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The effect of the Montessori program using physical activity games in enhancing the sensory – motor perception abilities of kindergarten children aged 5 to 6 years

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Abstract

The research aims to propose an educational approach inspired by Montessori's method using motor games to develop sensory motor skills in children aged (5-6) years, and to identify the impact of using Montessori's method with motor games in developing some cognitive sensory motor skills for children. The experimental method was used with the matched group design. The sample represented children from the Braum Al-Amal Nursery in Basra, who were selected to take the Haywood test to measure cognitive sensory motor abilities. It was concluded that Montessori's method using motor games contributed to the development of sensory motor skills and helped in enhancing overall and partial visual perception for children. The child learned about parts of the body, distinguished between body sides, and helped in enhancing balance and spatial awareness. The method also aided in teaching the child how to determine location. It was recommended to benefit from the Montessori method in developing motor and cognitive abilities, and to introduce specific courses for preschool teachers in teaching the Montessori method.

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1- The research Introducing

1-1 Introduction and the importance of research

Physical education has recently knocked on the doors of modern technology, as researchers race to design programs using the latest educational theories to reach the educational process to the highest level. Therefore, the great progress and development in various educational fields has naturally led to progress and development in the educational field, and as a result, it has necessitated development in Learning methods, using modern technologies and learning about Latest What science has reached in the field of education to keep the educational process abreast of progress and development.

One of the first educators who was interested in improving the learning environment was Maria Montessori, who called, through her theory, for developing the child's own abilities. She believed that the child should be given the freedom to practice his activities naturally and to choose the work he wanted to do, according to his desires, abilities, and abilities. Yulah Believing that the child is capable of discovering the world around him by possessing functional energies that he can develop by practicing fun and entertaining activities using the senses in a safe environment without fear of punishment or greed for reward. Montessori believes that the child, the maker of the future, is able to develop a healthy, harmonious and harmonious world through his efforts. Therefore, its ideas were not limited to education at a certain age, but rather its interest expanded to include humans from birth until they reach adulthood.(Lamyaa et al., 2013)

It is considered one of the most important stages in a person's life. During childhood, the child's abilities grow, his talents are revealed, and the child learns to speak, read, and write, and adapts to the society in which he finds himself.(Othman et al., 2023).The World Federation for Child Education has emphasized the importance of the years immediately preceding school or that children spend in kindergarten in its various aspects (physical, mental, social, emotional and spiritual). It has stressed the importance of education in the pre-school stage and the programs of international quality that provide appropriate experiences for children Linguistically, culturally and physically.

In building its educational philosophy, Montessori relied on the goals of education in general, as education has two goals that it seeks to achieve, mainly **the biological goal** and its importance to the growth of individuals naturally and with a **social goal** that focuses on the individual's role in dealing with environmental data and benefiting from it and achieving the biological and Social goals must be given to educating the senses because the development of the senses generates mental works at an advanced level.

Its philosophy also encourages direct experience with little guidance from the educator, so it prepared numbers Parameters for children to be able to organize and prepare a rich environment that provides the necessary materials and tools that encourage discovery and contribute to reducing stress and increasing enjoyment and concentration for the child.(Jabbar et al., 2023) (Mohan et al., 2024)

The Montessori curriculum is characterized by many features that make it different from other curricula. It mixes between different ages to allow supportive learning through peers, the presence of specific work times that cannot be interrupted, and a supportive environment in which a complete set of Montessori learning tools is available, arranged in a specific way and appropriate for their ages and within their reach. The activities are based on the senses that will develop the child's cognitive abilities through direct experience during which the child applies situations that simulate the real world and through the previous features of the Montessori approach. It focused on the child and the senses as they form two sides of the learning triangle and the environment completes the third side, and this triangle summarizes the educational process. If her theory of learning is applied, a child will emerge with a high degree of self-confidence, respect, ability to achieve, persevere, self-reliance, focus, involvement in work, and calm without screaming from other parties, whether it is from the teacher or from the child themselves.(Khazal et al., 2024) (Khdhim & Aldewan, 2023) (Abd Ali Khdhim et al., 2023)

Hence the importance of research experimentation with teaching kindergarten children the Perceptual-kinesthetic abilities Montessori way.

