A Study Investigating the Differences between Drag Racing Experts and Novices in Reaction and Anticipation times.

Gabrielle Barton McDonald
12366296

Supervisor: Dr. Arlene Egan
Programme Director: Dr. Grace O'Malley

BA (Hons) Psychology
National College of Ireland

Submitted to the National College of Ireland, March 2015

A Study Investigating the Differences between Drag Racing Experts and Novices in Reaction and Anticipation times.

Gabrielle Barton McDonald
National College of Ireland

Abstract

Introduction: Expertise has been a widely researched area, from chess expertise to language expertise. Expertise in sports has also been widely researched, from baseball pitchers to rugby players, understanding expertise is important. Within this study, drag racing experts (18%), novices (48%) and a control group (34%) were tested in their Reaction Times (RT), Anticipation Time (AT) and Self-Efficacy in a drag racing context. Differences between males and females were also investigated within this study. Method: 61 participants were tested in this study. 64% of the participants were male and the rest were female. The participants were tested using a Traffic Light RT task, a drag racing starting system and Law & Hall's (2009) self-efficacy questionnaire. Results: It was found that there were no differences found between experts, novices or control on the RT, AT and Self-efficacy questionnaires. However, experts were found to be more consistent than novices and control groups. There were also no differences between males and females on RT, AT and Self-efficacy.

Submission of Thesis and Dissertation

National College of Ireland

Research Students Declaration Form

Name: Gabrielle Barton McDonald

Student Number: 12366296

Degree for which thesis is submitted: BA Hons in Psychology

Material submitted for award

(a) I declare that the work has been composed by myself.

(b) I declare that all verbatim extracts contained in the thesis have been distinguished by quotation marks and the sources of information specifically acknowledged.

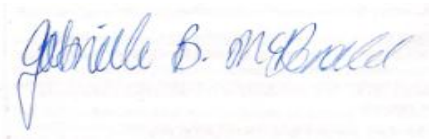
(c) My thesis will be included in electronic format in the College Institutional Repository TRAP (thesis reports and projects)

(d) ***Either*** *I declare that no material contained in the thesis has been used in any other submission for an academic award.

Or *I declare that the following material contained in the thesis formed part of a submission for the award of

BA Hons in Psychology, from the National College of Ireland

Signature of research student:



Date: 26th March 2015

Acknowledgements

I would like to take this time to thank my supervisor, Dr. Arlene Egan, for all her help, encouragement and support throughout my research and writing, also for her continuous and wonderful support over the past three years.

I would also like to thank Nigel Vahey, who also provided help throughout my research project. I would also like to thank all the psychology lecturers for their continuous support and help over not only the past year, but also the past 3 years.

I would also like to thank all of the participants who volunteered for this study, without your contribution the study would not have gone forth.

And finally, a very special thank you to my parents for their continuous support in my academia and extra curricular activities. Without your love, support and belief in me, I would never have gotten this far!

Table of Contents

Introduction

This section is the introduction to the study of the differences between drag racing expert and novices. Seven topics that are related to the present study will be discussed in this chapter. The topics are as follows: expertise, theoretical models of expertise, characteristics of expertise, anticipation time, reaction time, self efficacy & collective efficacy and gender differences. Within this section, expertise will be defined and the differences between how experts and novices organise their long-term memory will be discussed. Gagne's (1985) theory of expertise will be explained, along with two multidimensional models of expertise (Alexander, 2004; Steltler & Roessler, 2005). Characteristics of expertise will be explained. The importance of anticipation in the real world setting along with it's use in the sport setting will be reviewed. Also reviewing studies on reaction time and the reasoning why many sports require good reaction time. The need for self-efficacy and collective efficacy in a sporting context will also be discussed within this chapter. And finally, evidence to portray how there are minimal differences between male's and females across various contexts such as intelligence, mathematics and sports.

Expertise

An expert is defined as "a person who has special skill or knowledge in some particular field" (Webster's New Universal Unabridged Dictionary, 1996, as cited by Sternberg & Grigorenko, 2003, p. 157). Expertise is gained when an individual deliberately practices a task for 10,000 hours or ten years (Ericsson & Smith, 1991; Simon & Chase, 1973). Some studies have concluded that expertise is highly task specific and cannot be transferred into other domains (Vieluf, Mahmoodi, Godde, Reuter, Voelcker-Rehage, 2012). However, a more recent study performed by Moore & Muller (2014), found that expert and near expert baseball players were readily able to predict the pitch the pitcher was about to throw in a cricket setting from their knowledge in baseball. Shanteau & Weiss (2014) also proposed that experts must profit from past experiences to be able to predict certain outcomes. Although, according to previous research across

various sports, it has been widely suggested that experts are capable of anticipating more adequately than novices or the normal population in their domain of expertise (Gabbett & Abernathy, 2013; Abernathy & Russell, 1987; Abernathy 1990).

According to Halpern & Wai (2007), while experts do possess more knowledge than novices, their long-term memory is also organised differently, it is organised in such a way that makes it more accessible to the experts when needed (Charness, 1991 & Norman, 2005). According to Simon & Chase's (1973) theory, experts have an accretion of complex patterns that help the expert access their extensive body of knowledge.

Theoretical Models of Expertise

Gagne (1985) proposed the Differentiated Model of Giftedness and Talent (DMGT). This theory of expertise highlights an individual's innate ability (gift) and their mastery (Talent). Sternberg & Davidson (2005, p.99) stated that in Gagne's (1985) theory, which defines giftedness as entitling the possession and the usage of phenomenal natural abilities. Talent is the phenomenal mastery of systematically developed abilities and knowledge in at least one field of human activities, so much so that it positions the individual in the top 10% of the population in that particular area (Sternberg & Davidson, 2005, p.99).

The DMGT introduces four other components within the model; they are Intrapersonal Catalyst (IC), Environmental catalyst (EC), Learning and Practicing (LP) and finally Chance (C). The IC refers to the individual's physical and mental characteristics, such as appearance, handicapping, temperament or personality. The EC relates to the environmental factors, such as, culture, family or peers. LP indicates the individual's deliberate practice and learning. And finally C refers to chance happenings that influence the EC (Sternberg & Davidson, 2005).

Burgess & Naughton (2010) suggested that the DMGT model recognizes multiple types of domains from education to sports. And while it has gained some support, it does lack practical research. Gagne's (1985) DMGT model has yet to break into the sports domain, even though the model itself acknowledges the sporting domain (Tranckle & Cushion, 2006). Phillips et al (2010) suggested that while the DMGT provides an operational account of giftedness, it does not

however provide a comprehensive, informative rationale supporting the multi-dimensional model.

After outlining Gange's (1985) DMGT of expertise, attention will now turn to Alexander et al (1994) who viewed expertise in a different perspective. They suggested the Model of Domain Learning. These researchers were one of the first to suggest expertise was multidimensional. Alexander (2004) suggested that there were three components to domain learning. They are: 1), knowledge, 2), strategies and 3) interest. The first component, Knowledge, refers to the depth of the individual's knowledge about a certain subject. Strategies refer to both the general cognitive procedures used in summarization and the metacognitive procedures in self-evaluation regarding the monitoring of the individual's learning. The final component, interest, refers to the drive for the individual's underlying needs and desires (Alexander, 2004).

Alexander (2004) stated that the MDL hypothesizes that there is 3 components to domain specific learning: 1), Acclimation, 2), Competence and 3), Proficiency expertise. Acclimation refers to an individual needing to become orientated with the particular subject; other theories of expertise would label this individual as a novice. Alexander (2004) suggested that for an individual to reach the competence stage of the MDL, they must first show a sufficient base of subject-matter knowledge, a collection of surface-level and deep-processing strategies, or a growing personal association with the domain. And for an individual to reach the proficiency level of the MDL they must have high levels of domain knowledge, deep strategic processing and an individual interest. These are also required for the maintenance of the proficiency level of the MDL, as advancements in the contexts can happen rapidly (Alexander, 2004).

