Int J Sport Stud Health. 2022 April; 5(1):e128414. https://doi.org/10.5812/intjssh-128414.
Published online 2022 June 25.

Review Article

Improving Agility Performance Among Athletes by Jami Agility Table (JAT)

Saeed Jami[1] and Khadijeh Irandoust [2,*]
[1]Alton Snooker Academy, Mashhad, Iran
[2]Imam Khomeini International University, Qazvin, Iran

[*]*Corresponding author*: Imam Khomeini International University, Qazvin, Iran. Email: parirandoust@gmail.com

Received 2022 May 13; **Revised** 2022 June 01; **Accepted** 2022 June 02.

Abstract

Context: A model of agility ladder tool was designed in the current study to increase cognitive-motor performance in athletes with more advantages over conventional agility ladders.
Objectives: The aim of this study was to develop agility tool for athletes using Jami agility table (JAT) which has been the latest training model by creating mental challenge and recruiting muscle movement units for agile performance of sports skills.
Methods: In this descriptive-analytical study, a systematic review of agility development methods were presented to improve psychomotor performance in athletes and then the JAT agility table model was introduced. Based on the JAT, a special code is designed in order to develop agility both physically and mentally aspects, and athlete is always engaged with new algorithms of movement.
Results: One of the exclusive functions of JAT, is to increase contextual interference in the performance of motor skills which increases reaction time (RT) in athletes significantly. Laterality detection and empowering non-dominant hemisphere is one of the applications of the JAT, which ultimately increases the comprehensive development of the central nervous system (CNS).
Conclusions: The most important aspect of JAT is based on increasing contextual interference and random learning in learners and athletes. Additionally, neuromuscular coordination is one of JAT functions which would improve agility performance in athletes. JAT mechanism has been designed based on Movement algorithm models. In such a training model, which imposes a better cognitive function on the learner and athlete to create better motor memory, the process of constant algorithms is converted into variable and instantaneous algorithms, resulting in more reliable motor outputs.

Keywords: Jat Agility Table, Contextual Interference, Movement Algorithm, Neuromuscular Coordination

1. Context

With technology advancement, Sport science has also been scientifically developed. The executive structures of sports skills require the implementation of complex movement scenarios that are implemented in different sports (1). Motor components of sport skills along with psychomotor performance lead to success in motor performances. Factors such as anthropometric, speed, strength, endurance, coordination and agility performance are key variables in effective athletic performance as physical fitness index. Skill-related physical fitness consists of six parts: agility, balance, coordination, strength, speed, and reaction time (2). These are capabilities which improve athletic performance. Given that the ability of changing direction during sporting performance plays a key role in their failure or success. Generally, in all sports, there is a need to change the speed and direction in all parts of the body, which leads to either increase and decrease in acceleration by which athlete must be able to control and stabilize the body (3).

In other words, controlled changing of direction is very important in response to a particular situation in the game, Furthermore, the ability to change direction quickly is so important than high speed in a straight line; Therefore, for many athletes, agility is an important ability. Agility can be divided into two major parts: The first part is quick changing of direction and the second part includes perceptual factors including quick and correct decision-making power that are related to coordination and neurophysiological factors. In fact, many coaches and athletes seek to find effective methods and pathways in the comprehensive development of agility and speed (3).

Given the importance of agility and its role in the success of athletes, training tools and strategies in improving the agility process are very important and considerable. Based on research evidence, the agility ladder is one of the most effective tools for developing agility, which has provided a more useful training strategy even than plyometric exercises. It can be used to perform agility exercises (4). These movements increase the heart rate and improve balance and coordination, and can improve athletic speed and performance (5). Agility ladder exercises are often part of certain types of fitness exercises which provides athletes with great benefits. Agility ladder exercises are used for all athletes (especially, soccer, sprint, tennis, basketball, football and martial arts) who need strong legs, fast reaction time and coordination. The military also uses agility training and agility ladders to increase proper combat performance and fitness. Successful performance of sports skills requires several complex dynamic movements. To perform agility movement with agility ladder, the athlete usually performs and memorizes the training algorithm by the coach, and then implements the training instructions simply by recalling information from memory. For example, a pair-leg jump or single-leg jump from ladder is performed with a pattern designed forward or backward. Despite the very high value of this tool in agility development, athlete's mental challenge is significantly less than physical challenge imposed (6). Although memorizing movement patterns of exercises engages the muscles to change direction and speed, the need for decision-making power and high speed of correct perception is highly required in some sports (7). It should be noted that his goal is not fully achieved in such a model of ladder exercises. For example, in football, performing ball skills (such as passing, dribbling, heading) and non-ball skills (such as changing direction, acceleration, deceleration, jumping) is performed frequently in response to unpredictable environmental conditions. The effectiveness of such dynamic skills requires complex sensory-motor coordination, which ultimately ensures the success of athletic performance (8). Therefore, designing an effective agility tool the same as noted JAT with a new shape and unpredictable algorithms can create a new method in developing the perceptual and kinetic dimensions of agility.

