DEAKIN UNIVERSITY

SWIM

LESSON MODELS:

EFFECTIVENESS AND IMPACT STUDY

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PARCSwim

PENINSULA LEISURE

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Contents

Glossary

ASCTA – Australian Swimming Coaches and Teachers Association

AUSTSWIM – Australia's national organisation for the teaching of swimming and water safety

LSV – Life Saving Victoria

PARC – Peninsula Aquatic Recreation Centre

PL – Peninsula Leisure

RLSSA – Royal Life Saving Society - Australia

Executive Summary

The Vision Project:

"Every child in Frankston will be able to swim when they leave primary school.
They will be confident, comfortable and happy in deep water and able to swim 50 metres".
(PARC 2018a)

This report is the culmination of a year-long research project undertaken by Peninsula Leisure in partnership with Deakin University, to examine the efficacy and retention of swimming skills of various learn-to-swim models.

This research draws attention to the fact that approximately three in five primary school-aged children are leaving grade six without the skills to keep them safe around water (Birch & Matthews 2013). This is despite learning-to-swim being a requirement of government primary schooling in Victoria (DET 2019; VCAA 2019a) and beyond that, as a minimum target of the National Swimming and Water Safety Framework for Australia (RLSSA 2018). Barriers to young people accessing learn-to-swim lessons are many and varied, however, when and if they do engage in learn-to-swim programs, little is known about the effectiveness of the types of programs offered.

The research uses a strengths-based approach rather than a focus on drowning, in examining learn-to-swim models across a school calendar

year, in order to determine each model's strengths in the learning of swimming and water safety skills and the impact on retention of those skills. Using Peninsula Aquatic and Recreation Centre's (PARC) definition of 'can swim' (2018a), this research measures improvements and retention of swimming and water safety skills across the school year in intensive school programs, weekly year-long programs and a combination of both.

This longitudinal mixed methods approach provided the means to understanding the individual and diverse learn-to-swim experiences of these primary school-aged students. Analysis involved both qualitative and quantitative aspects of the participants' learn-to-swim achievement data, demographic information and parental perception data, using Qualtrics and SPSS v.24. Data is presented in a variety of ways.

Key findings:

- All modes of swimming investigated in this study resulted in swimming and water safety skill improvement.
- During developmental consolidation phases (usually early) of learning-to-swim, frequent and regular instruction and practice is required.
- The retention of skills learned in school intensive programs is level-dependent. The higher the skill level, the greater the retention.
- Intensive programs appear to be the most beneficial for those who have already established foundational swimming skills.
- The combination of regular weekly swimming, boosted by a school program, appears to be the most effective learn-to-swim mode.

Recommendations

- Given parents'/carers' support of school-based programs, and as weekly swimming in this study was primarily accessed by population with a SEIFA index above 1000, the need for subsidised school swimming is vital.
- As school swimming intensive programs are least effective overall for those children in the early stages of learning to swim, a reimagining of how school swimming could look in terms of frequency is recommended.

1. Introduction

1.1 Background to the study

This study has been designed from a strengths-based perspective, to explore how we might best equip young people to be safe, happy and comfortable in the water, by investigating the various learn-to-swim models to assess their capacity for skill improvement and retention.

A recent survey of 2.8 million Australian children aged five to 14 found that 1.7 million were involved in organised sport outside school in 2012 (ABS 2012), including 60.5% of Victorian children. Swimming recorded the highest participation levels, with over 492,000 children involved in an organised swimming program outside of school (17.7%) (ABS 2012). This corresponds with the common viewpoint that swimming and aquatic activities in Australia form part of the social makeup of the country (AWSC 2008). However, in spite of high participation rates for this age group, recent studies estimate that at least three in five Victorian children are thought to be leaving primary school without the required skills to keep them safe in and around water (Birch & Matthews 2013).

Research indicates that swimming and water safety skills are most effectively learnt at primary school age (Morgan 2005), the period during which the majority of Australian children learn to swim. The role of organised sport more generally in the growth and development of primary aged children has been well documented (Bailey 2017; Light 2010; Vella et al. 2016), with research exploring a range of physical, cognitive and social

developments arising from participation. Swimming, more specifically, has the potential to offer protective value in a similar environment to that in which swimming was learned (Stanley & Moran 2017), if skills and knowledge are developed from age five to eight, which is the most appropriate time for learning foundational movement skills (Franklin et al. 2015). Blanksby et al. (1995) suggest that readiness for learning to swim, more specifically, occurs around age five-and-a-half to six years of age. Younger children may not have the cognitive capacity to identify potentially dangerous situations around water (Anderson & Rodriguez 2014).

In the state of Victoria from 2017, the newly developed Victorian Curriculum places the requirement on schools to ensure students leave primary school with the Victorian Water Safety Certificate, meaning that children can swim 50 metres continuously, perform simple rescues and answer questions related to water safety by the end of year six (DET 2019). This places swimming ability as an integral part of a children's studies, alongside Mathematics and English (Seed 2016). The state government facilitates learning-to-swim through funding that contributes to current programs (DET 2018a). Likewise, the Australian Curriculum - the national document from which the Victorian Curriculum is derived, prioritises learning in aquatic environments. Similarly, the Royal Life Saving Society – Australia, National Swimming and Water Safety Framework sets the Swim and Survive program as its minimum recommendations for learn-to-swim providers, in order for young people to achieve the essential components of water safety and swimming technique, but is also cognisant of the variety of contexts within which learning-to-swim takes place (RLSSA 2018). According to the National Swimming and Water Safety Framework for Australia, the overarching vision for the population is to ensure that 'every individual in Australia should be provided with a balanced water safety, personal survival and swimming education' (RLSSA 2018). Likewise, the Australian Water Safety Strategy 2016-2020 (AWSC 2016b) is working towards 'a nation free from drowning' (p. 5).

A multitude of learn-to-swim courses are in place for primary school-aged children to develop swimming proficiency; including intensive vacation or school programs and weekly private swim school lessons in a community pool. However, very little research has been conducted on the effectiveness and impact of the timings and structures of these swimming lessons, in developing the swimming ability of primary school-aged children. Furthermore, there is no literature to investigate which mode of delivery is the most effective for the retention of the acquired skills.

1.2 PARC's vision

Peninsula Aquatic and Recreation Centre (PARC), located 1.2km from the beach in Frankston on Victoria's Mornington Peninsula, and owned by Peninsula Leisure, partnered with Deakin University to explore the effectiveness and impact of the various learn-to-swim models, in relation to both the learning and retention of swimming skills, that enable children to be safe, comfortable and happy in water. This research stemmed from PARC's vision that 'every child in Frankston can swim by the time they leave primary school' (PARC 2018a), and a more altruistic view to contribute to the improvement of learn-to-swim program decision-making both nationally and internationally. This research is timely, given the requirement for Victorian and Australian schools to ensure students are learning water confidence, safe entries, propulsion, movement and underwater skills within the primary school curriculum under the new Victorian and Australian Curriculum (ACARA 2018; VCAA 2019b). It is important to note that these curriculum documents have a predominate focus on water confidence and basic aquatic locomotor skills

rather than the development of competitive swimmers (ACARA 2018; VCAA 2017).

This longitudinal study assesses four core groups of learn-to-swim participants including:

- Group A - children who participate in a school intensive program only,
- Group B - children who participate in a weekly swim program only,
- Group C - children who do both of the above, and
- Group D - children who have not participated in any formal lesson over the year.

Although a vast amount of media and research attention has recently been given to drownings around Australia, this research focuses on seeking best practice in empowering children to be safe, happy and comfortable in the water.

1.3 Definition of swimming

For the purpose of this report, swimming will be defined using PARC's working definition of 'can swim' as:

- The ability to swim 50 metres comfortably and confidently, using strokes on the front and back.
- The ability to float and/or tread water for five minutes.
- Happy in deep and shallow water.
- The ability to retrieve an object from head depth water. (PARC 2018a)

Within PARC's learn-to-swim programs, 'can swim' is distinguished by the achievement of levels preceding Snapper level 7, according to the PARC Progression Chart (see Appendix 1). A child is promoted to Snapper level 7 when they are deemed to be a 'swimmer' and can consistently and comfortably perform the above skills. Throughout this report, we will refer to 'swimmers' as those achieving 'can swim' status, and 'non-swimmers' as those below level 7.

Firstly, this report will background the current research literature pertaining to delivery of swimming lessons to primary school-aged children.

2. Literature review

2.1 Research to date

To date, the majority of academic literature and media have focused primarily on the swimming ability of children under five years of age, as this group has been deemed the most at risk of drowning (AWSC 2016b). However, it has been shown that there are many benefits to swimming at a young age beyond the risk-based notion of drowning prevention. Swimming plays an important part in education more broadly and provides many health and social benefits beyond water safety (Peden, Franklin & Larsen 2008). A range of social, cultural, and personal development is experienced by children through their long-term, weekly participation in social settings, such as schools or swim clubs (Light 2010). Moreover, Langendorfer et al. (2009) proposed that the principal goals of aquatic programs for children should be more than simply 'drownproofing' (p. 9), but should also include preparing them for the acquisition of more complex skills, including stroke development and survival skills, as well as for the therapeutic benefits being able to swim reaps.

2.2 Learning to swim in Australia

In Australia, swim education is largely facilitated by the school system and community-based commercial swim schools via either daily or weekly lesson schedules (Bradley, Parker & Blanksby 1996; Light 2010). In schools, the Victorian and Australian Curriculum: Health and Physical Education (HPE) syllabi mandate swimming, although some have criticised the limited presence of aquatic-based activity in comparison to previous iterations of curriculum (Lynch 2015). In Victoria, the Department of Education and Training (DET) supports government schools with the Victorian Curriculum requirement (2019) that foundation to year ten students receive swimming and water safety education as part of the HPE curriculum. The Catholic Education Commission similarly supports Catholic primary schools (DET 2019). Unfortunately, there is little data to depict what is happening at the coalface in schools. Anecdotally, many government secondary schools tend to undertake only a swimming carnival as their adherence to the curriculum requirements from years seven to ten, whereas primary schools are more likely to offer a more coherent competency-based swimming program without a focus on competitive swimming. These primary programs often occur as one-or-two-week intensive schedules, once a year, where children are transported by bus to a local pool. PARC provides such programs which are largely popular in terms one and four especially, as dictated by weather. The average cost of each lesson within the City of Frankston (the site of this research) is approximately $10.17, excluding transport to and from the venue[1]. Problematically, evidence has emerged during the recruiting phase of this research program that some primary schools do not undertake a swimming program at all, despite government funding per head of grade six enrolment.

