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Analysis Of Hitting Softball And Baseball

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ABSTRACT

The purpose of this research is to perceive the skills of hitting softball and baseball from a "one-dimension system", which is based on the classification of the movement skills. This method uses descriptive qualitative with literature study. The results of the studies found that, the classification of hitting based on "size of primary musculature required" shows the use of large muscles based on the hitting phase. Based on the "specificity of where actions begin and end", in hitting there are a start and end point of the mechanic. And the classification of motion skills based on the "stability of environment hit context", is influenced by the moving environment where the ball that is thrown by the pitcher with a different location on each of its tosses, so that the pitcher's pitch cannot be predicted. Conclusion based on the "classification size of primary musculature required", hitting is a gross motor skill, classification of specificity of where actions begin and end, hitting is discrete motor skills, and based on the stability of environment context, hitting is an open skill.

1. Introduction

Hitting is crucial in softball because a win or a loss is ultimately determined by each team's offensive production (K Walker, 2007). Hitting is not only the most important part in softball, hitting is also a key factor in offensive. To produce points requires some offensive skills including hitting, base running, and sliding (Joseph, 2002; Noren, 2005; Ruth, 2020; Veroni & Brazier, 2006). Sliding will not occur if there are no runners on base to do base running, nor

will the base runner exist if it is not supported by good hitting skills. So it is not wrong if hitting is the first offensive softball skill to learn (Potter & Johnson, 2007)..

Hitting has been described as the most difficult task in all of sport (Garman & Gromacki, 2011). Some people can swing with their eyes closed but hitting the ball isn't that easy. The problem is that everyone has trouble connecting with the ball (Cross, 2011a), connecting two objects namely the bat and the ball that are both moving (National Fastpitch Coaches Association, 2014). Batting requires highly skilled movements (Nakata, Miura, Yoshie, & Kudo, 2012). Phase in hitting 1) stance, 2) stride, 3) swing, 3) contact, and 4) follow-through.

Each skill has different levels of difficulty. What needs to be understood from these skills is the characteristics of these movement skills. In learning movement skills, many questions arise, such as, how to start to do the movement? When to do the movement? What factors influence the movement so that it can be done in an effort to improve movement skills? And other questions that often arise in doing movement skills. Just as when people learn the skills of motion in hitting softball balls to produce the most efficient movements possible.

Motor skills as activities or tasks that require voluntary control over movements of the joints and body segments to achieve a goal (Magill & Anderson, 2017). In learning the skill of hitting the ball softball will be discussed with the approach of one-dimension classification systems. To make it easier to hit the ball softball, it is necessary to understand the classification of motor skills to provide optimal motion skills. These skills classifications include 1) Size of primary musculature required, 2) Specificity of where actions begin and end, 3) Stability of environment context (Ma'mum & Saputra, 2000; Magill & Anderson, 2017; Winarto, 2017).

First, the size of primary musculature required skills are distinguished based on the size of the muscle group. In this case, it can be categorized into Gross motor skills and fine motors skills. To perform gross motor skills, the skill is to use large muscles, while fine motor skills use small muscles. Second, another way to classify movement skills is by knowing the specificity of where actions begin and end. To know the beginning and end of the movement can be categorized into, discrete motor skills, continuous motor skills, and serial motor skills.

Discrete motor skills are skills that have a starting point and an end point of the movement. Continuous motor skills are one in which both the beginning and ending are arbitrary and unpredictable. While serial motor skills are concrete skills performed repeatedly (Edwards, 2011; Magill & Anderson, 2017).

Third, the classification of motion skills based on the stability of environment context is one system for classifying motor skills is based on the stability of the environment in which they are performed or can be called an environment that

affects the movement skills. Consists of two, namely open motor skills and close motor skills. Open motor skills are skills where the stability of the environment moves or can be said to be unstable and unpredictable. While close motor skills are skills whose environment stability tends to be silent or stable.