1-2 Research issue

The research problem lies in the following question: Does the Montessori method have an effect in developing some sensory-motor cognitive abilities in children aged (5-6) years?

1-3 Research objectives

- Developing a Montessori educational curriculum using movement games to develop sensory-motor abilities for children by age(5-6) Years.

- Recognition EffectUsing the Montessori method using motor games to develop some sensory-motor abilities for children aged (5-6) years.

1-4 Research hypotheses

1- There are statistically significant differences between the pre- and post-test in the sensory-motor perception abilities of the two research groups, in favor of the post-test.

2- There are statistically significant differences between the post-tests in the sensory-motor perception abilities of the two research groups, in favor of the experimental group.

1-5 areas of research

1-5-1 Human field: Children of Baraem Al-Amal Kindergarten in Basra, aged 5-6 years, for the academic year 2022-2023 AD.

1-5-2 The temporal domain The period: from 11/14/2022 until 4/30/2023

1-5-3 Spatial field Baraem Al-Amal Kindergarten Square in Basra

3- Research methodology and field procedures

3-1 Research methodology

The Researchers used experimental approach using two equal groups (experimental group and control group)

3-2 Research communityAnd I appointed him

The research population was chosen from kindergarten children aged (5-6) years, for the academic year (2022-2023), and they numbered (30) children. The research sample numbered 20 children distributed into (10) experimental group children and (10) children. A control group, i.e. a percentage (67%), and they were randomly selected.Note thatThe sample is homogeneous because they are from the same age group.

Sample equality was conducted in the pre-tests of sensory-motor abilities, using a testt-test as shown in the table (1).

Schedule (1)

It shows the results of the equality of the experimental and control groups, the arithmetic means, the standard deviations, the differences of the means, and the valuet calculated and significance level

No	Variables	Control group		Experimental group		value(T) calculated	degree (Sig)	Statistical significance
		s	±A	s	±A			
1	stability the size of things	2.50	0.971	2.90	0.875	0.967	0.345	Not a sign
2	Total and partial visual perception	1.80	0.788	2.20	0.788	1.13	0.272	Not a sign
3	Identify body parts	4.20	0.918	4.90	1.100	1.54	0.140	Not a sign
4	Distinguishing between the right and left body parts	1.80	0.788	2.30	0.823	1.38	0.182	Not a sign
5	set location	1.50	0.707	1.90	0.875	1.12	0.276	Not a sign
6	Balance	1.60	0.699	1.90	0.737	0.93	0.363	Not a sign

Degree of freedom (n – 2) = 18 level of significance (0.05)

from table (1(Values appeared)The calculated T) is higher than the significance level (0.05), which indicates that there are no differences between the two research groups, and this indicates the equality of the sample and the possibility of starting the experiment from one starting line.

3-4 Tools, devices and means of collecting information

- Various pictures - a small table - a small chair for the child to sit on - a chair for the examiner to sit on - a stopwatch - a pencil - a small bell - a balance platform - Arab and foreign sources. - Personal interviews. - International information network.

3-5 Field research procedures

3-5-1 Tests used in research

Haywood test of children's perceptual and kinesthetic abilities (Debono Center for Teaching Thinking, 2017)

The modified (Haywood) test was chosenTo measure aPerceptual, sensory, and kinesthetic abilities.

Duration of application:20 minutes

Application method:The appropriate age is 5-7 years. It is necessary to know whether the child is right-handed or left-handed before starting the tests. It is necessary to give the child a general idea about the test., weeIt included (6) tests, which are:

1- Constancy of the size of objects

2- Total and partial visual perception

3- Identifying the parts of the body

4- Distinguishing between the right and left body parts

5- Balance

6- Determine the location

First test:Constancy of the size of objects.

Application method:Three cubes are placed on a large table. The distance between one cube and another is approximately 15 cm, and the distance between where the child sits and the first cube is approximately 108 cm. After completing the first four questions and recording the children's answers, we place the cubes as in questions (5, 6) and then ask the child. About arranging cubes.

The test has 6 marks

questions	Class	zero
1- What is the color of the cube (we put our hand on one of the cubes)		
2- What is the color of the cube closest to you?		