The alternative to school swimming programs are community-based commercial swim schools with a variety of offerings. There are many private and

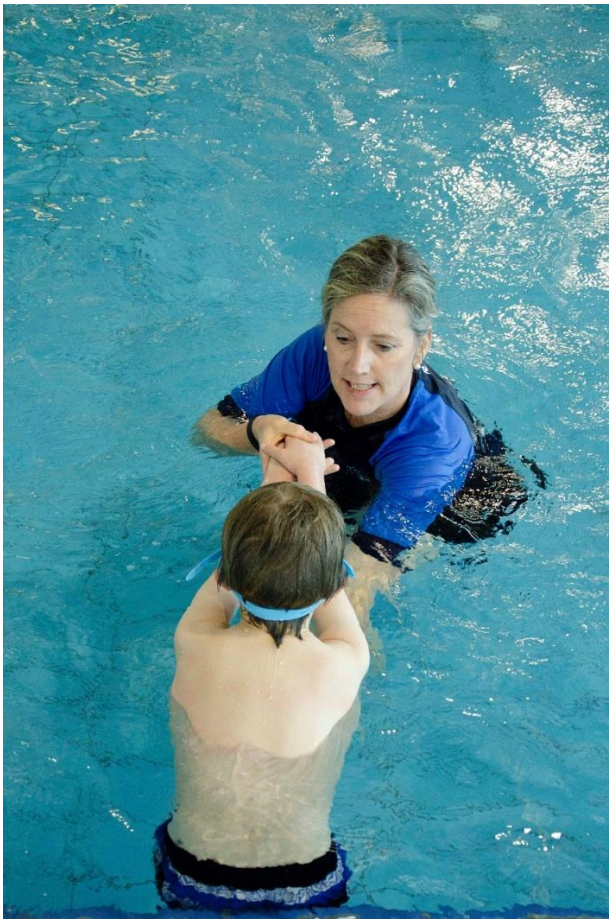
[1] This average was taken from a competitor analysis of seven local learn-to-swim venues in and around Frankston performed by PARC in 2018 (PARC 2018b)

public choices for parents. Most Australians have access to a public pool within their local municipality and within each pool, there is often a commercial swim school offering learn-to-swim programs (Light 2010). In Frankston alone, PARC is one of a multitude of learn-to-swim providers that cater to the suburb and its surrounds and at January 2019, PARC had approximately 2800 enrolments – the largest provider in Frankston (PARC 2018b). Most children who undertake these weekly programs access one lesson per week across a school term and continue this across an entire school year. PARC reports that a small percentage withdraw their children from weekly lessons during winter for a range of reasons, often related to the take-up of other winter sports and with the thought that withdrawal may diminish winter illnesses. The data collection protocols support this.

Unfortunately, weekly learn-to-swim lessons are not always accessible or desirable to everyone. Socio-ecological models would suggest that there are a range of barriers and enablers within the social and physical environment that impact on an individual or family's physical activity behaviours and choices (Essiet et al. 2017; Giles-Corti & Donovan 2002). Birch et al. (2015) report that in a study located in regional Shepparton, many low-socioeconomic families could not afford pool entry, and did not see the benefit of swimming, thus their children swam in the local channels without the skills required to look after themselves. The City of Frankston's population is very diverse and its Socio Economic Indexes for Areas (SEIFA) score of 1,001 is considered to be average in Australia (.id the population experts 2018). This does not entirely paint the picture of disadvantage for some families living in the City of Frankston though, as the SEIFA index indicates a low of 737-858 in some areas of Frankston City and Frankston North, in particular, well below the average in the City of Frankston (.id the population experts 2018). At an average cost of $18.70 per lesson[2], the price of weekly learn-to-swim lessons might be prohibitive for many in the City of Frankston, which has a significant impact on the study sample, who were already accessing weekly swimming lessons.

Hulteen et al. (2018) propose that the development of foundational movement skills such as swimming tends to be contextual to social, cultural and geographical locations, with the suggestion that people will choose to develop skills relevant to their perceived importance. In the case of living in Frankston, and in fact, many locations in Australia, where the weather is generally warm for large portions of the year and appropriate for aquatic activities, and where many communities live in close proximity to lakes, rivers, dams, beaches, swimming pools and other manmade and natural waterways, the requirement for learning to swim as a foundational movement skill becomes significantly heightened. It is understood that 85% of Australians live within 50 kilometres of the beach (Clark & Johnston 2017). Additionally, many families choose to holiday in regions with access to water, to the point where culturally, the beach has been considered a significant aspect of Australians' lives (Booth 2001; Huntsman 2001). It appears that learning to swim is a requisite foundational movement skill that is extremely relevant to the Frankston community in relation to its proximity to the beach.

[2] This average was taken from a competitor analysis of seven local learn-to-swim venues in and around Frankston performed by PARC in 2018



2.3 Modes of delivery

There is no existing research on the appropriateness and effectiveness of different modes of learning to swim for young children (Langendorfer et al. 2009), and very little on the retention of learned skills. However, there is a small pool of research that must be acknowledged, which engages with similar goals, themes and approaches that underpin this study. Franklin et al. (2015) and Erbaugh (1986) established that children who swam more regularly, demonstrated higher levels of ability, which is congruent with skill acquisition theories. Franklin et al's (2015) study was based on children undertaking ten lessons of survival, water safety and swimming skills within the Australian Capital Territory (ACT) schools' Swim and Survive program. Although it is not clear whether the study involved intensive or weekly programs, the results indicated that participation in regular or repeated programs, even fortnightly, were conducive to improving swimming and safety skills, as was some exposure to other aquatic environments for play (2015). There were many other factors that acted as enablers and barriers to improving swimming and safety skills, but the study gave no indication of skill retention.

Likewise, Asher et al. (1995) reported the greatest improvement in the swimming ability of children new to swimming, undertaking biweekly swimming and water safety lessons, as being in the first eight weeks of instruction with minor improvement occurring in the following four weeks. Unfortunately, no control group was used to compare this effect. Birch et al. (2015) also undertook a ten-week program in a low socio-economic school in country Victoria, focusing on skills of survival rather than learning to swim per se, in a before-school swimming program. There were improvements across the board in children's knowledge and ability to be safe in the water, however no follow-up study was undertaken in order to measure retention.

2.4 Skill learning and retention

It is critical that young children learn foundational movement skills as the choices they make regarding movement in later life are dependent on consolidating these skills in childhood (Payne & Isaacs 2016). These skills make potentially important contributions to future participation in play, sports, games and other physical activities (Hulteen et al. 2018) as these movement patterns act as the precursor patterns to more specialised, complex skills, and may enhance the development of an active lifestyle (2018). The term 'foundational movement skills' will purposefully be used in this study to reflect not only the traditional skills considered under the *fundamental motor skills* framework, including such skills as hopping, jumping, running, and skipping (Department of Education 1996; Gallahue, Ozmun & Goodway 2012), but a broader conception, inclusive of skills integral to further participation in games and sport beyond

childhood, including swimming (Hulteen et al. 2018). The Department of Education Western Australia, describe swimming as a fundamental or foundational motor skill, using the terms interchangeably in describing 'locomotor skills' (Department of Education WA 2013, p. 15). Importantly, the Australian Government include aquatic-based movement skills in their set of physical skills required to become physically literate (SPORTAUS 2018). Despite the varied terminology used in research and practice, this study acknowledges swimming and associated water skills as foundational to young children's lifelong participation in physical activity (Hulteen et al. 2018).

As with other foundational movement skills, the acquisition of swimming proficiency begins at a rudimentary level and is developmentally sequential. According to Langendorfer and Bruya (cited in Bradley, Parker & Blanksby 1996), learning sequences are organised hierarchically, with the disjointed rudimentary levels acquired before the more sophisticated advanced skills. The rate of development of foundational movement skills is specific to each individual child, however, there are general patterns or trends related to motor development that we rely on in terms of planning for instruction and for grouping children in situations, such as, learn-to-swim lessons. These can be loosely related to age, but only as a guide (Robinson et al. 2015). Roughly speaking, foundational movement skills are acquired from approximately age two to seven, then beyond age seven, children begin to develop specialised movement skills (Gallahue, Ozmun & Goodway 2012). Gallahue, Ozmun and Goodway (2012) promote that development, alongside quality instruction, explains learning, which suggests that a child will only be able to learn foundational movement skills when they are developmentally ready, physically, socially, emotionally and cognitively. Accordingly, the Australian Curriculum for schools targets the development of 'fundamental movement skills' up until the end of year four and 'specialised movement skills' beyond that, to year ten (ACARA 2018).

Practice is essential to the learning of any sort of motor skill, and much research has been done in attempting to understand the relationship of the amount and type of practice to learning (Spittle 2013). The implications of years of research around whether practice for motor skills should be massed for more intense learning or distributed across time, is complex and has not often been related to developing a continuous skill, such as, swimming. Spittle (2013) suggests more generally, that skill learning is improved when sessions are distributed, and specifically notes that this relates to skills that 'cause fatigue, are new or complex, require intense concentration, involve some element of risk or danger, or that could become monotonous or tedious' (p. 311). Learning to swim as a primary school-aged child fits many of these criteria, which may suggest that a short lesson once a week might be ideal, however, it is unknown whether the theory translates into the development and retention of swimming skill.

More generally, in relation to the learning of foundational movement skills, it has been considered that at least one hour per week spent practising movement skills in early primary school provides sufficient experience (Booth et al. 1999), however, repeated practice over time is required in order to master a skill (Department of Education 1996). Learning a foundational movement skill is an interaction between the biological and the environment and therefore practice is integral to its development (McKenzie et al. 1998), so as to enable a child to reach proficiency and move onto learning specialised movement skills. Theory suggests that the continuous provision of opportunities to practise (Logan et al. 2011), but with sufficient time for a young, growing child to rest between practices, appears to provide the most appropriate learning experience.

Once a child has reached proficiency in a foundational movement skill, the form of that skill changes little during the following stage – the 'specialised movement phase' (Gallahue, Ozmun & Goodway 2012, p. 306). This phase is recognised by the refinement and combination of skills to form more complex movement patterns, such as, swimming freestyle or breaststroke. Often a plateau in performance is noted at this stage as the child resolves the integration of the various task components (Coker 2018). Despite no obvious signs of development, it is understood that during this period of plateau, children are still learning (Rose & Christina 2006). However, it is growth and development of the individual, in terms of health and skill-related fitness components, such as, strength, endurance and coordination that occur year-to-year that can enable improved performance in this specialised movement phase (Gallahue, Ozmun & Goodway 2012). The rate of development of a child's performance across any of these phases is impacted by the environment, the quality of instruction and opportunities to practise in both formal and informal environments (Payne & Isaacs 2016). For example, free play in an aquatic environment is beneficial to continued reinforcement of swimming and safety skills in the water.

Children who struggle to progress from the foundational movement skill phase to the specialised movement skill phase experience a proficiency barrier (Seefeldt 1980). It is possible, for a variety of reasons, that proficiency is not attained in foundational movement skills, which then impacts a child's ability to engage in more complex patterns of movement, inhibiting involvement in lifelong physical activity habits (Hulteen et al. 2018). Other variables, such as, lack of motivation, anxiety and fatigue can affect performance negatively, causing either a plateau in performance (Coker 2018) or withdrawal from a learning program.