The authors believe that by JAT tool would provide a significant improvement in agility performance of athlete.

2. Methods

In this section, firstly, agility ladder tool (ALT) is compare with JAT. In ALT, athlete is asked to choose the executive pattern for working on the agility ladder. Then, the athlete tries to memorize a picture of the algorithm. For example, he should remember to make a jump to the left of the ladder first, then jump to the right and then into the first square of ladder. In the third stage, the athlete tries to retrieve information from memory and execute it according to the instructions of the algorithm. In this ladder, it is clear that the algorithm are amid at improving neuromuscular coordination. To better explain the subject, we selected and analyzed the In-Out Drill algorithm on a case-by-case basis, as shown in Figure 1.

In this exercise, athlete must jump into the agility ladder with paired-legs as the first step and then keeps on

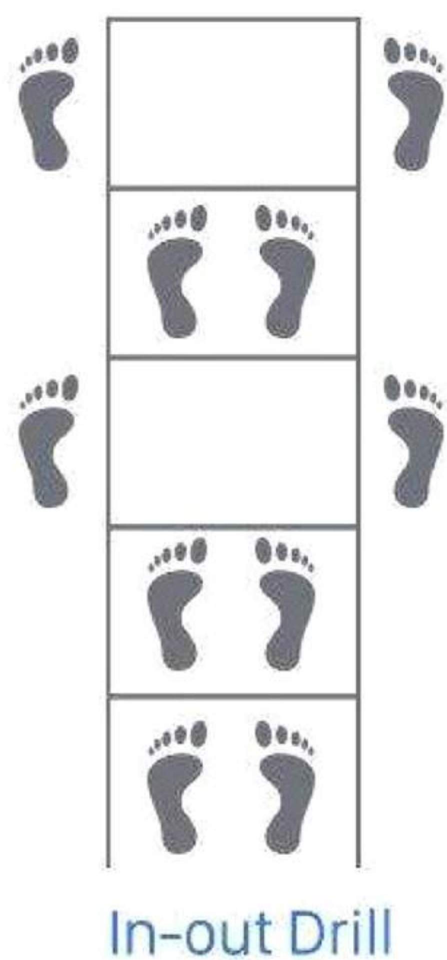

Figure 1. Drill in-out algorithm in agility ladder

for the second square. But for third square, athlete should open the pair-legs and puts them outside the square. Also, the fourth square, like the first and second ones, athlete must jump through it with pair-legs and this exercise is formed and repeated in the athlete's memory. It should be noted that these exercises focus on the body's muscular fibers and contractions, and involve most of the muscles that extend and close (open and contract) the thigh.

One of the important functions of exercise is to facilitate neuromuscular coordination, in addition to increasing strength and speed in muscles which can lead to improved agility in athletes (9). JAT model has been designed based on movement algorithms which ultimately increases Athletic performance and also shorten the time for achieved championship (unpublished authors' data on snooker champions). In JAT model, a table with the shape of a telephone dialer was designed by which the fixed algorithm are converted into variable and instantaneous algorithms.

In this process, the normal shape of cell phones or cell mobiles was used so that the shape of the table itself does not confuse the athlete and can be used easily. Individuals usually remember the shape of phone numbers and this causes them to have a picture in memory without remembering the houses. It would increase RT, as well as acquiring the physical and perceptual dimensions of the agility. The JAT platform is designed in two forms: simple (non-digital) and digital. One sample of JAT is shown in Figure 2.

There are even movements for the chest, back and arms in JAT model; therefore, all organs of the body remain motionless during the protocol. Based on the research related to motor skills and brain imaging, it has been shown that each section has effect on muscle stimulation (10, 11). By announcing three-digit or four-digit codes, the coach forces the athlete to execute a movement algorithm. In addition to physical fitness and agility skills, it helps to raise the level of brain functioning and muscle skills.