3- What is the color of the farthest cube?		
4- Are all cubes equal in scale?		
5- Place the blue cube higher up, then the yellow cube below the red one		
6- Place the cubes in the following order from top to bottom, yellow - blue - red		

Second test:Macro and micro perception.

Application method :We show any picture For children With the test, the child was then asked about two different pictures, and we recorded the child's answer, whether it was describing the picture, mentioning the name of the picture, or both.

***The test has 6 marks**

Image description	zero
Image name	
Class 1- 2	

The third test: sensory-motor perception (identifying body parts).

Application method: We direct to for children, the following questions We record the result

* The test has 12 scores each body part has a score

questions	Class	zero
1- Touch your nose		
2- Touch your pelvis (the seat) to the pelvis on which you are sitting		
3- Touch your wrist (each wrist a point)		
4- Touch your knee (each knee has a point)		
5- Touch your heel (on heel point)		
6- Touch your ears (each ear has a point)		
7- Touch the shoulders (each shoulder has a point)		

Fourth test:Sensory perception - motor (distinguishing between right and left body parts).

Application method:The child must know whether he is right-handed or left-handed, because the following actions are intended for a right-handed child, and unlike if he is left-handed, we ask the child for the following movements and then record the results.

* **The test has 5 marks**

questions	Class	zero
1- Touch your left ear		
2- Touch your left knee		
3- Pick up your pencil with your right hand		
4- Is the pen on the right or on the left (place the pen on the right)		
5- Touch the left part of your pelvis with your right hand		

the testFifth: PerceptionAuditory (locating).

Application method: At the start of the test YMuskthe teacherthe bellProvided he sees it Kids then He hides it Behind the backhoe we put the bell in the hands without the child knowing where it is, then place the hands under the table in front of the child and shake the bell, thenAskThe child asks about the location of the bell. Is the bell on the right or left hand? Repeat the exercise 5 times and then record your answerChild.

* **The test has 5 marks**

questions	Class	zero
1-		
2-		
3-		

Sixth test:Sensory-kinetic perception (moving balance).

Application method: We use a Swedish bench length (4.16) m and width (10) Its height is (12) cm. We ask the child to walk on the platform and record the number of steps the child takes on itMastaba.

Test from(2 degrees)

3- 6 The two exploratory experiments:to getReward for reliable resultsYanaTwo exploratory experiments on (5) children.

3-6-1 The first exploratory experiment:I ranExperienceOn (5 children) from the research community and outside the original sample, during the period from Monday, 11/21/2022, and the test was repeated on Monday, 11/28/2022.

3-6-2 The second exploratory experiment: It was conducted to determine the suitability of the educational units for the research sample

3-7 Scientific foundations of tests

3-7-1Scientific foundations of tests

To verify the validity and reliability of the testsWe roseWith what follows:

1- Validity of the test:To ensure the validity of the tests, use...NaSelf-honesty.

2- Test stability:AndThe reliability coefficient of the test was calculated using the test and repeat method. After completing the exploratory experiment, the test was repeated seven days later, on the same sample consisting of (5) Children, and useNaSimple correlation coefficient (Pearson) to see if there is a correlation between the tests, as the results showed a high correlation coefficient, as shown in Table (2).

Table (2)

It shows the coefficient of validity, reliability and objectivity of research tests

questions	Class	zero	questions	Class	zero
zero	**Size stability**	0.93	0.91	100%	statistical significance
zero	**Total and partial visual perception**	0.90	0.85	100%	statistical significance
zero	**Identify body parts**	0.91	0.88	100%	statistical significance
zero	**Distinguishing between the right and left body parts**	0.95	0.93	100%	statistical significance
zero	**Balance**	0.92	0.90	100%	statistical significance
zero	**set location**	0.91	0.86	100%	statistical significance
zero	**Total marks**	0.95	0.93	100	statistical significance

3-8 Pretests:has been donePre-measurement on the research sample on Thursday 12/1/2022OfTests are under investigation.