As mentioned earlier, practice is important for children learning skills, such as, swimming. Without practice, an individual will be unable to retain the skills learned in the same way that an already competent movement performer can, as once a skill has been mastered, retention is more likely to occur and the skills can be used again at a later time (Vera, Alvarez & Medina 2008). When a learner in the development phase of learning a skill has a break in the practice schedule or what is known as a 'retention interval' (Magill & Anderson 2017, p. 265), it is highly probable that a return to learning will result in a decreased retention of the previously learned skill. When returning to learning after a break, if the 'persistence characteristic' (Magill & Anderson 2017, p. 269) is evident, the performance should not look too different from the end of the previous practice period, and learning can be considered permanent (2017). This suggests that during the developmental phases of children's learning, frequent practice is essential to shifting a child's skills towards permanence.

Although there are many other factors that influence retention (including the manner in which feedback is given, the performer-centeredness of practice and the arrangement of practice within any session (Coker 2018)), regular practice, without significant breaks, should ideally be undertaken to achieve permanence in the skill being learned. According to Lai et al. (2014), numerous studies have measured retention in children's physical activity, fitness and fundamental movement skills, however, none of these have been related to swimming and each describes interventions between six weeks and six years of length. It is this gap in the literature that this research seeks to address. The 'intervention' described within this study is a five day intensive swimming program which means that outcomes from the studies cited in Lai et al. (2014) cannot be generalised to this research.

2.5 Barriers and enablers to accessing swimming lessons

Cost is a significant barrier to some parents/carers enrolling their children in weekly swim lessons and sometimes into school programs, as reported by numerous authors (Birch & Matthews 2013; Franklin et al. 2015; Larsen 2013; Lynch 2015; Symons 2013; Thompson 2012). Lack of family transport to aquatic venues can also be a limiting factor to accessing formal learn-to-swim programs (Macdonald et al. 2004). Time has been reported as another noteworthy barrier (Birch & Matthews 2013), as has the family environment and whether parents participate in swimming (Irwin et al. 2009). Cultural background and rural and remote-living are additional hurdles to accessing swimming lessons, and have both been the focus of recent Australian drowning prevention strategies in relation to providing increased access to formal lessons for relevant population groups (AWSC 2016a; RLSSA 2016).

Like individuals and families, schools can experience barriers to participation in aquatic programs. Difficulty in subsidising school swim programs, given the costs associated with transport to swimming venues, pool entry and lesson costs have hindered schools in the past (Birch & Matthews 2013; Franklin et al. 2015; Peden, Franklin & Larsen 2009; RLSSA 2008). Alongside cost, a crowded primary school curriculum and the pressures of accountability within contemporary schooling create a tension for principals, schools and teachers often leading to the prioritisation of academic subjects (Birch & Matthews 2013) over specialist subjects and extra-curricular programs.

Other issues that have been posed as barriers for schools in rural, regional and metropolitan areas include a lack of qualified swim teachers in regional areas (Birch & Matthews 2013; Peden, Franklin & Larsen 2009); poor instructor/teacher training (Peden, Franklin & Larsen 2009; RLSSA 2008); diversity in student skill level and problematic water depth of available pools (RLSSA 2008); class sizes and unmanageable student-to-staff ratios (Peden, Franklin & Larsen 2009; RLSSA 2008); identification of appropriate local venues (Peden, Franklin & Larsen 2009); issues with the management of risks (Peden, Franklin & Larsen 2009; RLSSA 2008); and cultural impediments for culturally and linguistically diverse (CALD) students (Birch & Matthews 2013).

Contrastingly, enablers for schools exist when many of the previously mentioned factors are not present. Additionally, individual students were reported by Franklin et al. (2015) as being more likely to be able to swim when they attended an independent school, swam at least once a fortnight, had a pool at home, participated in formal swimming lessons and had exposure to public pools and beaches. There are many factors that influence an individual's access to these positive enablers, including culture, socioeconomic and time factors (2015), as well as geographic location, family recreational activities and more, as mentioned earlier.

Amongst the many other barriers to accessing formal learn-to-swim programs and informal access to pools for play, cost was a significant barrier (Birch & Matthews 2013; Franklin et al. 2015; Peden, Franklin & Larsen 2009; RLSSA 2008). Given that swimming has been justified previously as an essential life skill, it is unsurprising to note government action in committing financially to school learn-to-swim programs.

2.6 Politics and school swim funding

Historically, the state and federal governments have funded learn-to-swim programs in schools and have made contributions to other non-school-related water safety programs. More recently, the Victorian state government funded $9.2 and $9.8 million respectively in the 2017/18 and 2018/19 budgets to subsidise swimming in school programs for government, specialist and Catholic

schools (DET 2019), with a view to ensuring 'all Victorian children know how to swim and stay safe in the water before they finish primary school' (Merlino 2018). The funding of $90 per head of year six enrolments (2018/19 budget) was intended to be used flexibly by schools to support whichever year levels they saw fit (DET 2018a). However the funding was specifically targeted at the cost of tuition, and did not include additional costs associated with transport or pool entry. Under the *Education and Training Reform Act 2006*, parents of government school students cannot be charged for standard curriculum programs, of which, learn-to-swim programs are an example (DET 2018b).

Swimming lessons were estimated to cost $65 to $80 per student each year, and the initial subsidy of $9.2 million in 2017/18 was predicted to contribute $50 to $55 per student (Tomazin 2017). The increase to $90 per head in the 2018/19 budget provided a much-needed boost. Although unable to charge for standard curriculum, schools finance the shortfall by charging parents for transport and pool entry costs. This is a necessity, with school budgets tight and many schools taking up learn-to-swim programs at more year levels than the funded grade six arrangement.

The federal opposition promised future funding to support learn-to-swim programs in schools and to assist with transport and pool entry costs, in both 2016 (Maiden 2016) and 2019 (*The Guardian*, 20 January 2019), pledging $46 million had they gained power in the recent 2019 federal election. Inequity of current access was cited as a primary driver for this assurance (*The Guardian*, 20 January 2019). Meanwhile, the current federal government's Sport 2030 report, released in 2018, made specific mention of swimming in an endeavour to reduce participation barriers. They have specifically deemed swimming, 'a skill for life' (Australian Government 2018, p. 24), and suggested that it was integral that a child be able to 'be buoyant in the water for at least 50 metres to save themselves' (p. 24) – a benchmark set by the RLSSA (2017; 2018).

There has been a flurry of media activity across 2017-19 that has served to heighten the case for research exploring the various learn-to-swim models, with much advocacy work done by key water safety bodies such as the Australian Water Safety Council and Royal Life Saving Society in promoting the need for compulsory school swimming programs (AWSC 2016b; RLSSA 2017), as recommended in the WHO Global Report on Drowning (2014).

3. Method

3.1 Research purpose

This research explored the effectiveness and impact of different structures and timings of swimming lessons including, intensive blocks of lessons, lessons distributed over a prolonged duration, and a combination of both, in developing the swimming ability and water safety of primary school-aged students. The retention of any improved ability in all groups was assessed through retesting ten months after initial testing, in keeping with a school calendar year, and for consistency across participant groups. The research sought insight into the ideal structure and program to teach children to learn-to-swim and retain those skills.

3.2 Research questions

This research has been driven by the following research questions:

- How does the structure of the learn-to-swim program impact upon primary school students' swimming ability and water safety skills?
- How effective is each mode of delivery in developing the swimming ability and water safety skills of primary school-aged children?
- How effective is each mode of delivery in relation to retention of skills and what factors impact upon the retention of any improvement in swimming ability resulting from these programs?
- What are the key enablers and barriers to primary school-aged students learning to swim?

3.3 Study design

This project employed a longitudinal mixed methods approach which provided the means to understanding the diverse learn-to-swim experiences of these primary school-aged students and measure effectiveness of each of the learn-to-swim models under observation. Qualitative (parent surveys and teacher interviews) and quantitative (swim records) data were collected to ensure objectivity and richness of the inferences made in the analysis.

Baseline and post-test measures of swimming and water safety skills were conducted with the school intensive group (A) in February, before and after a one-week intensive learn-to-swim program, followed by a review test for retention in December. Testing protocols followed regular PARC practices for testing swimming skill and water safety. Baseline and review tests were conducted for the other three groups – B, C and D. Groups B and C undertook the same testing protocol as group A, which is also part of the weekly program practices at PARC, whilst group D undertook an abridged version due to time constraints. This version is described in section 4.1.1.

Teacher data was collected through semi-structured interviews and analysed into themes. Parent data was gathered through survey and was analysed using online analytic software, Qualtrics.

3.4 Participants

PARC is located 1.2 kilometres from Frankston beach, which is a popular local swimming beach in the heart of Frankston City. The participants for this study were drawn from PARC's weekly swimming programs (groups B and C), schools who attended PARC for their school programs (group A) and schools who did not access learn-to-swim programs from any provider (group D). Parents/carers were deemed the participants of the study, as it was their consent that was required in order for researchers to access their

respective children's learn-to-swim progress data from PARC, and parents'/carers' permission that was necessary to obtain access to primary school-aged children who did not undertake a learn-to-swim program.

Table 1: Participant numbers recruited versus eligible data

GROUP	PARTICIPANT GROUPS	CONSENT OBTAINED	DATA USED
A	students participating in school swimming programs only	144	115
B	students participating in weekly lessons only	100	75
C	students participating in both A and B	155	153
D	students who do not participate in any kind of swimming lessons (control group participants)	149	94

As indicated in Table 1, consent was gained from a greater number of parents/carers than eventuated in the study as after data was sorted, a secondary check was conducted and ineligible participants were removed from the study for a range of reasons, including:

- Swimming data was incomplete, e.g. children were absent from any testing point.
- The information regarding which programs parents/carers were accessing for their children was incongruent with PARC records e.g. parents/carers ticking 'weekly only' lessons when their child was also involved in an intensive school program.

Additionally, three PARC staff participated in semi-structured interviews to gain further insight into learn-to-swim programs. One of these staff was a swim teacher; one was a swim teacher and deck supervisory staff; and one was administrative staff, but all were experienced teachers of learn-to-swim programs at PARC.

3.5 Recruitment of participants

Participants were recruited as per Deakin University ethics requirements. Consent was required from parents/carers of primary-aged learn-to-swim participants (and non-participants in the case of group D) so that testing data could be accessed by the researchers and a follow-up survey could be sent to participating parents/carers. Groups A, B and C were already enrolled in learn-to-swim programs at PARC, and as a regular protocol for learn-to-swim lessons, undertook consistent and systematic skill testing. The data required for the project therefore already existed. Group D (control group) was treated separately, as will be explained below.

