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Kick Frequency And Velocity Finswimming Analysis In Surface 100 Meter Number Reviewed From Stiffness Monofins Hard And Stiffness Monofins Extra Hard Characteristics

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ABSTRACT
Finswimming is a water sport that is done using assistive devices, such as bins, monofins, and snorkels. The fastest sport that is carried out in the pool is getting more and more enthusiasts and is starting to attract a lot of attention in its activities. The growing development of this sport makes manufacturers of monofins tools increasingly develop the types of stiffness that are presented, including stiffness monofins hard and stiffness monofins extra hard. The purpose of this study was to analyze the kick frequency and velocity in the number 100 Meter surface in terms of the characteristics of the stiffness monofins hard and the stiffness monofins extra hard. This research method is descriptive quantitative with a cross-sectional research design. The population of this research is finswimming athletes in Bandung, purposive sampling technique is used to determine the sample with several criteria. The sample consisted of 16 athletes with the following criteria: (1) Bandung City Finswimming Athletes had practiced monofins for at least three years. (2) had monofins stiffness hard and extra hard. (3) is in the top 20 of the inter-regional championship monofins. The conclusion of this study, the stiffness monofins hard and stiffness monofins extra hard contributed less to the kick frequency, while on the velocity both had an effect and the stiffness monofins hard gave a greater influence with a percentage of 98.3%.

Keywords: *Finswimming; Monofins; Velocity; Kick Frequency; Stiffness.*

INTRODUCTION

Finswimming or diving is a sport that is growing and in demand in Indonesia recently (Ganeswara et al., 2020). In historical context, this sport for the first time held a conference on 28 September 1958 and decided to become an international organization after the major conference in Morocco from 9 to 11 January 1959 and resulted in CMAS (Confédération Mondiale des Activités Subaquatiques) (Lin, 2015) .to get healthy, fitness, and even get better life skills.

Finswimming is a water sport that is carried out using assistive devices such as bins, monofins, and snorkels (NAKASHIMA et al., 2019). Finswimming is carried out on the surface and in the water, several numbers are contested in finswimming (Kunitson et al., 2015), including apnoea, surface, immersion, and bi-fins. Meanwhile, the development of finswimming is not only between freediving and pool diving but also in other directions, such as underwater rugby and underwater hockey (Rodriguez-Zamora et al., 2018).

In finswimming pool numbers are not much different from swimming competitions, the difference between swimming championships and finswimming is in the tools used, such as snorkels, fins, etc. (Zamparo et al., 2006). finswimming in training and competitions using equipment, namely bi-fins and monofins that are adapted to the CIMAS regulations (Ping et al., 2011). The race numbers on finswimming for monofins include 50M, 100M, 200M, 400M, 800M surface, and 50M apnoea. And for 50M, 100M, 200M, 400, and 800M bi-fins (Oshita et al., 2009).

Based on the information above, assistive devices in the sport of finswimming are things that must be considered. In addition, the tools used by athletes greatly affect the performance that will be displayed (Lin, 2015). Monofins have been the best tool found as the fastest swimming assistant to help athletes perform in competition (Luerse et al., 2009). In its development, monofins are the most widely developed tools in improving the performance of finswimming athletes (Kunitson et al., 2013). Monofins are indeed growing and their development is very diverse and numerous, but in practice, many aspects must be considered in their use, so that they can be applied according to the desired needs (Rejman & Ochmann, 2009).

Research on monofins related to performance still tends to be few and less in-depth, with situations like this very vulnerable to stabilizing athlete performance in competitions (Rejman, 2006). When more and more manufacturers make monofins, more and more materials are used and it becomes a new problem to analyze and get maximum performance from monofins producers (Marion et al., 2010). In addition, this difference in stiffness continues to grow and becomes one of the advantages that athletes have if the selection is following their abilities (Langendorfer, 2013).

