

SHSS4075

AQUATIC ACTIVITIES

“Water is 1000 times more dense than air, so when the body moves forward through it, the water resists its movement”

Discuss the above statement in relation to ‘Front Crawl’ and ‘Back Crawl’ showing a sound understanding of the different types of resistance/drag, swimmers need to overcome.

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Assessment Feedback Sheet

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Personal Evaluation – to support your academic progress please complete the section below <u>BEFORE</u> submitting your work.										
What do you consider to be the best aspects of this work?										
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What have you found most satisfying whilst undertaking this submission?										
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		Poor < 20%	Weak 20-29%	Unsatisfactory 30-39%	Satisfactory 40 – 49%	Good 50 – 59%	Very Good 60 – 69%	Excellent 70 – 84%	Exceptional 85– 100%	%
Accuracy and relevance of content.40%	1									40%
General plan and structure of answer.40%	1									40%
Range of sources of information and referencing accuracy.20%	1									20%
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This essay explores and discusses resistance that will be critically analysed in the relation of front and back crawl. Showing knowledge and understanding on how resistance and drag can limit a swimmer in their ability to swim; to overcome these limitations there are techniques and methods that will be clarified through the essay to improve swimmers performance.

As demonstrated by sport experts, resistance in swimming is defined as 'The way in which water acts against the solid mass of a swimmer's body and slows down their progress.' (Sports definition, 2020) When discussing resistance and drag we can break this down into four different types of drags, these four drags consist of form drag, viscous drag, eddy drag, and wave drag. All of these drags are different ways in which a swimmer could be challenged and limited to reach the top speed they can.

Views on form drag state that it can have effect on the speed of a swimmer in a pool; Nasr mentions that form drag is the strongest drag out of the four different drags. As the swimmer pushes on the water it pushes back towards you to make you move. Equally as important, Hall also mentions that there are several different aspects to the form drag that can limit a swimmers performance, that can affect their overall time speed within the water. The position of the swimmer is the first aspect; this is where the swimmer is positioned more underwater or on top of the water during the time they are in the pool. (Hall, 2018; Nasr, 2020) This limitation has been proven by a variety of researchers that states that practicing the technique of your body position can improve your overall time speed within the pool. (Wrenn and Wrenn, 2009)

The second aspect to form drag is the weight and height of the swimmer where this links to the importance of the swimmers position within the water is essential to their posture and body position; if their head is too high above the water, then the swimmer will be less streamline and will not be able to reaching their full potential speed. The third aspect to frontal drag links in with viscous drag; it is to do with what the swimmer is wearing; this includes the cap and the swimming suit. Illustrated by Sweeney (2017) in supporting Hall (2018) in the theory that a certain swimwear can increase drag around 10-15%, concluding in their research that the swimsuit can make a dramatic difference to the swimmers performance. Their research highlighted that polyurethane material reduced the drag of the swimmers body making them faster but also making it easier for the swimmer to consistently swim with ease at the same speed. Comparing this to traditional swimwear where they are made form lycra which has proven to absorb water and air causing the swimmer to swim slower.

Exploring viscous drag, discussed by researchers that this type of drag is when a layer of water gets stuck to the swimmers body and moves further with you. When the swimmer continues to swim the water attached to them will have friction with the water of the pool which will slow them down. The more surface area you have in the water the more viscous drag you will have. To help swimmers reduce viscous drag swimmers have done several tactics, one tactic was to shave all the visible hair on the body, this will reduce friction between the body and water; it can also make the swimmer slicker and faster when going through the water. Another tactic is wearing a suit; this will make the body tighter and it saves you from shaving all the hairs from your body. (Gary, 2017; Susan, 2020) from the writers personal experience in swimming, they found out that swimming with a swimming cap on can help improve the speed of both front crawl and back crawl weather than not having a swimming cap on.

Discussing eddy drag, FAQs (2020) suggest that eddy drag is formed when the swimmer moves through the water and there is a gap behind them that need to be filled, this causes the swimmer to pull water and air bubbles with them as they swim; affecting the swimmer in reducing their speed. This will lead the swimmer to creating water turbulence through a bad stroke technique. When a swimmer does front crawl then a small whirlpool forms; if this whirlpool maintains its

form for a long period of time then the stroke was executed inefficiently. More importantly, to overcome this barrier within eddy drag, Physics in Swimming (2020) have suggested that executing this with a high technique in front crawl can limit this limitation to affected speed.