3.5.1 Group A – Parents/carers of children accessing school swimming lessons only

Plain Language Statement (PLS), consent and revocation of consent forms were provided to the teachers of local schools who accompanied their classes to PARC for formal swimming lessons. These were circulated to students once they returned to school and were taken home to parents/carers. Parents/carers returned consent forms to the school. Follow-up trips to the schools were made in order to collect completed consent forms and to deliver further blank PLS to replace lost or missing forms.

These schools were all relatively local primary schools and were selected based on having large

numbers of children accessing intensive swimming programs offered through their schools, in order to positively impact participant numbers. They were also schools that had booked swimming lessons in the testing year of 2018.

To be eligible for inclusion in group A, the children must have undertaken an intensive five-day school program at PARC and not have engaged in any other formal swimming program across the school year. The proposed sample was 100 participants. Consent was obtained from parents/carers of 144 grade three or four students from two local schools, at which time, these completed forms triggered data access and an emailed survey to parents/carers. The data of 115 students was complete and eligible to be included in analysis.

Students were tested using the PARC swimming level competencies at baseline on the first day of the program and post-tested at the conclusion of the term one school program in February, and then retested against the same criteria one day in term four during December. The data will be referred to as baseline, post-test and review data.

3.5.2 Group B – Parents/carers of children accessing weekly learn-to-swim lessons

Parents/carers of group B participants were sent an electronic invitation to participate based on their child's weekly enrolment at PARC. This invitation included the same PLS and consent forms as group A. As initial take-up was low, PARC deck staff were engaged to recruit parent/carer participants poolside, during the children's weekly learn-to-swim lessons, with the researchers present in order to answer questions parents/carers might have of the study. Each PLS that was returned generated access to the respective child's swim testing data for the researchers, and provided a parent/carer email address to which a survey link was sent.

To be eligible for inclusion in group B, primary school-aged participants must have been enrolled in weekly swimming lessons distributed across all four school terms and not have undertaken any other type of formal swimming. It was proposed that 100 children would be a minimum number for this participant group. Consent was obtained from 100 parents/carers and the data of 75 of these was eligible to be included in analysis (see Figure 1). The most common reason for exclusion was that these children had also undertaken a school swimming program, which generated movement of their data to group C. The consequence of not meeting the proposed number of 100 participants was negligible as 75 participants' swim data still enabled a large enough sample to appreciate patterns in the data for that group.

The children were tested as part of their regular swimming program and the swim records of all were accessed in early term one, in February, as baseline data, and again late in term four, in December, as review data.

3.5.3 Group C – Parents/carers of children accessing a combination of weekly and school learn-to-swim lessons

Participants for group C were accessed in the same way as group B, through enrolment in PARC weekly learn-to-swim lessons. Parents/carers were provided with PLS and consent forms electronically, but were differentiated from group B once they returned their surveys, in which they were asked to identify which other forms of swimming their children participated in.

To be eligible for inclusion in group C, primary school-aged students must have been enrolled in weekly swimming across all four terms and in addition they must have participated in a school swimming program**.** Consent was obtained to access the swim records of 155 students; however, by December 2018 the number of students eligible for inclusion in this group was

153, as although some participants had been lost when data was cleaned, 22 had been gained after confirmation of swim groups against PARC records (see Figure 1).

3.5.4 Group D – Parents/carers of children who did not access formal learn-to-swim programs in 2018

Group D participants were from two local schools that did not access formal learn-to-swim lessons from any provider across 2018. All children from year three to six were invited to participate in a free 'Fun Day' at PARC, which involved an enjoyable water experience in the 'Splash Town' play area, and a swim testing protocol. Consent was obtained for the children to attend early in term one and late in term four, for baseline and review testing respectively. This provided the study with access to the swim testing data of 149 children as a control group (see Figure 1). Schools were provided with PLS and consent forms and return of these forms prompted access to data and surveys to be emailed. As some children within the sample were currently accessing weekly swimming lessons at PARC or elsewhere, these data sets were immediately removed from group D so that this group contained only children who did not currently access any type of formal swimming lesson. The proposed number of participants here was also 100. The final number of participants was 94. This dataset was used as a control group and was sufficient in number to view patterns within the group.

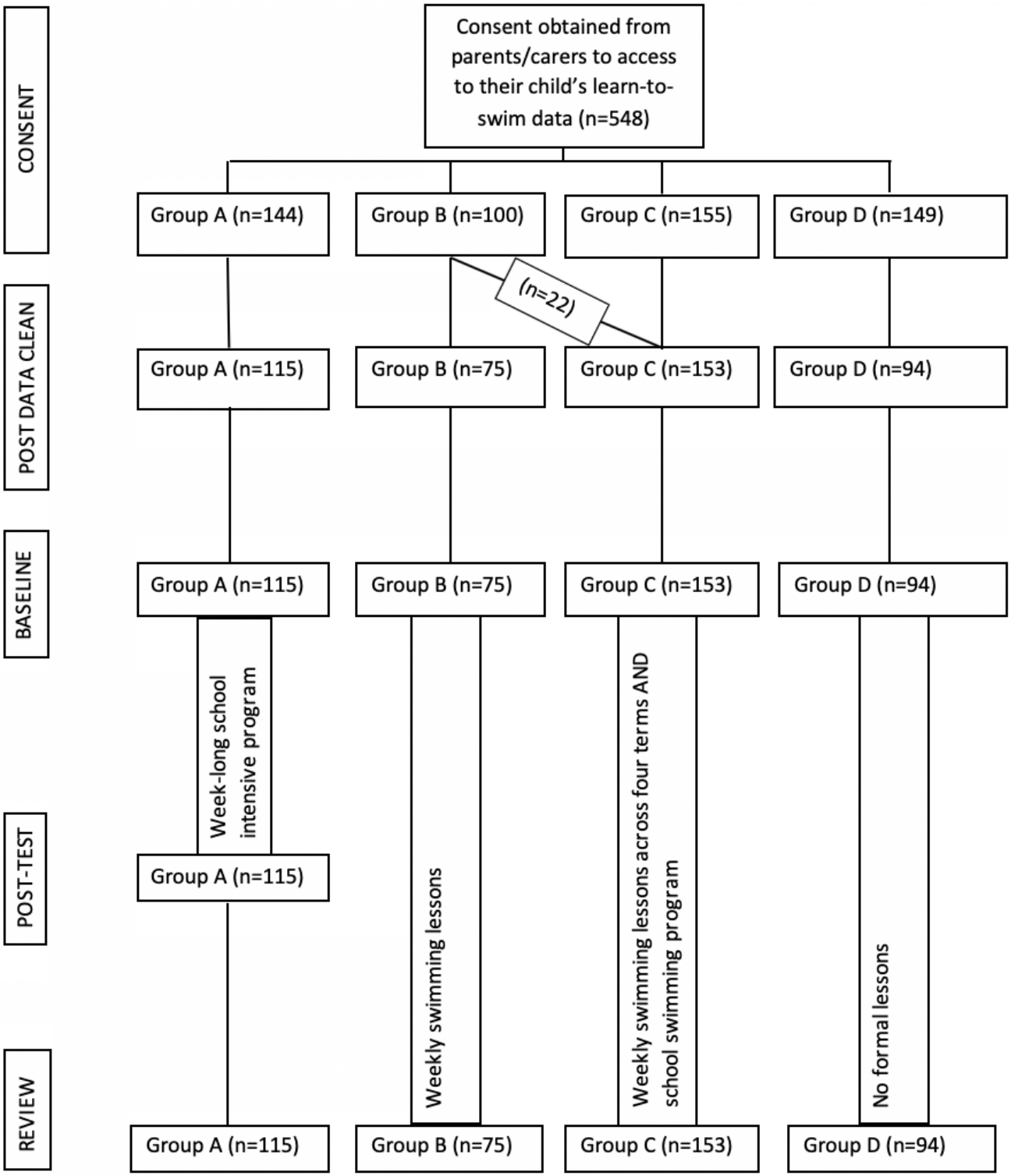


Figure 1: Participant flow

3.6 Structure of the programs

The research was undertaken at the PARC facility in Frankston. For the most part, day-to-day practices of learn-to-swim classes were not impacted by the research. The participants were drawn from weekly and intensive learn-to-swim programs already being undertaken or due to begin at PARC. The one exception was group D, who were from schools currently not accessing learn-to-swim programs anywhere.

Class sizes at PARC fall beneath the requirements of the Guidelines for Safe Pool Operation and AUSTSWIM teacher student ratios (2017), as indicated in Table 2. This enabled learn-to-swim participants ample opportunity each weekly lesson, for instruction and practice across the 30 minutes. At levels 8 and 9, weekly participants receive an additional 15 and 30 minutes per class respectively. For PARC intensive school programs, the ratio of teacher to students is a little higher at 1:8, but the length of lesson is 45 minutes, in order to cater for those greater numbers.

Table 2: Weekly class ratios of teacher to student, and lesson length

Guidelines for Safe Pool Operation	PARC Levels	PARC Ratio	PARC Lesson Length
Beginners 1:10	Levels 1-3	1:4	30 minutes
	Level 4	1:4	
	Level 5	1:5	
	Level 6	1:6	
Intermediate 1:12	Level 7	1:8	
	Level 8	1:8	45 minutes
Advanced 1:15	Junior Fit Swim (JFS or Level 9)	1:12	1 hour

4. Data collection

4.1 Measures

4.1.1 Skill testing

Participants in each of the groups A to D were tested and scored by an AUSTSWIM or ASCTA-qualified PARC swim teacher at the beginning of the school year, prior to instruction, as a form of baseline testing. As summarised in Table 3, Groups A and C were also post-tested at the conclusion of the week-long school intensive. Groups B and C underwent ongoing assessment as a component of their weekly swimming lessons, where swim teaching and deck staff are trained to undertake both formative and summative assessments that are informal and formal in nature. All groups were tested at the end of the school year at review stage, as a measure of skill retention. Rate of changes in score from baseline to post-testing reflected initial learning, whilst the review measured the participants' maintenance of skill for groups A to C. Group D was treated as a control group and was tested at two points – at beginning and end of the school year.

Table 3: Timing of skill testing

GROUP	Pre-testing (Jan-Feb)	Post-testing (Jan-Feb)	Retention testing (Nov-Dec)	Ongoing testing (across 4 school terms)
A – School	*	*	*	
B – Weekly	*		*	*
C – School and Weekly	*	*	*	*
D – Control group	*		*	

Skill testing was against a standard PARC criterion, previously established for their enrolled level and type of swim lessons for groups A to C. The competencies for each level varied in number and difficulty, but represented development towards the skills in the 'can swim' definition, and include both swimming and water safety skills. The competencies tested for the control group (group D) were less in number than those for groups A to C due to time limitations in testing and in consideration of group D as those not accessing formal learn-to-swim lessons. The three competencies selected for this group also reflected PARC's 'can swim' definition and included:

- Swim 50 metres in any stroke
- Enter water safely and tread water or float for five minutes
- Retrieve an object from head depth water

As described earlier, children within PARC learn-to-swim programs are deemed swimmer or non-swimmer using PARC's definition of 'can swim' (see Section 1.3). A child who has reached Snapper 7 level is considered a swimmer and is likely to be approximately 7 years of age or older. In the levels prior to Snapper 7, children are deemed a 'beginner' or 'improver' as they will not yet have achieved all skills required to be a swimmer, according to PARC's 'can swim' definition. These include being able to swim 50 metres in any stroke, tread water or float for five minutes and retrieve an object from the pool floor, in water greater than head height. See Appendix 1 – PARC's Progression Chart, includes a more detailed version of the various levels through which children progress.