The basic scope of research in finswimming is when an athlete uses monofins. Using monofins in finswimming is when an athlete looks for the velocity generated by the kick frequency which is done when using monofins because using monofins requires high efficiency because it is not easy to harmonize muscle performance with the load and resistance produced by the monofins themselves (Boitel et al., 2010). According to Connaboy et al., (2016), the need for activities in the water greatly affects the achievement of high effectiveness, among others, the magnitude of the contribution generated from the kick frequency and velocity, so that it can be a big advantage for athletes. In finswimming also the efficiency of kick frequency and velocity is of considerable concern because the energy itself is limited and must be maximized according to the needs carried out (Rejman et al., 2020). So the stiffness monofins used must be following the energy expenditure that needs to be used, the effectiveness of this stiffness selection will provide benefits for athletes to achieve the desired peak performance (Rejman et al., 2020). On the other hand, if the stiffness is selected incorrectly or does not follow the needs, it will result in injury to the athlete so that which will hamper the athlete's performance (Patent, 2010). The world's leading monofins manufacturer, Tornado Fins, is very aware of this situation, thus providing a variety of stiffness options for monofins. Starting from the numbers 3 (medium), 4 (medium-hard), 5 (hard), 6 (extra hard), and 7 (super hard). With the difference in carbon material which is the main ingredient in the blade used in monofins, it will likely affect the performance that will be displayed by athletes, thus the choice of stiffness is very important in finswimming monofins (Langendorfer, 2013). Seeing the various explanations above, it is very important that research with the analysis of kick frequency and velocity finswimming in the number 100 meter surface in terms of the characteristics of stiffness monofins hard and stiffness monofins extra hard is carried out.

METHOD

The research method that the author uses to test the hypothesis in this study is descriptive. The reason for using this method is because using a descriptive method will help researchers to describe the effect of monofin stiffness hard and monofin stiffness extra hard on kick frequency and velocity on the 100-meter surface. This research is classified as a descriptive study with a cross-sectional design. Cross-sectional research seeks to collect data at one time and create a kind of "portrait" of social life (Neuman, 2014). In this study, the population was all finswimming monofins athletes from West Java. The sample collection technique in this study used the Total Population Sampling technique. Therefore, five West Java finswimming athletes were determined, three men and two women.

The kick frequency and velocity tests in this study used a distance of 100 meters, according to Nicolas & Bideau, (2009) in the surface number of 100 meters the decision-making of start, underwater, and stiffness monofins used must be effective. In the 100 meter event, athletes only make one start, one turning (repair), one underwater, and must be done as well as possible without mistakes (Craig & Pendeegast, 1979). So the author decided to take a distance of 100 meters because it has covered all the needs needed in data collection.

The data taken in the 100-meter surface test include 1) Total Kick frequency in the 100-meter surface. 2) Velocity results generated by athletes are taken per 25 meters and will be accumulated into m/s (meters per second). 3) Total travel time from 100 meters surface. The data obtained in the field are then analyzed for normality of the data. The Statistical Package for Social Science (SPSS) program series 20 was used to analyze the data in this study. After the data is said to be normal, the next step is to test the hypothesis by using simple regression test statistical analysis.

RESULTS AND DISCUSSION

Normality Test

Table 1

	Shapiro-Wilk		
	Statistic	**Df**	**Sig.**
Monofins Hard	0.960	16	0.667
Monofins Extra Hard	0.951	16	0.513

Normality Test of 100 Meter Surface Monofin Results Data

Basics of Decision Making Normality Test

1. The data is categorized as normally distributed if the significance value is > 0.05
2. The data is not normally distributed if the significance value is < 0.05

Based on Table 1, seen in the Shapiro-Wilk column, it can be seen that both the results of the tests carried out using both the Hard Stiffness Monofins and Extra Hard Stiffness Monofins met the requirements that the data obtained had a normal levy with a significance value > 0.05. For Monofins Hard, the significance value obtained is 0.667, while for Monofins extra hard it is 0.513. Thus, the two data are said to be normal and can be used, or in other words, the two data show homogeneity that the author can use as a research reference.

Table 2
Kick Frequency Data Normality Test

	Shapiro-Wilk		
	Statistic	**Df**	**Sig.**
Monofins Hard	0.900	16	0.081
Monofins Extra Hard	0.943	16	0.387

Basics of Decision Making Normality Test

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1. The data is categorized as normally distributed if the significance value is > 0.05
2. The data is not normally distributed if the significance value is < 0.05

Similarly in **Table 2** in this case the data shows normal results. The kick frequency data obtained in the test using Monofins Hard and Monofins extra hard shows normal retribution results. This is indicated by the results of the monofins hard kick frequency of 0.081 and the extra-hard kick frequency of 0.387 which is greater than 0.05. In other words, the data obtained from the kick frequency test results can be said to be normal and can represent the results of the test data that has been obtained.