Many theories have discussed wave drag, which is the final type of drag; this type of drag uses energy to create a wave by alternating the mass of water due to a swimmer moving through it. This displacement of mass requires work of the swimmer, by doing this work on the water, kinetic energy that is gained by the water is taken by the swimmer. Further reducing the forward motion. The reacting force that is absorbing kinetic energy is known as the opposite source, which is wave drag. (Vennell, Pease & Wilson, 2006) This has been exemplified within another journal by Pease (2012) and Wilson (2006) that their research has shown that 'Wave drag has been shown to contribute to up to 50% of the total drag experienced during free swimming.' (Pease, 2012) However, reducing the wave drag the swimmer will need to be as streamlined as possible, the more streamlined a person is, the less movement and affect there is on the water. The more streamlined the individual the more smoothly the water will flow past them. Britannica mentions that a body that is moving causes air flow around them, these are known as streamlines. They are smooth airflows that travel around the body, this can also be known as Laminar flow. Laminar flow is the smallest disturbance of the air when the person goes through it. (Britannica, 2020a)

Despite all of the different types of drag, there are more difficulties that can affect the swimmers performance whilst swimming. The flow of the water can have a big affect on the swimmer as well as the drags. This is illustrated in the types of flow in the water; this would include the laminar flow and the turbulent flow.

Laminar flow is the first flow, this is a type of liquid flow when the fluid travels smoothly; it can also be found in regular paths. Laminar flow can also be called the streamline flow, due to its momentum going in a straight line. Alternatively, turbulent flow is a type of flow that is completely opposite to laminar flow. Turbulent flow is when the fluid performs irregular patterns in the water; it does not go in a straight line. (Britannica, 2020) During swimming there are opposites of what drags, and flows do, they do not affect you in slowing down they help you stay afloat and help you put force at the beginning of a stroke. These are known as Propulsion, Paddle action and finning action; all of them act on Isaac Newton's third law on motion. Newton says "for every action, there is an equal and opposite reaction". (Newton, 2020)

Elaborating on propulsion, it helps the swimmer by creating forward motion within each stroke, this is shown in sports lingo; propulsion is used in swimming to show the forward motion within each stroke of the arms and legs movements, Gabriel also supports the point as he mentions that swimmer propel through the water with the combination of pulling with their arms and kicking with their legs to get them through the water. (Gabriel, no date; Sports lingo, 2020; Newton, 2020) Secondly, paddle action is when a swimmer uses their hands to pull down in the water to keep them afloat; paddle action also shows Newton's third law on motion. This can be shown in physics in swimming. 'For every action there is an equal and opposite re-action.' During swimming Newton's law relates to this concept because the hand travels down which moves the swimmer forwards and keeps them afloat. (Gabriel, no date; Newton, 2020)

Lastly, finning action can also be known as sculling, sculling is the skill for keeping yourself afloat in the water. Christophe mentions that sculling is where you use quick movements of your hands in a horizontal movement; this will then keep our head above the water. Sculling also uses Newton's third law 'For every action there is an equal and opposite re-action.' Sculling links in with Newton's third law because you are moving your hands up and down causing motion. (Christophe, 2019; Gabriel, no date, Newton, 2020)

Density has been defined as 'how compact or concentrated something is,' (vocabulary.com, no date), humans have lower density, compared with the density of water, which makes it easier for us to float. As Relaxnswim mentions that humans weigh less than water due to your lungs being filled with air, the air in the lungs lifts the person to the surface of the water. (Relaxnswim, 2005) from the writers personal experience, taking a deep breath in to fill your lungs will help the body to float on top of the water.

In conclusion, through this essay it has been discussed the four resistances/ drags affect swimmers during the action of front and back crawl. After discussing these limitations, theory's and methods have been researched to support the development and progress in swimmers to become faster in their profession of swimming.

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