The execution method is such that the information processing and analysis is boycotted by giving instructions to the instructor and the learner or athlete performs the desired skill using brain and training codes. This allows the person to acquire sports skills that are influenced by the activity of the cerebral cortex and to strengthen their creativity and ideation. For example, code 127 is issued to strengthen the right hemisphere, which is the area associated with ideation in the brain. The instructor uses the audio part to pronounce this code immediately (in a simple model) and announces it to the athlete. Upon hearing this code, the athlete moves quickly from the zero square and by jumping to square1, 2 and then to 7 by touching with feet, returns to square zero and waits for another code from coach. In the digital model, the codes are announced by the software through headphones or a monitor screen based on the specific algorithm of each specific sport (audio-visual).

3. Discussion

The aim of this article was to introduce JAT with its creative movement algorithms in order to improve the athletic performance. One reason for conducting such a study was to design a model to increase the capacity of cognitive-motor functions in the brain, which creates the ability to perform sports skills more effectively. Improving individual level of performance in various sports requires a variety of exercises. In addition, each sport has its own skills, all of which require practice and experience to reach their peak. Physical activity is one of the basic principles necessary for the development of many physical, physiological, motor and psychological processes in athletes. For this reason, sports scientists are looking for innovative ways to provide effective training and educational methods.

One of the most important factors in the learning and performance process is to plan practice sessions with emphasis on the variability of practice due to the diverse needs of learners (9). We believe that JAT creates this important. The action mechanism of this method is the application of contextual interference in the performance, acquisition and retention of sports skills (7). Theories of motor learning declare that more variability in training protocols would lead to the development of skill with provided generalizability. Among the theories that emphasize the effectiveness of exercise variability are Schmidt (1975), Gentle and Nemetz (1978), and Newell and McDonald (1992) Dynamic Systems Theory (12-14)

It should be noted that appropriate exercises are differed in terms of age, gender and body health. In general, regarding the optimal ages in the classification of exercises, it can be said that up to the age of 12 - 13 years, rudimentary exercises are highly recommended while specific-related skills are needed for age 14 to 18 years old. JAT model has the ability to define motion algorithms for movement development at all defined levels. The contextual interference induced by JAT model can not only affect physical factors, but also enhance learning and affecting skills which are a key indicator of health (9). In this regard, it can be stated that interference programs have the potential to be implemented in order to develop both learning and skill capacities. For example, according to the existing research literature, speed and agility are among the abilities that are directly related to mental

Figure 2. JAT model to increase spatial awareness, retention and automation in motor skills performance

readiness and attention capacity. They can be developed with Jami agility table and its motion algorithm patterns.

The issue that highlights the importance of designing this model is that the main function of the JAT model is based on increasing contextual interference in learners and athletes.

In a study, the effect of different interactions in educational programs on speed and agility performance among students were investigated. The results indicated a significant difference in agility and speed scores and it was also found that the random group (variable exercises) improved their performance in both speed and agility compared to the constant group. One of the unique functions of this tool is to increase the contextual interference in the performance of motor skills, which in a way increases the ability of athletes to react quickly. In this regard, it is very important for athletes to increase their ability and skills in less time with smart training. It is obvious that with the help of science and technology, we can even shorten the championship time and get better results for success with smart efforts instead of trying hard. By eliminating duplicate and fixed algorithms, JAT model leads to boost memory status. As a result, the athlete focus more on diverse senses (auditory, visual, proprioceptive senses) to face with stimuli. We also enhanced other input senses, such as the sense of touch, in the process of recognizing and receiving signals from the environment to be a good stimulus to initiate a motor response. This phenomenon will occur in a way that the algorithm is imposed on the mind by the input gates of the body such as the senses (15). So we can say that an algorithm model will be designed every second and it will not be duplicated. Research evidence shows that stimulation of the brain in different areas, depending on the type of auditory, visual or other senses, increases brain activity at specific points that stimulate central nervous system (CNS), which ultimately cause muscle contraction. Therefore, with the correct use of this tool (Jami agility table; JAT) by professional trainers, in addition to strengthening physical functioning, we can achieve the mental empowerment of people and even patients with mental-cognitive problems. It should be noted that the simple and digital model of JAT has been prepared with the specific software for various sports, as well as the algorithm related to the increase of mental abilities, which is being used in separate parallel studies.