Table 3
Velocity Data Normality Test

	Shapiro-Wilk		
	Statistic	**Df**	**Sig.**
Monofins Hard	0.966	16	0.766
Monofins Extra Hard	0.976	16	0.920

Basics of Decision Making Normality Test

1. The data is categorized as normally distributed if the significance value is > 0.05
2. The data is not normally distributed if the significance value is < 0.05

Table 3 also explains that the data that has been taken is tested first. The kick velocity data obtained in the test using Monofins Hard and Monofins extra hard appear to show normal retribution results. With results greater than 0.05, namely 0.766 for hard monofins and 0.920 for extra hard monofins. Then the data obtained from the results of the velocity test can be said to be normal and can represent the results of the test data that have been obtained.

Hypothesis Testing

Table 4
Simple Linear Regression Test Results from monofins hard stiffness against kick frequency

		Kick Frequency	**Monofins Stiffness Hard**
Pearson Correlation	Kick Frequency	1.000	-0.209
	Monofins Stiffness Hard	-0.209	1.000
Sig. (1-tailed)	Kick Frequency	.	0.219
	Monofins Stiffness Hard	0.219	.
N	Kick Frequency	16	16
	Monofins Stiffness Hard	16	16

Hypothesis :

H_0: There is no effect of monofins hard stiffness on kick frequency.
H_1: There is an effect of monofins hard stiffness on kick frequency.

From the calculation results in **Table 4** above, Monofins Stiffness Hard has a correlation coefficient of 0.209. Thus it can be interpreted that there is no positive influence. In other words, the number of kick frequencies performed is not affected by the Monofins Stiffness hard. The significance level of the correlation coefficient is indicated by the probability value of 0.219. Thus the probability value is 0.219 > 0.05; then H0 is accepted. This means that there is no effect of monofins hard stiffness on kick frequency.

Table 5
R Square stiffness monofins hard to kick frequency

Model	R	R Square	Adjusted R Square	Std. The error of the Estimate
1	0.209[a]	0.044	-0.025	1.61616

In this **Table 5**, the number 0.044 is obtained. This R square can be referred to as the coefficient of determination or contribution, in this case, it is 4.4%; in other words, the variable kick frequency generated from monofins hard is 4.4%.

Table 6
ANOVA test results and monofins hard F stiffness test against kick frequency

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	1.667	1	1.667	0.638	0.438[b]
	Residual	36.568	14	2.612		
	Total	38.234	15			

From **Table 6**, the ANOVA or F-test results are obtained, the F-count results are 0.638 with a probability value of 0.438. Because the probability value (0.438) is much greater than 0.05; then the regression model cannot be used to predict the velocity results.

Table 7
Simple Linear Regression Test Results monofins extra hard stiffness against kick frequency

		Kick Frequency	Monofins Stiffness Extra Hard
Pearson Correlation	Kick Frequency	1.000	0.088
	Monofins Stiffness extra Hard	0.088	1.000
Sig. (1-tailed)	Kick Frequency	.	0.373
	Monofins Stiffness Extra Hard	0.373	.
N	Kick Frequency	16	16
	Monofins Stiffness Extra Hard	16	16

Hypothesis :

H_0: There is no effect of extra hard monofins stiffness on kick frequency.
H_1: There is an effect of extra hard monofins stiffness on kick frequency.

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Based on the calculation results in **Table 7** above, Monofins Stiffness Extra Hard has a correlation coefficient of 0.373. So it can be said that the number of kick frequencies is not affected by the extra hard monofins stiffness, or in other words, there is no positive relationship. The significance level of the correlation coefficient is indicated by the probability value of 0.219. Thus the probability value is 0.088 > 0.05; then H0 is accepted. This means that there is no effect of extra hard monofins stiffness on kick frequency.

Table 8
R Square monofin rigidity extra hard to kick frequency

Model	R	R Square	Adjusted R Square	Std. The error of the Estimate
1	0.088[a]	0.008	-0.063	2.14475

In **Table 8**, the number is 0.008. This R square can be referred to as the coefficient of determination or contribution, in this case, it is 0.08%; In other words, the variable kick frequency generated from the extra hard monofins is 0.08%.

Table 9
ANOVA test results and extra hard monofins stiffness F test against kick frequency

	Model	Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	0.503	1	0.503	0.109	0.746[b]
	Residual	64.400	14	4.600		
	Total	64.902	15			

From **Table 9**, the ANOVA or F-test results are obtained, the F-count results are 0.109 with a probability value of 0.764. Because the probability value (0.764) is much greater than 0.05; then the regression model cannot be used to predict the kick frequency results.