Like Alexander (2004), Steltler & Roessler (2005) suggested that expertise was multidimensional. Within this Multidimensional model there are at least three components; 1), experts are at high levels of play, 2), expertise involves specific skills and 3), expertise is dynamic. The first component of the model is experts are at a high level of play suggests that experts are required to perform at a high level of competitive play, such as professional and national teams. They also suggest that this is very important as some players can compensate for shortcomings in some areas but thrive in others. This also suggests that the higher the level of

competitive play of the individual, the more likely they are to have reached a satisfactory level of expertise (Steltler & Roessler, 2005).

The second component of the multidimensional model (Steltler & Roessler, 2005) is: Expertise involves specific skills. It has been suggested that some skills such as dribbling, passing and goal scoring, are assumed to be associated with perceptual and cognitive advantages than any other skill. Due to this, studying experts in certain areas of the skills makes it much easier to isolate the cognitive factors that are deemed to be important (Steltler & Roessler, 2005). The final component in Steltler & Roessler's (2005) model is expertise is dynamic. They proposed that performances by an expert are dynamic, which suggests changes in expertise can occur due to development, training and various other factors. They also suggest that, rather than concluding that the way in which experts act and perceive is always the norm, a research agreement in which variance in action and perception is studied in various contexts and variations in performance, it may provide a much clearer understanding of expertise (Steltler & Roessler, 2005).

Characteristics of Expertise

Anticipation is a skill that allows an individual to be prepared for a particular response, which can lead to an advantage (Rowe & McKenna, 2001). Rowe & McKenna (2001) suggested that anticipatory skills are characteristics of experts. Skilled anticipation is required in various mundane tasks, but it is also very important in tasks such as sport participation (Abernathy, 1991; Gabbett & Abernathy, 2013; Rowe & McKenna, 2001). It has been found that experienced drivers are more likely to detect a dangerous situation much quicker than a novice driver, which can lead to the experienced driver avoiding harm (McKenna & Horswill, 1999). Automatic processes are incredibly rapid and effortless, it has been suggested that automaticity is essential for early responses. (Rowe & McKenna, 2001)

Although Rowe & McKenna (2001) suggested that one of the characteristics of expertise was anticipatory skills, it has been found that there have been no significant difference between experts and novices on various other tests,

such as, Reaction time and depth perception (Gabbett & Abernathy 2012; Abernathy, 1991). It has also been suggested that the expert novice differences are not because of their visual information, however they are more likely due to information pick up (Gabbett & Abernathy, 2013).

Sheridan & Reingold (2014) stated that expert chess players can memorize a chess board after it being shown for a few seconds. They also suggested that expert chess players have a great visual span than novices, meaning that experts can process larger configurations of chess pieces than novices (Sheridan & Reingold, 2014). It has been suggested that expert and novice differs in uncertain situations. An expert will not be able to perform well in an uncertain situation, but they will also excel at the task at hand (Janelle & Hatfield, 2008).

Anticipation Time

Anticipation is "the imagining of future events, which sometimes creates an affective response" (Psychology Dictionary, 2015). It is required for the effectiveness of various types of cognitive processes needed in everyday life (van Boxtel & Bocker, 2004). "Skilled anticipation, the ability to respond early in an action sequence, is required for expertise in many dynamic real-world activities such as driving"(Rowe & McKenna, 2001, p. 60) Taking for example the sample used within this study, they were gathered based on their level of expertise or participation in Drag Racing.

The ability to make accurate anticipatory judgments in some sporting contexts can lead to a successful performance, especially those with severe time constraints (Abernethy et al, 2012), such as drag racing. It has been found that anticipatory skills can be frequently viewed in experts in their sporting domain (Abernethy et al, 2012). In a study performed by Abernethy, Woods & Parks (1999) on learner squash players, found that novices who received 20 training sessions over a four week period, on how to anticipate the ball and the cues to look out for, had significantly improved from pre to post training sessions.

In a study performed by Muller et al (2015), they investigated 49 expert and near expert rugby players on whether or not their anticipatory skill was domain

specific with the participants trying to predict pitch type in baseball. They found that anticipation skill was indeed domain specific (Muller et al, 2015). However, like previously mentioned, Moore & Muller (2014) found that expert baseball players were able to anticipate the pitchers throw. In drag racing the driver anticipates the "green light", which can come before two types of starting systems: the pro tree and the sportsman tree. The pro tree is the starting system used by drivers in the pro classes, such as top fuel, pro mod or top methanol. In this case the tree will illuminate all three amber lights for 0.400 of a second before the green light will appear. The sportsman tree is the starting system used by the remainder of the classes. The starting system will illuminate the tree amber lights separately at 0.500 of a second before the remaining amber lights and green light. Drivers in drag racing will know how their car will react and how long it will take to react before the green light.

Reaction Time

Reaction Time (RT) is the time in which it takes to respond to a stimulus, it is measured from the commencement of a crucial stimulus until the start of the response (Maslovat, Klapps, Franks & Jagacinski, 2014). RT can be simple or involve a choice. Simple reaction time is the time taken between the stimulus and the individual's movement. Choice reaction time is the time taken between the stimulus and an action, which involves a choice (Beashel, Sibson & Taylor, 2004). It has been stated that, in both cases of reaction time the individual still needs to react quickly. In some sports, such as tennis, choice reaction time is required, as they must anticipate the player's move and then make a choice as to where they need to be to hit the ball and where they would like the ball to go (Beashel, Sibson & Taylor, 2004). Simple reaction time and Choice reaction time are both validated measures of cognitive functioning (Dykiert et al, 2010).

RT tasks can be used to test individuals higher cognitive functioning (Dykiert et al, 2010). RT tasks are also crucial for testing an individual's

concentration (Dykiert et al, 2012). However, RT can be affected or influenced by their arousal, distraction and fatigue. According to Welford (1980), good results depended on how much concentration an individual had on the task. He also stated that reaction times increased when there were distractions present (Welford, 1980). Babkoff, Kelly & Naitoh (2001) stated that the longer an individual is sleep deprived the less likely they are to perform well and consistently in a cognitive task such as an RT task.

According to Dutilh, Kypotos & Wagenmakers (2011), practice effect occurs when an individual practices a particular task repeatedly. It was found that the mean RTs quicken with practice at the initial stages, but then diminishes as the practice progresses (Dutilh, Kypotos & Wagenmakers, 2011). They also stated that the initial speed up is consistent with many other theories of learning acquisition and it is mostly similar to Logan's (1988) Instance Theory (Dutilh, Kypotos & Wagenmakers, 2011). Logan (1988) suggested that over time an individual can do tasks on "automatic pilot", due to the person having the same routine and tasks to do on a daily/weekly basis.

Vickers (2007) suggested that an individual will have different reaction times for visual, auditory and touch stimulus. The mean reaction time for visual stimulus is 189.5 ms, 146 ms for auditory and 150 ms for touch stimulus. Reaction time is highly important, everyone must respond quickly to events in everyday life, in certain tasks such as driving or riding a bike, having incredibly quick reaction times can aid individuals in unlikely situations, as it could possibly lead to the individual avoiding a possible life threatening accident. (Beashel, Sibson & Taylor, 2004).

Eckner et al (2012) implied that, RT has a strong correlation with cognitive and physical health. It has been suggested that simple RT has been linked to general intelligence (Dykiert et al, 2010). It has been found that middle aged and older aged adults have much slower reaction times in comparison to younger adults (Dykiert et al, 2010; Der & Deary, 2006). It has also been stated that reaction times can be used as a predictor for death in individuals. It has been suggested that slower reaction times have been linked to mortality (Dykiert et al, 2010). It has been found that the mean for RTs increase at higher altitude. It has been suggested that this

occurs due to the effects of hypoxia (Dykiert et al, 2010).

Results from a sample of over 15 million people on the humanbenchmark.com suggest that, the average reaction time for the general population is 0.262 of a second and the median is 0.251 of a second. On this site their screen changes from red to green and the individual must click the screen when it goes green, after which, the site gives them their reaction time.