As represented in Table 4, group D participants were assessed by their ability to perform the three skills using a 0 to 3 rating. A 'swimmer' could achieve all four skills being tested with a rating of 3.

Table 4: Weekly and school program achievement levels/control group achievement levels

PARC achievement levels: weekly and school	Swimmer	Non-swimmer	PARC achievement levels: Fun day	Swimmer	Non-swimmer
Pufferfish Levels 1-5		*	0 = did not attempt		*
Flying Fish Levels 1-6		*	1 = made attempt		*
Snapper Levels 1-6		*	2 = attempted with difficulty		*
Snapper Levels 7-9	*		3 = completed confidently /comfortably	*	
Junior Fit Swim	*				

4.1.2 Parent survey

Surveys of parents/carers were undertaken using Qualtrics, a survey and data analysis software. This provided both qualitative and quantitative data to determine parents'/carers' perception of their child's swimming ability, the perceived efficacy of the different modes of swim lessons, barriers and enablers to participation, recreational swimming frequency and various other demographic information. Questions indicative of the parent surveys can be found in Appendix 2, although the survey for each testing group was slightly different in order to capture decision-making around the various modes of swimming.

Survey items were developed from systematic literature searches as well as research into the development and structuring of similar assessments used in the physical activity space. Initial face validity was conducted with a panel of experts to check that survey items were assessing the intended content. Any discrepancies were addressed before surveys were distributed to participants.

The response rate to parent/carer surveys was low at first, therefore deck supervisors were provided with a QR code to the survey and hard copy versions of the surveys to offer to parents/carers whilst they were waiting for their children to complete their weekly lessons.

4.1.3 Staff interview

A sample of PARC learn-to-swim teachers involved across various swim modes, were interviewed to further explore the experiences within different types of learn-to-swim programs. These three staff were experienced swim teachers working in a management role, deck supervisory role and swim teaching role respectively, but all with extensive experience in teaching and assessment. Questions exploring their experiences of teaching swimming were asked in order to gain a sense of the work of a swim teacher in teaching and assessing swimming and water safety skills. Indicative questions from those semi-structured interviews can be found in Appendix 3.

4.2 Data analysis

Swim data were collected at PARC by swim teachers, moderated by supervisory deck staff where necessary (as per regular protocol) and inputted into their database by administrative staff at PARC. Data were shared with the researchers on spreadsheets via email, and then inputted and analysed using Statistical Package for the Social Sciences v.24 (SPSS). The treatment of the data included three different tests. Any incomplete data from the prescribed time points for each group were excluded and these data were then entered into SPSS with variables relabelled and defined prior to analysis. Analysis included the use of Wilcoxon Signed Rank Tests to compare the baseline and review scores from the same participant. McNemar's testing was used to determine potential difference between two groups, and Chi-square testing to explore relationships between variables. Statistically significant associations were considered $p<0.05$.

Parent/carer surveys comprised both scale and written response questions. Scale data were analysed within Qualtrics, while written responses were assessed by thematic analysis. All interviews were transcribed verbatim by the researchers. The transcriptions of the interviews and the additional textual data were then analysed using content and thematic analysis to establish, identify and code according to themes.

5. Results

5.1 Participant data

The participants who enrolled their children in weekly swimming lessons (groups B and C) lived across a range of postcodes – many local, but some as far away as 35 minutes by car. Using the SEIFA index to explore the socio-economic advantage/disadvantage of this cohort, it is evident that the majority of clientele of weekly swimming lessons in this group were from postcode areas above the defined average (1000) of Australian postcodes as per Table 5 and Figure 2.

Table 5: Level of advantage/disadvantage of postcodes of participants

Suburb	2016 SEIFA index	Percentile	Postcode	Participant numbers
HMAS Cerberus	1,174	100	3920	1
Sandhurst	1,114.7	99	3977	4
Mount Eliza	1,110.1	98	3930	23
Sandringham	1,100.8	97	3191	1
Moorooduc	1,091.5	95	3933	2
Mount Martha	1,087	93	3934	6
Langwarrin South	1,080.2	91	3911	1
Parkdale	1,077.2	98	3195	4
Frankston South	1,075.3	89	3199	122*
Dingley Village	1,069.5	87	3172	1
Patterson Lakes	1,067.4	86	3197	4
Highett	1,060.9	82	3190	1
Langwarrin	1,043.8	73	3910	11
Chelsea	1,025	61	3196	11
Mornington	1,021.9	58	3931	7
Dromana	1,010.8	50	3936	4
Bittern	1,007.3	50	3918	1
Frankston City	1,001.0	45	3199	*
Seaford	993.6	41	3198	15
Frankston Heights	987.6	38	3199	*
Carrum Downs	979.2	34	3201	9
Rosebud	959.9	25	3939	1
Karingal	955.5	23	3199	*
Frankston Central	931.1	16	3199	*
Bangholme	863	N/A	3175	2
Frankston North	823.0	4	3200	2

**3199 is the postcode for all of these suburbs. 3199=122 participants.*
Adapted from Australian Bureau of Statistics, Census of Population and Housing 2016 (.id, the population experts).

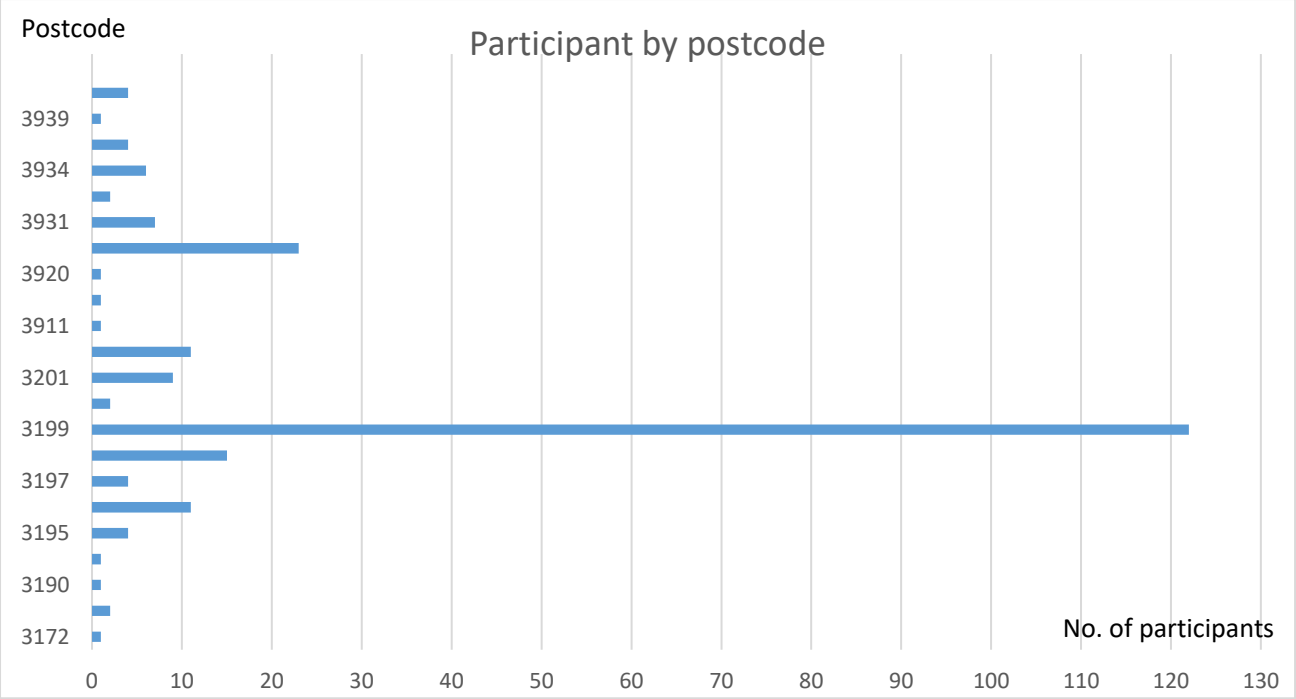


Figure 2: Participants by postcode

Rounding out this picture of the socio-economic profile of the families in this study, is the data which states the parental/carer occupation categories. Of the parents/carers who consented to their child's data being used in this study, 44% were from managerial and professional occupations (see Figure 3).

In addition, the majority (70.5%) of parents/carers of learn-to-swim participants in this study, were born in Australia (see Figure 4) which is indicative of the cultural mix of both Frankston and surrounds, and the percentage of the Australian population born overseas (28.5%) (ABS 2018).