Table 10
Linear Test Results from Simple regression of Monofins hard stiffness against Velocity

		Velocity	Mono Fins Stiffness Hard
Pearson Correlation	Velocity	1.000	0.992
	Mono Fins Stiffness Hard	0.992	1.000
Sig. (1-tailed)	Velocity	.	0.000
	Mono Fins Stiffness Hard	0.000	.
N	Velocity	16	16
	Mono Fins Stiffness Hard	16	16

Hypothesis :

H_0: There is no effect of monofins hard stiffness on velocity.
H_1: There is an effect of monofins hard stiffness on velocity.

The large influence between the monofins stiffness hard variable on velocity resulted in a correlation coefficient of 0.992. This shows that there is a positive effect, meaning that the faster you swim using monofins stiffness hard, the faster the velocity. And vice versa when swimming using monofins stiffness hard is slow, the velocity will be slower too. The significance level of the correlation coefficient is indicated by a probability value of 0.000. Thus the probability value is 0.000 < 0.05; then H0 is rejected. This means that there is an

Table 11

R Square stiffness Monofins hard against Velocity

Model	R	R Square	Adjusted R Square	Std. The error of the Estimate
1	0.992[a]	0.983	0.982	0.17580

In **Table 11** R square, the number is 0.983. This R square can be referred to as the coefficient of determination or contribution, in this case, it is 98.3%; in other words, the velocity variable generated from monofins hard is 98.3%.

Table 12

ANOVA Test Results and Monofins Hard F stiffness test against Velocity

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	25.530	1	25.530	826.098	.000[b]
	Residual	0.433	14	0.031		
	Total	25.963	15			

From **Table 12**, the ANOVA or F-test results are obtained, the F-count results are 826,096 with a probability value of 0.000. Because the probability value (0.000) is much smaller than 0.05; then the regression model can be used to predict the velocity results.

Table 13

Linear Test Results from Simple regression of Extra Hard stiffness monofins against velocity

		Velocity	Mono Fins Stiffness Extra Hard
Pearson Correlation	Velocity	1.000	0.966
	Mono Fins Stiffness Extra Hard	0.966	1.000
Sig. (1-tailed)	Velocity	.	0.000
	Mono Fins Stiffness Extra Hard	0.000	.
N	Velocity	16	16
	Mono Fins Stiffness Extra Hard	16	16

Hypothesis :

H0: There is no effect of extra hard monofins stiffness on velocity.
H1: There is an effect of extra hard monofins stiffness on velocity.

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The large influence between the monofins stiffness hard variable on velocity resulted in a correlation coefficient of 0.966. This shows that there is a positive effect, meaning that the faster you swim using monofins stiffness hard, the faster the velocity. And vice versa when swimming using monofins stiffness hard is slow, the velocity will be slower too. The significance level of the correlation coefficient is indicated by a probability value of 0.000. Thus the probability value is 0.000 < 0.05; then H0 is rejected. This means that there is an effect of monofins hard stiffness on velocity.

Table 14
Stiffness monofins Extra Hard against velocity

Model Summary				
Model	**R**	**R Square**	**Adjusted R Square**	**Std. The error of the Estimate**
1	0.966[a]	0.934	0.929	0.28103

In **Table 14** R square, the number 0.934 is obtained. This R square can be referred to as the coefficient of determination or contribution, in this case, it is 93.4%; in other words, the velocity variable generated from monofins hard is 93.4%.

Table 15
Results of ANOVA Test and Extra Hard stiffness monofins F Test on velocity

ANOVA						
Model		**Sum of Squares**	**Df**	**Mean Square**	**F**	**Sig.**
1	Regression	15.618	1	15.618	197.754	0.000[b]
	Residual	1.106	14	0.079		
	Total	16.724	15			

From **Table 15**, the ANOVA or F-test results are obtained, the F-count results are 197,754 with a probability value of 0.000. Because the probability value (0.000) is much smaller than 0.05; then the regression model can be used to predict the velocity results**.**

Table 16
Simple Regression Linear Test Results Comparison of Hard and Extra Hard Monofins Stiffness to Kick Frequency

Stiffness Monofins	R Square	Persentase	Gain
Stiffness Hard	0,044	4,4%	3,6%
Stiffness Extra Hard	0,008	0,8%	

Hypothesis:

H0: *Hard stiffness has a better impact than extra hard stiffness on kick frequency*.
H1: *Extra hard stiffness has a better impact than hard stiffness on kick frequency.*

Although the two stiffnesses do not affect the kick frequency, monofins stiffness hard has a higher percentage compared to monofins stiffness extra hard. It can be seen from table 4 that monofins stiffness hard has 4.4% while for extra hard stiffness it is 0.8%. Thus there is a difference between these two stiffnesses, the difference between the two is 3.6%. Thus, H0 is accepted, namely monofin stiffness hard has a better impact than extra hard monofins stiffness. Acceptance of H0 indicates that the proposed hypothesis is rejected.