Self-efficacy & Collective Efficacy

Within is this section self and collective efficacy will be discussed. Self-efficacy will be defined, along with the importance of self-efficacy will also be highlighted within a sports setting. The theory of self-efficacy that was devised by Bandura (1977), within the Social Learning Theory, will also be discussed. Collective efficacy will then be defined, along with the importance of collective efficacy within a team setting.

Barkhoff & Heiby (2010) stated that self-efficacy is characterized as one's expectations of their ability to victoriously perform a particular behaviour (Bandura 1977). The theory of self-efficacy was devised by Bandura (1977), it was developed within the framework of the Social Cognitive Theory (Feltz, Short & Sullivan, 2008, p.5). There are three dimensions within these beliefs, the level, strength and generality. The level of self-efficacy relates to the individuals expected performance at different levels of difficulty (Feltz, Short & Sullivan, 2008, p.6). The strength refers to the level of confidence and certainty the individual possess about a particular situation at different difficulty levels (Feltz, Short & Sullivan, 2008, p.6). The final dimension is the generality dimension. This illustrates the number of different domains of functioning in which individuals deem themselves effective. It is also the transferability of the individual's efficacy judgment across various different sports and activities. (Feltz, Short & Sullivan, 2008, p.6)

Individuals perceived self-efficacy is based upon their beliefs in their own ability to influence events that can affect their lives. It is a core belief and it's the foundation of human motivation and performance accomplishments (Bandura,

1997, 2006, 2010). Self-efficacy affects the choices an individual makes within a particular area, along with it affecting the level of effort put into the task at hand (Bandura, 1977; Myers, Feltz & Short, 2004). According to a study by Nicholls et al (2010), they found that athletes with high level of self-efficacy were much inclined to deal with stressors more effectively than the regular population (Feltz, Short & Sullivan, 2008, p.4).

Slovinec D'Angelo et al (2014) suggested that self-efficacy was required for the initiation of a desired behaviour, but motivation sustained it. However, they also suggested that if an individual needed a high level of self-efficacy during the original behaviour change. Individuals are more likely to engage in activities where they have a high level of self efficacy, rather than an activity they possess little to no self-efficacy (Slovinec D'Angelo et al, 2014). The relationship between behaviour and self-efficacy is reciprocal, failure hinders individual's self-efficacy beliefs, whereas success promotes an individuals self-efficacy, which leads to the activity being repeated (Slovinec D'Angelo et al, 2014).

While successful performance can be understood to be partially due to psychological factors, it is also good to note that the individual must possess the required physical skills and capabilities to perform well. The most successful athletes must also sustain their hard work, perform skillfully and cope with performance pressure. The athletes, who cannot cope or perform like such, do not possess a high level of self-efficacy. (Feltz, Short & Sullivan, 2008, p.4) It has also been suggested that self-efficacy is one of the most influential psychological constructs, especially for the likes of athletes (Feltz, Short & Sullivan, 2008; Feltz, 1994).

Collective efficacy is a group or team's collective belief about their ability to succeed (Bandura, 1986; Allen, Jones & Sheffield, 2009; Myers, Feltz & Short, 2004; Myers, Paiement, & Feltz, 2007). While collective efficacy is the group or team's belief, it still, however, reflects the individual's belief of the team's capabilities (Myers, Payment & Feltz, 2004). Collective efficacy is important in many domains, such as sports, educational, business and the military (Allen, Jones & Sheffield, 2009; Myers, Feltz & Short, 2004; Myers, Paiement, & Feltz, 2007; Myers, Payment & Feltz, 2004; Stajkovic, Nyberg & Lee, 2009). While drag racing involves one individual racing another, it is important to note that multiple team members are required to run the car/bike. The collective efficacy of the team

before and during a race event may make the slightest difference between a win and lose situation.

Majority of studies in sports researched the correlation between self-efficacy and individual performance, whereas majority of sports are team based (Myers, Feltz & Short, 2004). It wasn't until 1982 when Bandura suggested a collective efficacy approach (Myers, Feltz & Short, 2004). Allen, Jones & Sheffield (2009) investigated 31 interdependent sports teams, they were testing their levels of collective efficacy before a sporting event and immediately after the sporting event. They found that teams that had high levels of collective efficacy before the sporting event were more likely to achieve.

Collective efficacy has been shown to have a long lasting effect on a team's performance (Allen, Jones & Sheffield, 2009; Gully, Incalcaterra, Joshi, & Beaubien, 2002). It has been suggested that collective efficacy is a crucial factor in the success of a sports team (Allen, Jones & Sheffield, 2009; Myers, Feltz & Short, 2004; Myers, Payment & Feltz, 2004). In a meta-analysis, of over 31,000 participants, performed by Stajkovic, Nyberg & Lee (2009), it was found that there was a significant, positive correlation between group performance and collective efficacy, which is similar to other studies. Collective efficacy is highly important because it influences a group to take action, how much effort the group puts in and how long it will last (Stajkovic, Nyberg & Lee, 2009).

Similar to various other studies, Myers, Payment & Feltz (2004) suggest that teams who possess high levels of collective efficacy tend to outperform their opponents and overcome obstacles quickly and efficiently (Myers, Payment & Feltz, 2004; Bandura, 1986; Lindsey, Brass & Thomas, 1995). According to Goddard (2001), collective efficacy is heavily influenced by past experiences; past levels of success should affect the group's performance.

A contrast to self-efficacy and collective efficacy could be meta-cognition. Meta-cognition refers to how well an individual understands the concept, people with accurate meta-cognition tend not to be overly confident in their ability and perform well, whereas people who have inaccurate meta-cognition tend to be overly confident in their ability and perform badly, which seems to reject Bandura's (1977) theory of self and collective efficacy (Zimmerman & Schunk, 2004).

Gender Differences

For decades there has been numerous amounts of studies conducted on gender differences, whether it be for cognitive functions or general intelligence (Dykiert et al, 2012; Deary, Irwing, Der, & Bates, 2007; Voyer & Voyer, 2014). It has been found that although there are no differences in general intelligence between men and women, there is a difference in cognition (Dykiert, et al, 2012; Praetorious et al, 2014). For example, women tend to perform better than men on episodic memory tasks and verbal tasks, whereas men out perform women on visuospatial tasks and quantitative ability (Herlitz & Loven, 2009; Dykiert, et al, 2012; Praetorious et al, 2014). However, it has been shown that while they do perform better than one another in certain tasks, the difference between the mean score levels tends to be very small and the differences tend to be stable across the lifespan (Praetorious et al, 2014). However, in a study performed by Praetorious et al (2014), they found no gender differences in episodic memory or spatial tasks, when they controlled for longevity. They hypothesized that if they controlled for the individuals time to death, it would decrease any advantage an individual had. They did, however, find that men's semantic memory declined at a steeper rate than women, which the researchers found to be due to the fact men tend to develop dementia at a younger age than females (Praetorious et al, 2014).

It has been suggested that differences appear between men and women in general intelligence. It has been found that males in younger cohorts tend to outperform women, however, this finding has not been supported across the adult years (Praetorious et al, 2014; Lynn, Ivanec, & Zarevski, 2009). Another gender difference that has been studied quite frequently in educational research is the female advantage in school (Voyer & Voyer, 2014). It has been found that females tend to perform better in subjects such as language, where as males perform better in math and science based subjects (Voyer & Voyer, 2014). However, it has now been suggested that the gap in gender differences between males and females in mathematics is almost dissolved (Voyer & Voyer, 2014).