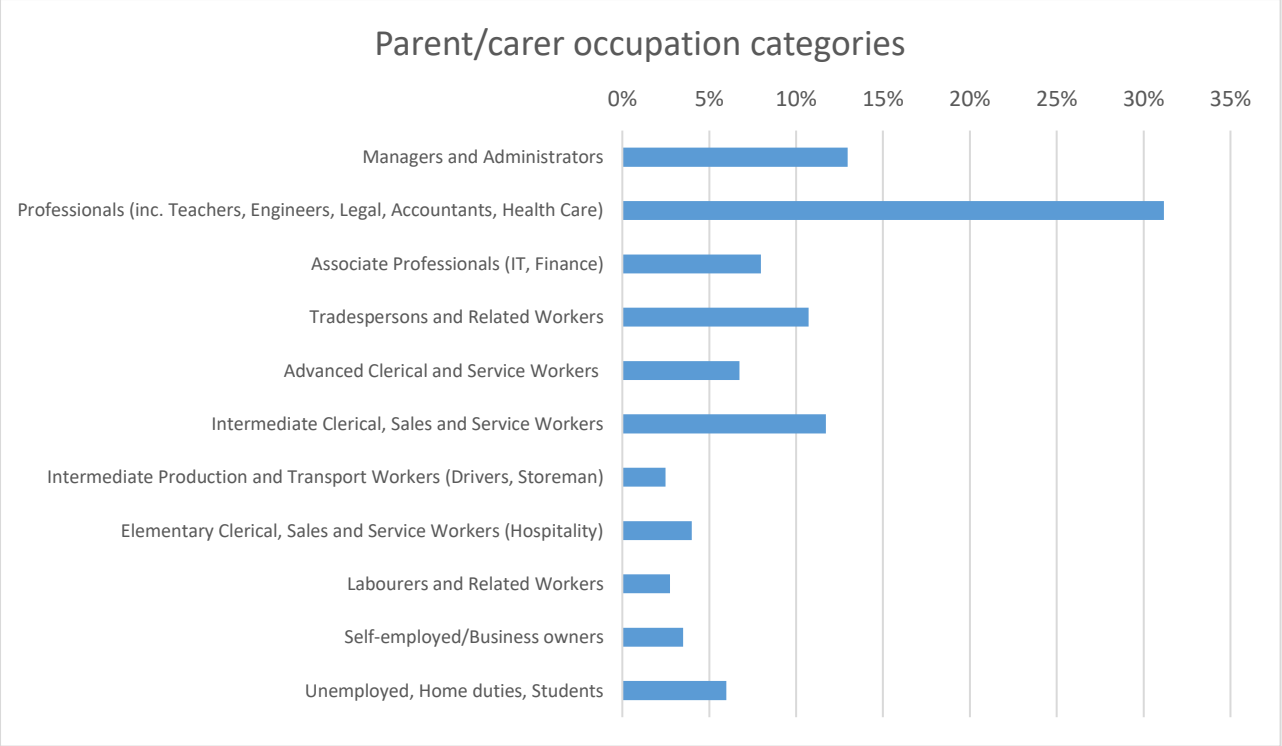


Figure 3: Parent/carer occupation categories

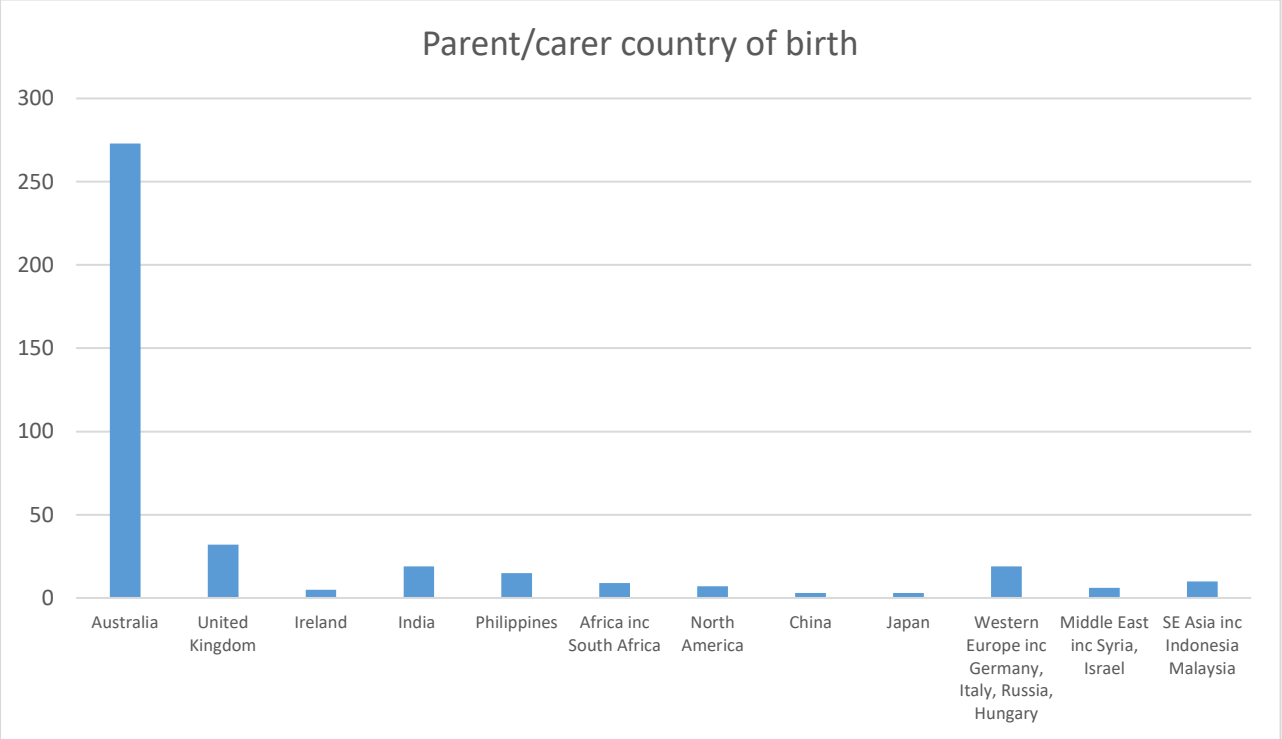


Figure 4: Parent/carer country of birth

5.2 Swim data

5.2.1 School swimming (group A): Effectiveness and retention data

Of the 115 participants who undertook a school swimming program only (group A), 57% were male, whilst 43% were female. These students were accessed from two local government primary schools and data was taken specifically from grade three and four students. As indicated in Table 7, the baseline testing procedure revealed the majority of children grouped in the level 4 to 6 range. The data in this group is presented as the number of skills participants were able to achieve out of a possible seven from the testing protocol, measured at three time points – baseline, post-test and review. Participants were grouped with similarly skilled children at the first testing protocol and remained in those groups across the five days of the swimming intensive, in keeping with the school swimming intensive practices of PARC. There is no opportunity to advance levels once baseline testing identifies their competencies. Of the 115 participants, 82% were assessed on day one at baseline as non-swimmers, at level 6 or below (see Table 6). Only 18% were considered swimmers by the same definition, at level 7 or above.

Table 6: School Participants (group A)

Characteristics	**n=115 Grade 3-4**
Gender	**n (%)**
Male	66 (57%)
Female	49 (43%)
School Enrolment	**n (%)**
Primary School A	52 (45%)
Primary School B	63 (55%)
Swim Level Baseline	**n (%)**
Level 2	4 (3%)
Level 3	11 (10%)
Level 4	27 (24%)
Level 5	28 (24%)
Level 6	24 (21%)
Level 7	15 (13%)
Level 8	2 (2%)
Level 9	4 (3%)

The results of testing at the conclusion of the intensive program indicated skill improvement across all swim levels. Although all groups improved their level of skill across the various aspects of the learning and testing protocol, the greatest development was evident in PARC swim levels 4 to 9.

Figures 5 and 6 below, represent the average number of skills achieved by all participants at each testing point for each level. Each level contains a number of different competencies (actual number varies between levels) that participants are working towards achieving. The progression and retention at each testing point is highlighted through these graphs.

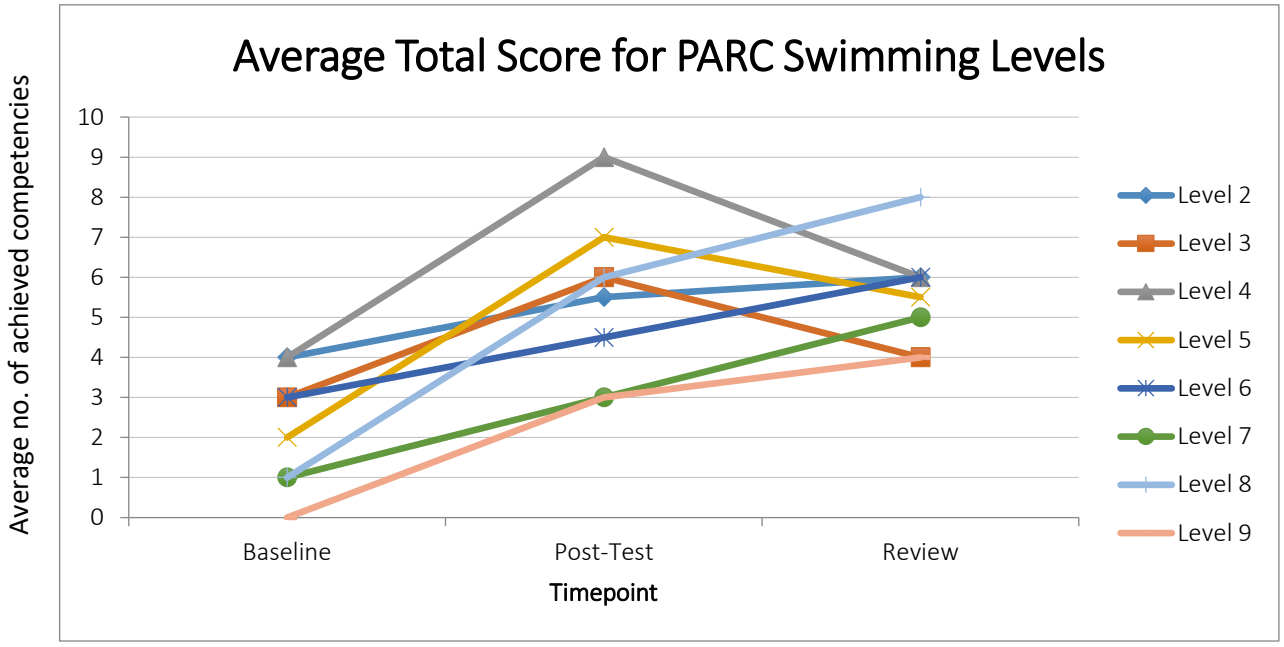


Figure 5: Average number of achieved competencies per PARC swimming levels (group A)

All levels experienced some improvement in swimming skills across the school intensive swimming program (baseline to post-test). Additionally, all levels still had a higher average number of competencies achieved at review, nine months later. However, of importance, there was a marked regression between post-testing and review across a number of levels.

- The groups that experienced the greatest improvement from baseline to post-test were those participants learning in levels 3 to 7 ($p<0.01$). When considering baseline to review, nine months later, only those swimmers in levels 4 to 7 demonstrated a statistically significant improvement ($p<0.01$).
- Improvement from baseline to post-test was lowest for level 2. At level 2, the improvement was not statistically significant, given the small numbers within the group (n=4), however, level 2 participants developed an average of two new skill competencies across the week.
- The post-test to review data indicates that there was a statistically significant regression ($p<0.01$) at levels 3 and 4. Retention of swimming skills developed in school intensive swimming programs appears to be level-dependent.
- There was also some regression from post-test to review within level 5.

The improvement and retention data for the individual swimming levels is represented separately in Figure 6. Further data, drilling down into the development of swimming skills within the school intensive program can be found in Appendix 4.