Acknowledgments

The authors hereby thanks Dr. Jamshid Razmyar for proofreading and editing the article. Special thanks to Dr. Taheri, the head of the Research Institute for Future Studies at Imam Khomeini International University for providing the conditions for the registration of intellectual property.

Footnotes

Authors' Contribution: Inventor of the table: S. J.; Study concept and design: Kh.I and S. J.; Drafting of the manuscript: Kh.I; Critical revision of the manuscript for important intellectual content: Kh.I., and S. J.

Conflict of Interests: There is no conflict of interests.

Ethical Approval: The study was approved by the Ethics Committee of Imam Khomeini International University and was carried out in accordance with the Declaration of Helsinki.

Funding/Support: There was no funding/support.

References

1. Glazier PS. Towards a Grand Unified Theory of sports performance. *Hum Mov Sci*. 2017;**56**(Pt A):139–56. [PubMed ID: 26725372]. https://doi.org/10.1016/j.humov.2015.08.001.
2. Zou L. Relationship between functional movement screening and skill-related fitness in college students. *Age*. 2016;**20**:2–62016.
3. Afonso J, da Costa IT, Camoes M, Silva A, Lima RF, Milheiro A, et al. The Effects of Agility Ladders on Performance: A Systematic Review. *Int J Sports Med*. 2020;**41**(11):720–8. [PubMed ID: 32396965]. https://doi.org/10.1055/a-1157-9078.
4. Dawes J. *Developing agility and quickness*. Human Kinetics Publishers; 2019.
5. Sampaio JE, Lago C, Goncalves B, Macas VM, Leite N. Effects of pacing, status and unbalance in time motion variables, heart rate and tactical behaviour when playing 5-a-side football small-sided games. *J Sci Med Sport*. 2014;**17**(2):229–33. [PubMed ID: 23683687]. https://doi.org/10.1016/j.jsams.2013.04.005.
6. Rauschenbach J, Balakshin A. Agility ladders. *Strategies*. 1997;**10**(5):5–7.
7. Schmidt RA, Wrisberg CA. *Motor learning and performance: A situation-based learning approach*. Human Kinetics; 2008.
8. Levac DE, Huber ME, Sternad D. Learning and transfer of complex motor skills in virtual reality: a perspective review. *J Neuroeng Rehabil*. 2019;**16**(1):1–15. [PubMed ID: 31627755]. [PubMed Central ID: PMC6798491]. https://doi.org/10.1186/s12984-019-0587-8.
9. Lee TD, Wulf G, Schmidt RA. Contextual interference in motor learning: Dissociated effects due to the nature of task variations. *Q J Exp Psychol*. 1992;**44**(4):627–44.
10. Calvo-Merino B, Glaser DE, Grezes J, Passingham RE, Haggard P. Action observation and acquired motor skills: an FMRI study with expert dancers. *Cereb Cortex*. 2005;**15**(8):1243–9. [PubMed ID: 15616133]. https://doi.org/10.1093/cercor/bhi007.
11. Fried I, Katz A, McCarthy G, Sass KJ, Williamson P, Spencer SS, et al. Functional organization of human supplementary motor cortex studied by electrical stimulation. *J Neurosci*. 1991;**11**(11):3656–66. [PubMed ID: 1941101]. [PubMed Central ID: PMC6575551].
12. Magill RA, Hall KG. A review of the contextual interference effect in motor skill acquisition. *Hum Mov Sci*. 1990;**9**(3-5):241–89. https://doi.org/10.1016/0167-9457(90)90005-X.
13. Newell KM, McDonald PV. Searching for solutions to the coordination function: Learning as exploratory behavior. *J Mot Behav*. 1992;**2**(517–532).
14. Gentle AM, Nemetz K. Repetition effects: A methodological issue in motor short-term memory. *J Mot Behav*. 1978;**10**(1):37–44. [PubMed ID: 15178521]. https://doi.org/10.1080/00222895.1978.10735133.
15. Müller M, Toorop W, Chung T, Jansen J, van Rijswijk-Deij R. The reality of algorithm agility: Studying the DNSSEC algorithm life-cycle. *Proceedings of the ACM Internet Measurement Conference*. Association for Computing Machinery; 2020. p. 295–308.