Demirakca et al., 2016). Multimodel Cognitive Training is a combination of three training, namely activity training, cognitive challenge training, and visual perception training (Komarudin & Awwaludin, 2019). Using Multimodel Cognitive Training with Life Kinetik is a modern technical action training program based on locomotive habit formation paired with high nervous system activity – especially athlete intelligence (Duda, 2015). Athletes who have high intelligence will more easily and quickly find solutions to problems that occur in training and competitions than athletes who have low intelligence levels (Effendi, 2016). Therefore, Multimodel Cognitive Training through Life Kinetik is one of the training methods to improve the cognitive function of athletes in the open-skill category.

Multimodel Cognitive Training can improve the cognitive function of athletes (Komarudin, 2019), many previous studies have proven this, for example, Life Kinetik can improve the physical condition of soccer athletes (Komarudin & Awwaludin, 2019), increase the effectiveness

of players' motor and mental disposition. For players who can help increase effectiveness when athletes exercise (Duda, 2015), Life Kinetik also increases the concentration of soccer athletes (Mulyadi et al., 2021). While traditional or conventional practice training is often criticized for ignoring the active role of performance in shaping movement behavior and decision-making, as well as the limited scope for action variability in athletes (Davids et al., 2013). In addition, multimodel training may be more effective than unimodal training (Kraft, 2012).

METHODS

The research method used is an experimental method with pretest and posttest control group design research (Fraenkel et al., 2012). In this study, the independent variable is multimodel cognitive training, while the dependent variable is decision-making. The sample in this study was 28 athletes in open-skill sports taken using a random sampling technique from the population. The sample was then divided into two groups using a random assignment technique, namely the experimental group and the control group. The treatment given to the experimental group was in the form of 16 sessions of multimodel cognitive training (Bompa & Buzzichelli, 2019), three times a week with an intensity of 40-60% (Komarudin, 2018). While the control group was given treatment in the form of physical activity games. The Decision Styles Questionnaire (DSQ) (Leykin & Derubeis, 2010) which contains 43 items using a Likert scale is used as a research instrument that is given twice to the sample at the beginning and end. The data obtained were then processed and analyzed using SPSS version 24 (Santoso, 2017).

RESULTS AND DISCUSSION

After processing and analyzing the data, the results are presented in **Table 1**.

Table 1. Data Description

Group	Pretest (n=14)	Posttest (n=14)
Experiment	147,2 ± 3,82	172,6 ± 3,6
Control	145,2 ± 4,7	159,6 ± 4,7

Hasil perhitungan pada **Table 1** menunjukkan bahwa rata-rata decision-making pada atlet cabang olaharaga kategori open-skill sebelum diberikan perlakuan multimodel cognitive training adalah 147,2. Sedangkan metode latihan physical activity games dengan rata-rata sebesar 145,2. Kemudian setelah dilatih dengan menggunakan metode yang berbeda, hasil decision-making pada masing-masing metode menunjukkan adanya perubahan. Pada multimodel cognitive training nilai rata-rata berubah menjadi 172,6, sedangkan nilai rata-rata physical activity games yaitu 159,6. Berdasarkan hal tersebut, dapat dilihat bahwa rata-rata decision-making dengan menggunakan multimodel cognitive training memiliki nilai decision-making yang lebih baik dibandingkan dengan menggunakan latihan physical activity games. Selanjutkan uji normalitas dilakukan menggunakan Shapiro-Wilk Test, dapat dilihat pada **Table 2**.

Table 2. Normality Test

Group		Shapiro-Wilk		
		Statistic	df	Sig.
Pretest	Experiment	0,920	15	0,221
	Control	0,938	15	0,394
Posttest	Experiment	0,926	15	0,267
	Control	0,920	15	0,218

Based on **Table 2**, it can be seen that all data are normally distributed because they have a significant value (sig) greater than 0.05 (5%). Furthermore, the homogeneity test was carried out, it can be seen in **Table 3**.

Table 3. Homogeneity Test

Group	Lavene Statistic	Sig.
Experiment	0,118	0,733
Control	0,345	0,562

Based on**Table 3**, it can be seen that all data can be declared homogeneous because they have a significant value (sig) greater than 0.05 (5%). After that, hypothesis testing was carried out using paired sample t-test, which can be seen in **Table 4**.

Table 4. Hypothesis Testing

Group	t	Sig.	Conclusion
Experiment	112,7	0,000	H0 rejected
Control	72,112	0,000	H0 rejected

Based on **Table 4**, it can be seen that the experimental group has a Sig value. of 0.000, which means H0 is rejected. It can be concluded that multimodel cognitive training has a significant effect on increasing the decision-making ability of athletes in open-skill sports. The control

group has a value of Sig. of 0.000, which means H0 is rejected. It can also be concluded that physical activity games have a significant effect on increasing the decision-making abilities of athletes in open-skill sports. However, the results of the different test showed a value of Sig. of 0.000, which means that it can be concluded that multimodel cognitive training and physical activity games have a significant difference in the effect of increasing the decision-making ability of athletes in open-skill sports.

Based on the findings of the processing and analysis of data that has been obtained from the initial and final tests, the psychological condition and cognitive abilities of athletes in the open-skill category, especially in decision-making, can be improved. In this study, the results show that Multimodel Cognitive Training and Physical Activity Games have an impact on increasing decision-making. However, Multimodel Cognitive Training has a higher level than Physical Activity Games. This has been proven according to data processing, that the decision-making of athletes in the open-skill category increased after doing Multimodel Cognitive Training through Life Kinetik with a percentage of 14.64% while using Physical Activity Games increased by a percentage of 9%.