3-9Prepare stepsThe Montessori method curriculum and its implementation mechanism

Buds of Hope Kindergarten was chosen due to the approval of the kindergarten administration to aid in the implementation of tests and ease of access by the researchers. The control and experimental groups were randomly assigned. The reason for choosing the kindergarten children is due to the fact that the childIn thisThe basic and foundational stage in TamkeenHOf

knowledge and skills to discover knowledge of all kinds and employ it in life contexts, as it is considered the most important age stage in child development.And the numbers were doneThe Montessori educational curriculum using motor games to develop the perceptual and sensory-motor abilities of kindergarten children. The time period was five weeks from 12/4/2022 to 1/8/2023 to implement the program at a rate of (4) educational units per week, as the program included (20) educational units. . The time of each educational unit is (30) minutes, starting from half past nine to ten o'clock (according to the schedule set in the kindergarten).AndEach educational unit consists of three sections.The preparatory section, which is (5) minutes long, the main section, which is (20) minutes long, includes the educational activity, which is (10) minutes long, the applied activity, which is (10) minutes long, and the final section, which is (5) minutes long. The curriculum included a group of movement games ([1])wherestart parameterBy takingThe children's opinion of the game, that is, the game is chosen by the children after the teacher explains how to play. The researcher took into account the choice of motor games because they are popular with children and are characterized by diversity and change to help children develop cognitive abilities.

3-10 posttests: The post-test was conducted on the research sample on Monday, January 9, 2023, where the results of the tests under research were applied and recorded in the same manner as the pre-tests.

3-11 Statistical methods: The statistical bag was used spas v24 in statistical processors.

4- Presenting, analyzing and discussing the results of the research tests

4-1 Presenting and analyzing the results of the pre- and post-tests for the two research groups (control and experimental).

Table (3)

Shows the arithmetic meanThe standard deviations of the differences between the pre- and post-tests, the arithmetic means, the standard deviations of the differences, and the values of (T) calculated and statistical significance of the control group variables

No	Variables	Pretest		Posttest		value(T) calculated	degree (Sig)	Statistical significance
		s	±A	s	±A			
1	Constancy of the size of objects	2.50	0.971	3.10	1.100	3.674	0.005	positive
2	Total and partial visual perception	1.80	0.788	2.70	0.823	9	0.000	positive

[1]- Appendix (1)

3	Identify body parts	4.20	0.918	5.60	1.074	8.573	0.000	positive
4	Distinguishing between the right and left body parts	1.80	0.788	3.20	0.918	8.577	0.000	positive
5	set location	1.50	0.707	2.60	0.516	6.12	0.000	Positive
6	Balance	1.60	0.699	2.80	0.917	9	0.000	Positive

Degree of freedom (n – 1) = 9 level of significance (0.05)

Table (4)

It shows the arithmetic means and standard deviations of the differences between the pre- and post-tests, the arithmetic means and the standard deviations of the differences, and the values of (T) calculated and statistical significance of the experimental group variables.

No	Variables	Pretest		Posttest		value(T) calculated	degree (Sig)	Statistical significance
		s	±A	s	±A			
1	Constancy of the size of objects	2.90	0.875	4.70	0.823	13.500	0.000	positive
2	Total and partial visual perception	2.20	0.788	4.10	1.197	8.13	0.000	Positive
3	Identify body parts	4.90	1.100	8.40	2.065	10.24	0.000	Positive
4	Distinguishing between the right and left body parts	2.30	0.823	4.40	0.516	11.69	0.000	Positive
5	set location	1.90	0.875	4	0.666	11.75	0.000	Positive
6	Balance	1.90	0.737	4.20	0.816	21	0.000	Positive

Degree of freedom (n – 1) = 9 level of significance (0.05)

4-1-2 Presentation of the results of the post-tests for the two research groups (Control and experimental), analyzed and discussed

Table (5)

It shows the arithmetic means, standard deviations, and values of (T) The calculated and statistical significance of the results of the post-tests of the investigated variables for the control and experimental groups

No	Variables	Pretest		Posttest		value(T) calculated	degree (Sig)	Statistical significance
		s	±A	s	±A			
1	Constancy of the size of objects	3.10	1.100	4.70	0.823	13.68	0.002	positive
2	Total and partial visual perception	2.70	0.823	4.10	1.197	3.04	0.007	Positive
3	Identify body parts	5.60	1.074	8.40	2.065	3.80	0.001	Positive
4	Distinguishing between the right and left body parts	3.20	0.918	4.40	0.516	3.60	0.002	Positive
5	set location	2.60	0.516	4	0.666	5.60	0.000	Positive
6	Balance	2.80	0.917	4.20	0.816	3.08	0.006	Positive