According to Miller, Branch & Ogilvie (2008), they found that there were gender differences in learning styles for sports activities. The statistically significant differences that favoured females were facilitation to change, ability

to trust, willingness to change, feedback preference and interpersonal control, whereas the factors favouring males were frustration tolerance, ability to change, skill rating, and compliance (Miller, Branch & Ogilvie, 2008). While some studies on gender differences in regards to motivation has shown some significant differences (Hamilton, Cox & White, 2012), other studies have provided no difference at all (Hall, Rodgers, Wilson & Norman, 2010). This area seems to provide rather inconsistent results (Guerin, Bales, Fortier & Sweet, 2012). In a Meta analysis, including 27 studies, performed by Guerin, Bales, Fortier & Sweet (2012), it was reported that near-zero effect sizes were found for differences between men and women on motivation. It has been suggested that there are some gender differences in regards to driving habits. It has been found that women tend to voluntarily cease driving as they age, whereas men tend to drive as long as their health allows (Okonkwo et al, 2007). In the same study it was also found that women avoided particularly dangerous situations more than men (Okonkwo et al, 2007).

Another thing to consider is stereotype threat. Stereotype threat is "a phenomenon whereby certain groups of people are affected by an unconscious fear of confirming a negative stereotype concerning their performance in a particular domain" (Ganley et al, 2013, p.1887). It has been suggested that reasons for the gap between genders in standardized tests could be due to stereotype threat. However, Ganley et al (2013) found that stereotype threat didn't occur within his study and suggests that it could only happen in specific instances.

In various different sporting backgrounds, women tend to be seen as inferior or possess second-rate skills (Pflugfelder, 2009). However, Pflugfelder (2009) suggests that in a motorsport setting women tend to drive the same cars as men and have all the same equipment and race on the same tracks. Everything is the same regardless of gender, which in other sports it isn't. The only problem women have are how fans of the motorsport fear that a woman's body is inferior to a man's and can be seen as a handicap in the sport. Pflugfelder (2009) also suggested that women in the male dominated, motorsport world threaten others within it. In drag racing, since it's start in the early 1950's, women have won just over 100 races in total, whereas Tony Schumacher has over 70 event wins on his belt alone.

Summary

This chapter introduced the theory behind the present study. Seven topics were discussed within this chapter, these topics were: expertise, theoretical models of expertise, characteristics of expertise, anticipation time, reaction time, self efficacy & collective efficacy and gender differences. Within this section, expertise was defined and the differences between how experts and novices organise their long-term memory were also discussed. Gagne's (1985) theory of expertise was explained, along with the multidimensional model of expertise and the Model of Domain Learning (Alexander et al, 1994). Characteristics of expertise were also discussed in this chapter. The importance of anticipation in the real world setting along with its use in the sport setting was reviewed. Studies on reaction time and why many sports require good reaction times were also mentioned in this chapter. The need for self-efficacy and collective efficacy in a sporting context was also discussed. And finally, research findings in the differences between males and females, which showed males still perform better than females in mathematics, however, as mentioned above, could be due to the effect of stereotype threat.

Rationale

The purpose of this present study is to investigate reaction and anticipation times between experts and novices within a drag racing sample. This present study was performed due to the uniqueness of the study, there are no previous studies reported using a drag racing sample. While numerous studies have been conducted testing expertise and reaction times, there are no drag racing samples among them. The dearth of research in this area led to the design of this study. In drag racing, an individual is constantly stimulating their reaction times, along with anticipation, as the individual is anticipating the 'green light'. Drag racers use a device called a 'Porta-Tree'. It allows them to practice their anticipatory skills before each race.

It is understood that reaction time, anticipation tasks and other cognitive

functioning declines with age. However, in this present study, there was no age limit for the experts, novices and control group. Which could result in various older adults participating who stimulate their reactions on a regular basis, and due to practice effects, could in fact have quick reaction times unlike previous research suggests (Dykiert et al, 2010; Der & Deary, 2006).

Hypothesis 1: That there will be a difference between the expert group and the novice and control group on the reaction time task.
Hypothesis 2: That there will be a difference between the expert group and the novice and control group on the anticipation time task.
Hypothesis 3: That there will be a correlation between self-efficacy statements and quicker reaction times.
Hypothesis 4: That experts will be more consistent in the reaction time tasks in comparison to the novice and control group.
Hypothesis 5: That there will be no differences between males and females within the reaction time and anticipation time tasks.

Method

Within this section of the paper, the research design, participants, materials and procedure will be outlined.

Design

The design for this study is a quantitative, cross-sectional, between participants design. This design was chosen due to the hypotheses and the materials used. This design was deemed suitable due to the fact the analysis run would examine

the differences between groups. E.g. differences between expert and novices in the reaction time task.

Participants

The sample was made up of 61 participants in total: 22 females (36%) and 39 males (64%). 38% of the participants were Irish, 53% from the UK, 8% from the USA, 5% from Australia and 2% from the Philippines. The participants ranged in age from 16-64 years of age.

The participants were split into two groups, the Drag Racing sample and the control. Within the Drag Racing sample, the sample was further split into another two groups, the experts (6+ years experience) and the novices (0-5 years experience). 11 participants were in the expert category, 6 years and upward, whereas 21 participants were considered to be in the novice group, 0-5 years of experience. 51% of the participants took part in drag racing; the remainder of the participants (49%) were the control group (See table 1).

The frequencies for the participants' gender, country of origin, age and group they were placed in are all outlined in the table below, table 1.

Table 1. *Frequencies of Gender, Country of Origin, Age and Grouping.*

Variable	Frequency	Valid Percentage
Gender		
Male	39	63.9
Female	22	36.1
Country of Origin		

Ireland	20	32.8
United Kingdom	32	52.5
USA	5	8.2
Australia	3	4.9
Philippines	1	1.6
Age		
18-29	39	63.9
30-49	15	24.6
50-64	5	8.2
Under 18	2	3.3
Groups		
Expert	21	18
Novice	11	47.5
Control	29	34.4

Materials

A list of demographic questions was used, along with questions to assess the participant's participation in drag racing. (See appendix B)

The Self Efficacy Questionnaire (Law & Hall, 2009) was modified slightly to suit the participant's of this study. (See appendix C)

The reaction time task included a set of traffic lights, when the light turned green the participant must hit a button to record their reaction time and must complete the task initially five times and additionally five more times after the anticipation time task. (See appendix D)

The anticipation time task consisted of a set of lights called "The Christmas Tree". It has four sets of lights at the top of the tree to indicate the participant is staged and ready to go. Following the four sets of lights, there are six more amber coloured lights below which illuminates before the green light. The participant had to let go of the button once all six amber lights illuminated, before the green to get an anticipation time score. (See appendix D)

A smartphone app called Dream days was also used throughout the entire study. It helped track deadlines and encouraged and maintained goal setting. (See appendix E)

Procedure

Prior to the start of the data collection, a pilot study was performed on one participant through Skype. The pilot was undertaken to check for problems within the study, to time the study and give the participants an estimated amount of time and finally to check if the tasks within the study ran smoothly. Once completed the real study commenced.

The participants in this study were informed of the nature of the study through an information sheet given before the tasks began. (See appendix A) Further questions regarding the tasks were answered throughout the testing by the experimenter. Written consent was obtained for the two participants who were under the age of eighteen. (See appendix F) Verbal consent was also retrieved for participants over the age of eighteen.

All participants were made aware that the assessment was completely voluntary and that they could revoke their participation at any point and also may remove their results from the study if they wished.

Once each of the participants was fully briefed, the experimenter instructed them to share their screen with the researcher on Skype. Skype was essential for completing this test, as it was necessary for the participants to share their screen with the experimenter to gather the results as they occurred, to ensure that no modifications to the results were made. After the participant shared their screen, the experimenter began completing the demographic and

drag racing participation questions, whilst the participant informed them of their answers. After the demographic and drag racing participation questions were completed, the experimenter put the participant into one of three groups, the drag racing sample group, which contained the experts or novices or the control sample group.

The researcher then continued by asking the participants the statements from the self-efficacy questionnaire. The participants were asked to answer honestly and to answer the statements between 1 and 7, 1 being not confident at all and 7 being highly confident.