Based on the results of the data processing above, it shows that there is an effect of Multimodel Cognitive Training on improving the Decision-Making of athletes in the open-skill category of sports. A Multimodel Cognitive Training intervention that combines coordinative, cognitive, and visual tasks through physical exercise (Demirakca et al., 2016), and includes fitness training, cognitive training, and mindfulness meditation, significantly improves belief value assessments and has a beneficial effect on decision-making competence (Christopher E. Zwilling, 2019), attention focus, self-confidence, motivation, energy management, anger management, productive thinking, and athlete performance (Tenenbaum & Eklund, 2007), executive function, working memory, and planning and problem-solving (Ward et al., 2017), and can improve coordination ability and cognitive function (Sentani et al., 2019). Cognitive functions such as attention, spatial ability, memory, and executive function (Komarudin, 2019).

This is because of the involvement of executive function mechanisms in cognitive control, namely the frontal lobe (Christopher E. Zwilling, 2019). The frontal lobe is thought to play a major role in executive function, this is a brain region that functions in problem-solving, planning and organizing behavior and ideas, abstraction, judgment, mental flexibility, decision-making, working memory, and self-monitoring (Stuss & Knight, 2013). According to previous studies, several studies suggest that the presence of psychological interventions can lead to psychological parameters, such as discipline towards rehabilitation or recovery, and biological (eg, circulation) that contribute to therapeutic outcomes (the presence of therapy) (Tenenbaum & Eklund, 2007). In addition, according to Komarudin (2019), this training can provide fuel to the brain in the form of oxygen, can trigger the release of neurotrophic (vitamins for nervous system health), and stimulate the growth of new cells in the brain so that it is positively correlated with memory.

According to Duda (2015) Multimodel Cognitive Training through Life Kinetik also forms mental capacities that encourage the formation of special abilities to act, so that a person can accelerate the process of learning the game. In addition, Multimodel Cognitive Training through Life Kinetik significantly simplifies the process of educating players, to achieve increased decision-making efficiency. With Multimodel Cognitive Training through Life Kinetik, it provides a stimulus or stimulus to the brain's performance system (Iqbal & Tafaqur, 2020), and results in the formation of two neurons in the nervous system in the motor cortex and cerebellum which are useful for athletes in improving cognitive function so that athletes are required to move, change directions quickly and efficiently, trying to react quickly to the tasks that must be done (Komarudin & Awwaludin, 2019).

This is closely related to athletes in open-skill sports such as basketball and volleyball where athletes are required to react in an environment that is dynamically changing, unpredictable, and completely external, in these sports can develop some cognitive functions, especially visual attention, decision-making or action execution (Pacesová et al., 2020). This open-skills category of sports involves the performance of a combination of many skills simultaneously (Bonk & Tamminen, 2021), which can be seen as a combination of physical training and cognitive training. This sport requires athletes to invest higher cognitive efforts in unpredictable environments (Guo et al., 2016). Therefore, Multimodel Cognitive Training in the form of Life Kinetik exercises that combines coordinating, cognitive and visual tasks carried out by physical exercise, there is an influence increasing decision-making or decision-making for athletes in open-skill sports, because with in-

creasing cognitive function abilities athletes can support the athlete's performance when playing. Especially for athletes in the open-skill category who need higher cognitive efforts.

Multimodel Cognitive Training allows it to be more effective than unimodal learning (such as imagery, self-talk, and brain visualization exercises) (Kraft, 2012). Recently, several attempts at multimodel training by supplementing cognitive training with physical exercise have shown positive changes, as in previous research it has been found that the group receiving multimodel training outperformed other unimodal training (Ward et al., 2017), because Multimodel Cognitive Training through Life Kinetik can change the strength of connectivity between several brain regions (Demirakca et al., 2016). It is explained that increased connectivity of the motor region is considered the most likely, particularly the connection of the right motor and premotor cortex which is responsible for the left side of the body. According to Kraft (2012), multimodel exercise stimulates important metabolic changes that directly affect cognition and also enhances neurophysiological mechanisms that can be used by cognitive training, namely structural and functional plasticity in which the brain reorganizes in the form of new interconnections in the nervous system. This Multimodel Cognitive Training involves many motor activities and all athletes predominantly use their right hand, so they are forced to coordinate their left hand, arm, and leg (Demirakca et al., 2016).

Therefore, Multimodel Cognitive Training can influence the decision-making of athletes in the open-skill category and is better cognitive training than unimodal training. As experts have said, this training can stimulate the growth of new cells in the brain so that it is positively correlated with memory, resulting in the formation of two neurons of the nervous system in the motor cortex and the cerebellum, other brain regions such as the frontal lobe. In addition, it also improves the neurophysiological mechanisms that can be used by cognitive training, namely structural and functional plasticity. So that athletes can practice their control and actions to make decisions, especially for athletes in the open-skill category with dynamic, unpredictable game situations, and external circumstances.

CONCLUSION

This study concludes that the multimodel cognitive training and physical activity games given in this study have a significant effect on improving the decision-making abilities of athletes in open-skill sports. However, these two treatments have a significant difference in effect, where multimodel cognitive training has a greater influence on improving the decision-making ability of athletes in open-skill sports. Multimodel cognitive training is a relatively new training model in Indonesia, but it turns out to provide useful results for athletes. Therefore, it is highly recommended to apply this training model in the training periodization that is prepared.

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