Table 17
Comparison of Monofins Hard and Monofins Extra Hard against Velocity

Stiffness Monofins	R Square	Persentase	Gain
Stiffness Hard	0,983	98,3%	4,9%
Stiffness Extra Hard	0,934	93,4%	

Hypothesis:
H0: *Hard stiffness has a better impact than extra hard stiffness on velocity.*
H1: *Extra hard stiffness has a better impact than hard stiffness on velocity.*

Based on the data analysis described above, shows that hard stiffness and extra hard stiffness affect velocity. but when compared based on the percentage contribution of the influence, it can be seen in the table above which shows that monofins hard stiffness contributes 98.3%, while for extra hard monofins stiffness it is 93.4%, with that data there is a gain/range difference of 4, 9% which shows the effect of stiffness hard effect is 4.9% better than monofins extra hard stiffness. So with this, it can be said that H0 is accepted, namely, hard stiffness has a better impact than extra hard stiffness on velocity. This means that the proposed hypothesis is rejected.

Discussion

Effect of monofins hard stiffness on kick frequency.

In this discussion, the proposed hypothesis is rejected. The rejection of the hypothesis here illustrates that the stiffness of the monofins hard does not contribute to the kick frequency. Judging from the research described by Gautier & Watier, (2002) in its implementation in addition to supporting tools to achieve maximum kick frequency, other supporting factors must also be considered, such as height and depth of kicks made by athletes. With different heights, an athlete's perception will be different regarding kick frequency. Capital height owned by athletes is one factor that needs to be considered. Because the height difference will also affect how athletes swim. It is unlikely that

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athletes with short stature will take the same number of kicks as athletes with taller postures.

Likewise expressed by Vodickova et al., (2005) that character formation in athletes is formed during the preparation period and the characteristics of the race numbers that are followed by athletes. When an athlete has a certain swimming distance specification, the athlete will make that habit the basic benchmark for athletes to perform a task. In other words, the different distance specializations possessed by athletes make an influence on the kick frequency of the athlete, not on what equipment the athlete uses to carry out an activity. For example, short-distance athletes will maximize the frequency as much as possible to reach the maximum swimming distance. In contrast to short-distance athletes, what they plan is how athletes can reach a predetermined point efficiently and as quickly as possible, then the athlete will adjust the number of kick frequencies that will correspond to energy efficiency Zamparo et al., (2006)

So at the distance that has been determined in this study at a distance of 100M, the athletes will bring their number specialization character. In other words, athletes will show the characteristics of techniques that are often applied to training sessions. So in the implementation of the test, there will be two characters that appear, the character of the athlete with the basis of a short distance diver and the character of a long-distance diver. In table 4.2 several athletes have different distance specializations, seven of them are long-distance swimmers, namely; Ali, Oktab, Firdan, Zain, Oza, Fire, and Hani. While the other nine athletes are short-distance divers. Thus, it can be ascertained that there will be a difference in kick frequency between the two characteristics of the divers involved in this study. Because basically, the shape of the muscles that have been formed during exercise makes the character of a diver is formed Luersen et al., (2006). So giving monofins with stiffness hard doesn't have much effect on the kick frequency.

Effect of stiffness monofins extra hard on kick frequency.

Monofins with high stiffness have begun to be seen by athletes in various countries, not only in Indonesia, but developments regarding monofins have also begun to penetrate European countries. Even well-known manufacturers are starting to compete with each other to develop research, starting with Tornado Fins which have stiffness from stiffness 1 to 7, and followed by Rocket Fins which provide monofin stiffness from 1 to 9. only adjustments in athletes and even adaptations of related training programs must be developed. According to Nakashima et al., (2010) in its application, the many levels of stiffness in monofins is not easy, with so many stiffness monofins there will be more understanding of the characteristics of monofins. Because individualization must be considered when using monofins. Individualization is meant when a diver finds the appropriate stiffness and matches the athlete's characteristics. The incompatibility of the athlete's character with monofins can have an effect that becomes a new weakness for athletes, Luersen et al., (2006). Thus the kick frequency will tend to change and be unstable when the stiffness of the monofins is different.