After the participants answered 7 self-efficacy statements they were then given the link to the first task, which was the reaction time task and were given the following instructions. The participants were told that a traffic light system would appear on their screen and that there would be a button next to it saying 'Click to Start'. The participants were told when they were ready they were to click the button and wait for the Traffic light to turn green and click the button again once they saw the green light. They were then told to perform the RT task five times, as the experimenter observed the participants as they partook in the task, recording each result to three decimal places. The experimenter informed the participant to keep the window for the task open, as they would be returning to the task after the anticipation time task. It was imperative that the participants received the links for the tasks just prior, as the researcher wanted to ensure none of the participants practiced the tasks prior to the experiment.

The participants were given the link to the second online task, the anticipation time task. The participants who did not partake in drag racing were given extensive instructions, more so than those who partook in drag racing, as the "Christmas tree" is used in drag racing. The participants were told that the task involved clicking a button called 'Pre Stage' at the bottom of the screen. They were also informed that when they were ready they were to hold the button saying 'Go' until the three lights appeared all at once or in a sequential order. They were also informed to perform the task five times. The experimenter took note of the participant's results. Once the participants had completed the anticipation task they were informed to return to the previous task to complete the RT task another five more times.

After each participant had completed the final reaction time task, they were asked to answer one last statement on how confident they were that they had performed well in the previous tasks. After they had answered the question they were thanked for taking part and reminded again that they may remove their results if they wished and were also reminded that the experimenter would be publishing the results, but completely anonymising the results.

Within this method section, the study's quantitative; cross sectional research design was mentioned. Along with the 61 participants, their age and country of origin. The materials used in this study, such as demographic questions, RT and AT tasks and self-efficacy questionnaires. And finally, the procedure of the study was outlined in great detail.

Results

In this chapter, tables for descriptive statistics for the continuous variables will be displayed below. Tables containing results for the five hypotheses for this present study will also be displayed below. Tables containing

interesting correlations, which were not linked to the hypotheses will also be displayed below.

The descriptive statistics for this report, the Mean (M), Standard Deviation (SD), Range (R), Possible Range (PR) and Cronbach's Alpha were used to measure the participants RT, AT and Self-Efficacy. These are all described below in table 2.

Table 2. *Descriptive statistics and reliability of all continuous variables*

	RT	AT	Self-Efficacy
Mean	.49	.19	5.37
Standard Deviation	.34	.18	.80
Range	.05-7.06	.00-2.06	1-7
Possible Range	0-∞	0-∞	1-7
Cronbach's Alpha	.70	.74	.79

Hypothesis 1 stated that there would be a difference between the expert group and the novice and control group on the reaction time task. A one way between groups ANOVA was performed to compare the effects of expert, novice and control groups on reaction time. There was no significant effect of level of expertise on RT at the $p<.05$ level [$F(1, 59) = 0.03$, $p = 0.40$]. Hypothesis 4 stated that experts would be more consistent in the reaction time tasks in comparison to

the novice and control group. It can be seen in the table below, that experts had a much lower SD than novices and the control group.

Table 3. *Descriptive statistics for all groups for reaction time*

Reaction Time	Expert	Novice	Control
Mean	.38	.55	.50
Standard Deviation	.10	.34	.39
Range	.20-2.80	.09-7.06	.23-6.84
Possible Range	0-∞	0-∞	0-∞

Hypothesis 2 stated that there would be a difference between the expert group and the novice and control group on the anticipation time task. A one way between groups ANOVA was performed to compare the effects of expert, novice and control groups on anticipation time. There was no significant effect of level of expertise on AT at the $p<.05$ level [$F(1, 59) = 0.02$, $p = 0.58$].

Table 4. *Descriptive statistics for all groups for anticipation time*

Anticipation Time	Expert	Novice	Control
Mean	.18	.17	.22

Standard Deviation	.14	.13	.23
Range	.00-0.90	.00-0.87	.05-2.05
Possible Range	0-∞	0-∞	0-∞

Hypothesis 3 stated that there would be a correlation between self-efficacy statements and quicker reaction times. A one way between groups ANOVA was performed to compare the effects of expert, novice and control groups on Self-efficacy. There was no significant effect of level of expertise on Self-efficacy at the $p<.05$ level [$F(1, 59) = 0.03$, $p = 0.38$].

Table 5. *Descriptive statistics for all groups for self-efficacy*

Self-Efficacy	Expert	Novice	Control
Mean	5.66	5.38	5.26
Standard Deviation	.68	.95	.72
Range	5-7	2-6	3-6
Possible Range	1-7	1-7	1-7

Hypothesis 5 stated that there would be no differences between males and females within the reaction time and anticipation time tasks. A one way between groups ANOVA was conducted to compare the effects of Gender on RT, AT and Self-efficacy. There was no significant effect of gender on RT at the $p<.05$ level [$F(1, 59) = 0.39$, $p = 0.61$]. There was also no significant effect of gender on AT

at the p<.05 level [F(1, 59) = 0.71, p = 0.53]. And finally, there were also no significant effects of gender on Self-efficacy [F(1, 59) = 2.67, p = 0.23].

Table 6. *Gender differences between all continuous variables*

Gender Differences	Male	Female
RT		
Mean	0.50	0.48
Standard Deviation	0.55	0.39
Range	0.46-7.06	0.83-5.77
Possible Range	0-∞	0-∞
AT		
Mean	0.13	0.15
Standard Deviation	0.27	0.25
Range	0-1.50	0-2.06
Possible Range	0-∞	0-∞
Self-Efficacy		
Mean	5.44	5.25
Standard Deviation	1.30	1.11
Range	1-7	1-7
Possible Range	1-7	1-7

The relationship between RT, AT and Self-efficacy was investigated using Pearson product-moment correlation coefficient. Preliminary analyses were performed to ensure that there were no violations in the assumptions of

normality. There was a moderate, positive correlation between reaction time and anticipation time, with no correlation between self-efficacy and reaction time or anticipation time, these results are displayed in Table 7 below.

Table 7. *Correlations between all continuous variables*

Variables	1	2	3
1. Reaction Time	1		
2. Anticipation Time	.34*	1	
3. Self-Efficacy	-.127	-.18	1

Note. Statistical significance: *$p < .01$

The relationship between RT, AT, Education and Self-efficacy statements were investigated using Pearson product-moment correlation coefficient. Preliminary analyses were performed to ensure that there were no violations in the assumptions of normality. There was a moderate, positive correlation between reaction time and Self-efficacy statement 2, 3 and 8, with AT Go 1 being correlated with statement 2 and 8, along with Education having a positive correlation with statement 6. These results are displayed in Table 7 below.

Table 8. *Correlations between variables and Self-efficacy statements.*

Variables	Q2	Q3	Q6	Q8
1. RT Time 1 Go 2	-.29*	-	-	-
2. RT Time 1 Go 5	-	-.35**	-	-
3. RT Time 2 Go 1	-	-	-	-.36
4. AT Go 1	-.29*	-	-	-.28*
5. Education	-	-	.29*	-

Note. Statistical significance: *$p < .05$; **$p < .01$;

An independent-samples t-test was conducted to compare the effects of gender on self-efficacy statements. There was a significant difference in the scores for Males (M=5.97, SD=1.25) and females 2 (M=5.14, SD=.99) conditions; t(59)=-2.71, p = 0.009.

Table 9. *Correlations between gender and Self-efficacy statement 1.*

Variables	Self-Efficacy Q1
1. Gender	.34**

Note. Statistical significance: *$p < .05$; **$p < .01$;

Table 10. *Descriptive statistics for gender and self-efficacy statement 1.*

Self-Efficacy Q1	Male	Female
Mean	5.97	5.14
Standard Deviation	1.25	.99
Range	1-7	3-6
Possible Range	1-7	1-7

Discussion

In this final section of the study, the hypotheses will be defined again. The results for the five hypotheses will be discussed. The strengths and limitations of this study will be presented. And finally the suggestions for future research will be spoken about in this final chapter.

The aim of the present study was to investigate whether there would be a difference between the expert group and the novice and control group on the reaction time task, anticipation time tasks and self-efficacy statements.