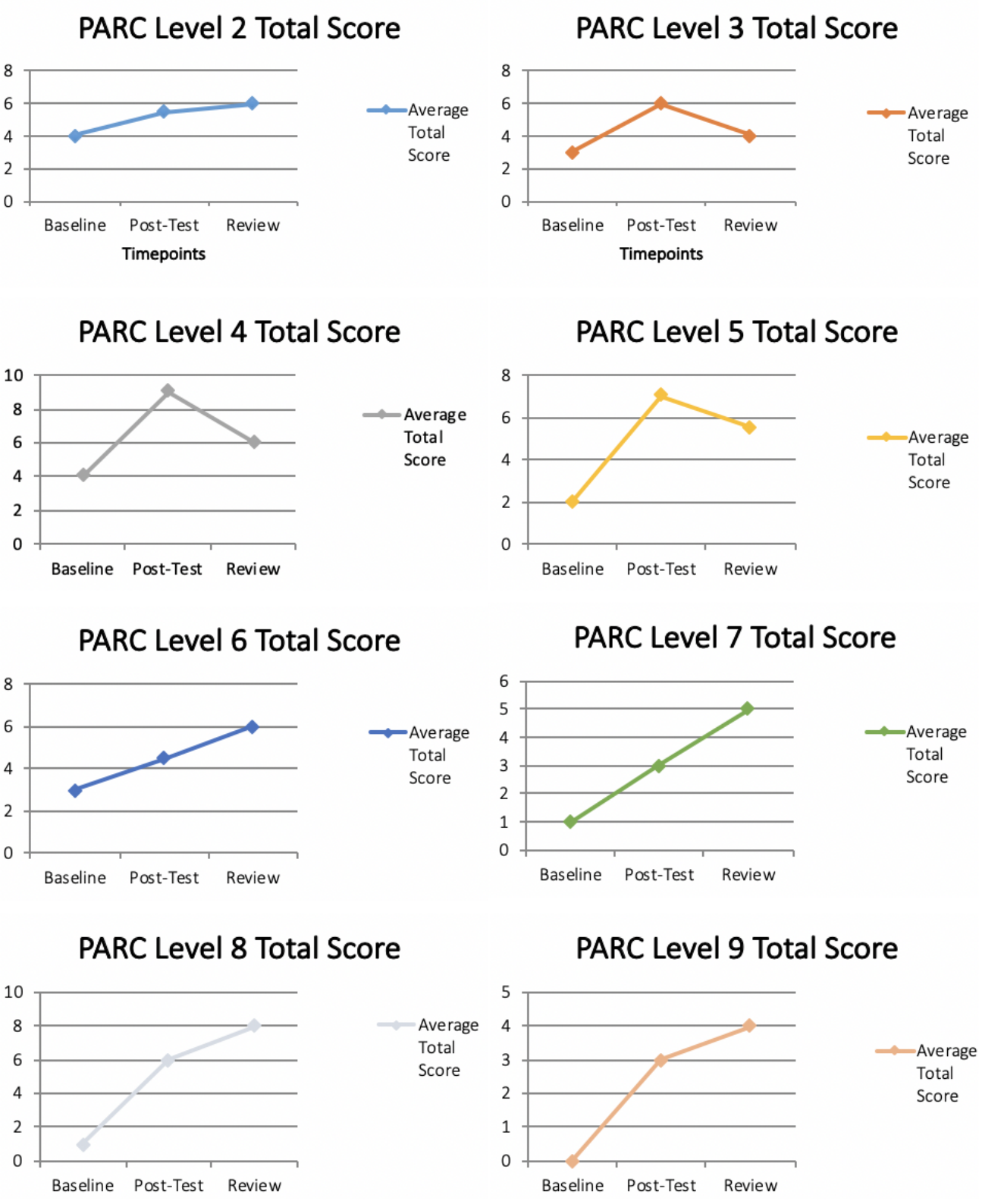


Figure 6: Baseline testing, post-test and review data by number of achieved competencies – all levels (group A)

5.2.2 Weekly swimming (group B): Effectiveness and retention data

Students who participated in weekly swimming programs (group B) numbered 75 in total. Of these participants, 52% were male and 48% were female (see Table 7). These participants were drawn from PARC's regular weekly swimming program and engaged in learn-to-swim lessons across four terms of the school year. Similar to group A, there was a range of swimming abilities at the beginning of the testing period in February, with the majority beginning the term one swimming program between levels 3 to 6, still at the 'improver' swimmer stage, which deems them to be non-swimmers. Only 16% were considered swimmers according to the same criteria, whilst the remaining 84% were level 6 or below. Level 4 and 5 accounted for 55% of all weekly swimmers at baseline testing. At completion of the calendar year of learn-to-swim lessons, 29% finished as Level 7 or above (swimmers), whilst the majority (51%) of swimmers were sitting at levels 5 and 6.

Table 7: Weekly participants (group B)

Characteristics	**n=75**
Gender	**n (%)**
Male	39 (52%)
Female	36 (48%)
Swimming Level at Baseline	**n (%)**
1	1 (1%)
2	0 (0%)
3	10 (13%)
4	26 (35%)
5	15 (20%)
6	11 (15%)
7	6 (8%)
8	5 (7%)
9	1 (1%)
Swimming Level at Review	**n (%)**
1	0 (0%)
2	1 (1%)
3	2 (3%)
4	12 (16%)
5	24 (32%)
6	14 (19%)
7	8 (11%)
8	6 (8%)
9	8 (11%)

As part of the PARC weekly swimming program, children are regularly assessed using the swim level competencies. The same protocol was used across the year. Researchers gained access to that data at two time points - in February, at the beginning of term one lessons and at the completion of term four lessons in December. Unlike the school intensive program (group A), the data available for this group was their starting swim level (baseline) and their final swim level

(review) at the end of the school year. Individual progress was therefore measured by progression across levels. In order to progress across the swim levels, students must have attained competency at every skill within each respective level.

The testing protocols revealed that 73% of participants progressed at least one swim level across the school year. A chi-square test of independence indicated there was a statistically significant association between baseline and review PARC swimming levels ($p<0.01$). A further 27% remained within the level at which they commenced, however, there was no means to measure improvement within a level. The participants who commenced on level 9 (n=1) had no opportunity to progress as this is the highest level within the program (see Table 8).

Table 8: Changes from baseline to review - PARC swimming levels for weekly participants (group B)

	Review Levels								
	LVL 1	**LVL 2**	**LVL 3**	**LVL 4**	**LVL 5**	**LVL 6**	**LVL 7**	**LVL 8**	**LVL 9**
Baseline Levels									
LVL 1 (n=1)		1 (100%)							
LVL 2									
LVL 3 (n=10)			2 (20%)	7 (70%)	1 (10%)				
LVL 4 (n=26)				5 (19%)	19 (73%)	2 (8%)			
LVL 5 (n=15)					4 (27%)	6 (40%)	4 (27%)		1 (9%)
LVL 6 (n=11)						6 (55%)	4 (36%)		1 (9%)
LVL 7 (n=6)								3 (50%)	3 (50%)
LVL 8 (n=5)								3 (60%)	2 (40%)
LVL 9 (n=1)									1 (100%)

In relation to changes in swimming ability across the school year, of particular interest within group B was:

- 56% of weekly participants advanced one level; 13% progressed two levels; 1.3% advanced three levels; 1.3% progressed four levels across the school year.
- Level 6 – had the lowest progression rates, with 55% working within the same level as recorded at the beginning of the school year; 45% progressed one or more levels.
- Level 5 – 40% progressed one level; 27% advanced two levels.
- Level 4 – 73% progressed one level; 8% advanced two levels.
- Level 3 – 70% progressed one level; 10% advanced two levels.

With regular weekly swimming, the impact was greatest at levels 3 and 4.

5.2.3 Weekly and school swimming (group C): Effectiveness and retention data

The weekly and school group (group C) consisted of 153 participants, 52% of whom were females and 48% male (see Table 9). As with group B, the participants were drawn from PARC's regular weekly swimming program and engaged in learn-to-swim lessons across the full four terms of the

school year. There was a range of swimming abilities at baseline testing in February with the majority starting between levels 4 to 6. Of the group, 13% were considered swimmers, whilst 87% were non-swimmers. At review testing, 29% were eligible for 'can swim' status whilst 71% remained non-swimmers. A chi-square test of independence indicated there was a statistically significant association between baseline and review swimming levels ($p<0.01$). The majority of participants (75%) finished the calendar year of learn-to-swim lessons within levels 5 to 8.

Table 9: Weekly and school participants (group C)

Characteristics	**n=153**
Gender	**n (%)**
Male	74 (48%)
Female	79 (52%)
Swimming Level at Baseline	**n (%)**
1	0 (0%)
2	1 (1%)
3	11 (7%)
4	43 (28%)
5	46 (30%)
6	32 (21%)
7	11 (7%)
8	4 (3%)
9	5 (3%)
Swimming Level at Review	**n (%)**
1	0 (0%)
2	1 (1%)
3	1 (1%)
4	20 (13%)
5	35 (23%)
6	52 (34%)
7	25 (16%)
8	9 (6%)
9	10 (7%)

Access to this group's swimming records was done at two time points, in February and December, at the beginning and completion of four terms of learn-to-swim lessons. Additionally, parents/carers provided confirmation that their child had participated in a school swimming program through the survey administered to all parents/carers of all groups. School swimming data was not utilised for this research, as the participants had accessed a variety of learn-to-swim venues and program types through their school swimming.

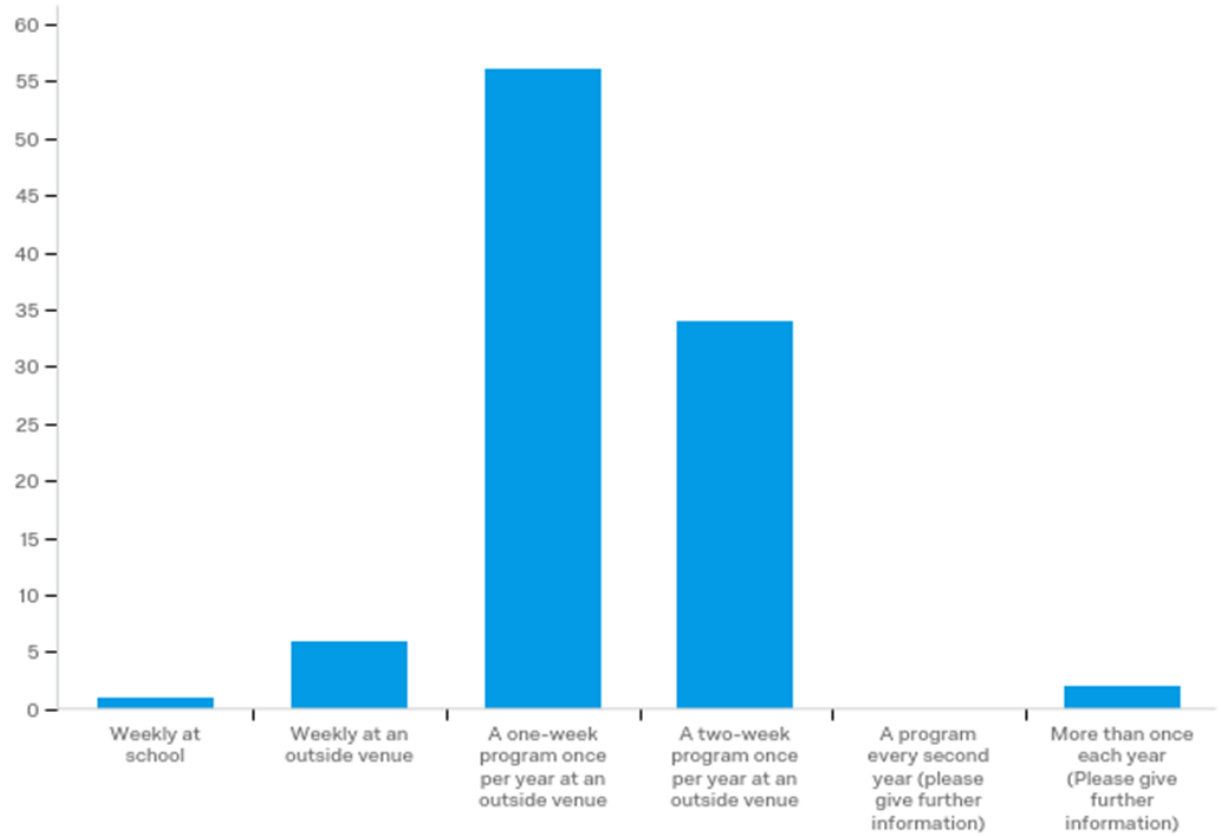


Figure 7: Weekly and school (ground C) – Type of school swimming undertaken by percentage (%)

The types of school learn-to-swim programs accessed by this group were varied, from weekly at school to one and two-week intensive programs, as per Figure 7, above. The most common type of program was a once-a-year program at an outside venue, as is offered at PARC. The progression of these 153 participants is highlighted in Table 10.