Even though it is research and development that monofins with higher stiffness are widely used in finswimming activities these days, their needs and uses are not necessarily following the needs of athletes. Looking at the correlation with the research conducted, it is true, when an athlete, even though an athlete uses a higher stiffness monofin, does not have a significant effect on the kick frequency performed. Athletes will tend to stick to the number specialization character they master. Adaptations that occur when athletes use monofins must also be seen because the difference in stiffness is a new character formation in the strokes performed, adaptation to training programs and match numbers must be following Caspersen et al., (2010). Based on the explanation above, it is most likely that the monofins stiffness hard will not affect the kick frequency due to the incompatibility of the testing distance with the characteristics of the diver. When tested at a distance that is following the athlete's specialization of race numbers, the effect of stiffness monofins may be seen in its contribution to kick frequency.

Effect of monofins hard stiffness on velocity

In addition, to kick frequency, velocity is also one of the supports that must be considered when determining the type of monofin to be used. As discussed in table 4.16 that H0 is rejected or in other words that the hypothesis is accepted, that monofin stiffness hard has an impact on velocity. By determining the exact stiffness of the monofins, the greater the athlete's influence on the velocity, which is done by Oshita et al., (2009). Determination of this type of monofins needs to be addressed carefully and with full preparation.

With the discovery of the interrelated influence between the stiffness of monofins hard, in other words, many advantages can be obtained when an athlete finds the greatest velocity produced by using monofins. As revealed by Craig & Pendeegast, (1979) that three aspects must be understood and examined by the coach and understood by athletes, namely, velocity, stroke rate, and stroke distance. With the discovery of these three aspects, coaches can discuss with athletes about the advantages and disadvantages when an athlete uses different stiffness monofins. This statement is also supported by Saito, (1982) that when athletes need other parties in determining the tools they will use during practice and even during matches, the key is to communicate with the coach about three aspects, namely velocity, stroke rate. , and stroke distance. Thus the strategy that will be used in the match can be tried while practicing. In other words, there is a coach's role when athletes try to use stiffness monofins with different stiffnesses, so athletes don't just guess whether the monofins used are following what the coach is targeting. The results showing velocity in this study can be used as a reference for coaches to see how the influence of monofins stiffness hard affects the level of velocity produced by athletes. as a material for determining the coach to choose which tools are suitable for use during training and matches.

Effect of extra hard monofins stiffness on velocity

The extra hard stiffness monofins contribute to the diving athlete's velocity. The use of various stiffness has become a hot topic in the field of finswimming, with the existence of various stiffness monofins giving athletes a new dilemma. when athletes feel interested in trying the monofins but in fact, the selection of stiffness monofins has not fully involved the science that accompanied Nakashima et al., (2010). It is undeniable, in Indonesia itself, the determination of the stiffness of monofins is quite tough and is still based on experience. With the update on the stiffness of monofins, many changes will likely occur, the stroke rate, especially on the velocity, will be more interesting to study further in Nakashima et al., (2018). This high expectation is still of great concern in the world of finswimming, as revealed by (Luerse et al., 2009) in testing using 3D and 2D identification that the stiffness of monofins with higher thickness contributes to greater velocity. So with the presence of manufacturers who continue to develop better monofins models, it is hoped that it will affect all aspects of surface number finswimming. This increase in stiffness can have a good effect on velocity while supporting factors can also provide the same support for different stiffness monofins. Nicolas et al., (2010). The difference in stiffness affects the way divers do their activities underwater. So when the coach wants to maximize the advantages of extra hard stiffness monofins, the coach must also be able to see the abilities of the athlete.

Comparison of hard and extra hard stiffness to kick frequency

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The results obtained that the two monofins do not have a significant effect on kick frequency. However, it should be noted that monofins stiffness hard has a larger contribution percentage than stiffness monofins extra hard. Thus, the discussion of stiffness monofins is still very deep. According to Boitel et al., (2010) kick frequency is one of the visible indicators that can be taken into consideration for coaches to see the characteristics of athletes. The kick frequency performed by the athlete must be able to reflect the number of characteristics possessed by the athlete, thus the evaluation carried out by the coach can be carried out as quickly as possible when the athlete makes a mistake during the exercise. Visually, in kick frequency, several evaluations can provide initial indicators, including whether the stiffness monofins used are appropriate and suitable for athletes. Yamakawa et al., (2017) revealed that the decrease and increase in kick frequency in athletes must have reasons and can be used as parameters for athletes and coaches. When an athlete increases the kick frequency is the stiffness monofin used too small so the athlete finds it too easy, or when the kick frequency decreases the athlete has difficulty using high stiffness monofins. This can be a very visible indicator when athletes determine the stiffness monofins to use.