Hypothesis 1 & 2

Hypothesis 1 stated that there would be a difference between the expert group and the novice and control group on the reaction time task. Similar to other research by Gabbett & Abernathy (2012) and Abernathy (1991) there was no significant differences between expert, novices and the control group on reaction time task; however, it can be seen that on an average experts tended to have quicker reaction times than novices and the control group. And from the correlations, it has been shown that RT and AT are correlated, which suggests that experts in drag racing should perform well in RT tasks, like they did in the AT tasks, which has been shown in this study. Phillips et al (2010) also suggested that time spent in a particular sport doesn't discriminate between expert and novices. They also suggested that the relationship between practice and performance is non linear.

Hypothesis 2 stated that there would be a difference between the expert group and the novice and control group on the anticipation time task. Rowe & McKenna (2001) suggested that anticipatory skill is a characteristic of an expert. But from the results above it can be concluded that there was no significant difference between the expert, novice and control groups on anticipation time task. It should also be noted that looking at the results, it shows that the novice's performed slightly better in the anticipation time task than the experts. This may have something to do with an expert's increased age and research suggests for RT that it decreases with age (Dykiert et al, 2010). And it was also discovered in this study that there was a positive, moderate correlation between RT and AT, which may support that like RT, AT decreases with age, however further research into this area is needed.

Hypothesis 3 & 4

Hypothesis 3 stated that there would be a correlation between self-efficacy statements and quicker reaction times. However, the hypothesis that quicker RT's would correlate with higher self-efficacy scores was rejected. Instead, it was found

in this study that there were in fact correlations between self-efficacy statements and reaction times. It was found that there was a moderate, negative correlation between self-efficacy statements 2, 3 and 8 and RT. It was found that higher self-efficacy scores were correlated with slower reaction times. Which seems to reject Bandura's (1977) theory of self-efficacy, which suggests that the more confident and individual is, the more likely they are to achieve. A suggestion as to why higher self-efficacy meant slower RT's could be due to an inaccurate measure of their meta-cognition.

Hypothesis 4 stated that experts would be more consistent in the reaction time tasks in comparison to the novice and control group. From the results above it can be seen that experts were more consistent than the novice and control group. The novice and control group deviated 0.24-0.29 away from the mean more than the experts did. Which supports the hypothesis that experts would be more consistent that the novice and control groups. It was also found that the novice group were slightly more consistent in the AT task than the experts and both the expert and novices were more consistent than the control. It could possibly be concluded that drag racing experts may not be quicker overall, but due to practice within the sporting context, it could lead to an inkling of when to leave, rather than focusing on the accuracy of when they leave.

Hypothesis 5

The fifth and final hypothesis was supported, which stated that no differences would be found between males and females across all three tasks, which supports previous research on gender differences (Hall, Rodgers, Wilson & Norman, 2010). The only significant difference was found when further analysis was done between each self-efficacy statement individually. It was found that male's were more confident in the first self-efficacy statement than females. This could be related to stereotype threat. Taking for example, drag racing, the need to do well in a male dominated sport, could possibly be the reason as to why there was a difference in self-efficacy scores on their first statement.

Unexpected Findings

An interesting correlation was found between Education and Self-efficacy statement revolving around positivity. There was a moderate, positive correlation between education and positivity. From previous research, it has been found that higher education levels are linked to higher life satisfaction and positivity (Ross & Van Willigan, 1997; Baumeister et al, 2003), which seems to support the findings in this study.

Strengths

While like most, if not all research, this study has some limitations. However, it also contained a number of strengths. This study is the first of its kind which studies RT and AT in a drag racing context. While some studies have looked at motorsports, this is the first to focus on a drag racing sample, which is the fastest form of motorsport in the world. Another strength of this study is that it was performed on an international sample, which can be hard to attain. This study also had a balanced sample of drag racers and the control group.

Limitations

Although this research has produced some interesting findings, it is important to highlight some limitations and recommendations for future research. One of the limitations of this study was the gender balance. There were 17 more males than females in this study, which could have been the reason why the self-efficacy scores were significantly higher. If this study was to be repeated, a much more equal gender balance should be used. Guerin, Bales, Fortier & Sweet (2012) found no differences between males and females on motivation but did find a difference in driving, if this study was to be repeated, it would be interesting to find out the individual's achievements in the drag racing setting.

Another limitation of this study is the use of Skype. It had caused a lot of problems setting up, if this study was to be repeated Skype should be eliminated from the study, along with finding a way to have the RT and AT scores automatically recorded. It would make the study a little more convenient and could possibly help boost participation. This study could have benefitted from more participants, therefore, if this study was to be done again, there should be more participant's involved.

A further limitation of this study was that some, not all, participants had to be retested due to the use of the wrong starting system. Which could have increased the chances of practice effects. If this study was to be repeated the experimenter should clarify with the participant which starting system they use most in the drag racing context.

Future Research

If this study was to be repeated, it may benefit from testing all participants in a drag racing setting. If they participant's were tested on a track using their own cars/ borrowed cars, it could be found that individuals have different anticipation times while using their foot to press down the pedal, rather than using their hand to press/let go of a button. Which in turn would mean the tests would occur in a natural setting, rather than on their computers at home, giving more strength to the study. Using a real life traffic light on the track could in turn use it to test individuals in cars for their reaction times.

Conclusion

In conclusion, while majority of the hypotheses were rejected in this study, it has been found that there are no differences between experts, novices and the control group in RT and AT and no differences between males and females, however, there was a difference in consistency in both reaction and anticipation time. With being the first study of its kind, future research looking at the differences between experts and novices in a drag racing context could add to the great body of research in cognitive psychology. RT tasks are used to test cognitive functioning, which therefore could lead to more research in this area and also contribute to the sports psychology domain. The differences between males and females in a drag racing context found in this study will add to the body of research already conducted on gender differences, which further supports that there are limited amounts of differences between males and females.

References

Abernethy, B. (1987). Anticipation in sport: A re- view. *Physical Education Review, 10,* 5–16.

Abernethy, B. (1990). Anticipation in squash: Differences in advance cue utilization between expert and novice players. *Journal of Sports Sciences, 8,* 17–34. doi:10.1080/02640419008732128

Abernethy, B., & Russell, D. G. (1987a). Expert- novice differences in an

appliedselective attention task. *Journal of Sport Psychology*, *9*, 326–345.

Allen, J. (2002). Online Reaction Time Test. Retrieved from https://faculty.washington.edu/chudler/java/redgreen.html

Allen, M. S., Jones, M. V., & Sheffield, D. (2009). Attribution, Emotion, and Collective Efficacy in Sports Teams. *Group Dynamics-theory Research and Practice*, *13*(3), 205-217. doi:10.1037/a0015149

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. Psychological Review, 84, 191-215.

Bandura, A. (1982). Self-efficacy mechanism in human agency. American Psychologist, 37, 122–147.

Babkoff, H., Kelly, T., & Naitoh, P. (2001). Trial-to-Trial Variance in Choice Reaction Time as a Measure of the Effect of Stimulants During Sleep Deprivation. *Military Psychology*, *13*(1), 1-16. doi:10.1207/S15327876MP1301_01

Barkhoff, H., & Heiby, E. M. (2010). The relations between self-efficacy, competition success, delight, self-esteem, and body care among artistic elite roller skaters. *Journal of Behavioural Health and Medicine*, *1*(1), 43-51.

Baumeister, R. F., Campbell, J. D., Krueger, J. I., & Vohs, K. D. (2003). Does High Self-Esteem Cause Better Performance, Interpersonal Success, Happiness, or Healthier Lifestyle? *Psychological Science in the Public Interest*, *4*(1), 1-44.