Based on the theoretical study and classification of the motion skills, the writer found a gap where when the trainer or athlete who had known each step by step hitting, in fact they did not understand well how to improve the ability to hit and how to apply the movement when going to train to athletes in terms of classification of human movement skills. So that in this study the author will discuss softball movement skills, so that they are easily understood in an effort to apply, perform or practice motion skills in hitting softball balls.

2. Research Methods

This research is a descriptive qualitative research and participatory. The material object in this research is hitting softball. While the formal object is motion skills. The main library sources that will be used in this research are books and journals on the skills of motion and hitting softball balls. While supporting sources in the form of methodology books, encyclopedias, articles and newspaper news, as well as internet sites that are concerned with developing discourse on sports science.

3. Results

Based on the results of the study of the classification of the skill of hitting a softball ball, the following results are obtained;

Size of primary musculature required

Based on the results of a literacy study of several studies of softball hitting skills in the required size of primary musculature classification is gross motor skills in the phase of hitting a softball with the explanation as follows;

In the phase of stance the highest muscle activation is in the pectoralis major muscle around 9.08% and the lowest is in the Rectus Abdominus muscle section around 1.43%. In the loading phase the highest muscle activation is in the pectoralis major muscle around 22.81% and the lowest in the middle deltoid muscle is around 7.03%. In the contact phase, the highest ototo activation was in the External Oblique muscle, around 23.93% and the lowest was in the biceps femoris muscle, around 7.98%. The last in the follow-through phase of muscle activation is highest in the Gastronemius muscle around 18.09% and the lowest is in the posterior deltoid muscle around 4.49%. Upper muscle strength strongly influences the bat swing (Hussain et al., 2019; Oguchi, Emura, Akahashi, Emura, & Ori, 2014; Park, Kim, & Lee, 2019; Petra, Petra, Vladimir, & Ivan, 2017).

With the above information it can be concluded that hitting a softball ball is more dominant using large muscles where in the use of large muscle groups is called gross motor skills

Specificity of where actions begin and end,

To determine the classification of the skill of hitting a softball ball based on initial and final movements, the following analysis of hitting a softball ball is seen from the mechanics of hitting motion. In a motion analysis based on the beginning and end of the motion in softball will be illustrated in a swing as shown in Figure 1
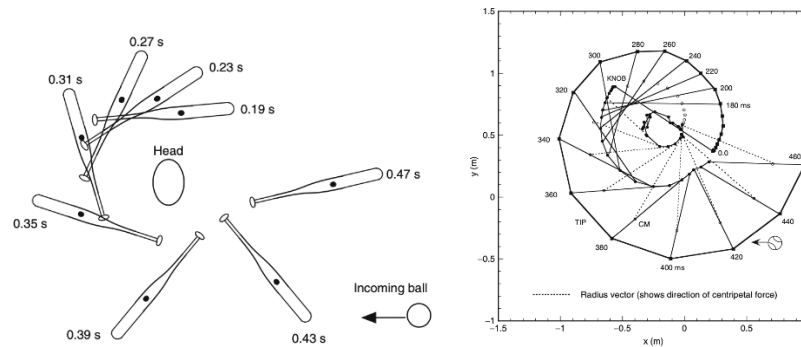
Figure 1. Swing Bat softball/baseball (Cross, 2011b)

In Figure 1, you can see how the hitter makes a movement of swinging the bat from a certain point and ends at a certain point. The starting point is that hitting has an initial movement, (Katsumata, Himi, Ino, Ogawa, & Matsumoto, 2017) Bat swing start the moment when the top of the bat reached the leftmost position was defined as the start of the bat movement. (Edwards, 2011) Some skills, like hitting a baseball, have specific beginning and ending points. A batter must begin swinging as the ball approaches home plate, and once the swing is completed, all relevant action is over.

Based on the results of the study above, it can be concluded that hitting is discrete motor skills, where the movement in hitting softball balls has a starting and ending point of movement.