In this test there are two categories of athletes who take the test, there are four athletes who take part in the inter-provincial championship (PON) and most of them are still in the coaching stage in the inter-regional championship (PORDA). However, both categories are used to use various types of stiffness monofins, both during practice and when competing. In the exercise, participants usually take turns using different stiffness monofins. In aerobic exercise, athletes usually use stiffness hard on average, with the assumption that when doing the aerobic exercise the duration of using monofins is long enough and the efficiency of the energy released can be well organized. Zamparo et al., (2006). Meanwhile, when the training program is at a higher intensity, athletes will usually use higher stiffness monofins, the stiffness that may be selected is extra hard and super hard stiffness which is above hard stiffness. With the hope that when in high-intensity programs athletes can adapt to the stiffness monofins that will be used during matches so that the adaptation obtained is at least 80-95% of matches Costill, Thomas, (1989). Usually, in high-intensity training activities, the characteristics of the athlete's kick frequency will be seen to adapt to the conditions during the match, usually, the kick frequency that is carried out during practice is not much different from what is done during the match. Thus, when athletes increase their stiffness, they can predict which stiffness can make a better contribution by looking at the kick frequency performance.

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From research conducted in the field, the kick frequency of athletes who are at the PON championship level is arguably more consistent than athletes who are still at the PORDA level. For PON athletes, the average time difference obtained is not far when using hard and extra hard monofins stiffness, as well as the kick frequency, obtained. While the case is different with PORDA athletes, there are some athletes whose travel time and kick frequency are quite different. According to Yamakawa et al., (2017), the determination of adding and reducing kick frequency by athletes must have an effect on the travel time obtained. So the decision to increase or decrease the kick frequency must have a clear and justifiable basis for assumptions. This is followed by what Shimojo et al., (2014) said that kick frequency characteristics are formed by the athlete's habit of adapting to the number of specializations possessed by the athlete. While long-distance athletes rely on large amplitudes for a more efficient kick frequency, it cannot be equated with short-distance athletes who rely on kick frequency as much as possible to achieve the best time. Then the type of muscle that is formed based on the number specialization will be formed and become the character of the athlete Abdulazim & Mohamadine, (2017). So when the test is carried out with the same distance of 100 meters, two different characteristics will appear. This characteristic is what makes athletes have different kick frequencies and give different responses when getting an increase in monofin stiffness. So Kunitson et al., (2015) argue that the formation of athletes to specialize in the number 100 Meter Monofins must be balanced with an adaptation of stroke, stiffness monofins, and muscle strength.

Hard and extra hard stiffness comparison to the velocity

With the acceptance of H0 in this study, the proposed hypothesis is certainly rejected. In this case, it states that the stiffness monofins hard provide better performance than the stiffness monofins extra hard. In terms of renewal in finswimming, it is indeed extra hard stiffness that is mostly seen by athletes, with the hope that an update to existing stiffness will become a discovery that can be used as an update for best time achievements. But it must be admitted that in this study it was found that the stiffness of hard monofins had a better impact than the stiffness of extra hard monofins. However, it should also be noted that Marco A. Luersen et al., (2004) stated that basically when the use of higher stiffness monofins provides difficulties in adapting and optimizing performance, it requires a deeper study of its use.

If we look at the spread of monofins in Indonesia, there are only a few reliable importers who can bring in monofins with specifications that suit the needs of athletes. A trusted importer who can bring in monofins according to the needs of athletes, namely in East Java, this importer facilitates athletes who need monofins with specifications that suit their needs, ranging from different stiffness, many manufacturers, and varied prices. In addition to new monofins that can be imported, there are also second monofins that they usually provide, when athletes are looking for monofins with certain specifications and are limited at a cost, they will usually be directed to buy the second monofins they have. The average second monofin owned by this importer has stiffness hard with various conditions. So the average athlete has monofins with stiffness hard for training purposes which are more affordable in terms of cost. Some areas that carry out construction are the same, usually, the area provides monofins with hard stiffness that can be purchased at affordable prices due to limited costs.

From the information above, it can be concluded that the distribution of monofins, especially in West Java, tends to be larger in monofins with hard stiffness. So in line with Vercruyssen et al., (2012) a better adaptation is when an athlete understands the characteristics of the monofins used, both the stiffness of the monofins or the monofins used. Considering adaptation more often is one of the key factors for maximum athlete performance. Reinforced by Toubekis et al., (2011) that during exercise at certain intervals, athletes will respond to these activities by giving the same effort in each repetition so that the resulting velocity can be the same and consistent in each repetition. Similarly, when practicing using stiffness monofins hard, athletes tend to adapt more to monofins that are often used during training and are accustomed to the rhythm of strokes performed with stiffness hard monofins, which makes the velocity stability produced by using stiffness hard monofins greater.