Burgess, D. J., & Naughton, G. A. (2010). Talent Development in Adolescent Team Sports: A Review. *International Journal of Sports Physiology and Performance,5,* 103-116. Retrieved from

http://www.humankinetics.com/acucustom/sitename/Documents/DocumentItem/17916.pdf

Charness, N. (1991). Expertise in chess: The balance between knowledge and search. In K. A. Ericsson & J. Smith (Eds.), Toward a general theory of expertise: Prospects and limits (pp. 39 – 63). New York: Cambridge University Press.

Chase, W. G., & Simon, H. A. (1973). Perception in chess. *Cognitive Psychology, 4,* 55–81.

Dai, D. Y., & Sternberg, R. J. (2004). A Model of Domain Learning: Reinterpreting Expertise as a Multidimensional, Multistage Process Patricia A. Alexander. In *Motivation, emotion, and cognition: Integrative perspectives on intellectual functioning and development* (pp. 273-294). Mahwah, NJ: Lawrence Erlbaum Associates.

Dai, D. Y., & Sternberg, R. J. (2004). Barry Zimmerman & David Schunk: Self Regulation. In *Motivation, emotion, and cognition: Integrative perspectives on intellectual functioning and development* (pp. 323-345). Mahwah, NJ: Lawrence Erlbaum Associates.

Deary, I. J., Irwing, P., Der, G., & Bates, T. C. (2007). Brother-sister differences in the g factor in intelligence: Analysis of full, opposite-sex siblings from the NLSY1979. Intelligence, 35, 451– 456. doi:10.1016/j.intell.2006.09.003

Drag Tracker. (2007). Drag Racing Pro (0.400) Practice Tree | DragTracker.com. Retrieved from http://www.dragtracker.com/ptree/pro-400/

Dykiert, D., Der, G., Starr, J. M., & Deary, I. J. (2012). Sex Differences in Reaction Time Mean and Intraindividual Variability Across the Life Span. *Developmental Psychology*. doi:10.1037/a0027550

Ericsson, K. A., & Smith, J. (1991). Toward a general theory of expertise: Prospects and limits. Cambridge, UK: Cambridge University Press.

Feltz, D. L., Short, S. E., & Sullivan, P. J. (2008). Self-Efficacy Theory in Sport. In *Self-efficacy in sport*. Champaign, IL: Human Kinetics.

Gabbett, T. J., & Abernathy, B. (2013). Expert–Novice Differences in the Anticipatory Skill of Rugby League Players. *Sport, Exercise, and Performance Psychology*,*2*(2), 138-155. doi:10.1037/a0031221

Goddard, R. D. (2001). Collective Efficacy: A Neglected Construct in the Study of Schools and Student Achievement. *Journal of Educational Psychology*, *93*(3), 467-476. doi:10.1037/0022-0663.93.3.467

Gully, S. M., Incalcaterra, K. A., Joshi, A., & Beaubien, J. M. (2002). A meta analysis of team-efficacy, potency, and performance: Interdependence and level of analysis as moderators of observed relationships. Journal of Applied Psychology, 87, 819 – 832.

Hall, C. R., Rodgers, W. M., Wilson, P. M., & Norman, P. (2010). Imagery use and self-determined motivations in a community sample of exercisers and non exercisers. Journal of Applied Social Psychology, 40, 135– 152. doi:10.1111/j.1559-1816.2009.00566.x

Halpern, D. F., & Wai, J. (2007). The World of Competitive Scrabble: Novice and Expert Differences in Visuospatial and Verbal Abilities. *Journal of Experimental Psychology-applied*, *12*(2), 79=94. doi:10.1037/1076 898X.13.2.79

Hamilton, K., Cox, S., & White, K. M. (2012). Testing a model of physical activity among mothers and fathers of young children: Integrating self determined motivation, planning, and the theory of planned behavior. Journal of Sport & Exercise Psychology, 34, 124 –145.

Herlitz, A., & Loven, J. (2009). Sex differences in cognitive functions. Acta Psychologica Sinica, 41, 1081–1090. doi:10.3724/SP.J.1041.2009.01081

Kim, K., Bae, J., Nho, M., & Lee, C. H. (2011). How Do Experts and Novices Differ? Relation Versus Attribute and Thinking Versus Feeling in Language Use. *Psychology of Aesthetics Creativity and The Arts*, *5*(4), 379-384. doi:10.1037/a0024748

Maslovat, D., Jagacinski, R. J., Klapps, S. T., & Franks, I. M. (2014). Control of Response Timing Occurs During the Simple Reaction Time Interval but On Line for Choice Reaction Time. *Journal of Experimental Psychology: HumanPerception and Performance*, *40*(5), 2005-2021. doi:10.1037/a0037522

McKenna, F. P., & Horswill, M. S. (1999). Hazard perception and its relevance for driver licensing. *Journal of the International Association of Traffic and Safety Sciences, 23*, 36-41.

Myers, N. D., Feltz, D. L., & Short, S. E. (2004). Collective Efficacy and Team Performance: A Longitudinal Study of Collegiate Football Teams. *Group Dynamics-theory Research and Practice*, *8*(2), 126-138. doi:10.1037/10892699.8.2.126

Myers, N. D., Paiement, C. A., & Feltz, D. L. (2007). Regressing team performance on collective efficacy: Considerations of temporal proximity and concordance. Measurement in Physical Education and Exercise Science, 11, 1–24.

Myers, N. D., Payment, C. A., & Feltz, D. L. (2004). Reciprocal relationships between collective efficacy and team performance in women's ice hockey. Group Dynamics: Theory, Research, and Practice, 8, 182–195.

Norman, G. (2005). From Theory to Application and Back Again: Implications of Research on Medical Expertise for Psychological Theory. *Canadian Journal of Experimental Psychology*, *59*, 35-40. doi:10.1037/h0087458

Phillips, E., Davids, K., Renshaw, I., & Portus, M. (2010). Expert Performance in Sport and the Dynamics of Talent Development. *Sports Medicine*, *40*(4), 271-283. doi:10.2165/11319430-000000000-00000

Praetorius, M., Thorvaldsson, V., Johansson, B., & Hassing, L. B. (2014). GenderDifferences in Cognitive Performance in Old Age. *GeroPsych*, *27*(3), 129 134. doi:10.1024/1662-9647/a000111

Ross C. E., Van Willigen M. Education and the subjective quality of life. Journal of Health and Social Behavior 1997;38(3):275-97.

Rowe, R. M., and McKenna, F. P. (2001). Skilled anticipation in real-world tasks: measurement of attentional demands in the domain of tennis. *J. Exp. Psychol. Appl.* 7, 60–67. doi: 10.1037/1076-898X.7.1.60

Simon, H. A., & Chase, W. G. (1973). Skill in chess. *American Scientist*, *61*, 394 403.

Slovenic D'Angelo, M. E., Pelletier, L. G., Huta, V., & Reid, R. D. (2014). The Roles of Self-Efficacy and Motivation in the Prediction of Short- and Long-Term Adherence to Exercise Among Patients With Coronary Heart Disease. *Health Psychology*, *33*(11), 1344-1353. doi:10.1037/hea0000094

Stelter, R., & Kaya Roessler, K. (2005). *New Approaches to Sport and Exercise Psychology*. Oxford, UK: Meyer & Meyer Sport (UK).

Sternberg, R. J., & Davidson, J. E. (2005). *Conceptions of Giftedness* (2nd ed.).

Sternberg, R. J., & Grigorenko, E. L. (2003). Expertise and Mental Disabilities. In *The psychology of abilities, competencies, and expertise* (pp. 156-178). Cambridge, UK: Cambridge University Press.

Tranckle, P., & Cushion, C. J. (2006). Rethinking Giftedness and Talent in Sport. *Quest,58,* 265-282. doi:10.1080/00336297.2006.10491883

Vieluf, S., Mahmoodi, J., Godde, B., Reuter, E. M., & Voelcker-Rehage, C. (2012). The Influence of Age and Work-Related Expertise on Fine Motor Control. *GeroPsych,25*(4), 199-206. doi:10.1024/1662-9647/a000071

Appendix A

Information Sheet

Purpose of the Study. As part of the requirements for a BA Honors Degree at National College of Ireland, I have to carry out a research study. The study is concerned with testing experts and novices on reaction times and anticipation

times.