Stability of environment context

Hitting a softball ball is not like hitting a golf ball. Beating in baseball or softball where the hitter is trying to hit the ball from the pitcher (Ae et al., 2018). the pitcher throws a ball using various pitch types (different speed and trajectory) (Kidokoro, Matsuzaki, & Akagi, 2019, 2020), so that the pitch of the pitcher cannot be predicted. Pitcher in throwing a ball other than with speed (Kobayashi, Nasu, Morimoto, Kashino, & Kimura, 2018) and different ball turns with variations of the throw (Nakata et al., 2012) so that makes the object in this case the ball unpredictable. Besides the location of the placement of the

ball there are also several points like those in the picture. 3. This also causes the duration of the bat swing to vary (Katsumata et al., 2017).

In hitting a softball ball in addition to the location of the ball thrown by the pitcher, it is also the distance and time also makes a batter perform three stages including; a) see, b) think, c) Act (Adair, 2014).

The process of hitting where a hitter has 75 ms to make observations, 50 ms to think, 25 ms to decide wheter to swinging or not swinging. The human brain is different from a computer, where the computer can be regulated by an existing system, while the neuron elements of the human brain can be arranged in such a way, which can be said to be a "voter coincidence" of successful or failed circuits, yielding yes or no decision making.

Signals move from nerve-axons to muscle fibers through connections (synapses) that depend on the electrochemical process (first messenger) which takes about 2 milliseconds. Further transmission of signals along the muscle is carried out through the diffusion (second messenger) of Ca ++ ions along the muscle fibers, and diffusion is slow.

Based on the explanation above it is very clear that hitting is an open motor skill where the object to make a move cannot be predicted. The distance and time taken to do the punch need to be trained properly so as to produce good automation of movement.

4.   Conclusion

Based on the results and discussion of the hit motion analysis in terms of the classification of motion skills, it can be concluded that:

1. Based on the Size of primary musculature required, hitting is a gross motor skill, where this skill requires large muscle groups.

2. Specificity of where actions begin and end, hitting is dicrete motor skills, where the movement in hitting has a starting point and an ending point in hitting

3. Stability of environment context, hitting is open skills, where the movement hits the stability of the environment against movement, unstable and unpredictable

Based on these findings, it can be understood in the implementation of exercises to improve movement skills in hitting, so as to produce optimal, efficient and effective movements in making movements.

References

Adair, R. K. (2014). *The Physics of Baseball*.
Ae, K., Koike, S., Fujii, N., Ae, M., Kawamura, T., & Kanahori, T. (2018). A comparison of kinetics in the lower limbs between baseball tee and

pitched ball batting. *Human Movement Science*, *61*. https://doi.org/10.1016/j.humov.2018.07.010

Cross, R. (2011a). *Physics of Baseball & Softball*. Sydney, Australia: Springer. https://doi.org/10.1017/CBO9781107415324.004

Cross, R. (2011b). *Physics of Baseball & Softball*. Sydney, Australia: Springer. https://doi.org/10.1017/CBO9781107415324.004

Edwards, W. H. (2011). *Motor Learning and Control: From Theory to Practice. SAS for Epidemiologists*. Belmont, Unites States of America: Wadsworth Cengange Learning. Retrieved from http://www.springerlink.com/index/M368G660J3244576.pdf

Garman, J., & Gromacki, M. (2011). *Softball skills & drills* (Second Edi). Champaign, United States of Amerika: Human Kinetics.

Hussain, R. N. J. R., Mea, K. K., Razman, R., Shariman Ismadi, I., Maisarah, S., & Idris, N. M. (2019). The Comparison Between Major Muscle Activations during Different Phases in Softball Batting. *Pertanika Journal of Social Sciences and Humanities*, *27*, 147.

Joseph, J. (2002). *The Softball Coaching Bible* (Vol. II). Champaign, United States of Amerika: Human Kinetics.