When viewed from the standpoint of extra hard monofins stiffness, then this is a monofin that is still relatively new to finswimming. Usually, athletes who already have extra hard stiffness have discussed with the coach and once again still use a mismatched system that is not yet based on sports science. This update to monofins is not accompanied by performance updates in determining the use of monofins themselves, in Stavrou et al., (2018) the determination of the use of higher stiffness monofins must be closely monitored by the trainer because it will change the way of swimming a lot and improvise a lot from athletes who use the device. The improvisation carried out by these athletes must be immediately addressed by the coach, because with the adaptation process that is less escorted by the coach, this improvisation will become a bad habit. There are times when with higher stiffness, athletes feel uncomfortable and there is no benefit that can be extracted with higher stiffness. Steinberg et al., (2011).

It should also be seen in Luerse et al., (2009) in their research that higher stiffness monofins have a higher contribution compared to smaller stiffness. So the wrong perception about the high stiffness of monofins will also affect the high velocity produced. However, in his research, the implementation of the test using a robot that indirectly optimizes the energy expended will be greater, in contrast to when used by humans in general. In humans, there are several supporting factors so that optimization of stiffness can be maximized. Nicolas et al., (2010). The anthropometric factor is one of the big supporters in optimizing the velocity obtained in the use of extra hard stiffness monofins. As stated by Mahiou et al., (2011) progress in the field of finswimming must be effective, in the sense that when high stiffness monofins are not used properly in athletes who have anthropometric capital, athletes with higher anthropometrics will not produce the same velocity. with athletes who have shorter anthropometrics.

This is interesting because, in addition to the characteristics of different match numbers, other factors affect the resulting velocity, namely athlete anthropometry. So Borazjani & Sotiropoulos, (2010) see that this is quite an interesting concern because the difference in anthropometry will also make a difference in muscle efficiency and performance when using monofins. Especially when athletes are less adapted to monofins. From the results obtained that in the fourth test the PON athletes showed that the velocity was stable and tended to rise when doing two experiments using different monofins. But it is different with PORDA athletes who tend to be unstable when using two different types of monofins. The lack of adaptation to monofins with higher stiffness is a significant obstacle, as stated in Wylegala et al., (2007) proper adaptation when using tools in finswimming is the key to the formation of stroke rhythms that will increase the velocity and muscle strength of athletes. This lack of adaptation is the cause of the non-optimal results obtained by the extra hard stiffness monofins concerning velocity. It is also supported by the research of Takahashi et al., (2009) that in the exercise the consideration of using athletes should be as much and as often as possible so that adaptation and velocity targets can be met.

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CONCLUSIONS AND SUGGESTIONS

Conclusion based on the research questions and research objectives presented in CHAPTER I, as well as from the results of data processing and analysis, it can be concluded that: There is no effect of monofins hard stiffness on kick frequency, There is no effect of monofins extra hard stiffness on kick frequency, There is an effect of monofins hard stiffness on velocity, There is an effect of extra hard monofins stiffness on velocity, Hard stiffness has a better impact than extra hard stiffness on kick frequency, and Hard stiffness has a better impact than extra hard stiffness on velocity.

Suggestions based on research that has been done on the analysis of kick frequency and velocity finswimming in the number 100 meter surface, is reviewed from the characteristics of stiffness monofins hard and stiffness monofins extra hard. There is still a lot that can be explored and sought again from finswimming whose research is not enough in Indonesia, there are several suggestions and inputs that can be used as references/suggestions for several parties including To the coaches when determining the stiffness monofins either in practice or in matches, you should always involve sports science in the determination. Because in the development carried out by monofins manufacturers, it can be proven in more detail when it involves sports science; For athletes who are interested in using higher stiffness monofins, it is better to consult and discuss with the coach. In addition to the coach who knows the performance requirements that will be needed in the match, the coach will also provide input on the advantages and disadvantages when deciding to use higher stiffness monofins; and For further researchers, much can still be explored regarding the stiffness of monofins related to athlete anthropometry, stiffness of monofins with competition distance. Stiffness monofins with athlete's stroke rate. However, it is a note to prepare and check the availability of the type of monofins that will be examined;

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