



BRIN
BADAN RISET
DAN INOVASI NASIONAL



LATO-LATO EXPERIMENT

INDONESIA

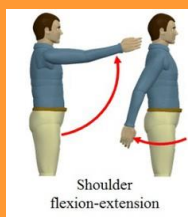
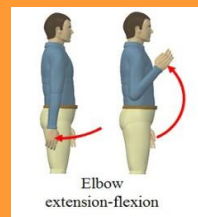
Details of Experiment

Lato-lato game is an example of the application of the principle of Newton's third law, action-reaction. If each ball collides with some conditions, it will result in a total elastic collision.

There are some probabilities of the collisions:

<ul style="list-style-type: none"> • The Ball meet in a straight line • Produce total elastic collision 	<ul style="list-style-type: none"> • The Ball meet in a straight line • Produce partial elastic collision 	<ul style="list-style-type: none"> • The Ball do not meet in a straight line • Produce total elastic collision 	<ul style="list-style-type: none"> • The Ball do not meet in a straight line • Produce partial elastic collision 	<ul style="list-style-type: none"> • The Ball meet in a straight line • Do not produce elastic collision 	<ul style="list-style-type: none"> • The Ball impossible to meet each other

This experiment aims to see the success of playing lato-lato in space and the effect of different hand movement lengths.



Hypothesis:

- Lato-lato can be played in space
- Different lengths of hand movements affect lato-lato play.

Result and Discussion

Rope Lato-Lato



The rope lato-lato game is very difficult and almost impossible to do in space because the movement of the lato-lato ball is very random (it is very difficult to predict the movement).

Stick Lato-Lato



The stick lato-lato game can be played in space because the movement of the balls will still meet each other at one point. To play this type of lato-lato, the player only needs to make each ball have the same speed when colliding to produce a total elastic collision impact movement to play the lato-lato game.

Result and Discussion

Shoulder Extended



Elbow Flexed



Playing lato-lato with the shoulder extended is easier when compared to elbow flexed, this can be seen in the success of Astronaut Satoshi Furukawa playing lato-lato with the shoulder extended in the first try. Because the movement of the hand when the shoulder extended is more freely moved, so that the speed of this game can also be easily adjusted resulting in the period and frequency of the game that can be controlled as astronaut Satoshi Furukawa wants.

Result and Discussion



The frequency and period of playing the stick lato-lato in space was found to be more influenced by the speed of the hand swing.

Playing the stick lato-lato game in space is similar to the lato-lato game on Earth; the most striking difference is the force that works when playing lato-lato it self. On Earth, the lato-lato game must use a greater force when swinging in order to create an impact movement that can lift the lato-lato ball up, meaning that this force must be greater than the gravitational force on Earth, while in space, there is no gravitational influence, so the lato-lato game in space can be adjusted very easily.

Conclusion

From the lato-lato game, we can see that there are several forces at work, namely:

- Kinetic energy
- Law of conservation of momentum
- Elastic deformation and collision
- Material characteristics

In a game of lato-lato in space, we can study the behavior of a lato-lato ball when it collides with a another surface. For example, whether the lato-lato ball bounces back or any energy is lost in heat or permanent deformation. This can provide insights for testing the elastics of materials.

At the end, we conclude that

1. The stick lato-lato game can be played in space, while the yarn lato-lato cannot.
2. The difference in hand position when playing lato-lato affects the lato-lato game. lato-lato game is easier to play and set the speed when Astronaut Satoshi Furukawa uses a shoulder extended

Acknowledgement

We want to thank the many people who helped with this experiment. We thanks go to our research supervisor, **Dr. Ibnu Nurul Huda, M.Si**, a researcher at the Center for Computational Research of the National Research and Innovation Agency of Indonesia (BRIN), **Rasdewita Kesumaningrum, M.Si**, a researcher at the Center for Astronomical Research of the National Research and Innovation Agency (BRIN), **Dr. Emanuel Sungging Mumpuni**, Head of Research Center for Space of the National Research and Innovation Agency of Indonesia (BRIN), as well as all parties from the **Defense University of the Republic of Indonesia, National Research and Innovation Agency of Indonesia (BRIN)**, and **Japan Aerospace Exploration Agency (JAXA)** who have helped launch this experiment.

Thank you



For queries and further information:
habbanriawansyahrul133@gmail.com
bramantara.utu@gmail.com