Katsumata, H., Himi, K., Ino, T., Ogawa, K., & Matsumoto, T. (2017). Coordination of hitting movement revealed in baseball tee-batting. *Journal of Sports Sciences*, *35*(24). https://doi.org/10.1080/02640414.2016.1275749

Kidokoro, S., Matsuzaki, Y., & Akagi, R. (2019). Acceptable timing error at ball-bat impact for different pitches and its implications for baseball skills. *Human Movement Science*, *66*(June), 554–563. https://doi.org/10.1016/j.humov.2019.06.011

Kidokoro, S., Matsuzaki, Y., & Akagi, R. (2020). Does the combination of different pitches and the absence of pitch type information influence timing control during batting in baseball? *PLoS ONE*, *15*(3), 1–12. https://doi.org/10.1371/journal.pone.0230385

Kobayashi, A., Nasu, D., Morimoto, Y., Kashino, M., & Kimura, T. (2018). Detecting and Sonifying Temporal Patterns of Body Segments When Batting. *Proceedings*, *2*(6), 205. https://doi.org/10.3390/proceedings2060205

Ma'mum, A., & Saputra, Y. M. (2000). Perkembangan Gerak dan Belajar Gerak. *Perkembangan Gerak Dan Belajar Gerak*, 20.

Magill, R. A., & Anderson, D. I. (2017). *Motor Learning and Control : Concepts and Applications* (11th ed.). New York: Mc Graw Hill Education.

Nakata, H., Miura, A., Yoshie, M., & Kudo, K. (2012). Differences in The Head Movement During Baseball Batting Between Skilled Players and Novices. *Journal of Strength and Conditioning Research*, *10*(26), 2632–2640.

National Fastpitch Coaches Association. (2014). *The Softball Coaching Bible*. (National Fastpitch Coaches Association, Ed.) (II, Vol. II). Champaign, United States of Amerika: Human Kinetics.

Noren, R. (2005). *Softball Fundamentals*. Champaign, United States of Amerika: Human Kinetics.

Oguchi, T. A. N., Emura, S. H. D., Akahashi, K. E. T., Emura, G. O. U. D., & Ori, Y. A. M. (2014). Differences in Muscle Power Between The Dominant and Non Dominant Upper Limbs of Baseball Players. *Journal of Strength and Conditioning Research*, 82–86.

Park, C.-B., Kim, B.-G., & Lee, S.-J. (2019). Correlation Between Bat Swing Speed and Trunk Muscle Thickness and Asymmetry in High School Baseball Players. *Korean Journal of Sports Science*, *28*(3), 955–963. https://doi.org/10.35159/kjss.2019.06.28.3.955

Petra, P., Petra, M., Vladimir, S., & Ivan, A. (2017). Differences in The Timing of Baseball Swing in Different Condition for Hitting of Elite Baseball Players in The Czech Republic. In *11th International Conference on Kinanthropology* (Vol. 53, p. 97). Ceko. https://doi.org/10.1017/CBO9781107415324.004

Potter, D., & Johnson, L. V. (2007). *Softball Steps To Success*. *Human Kinetics*.

Ruth, B. (2020). *Coaching youth softball*. (B. R. League, Ed.). Champaign, United States of Amerika: Human Kinetics.

Veroni, K. J., & Brazier, R. (2006). *Coaching Fastpitch Softball Succesfully*. (B. Roanna, Ed.) (Second Edi). Champaign, United States of Amerika: Human Kinetics.

Walker, K. (2007). *The Softball Drill Book*. (Kirk Walker, Ed.). Champaign, United States of Amerika: Human Kinetics. Retrieved from https://books.google.com/books?hl=en&lr=lang_en&id=kPB6DwAAQ BAJ&oi=fnd&pg=PT11&dq=softball+pitch+injury+fatigue&ots=3M0t WQAoNc&sig=G80DkymAq97PooG9u4bUCxXbZJs%0Ahttp://search .proquest.com/openview/02c33374a603f1cd28a8e2990ac47989/1?pq-origsite=gscholar&cb

Winarto, M. E. (2017). Belajar Motorik. *Belajar Motorik*, *91*, 399–404. Retrieved from http://lib.um.ac.id/wp-content/uploads/2018/02