Degree of freedom (n – 2) = 18 level of significance (0.05)

4-2 Discussion of the results

The researchers attributeThe reason for the superiority of the experimental group over the control group in the post-tests is that it used the Montessori method, which made the children more effective and active in the lesson because this method respects the child's ability and potential and accepts the differences and disparities between children.It also encourages the child to take responsibility, become self-reliant, and raise the child's morale(LAMYAA et al., 2020) (Ameer et al., 2021)

The Montessori method is a set of effective methods for teaching, which the teacher can employ within the classroom environment in the form of independent learning, that is, providing the child with the opportunity to choose the activity that appeals to him and attracts

him; Then you leave him to discover his mistakes on his own.(Lisa, 2010) (Oudah et al., 2022)

The Montessori method methodology relies on providing children with a number of sensory experiences through the use of motor activities appropriate for them, the games that were used also had an effective and direct effect in developing perceptual and sensory-motor abilities, and this was demonstrated by the results of the post-tests, with the superiority of the experimental group over the control group. Perceptual and kinesthetic abilities are characteristics acquired from the environment, and training and practice are the basis for them, and they develop according to the individual's physical, sensory, and cognitive ability.

Also, the researchers' reason for the superiority of the experimental group over the control group is that the experimental group used small games that develop the perceptual and sensory-motor abilities of children because the role of play is clearly important in childhood, and it is an important key and helps the child toDiscover his hidden abilities.(Ghazi et al., 2024) (Kadhim et al., 2024)

Through play, the child's mental awareness developsIt also contributes a vital role to the formation of the child's personality with all its dimensions and characteristics. It is one of the main vocabularies in the world of childhood and one of the tools for learning and gaining experience. Therefore, from the perspective of psychologists and educationists, the child's play is considered an extremely important card in the childhood file. Some scholars confirm that play Childhood is an important educational medium that works to prepare the child for this crucial stage in human development. (Al-Diwan et al., 2007) (Aldewan et al., 2006) (Rasoul et al., 2024)

5-1 Conclusions: After getting Results from the Tests and conduct statistical the following conclusions:

1- The Montessori method using motor games contributed to developing the sensory-motor abilities of kindergarten children.

2- The Montessori method, using motor games, enabled children to develop children's total and partial visual perception.

3- The Montessori method using motor games contributed to the child's recognition of body parts.

4- The Montessori method, using motor games, contributed to the child's recognition of distinguishing between two sides of the body

5- The Montessori method, using motor games, helped develop balance and knowledge of determining location.

6-The Montessori method using motor games contributed to the child's knowledge of how to locate a place.

5-2 Recommendations:In light of the results and conclusions reached by the researcher, she recommends the following:

1- The necessity of benefiting from the Montessori method in developing the various motor, cognitive and creative abilities of children.
2- Conduct a study similar to the current study on other topics.
3- Kindergarten teachers introduce special courses in teaching the Montessori curriculum.

Thanks and appreciation

We register our thanks to the research sample, which is kindergarten children

Conflict of interest

The authors declare that there are no conflicts of interest

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Appendix 1

A model of motor games that represents the basis of the Montessori method

1-**Flying game**:The children spread out on the playground, facing the teacher who is leading the game. The teacher begins by calling out the name of an animal that flies, and the children imitate the flying movement. The teacher continues by mentioning the names of birds such as the pigeon flies, the eagle flies, the bulbul flies...etc. Meanwhile, the teacher mentions a flightless animal, such as a flightless horse, and the children stop moving, taking care to diversify the names of animals and birds so that the teacher maintains the liveliness of the game.

2- **Musical hoops game**:The hoops are spread out in the hall, and each child stands in the middle of the hoop. When the music is heard, the children must walk around all the hoops, and when it stops, they must enter the nearest hoop and stand inside it. Basic skills are used every time the music starts, such as sometimes jumping, sometimes walking, and sometimes running.

3- **Fishing game** :Two opposite lines are drawn to represent the river and a group of fish is placed between them. The children stand on a line 5 meters away from the river and a basket is placed in front of each child to collect the fish. When the whistle is heard, each child runs to the river carrying the rod in his hand to catch the fish by inserting the rod into his head. The fish then runs back to put the fish in the basket.