What will the study involve? The study will involve taking part in two anticipation time tasks and one reaction time task. You will also have to complete a questionnaire. It should take no longer than 30 minutes.

Why have you been asked to take part? You have been asked because you are either from the drag racing community and will be referred to as an expert or you have been asked to take part because you have never participated in any sort of drag racing.

Do you have to take part? No, you do not have to take part if you do not wish to. And if at any stage throughout the study that you wish to stop, you may do so.

Will your participation in the study be kept confidential? Yes, completely confidential. I plan to de-identify all participants.

What will happen to the information that you give? The data will be kept confidential for the duration of the study. On completion of the thesis, they will be retained for a further six months and then destroyed.

What will happen to the results? The results will be presented in the thesis; the results of this study will also be seen by my supervisor, a second marker and the external examiner. The thesis may be read by future students on the course. The study may be published in a research journal.

What are the possible disadvantages of taking part? I don't envisage any negative consequences for you in taking part. It is possible that talking about your experience in this way may cause some distress but it is highly unlikely.
Any further queries? If you need any further information, you can contact me: Gabrielle Barton McDonald, Email: x12366296@student.ncirl.ie.

Appendix B

Demographic Questionnaire

Please circle, where appropriate.

Age: Under 18
18-29

30-49
50-64
65+

Gender: Male
Female

Education level: Secondary School
Bachlors Degree
Masters
PHD

The following questions are to discover your expertise level in drag racing, whether you are experts or novices.

Have you ever heard of drag racing? _____
Have you ever drag raced? _____
If yes, please answer the following questions:
How many years' experience do you have in drag racing?
_____
How did you discover drag racing? _____
Do you have any parents, siblings or relations that also partake in drag racing? _____

If no, please answer the following questions:
Do you participate in any other sports? _____
Have you ever tested your reaction times before? _____
Do you participate in a sport that requires you to have good reaction times? _____

Appendix C

Self-Efficacy Questionnaire

The following questionnaire is to test your confidence in your sport (e.g. Drag racing) and your confidence on how well you will perform in the following Reaction Time Task and Anticipation Time Task.

In the following task you must rate your confidence between 1-7 on the particular skill/ability. 1(not confident at all) to 7(highly confident).

1. I am confident that I can learn the skills necessary for the following Reaction time and Anticipation time tasks. _____
2. I am confident that I can improve the skills I have already acquired for the following Reaction time and Anticipation time tasks. _____
3. I am confident that I can master the skills for the following Reaction time and Anticipation time tasks. _____
4. I am confident that I can stay motivated to do well in the following Reaction time and Anticipation time tasks. _____
5. I am confident that I can stay focused while performing the following Reaction time and Anticipation time tasks. _____
6. I am confident that I can stay positive throughout the following Reaction time and Anticipation time tasks. _____
7. I am confident that I will perform well in the following Reaction time and Anticipation time tasks. _____

The following questionnaire is to test your confidence after the previous Reaction time and Anticipation time tasks.

In the following task you must rate your confidence between 1-7 on the particular skill/ability. 1(not confident at all) to 7(highly confident).

1. On a scale of 1-7, how confident are you that you have performed well in the previous Reaction time and Anticipation time tasks? _____

Appendix D

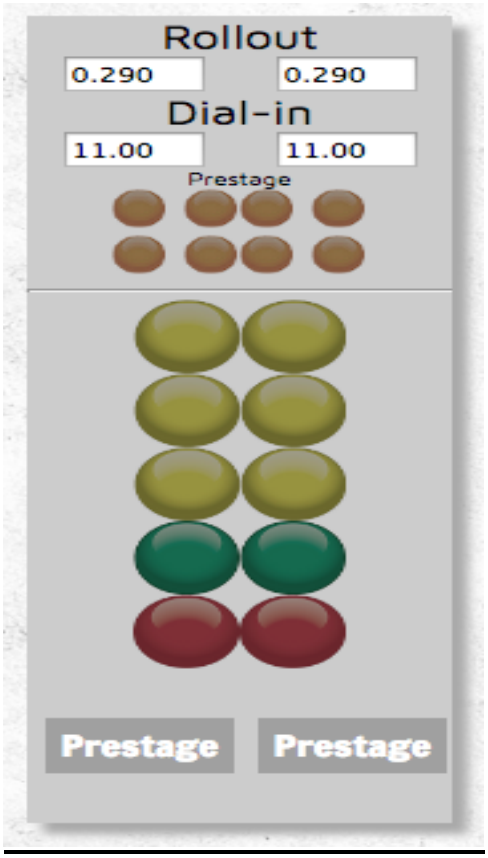
RED LIGHT - GREEN LIGHT Reaction Time Test

Instructions:

1. Click the large button on the right to begin.
2. Wait for the stoplight to turn green.
3. When the stoplight turns green, click the large button quickly!
4. Click the large button again to continue to the next test.

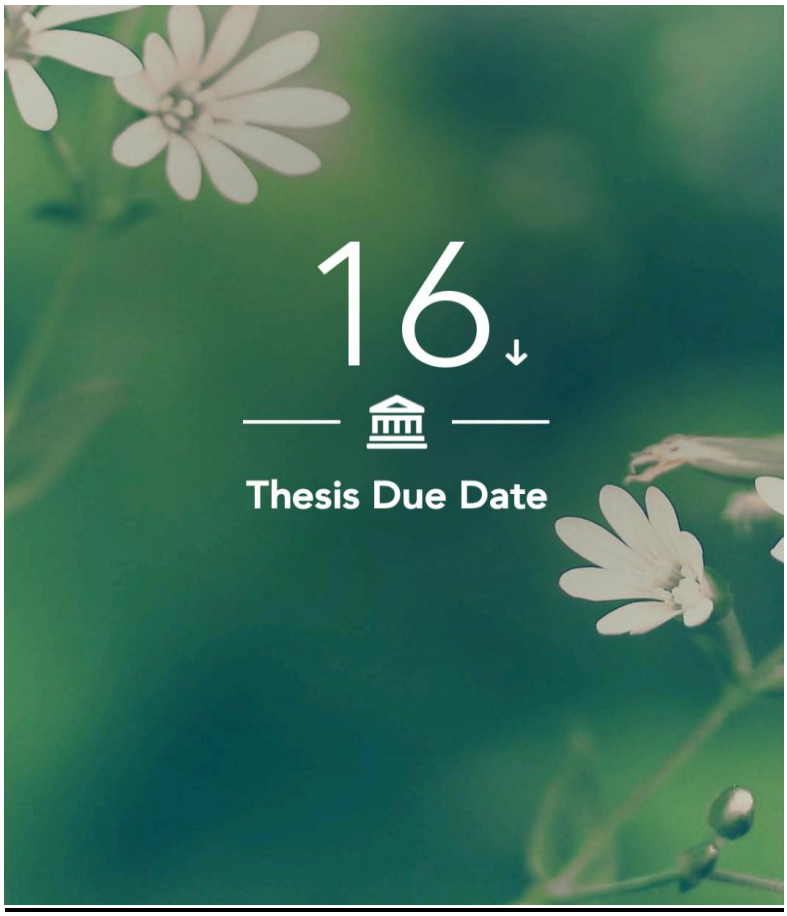
Test Number	Reaction Time	The stoplight to watch.	The button to click.
1			
2			
3			
4			
5			
AVG.			

Start Over



Appendix E

Dream Days App



Appendix F

Consent Form

I……agree to allow my child to participate in Gabrielle McDonald's research study.

The purpose and nature of the study has been explained to me in writing.

I am allowing them to participating voluntarily.

I understand that I can withdraw them from the study, without repercussions, at any time, whether before it starts or while they are participating.

I understand that I can withdraw permission to use the data within two weeks of the study, in which case the material will be deleted.

I understand that anonymity will be ensured in the write-up by disguising my child's identity.

Signed……. Date…….