4- **Musical chairs**:(6) children stand in a circle around (5) chairs and revolve around them with the music. When the music stops, they sit down. The child who cannot find a chair is out of the game, and the winner of the competition is the last child in the game.

5- Ball transfer raceAndThe children are divided into two groups at the starting line, and in front of each locomotive is a basket of balls. The first of all runs to take the ball from the basket and run and transfer it to the other basket located on the finish line. The locomotive that finishes first is the winner.

6- **GameNumbers** :The children stand in a spread position, and when the whistle is heard, the teacher raises his hand and clarifies the number, for example (5). All five children gather together, and the remaining children leave the game, and so on.

7- **The Postman game**:Each child imagines that he is a postman transporting letters to and from homes. Each child holds a ball in his hand, which represents the message, and begins running between the boxes that represent the postman passing on a winding road. Then the child stands and throws the ball to his colleague, who catches it and throws it again to the

child, the postman. Here it represents the arrival of the first letter. Then the postman continues jogging until he reaches hoops distributed on the ground, into which the child jumps. These represent many cities that he crosses. He continues jogging until he reaches another child and delivers and receives the message (the ball). The postman continues jogging and faces a crossing that the child crosses. Then the child returns to the same starting place.

8- **Touch circle**:The child stands in a circle except for one person standing outside it. The player outside the circle identifies one person to touch and when the signal comes, he runs after him until he reaches his position.

9- **Standing and sitting**:The children stand in a row, and when they hear the word standing, they stand, and when they hear sitting, they sit until one person remains the winner.

10- **Bunny jumping race**:Sitting, with the knees close together and the arms outside the legs, the hands are placed on the ground. Jumping forward by moving the hands in front, then bringing the feet closer to the hands. The performance is repeated for a specific distance.

11- **Kangaroo jump race**:Sit down with the arms squared. Jump forward with the knees bent and repeat for a specified distance

12- **Air balloon**:The children are divided into equal sections, standing in locomotives, and the first child from each section is given a balloon at the signal. The first child from each locomotive blows the balloon high in the air and continues the blow until the turning line, then returns a second time to his locomotive in the same way and touches the second child and repeats the end of the locomotive.

13- **Imitating voices**:One of the children blindfolds himself inside a circle, and the colleague must imitate a certain sound, and the blindfolded child must blindfold the contestant through his voice, and if he recognizes him, the place is changed.

14- **The best balance**:The children spread out freely on the playground, and when the teacher gives the signal, the children stand on one foot and count to ten, and the teacher encourages the student with the best balance.

15- Protecting the fort:The children stand in a circle, and a scepter (the fort) is placed in the center of the circle. One of the children is chosen to protect the fort. Then the children shoot at the fort with the ball, while the guard pushes it away by removing the ball. If a student succeeds in hitting the fort, he exchanges places with the guard, and so on.

16- **Sun and wax**:The children are divided into two equal groups, two meters apart, one of which is Shams and the other is Shama. The teacher calls Shams or Shama with a long pronunciation of the letter S. The team that hears his name runs backwards and the other team tries to run behind it and touch as many of it as possible.

17- **Collecting the crop**:The children literally spread out on the court, and the teacher throws tennis balls on the court and asks the student to collect these balls. Whoever collects the largest number of balls is considered an honorable mention.

18- **Partridge race**:The children stand in two trains at the starting line, and at the signal, the first child jumps to the end of the field, turns around, and returns. The train that finishes the race first wins.

19- Under the rope race:The children are divided into four trains with a stick in each train, and the first player from each train runs, crawling under the rope and running to the winning line.

20- **Race to get the treasure**:The children stand in two equal rows, facing each other. The distance between them is appropriate. The row is numbered in the opposite direction. The ball (the ball) is placed in the middle of the distance between the two rows. When the teacher calls out one of the numbers, the child carrying the number runs from each row, trying to take the ball before his colleague with his leg and return it to his row. The winner is awarded a point. .

21- **Ball rolling race**:The class is divided into four trains, with each train carrying a ball. The start and finish lines are determined, and when the whistle is heard, the first student from each train begins to roll the ball to the finish line and returns it to his next colleague, and so on until the group members finish, and the one who finishes first becomes the winner.