Table 10: Changes between baseline and review - PARC Swimming Levels for weekly and school participants (group C)

	Review Levels								
	LVL 1	**LVL 2**	**LVL 3**	**LVL 4**	**LVL 5**	**LVL 6**	**LVL 7**	**LVL 8**	**LVL 9**
Baseline Levels									
LVL 1									
LVL 2 (n=1)		1 (100%)							
LVL 3 (n=11)			1 (9%)	6 (55%)	3 (27%)	1 (9%)			
LVL 4 (n=43)				14 (33%)	22 (51%)	6 (14%)	1 (2%)		
LVL 5 (n=47)					10 (21%)	33 (70%)	4 (9%)		
LVL 6 (n=32)						12 (38%)	15 (47%)	5 (16%)	
LVL 7 (n=10)							5(50%)	3(30%)	2(20%)
LVL 8 (n=4)								1 (25%)	3 (75%)
LVL 9 (n=5)									5 (100%)

The testing protocols revealed that 68% of participants progressed at least one swim level across the school year. A chi-square test of independence indicated there was a statistically significant association between baseline and review PARC swimming levels ($p<0.01$). A further 32% remained within the level at which they commenced, however, there was no means to measure improvement within a level. The participants who commenced on level 9 (n=5) had no opportunity to progress as this is the highest level within the program.

Of interest within group C:

- 54% of participants in this group progressed one level; 13% advanced two levels; 1% progressed 3 levels within a calendar year
- Level 6 – 47% progressed one level; 16% advanced two levels
- Level 5 – 72% progressed one level; 9% advanced two levels
- Level 4 – 51% progressed one level; 14% advanced two levels; 2% improved three levels
- Level 3 – 55% progressed one level; 27% advanced two levels; 9% improved three levels

5.2.4 Control group (group D): Swim data

The control group (group D) consisted of 94 participants, 53.2% of whom were females and 46.8% male (see Table 11). The participants were drawn from two local government schools and from both grade three/four (18%) and grade five/six (82%). The control group data set was designed to capture primary school-aged children who did not access formal learn-to-swim lessons. Unfortunately, upon testing, it became evident that half of the children recruited for this control group were able to swim, often at higher levels of proficiency than those recruited in the other three groups. This has impacted the results of the study for this control group in a number of ways. Firstly, the highly competent swimmers in this group appeared to improve despite no formal lessons during the intervening time between assessments. This counter-intuitive outcome may have occurred merely as a result of becoming familiar with the requirements of the exercise, as discussed below. Secondly, it is likely that highly proficient swimmers are more inclined to engage in forms of incidental swimming (Franklin et al. 2015) not assessed under this research which may help them to seemingly improve without practice. It is notable that there are numerous opportunities for a proficient swimmer to engage in recreational swimming in the bayside area of Frankston and surrounds. It was also notable that group D had the greatest number of families with a pool at home (see Figure 21).

Nevertheless, when only those children in group D who had never attended swimming lessons are considered, unsurprisingly, their swimming abilities did not improve over the research period, as is further discussed below. The limitations of this research meant that it was impossible to judge what levels of swimming ability were held by the children in this group upon them being recruited. Excluding those clearly proficient as swimmers would have reduced the sample size of group D to 35 participants – that is, a sample size too small to make statistically meaningful statements.

Table 11: Control group participants (group D)

Characteristics	n=94	
Gender	**n (%)**	
Male		44 (46.8%)
Female		50 (53.2%)
School Enrolment	**n (%)**	
School C		42 (44.7%)
School D		52 (55.3%)
Swim Level	**n (%)**	
Grade 3/4		17 (18%)
Grade 5/6		77 (82%)

At initial testing, 22% of the years three to six at both schools scored a three for each variable which would deem them swimmers. The remaining 78% of these students would not meet this criteria, however, there were varying levels of skill across that group (see Figure 8).

Of interest within this group:

- 53% of all participants did not meet PARC 'can swim' criteria at either testing point, meaning they are non-swimmers.
- It was evident that swimming 50 metres was the most difficult skill for participants to achieve, with 47% not able to achieve this by the end of the control period.
- 34% of the students in years 5 and 6 could not swim 50 metres at either testing date; 22% of years five/six scored 0 or 1, which means they 'made no attempt' or 'attempted with difficulty'.
- 47% of years three/four could not swim 50 metres at either testing point; 29% of years three/four scored 0 or 1, which means they 'made no attempt' or 'attempted with difficulty'.
- A high percentage of participants (81%) were not able to demonstrate all three skills in the testing protocol consistently and comfortably at baseline, despite parent/carer surveys indicating that 50% had previously completed significant periods of learn-to-swim lessons. It is thought perhaps unfamiliarity with the testing protocol and lack of recent practice may have impacted those results.

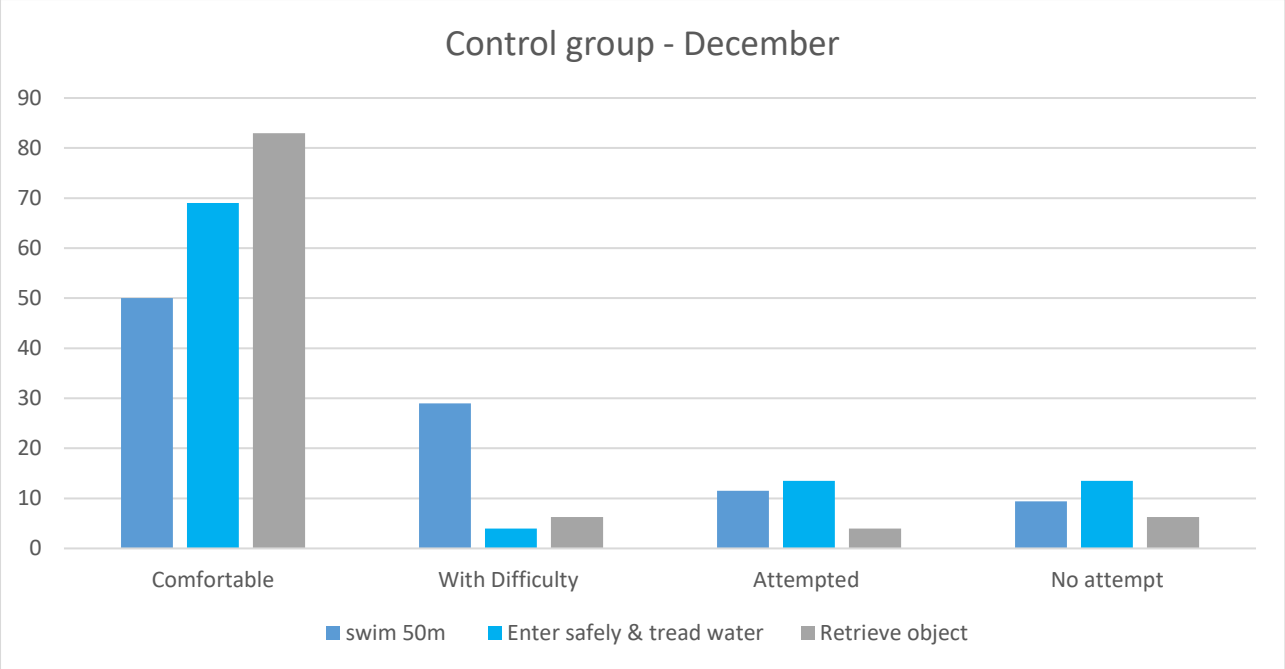


Figure 8: Control group – December (group D) performance against criteria

As previously identified, 50% of parents/carers who responded to the survey, noted that their children had already completed a learn-to-swim program and could swim, and this is why they were no longer enrolled in any type of formal swimming program. Not all of these pre-identified swimmers met PARC's criteria of 'can swim' at baseline testing, however, all achieved it at review, which is suggestive of the greater familiarity with the tests at second attempt.

5.3 Survey data

5.3.1 Parent/carer decisions regarding mode of learn-to-swim lessons

The survey explored a range of issues relevant to the decisions parents/carers make, and the value they place on learn-to-swim programs. The response rate for surveys was 59.5% from all groups, with the highest number of responses coming from groups B and C. Resoundingly, 94% of parents/carers who completed the survey from groups A and C indicated that they had chosen to enrol their child in every learn-to-swim program offered by their school (see Figure 9).

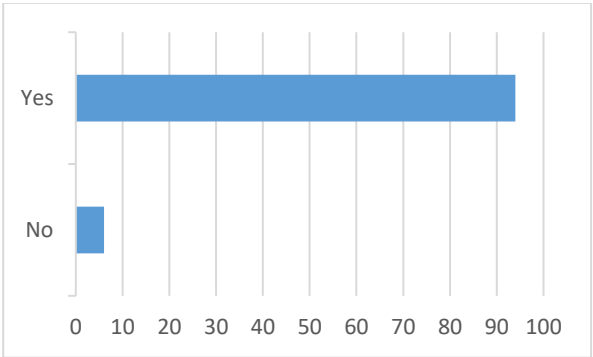


Figure 9: Has this child taken up every school swimming program made available to them, by percentage (group A and C)?

There were a range of reasons why parents/carers chose to enrol their child in school learn-to-swim lessons. In terms of the decision to enrol their child in a school swimming program, parents/carers selected the reasons in Figure 10, in order of importance from 'extremely important' to 'not at all important'.

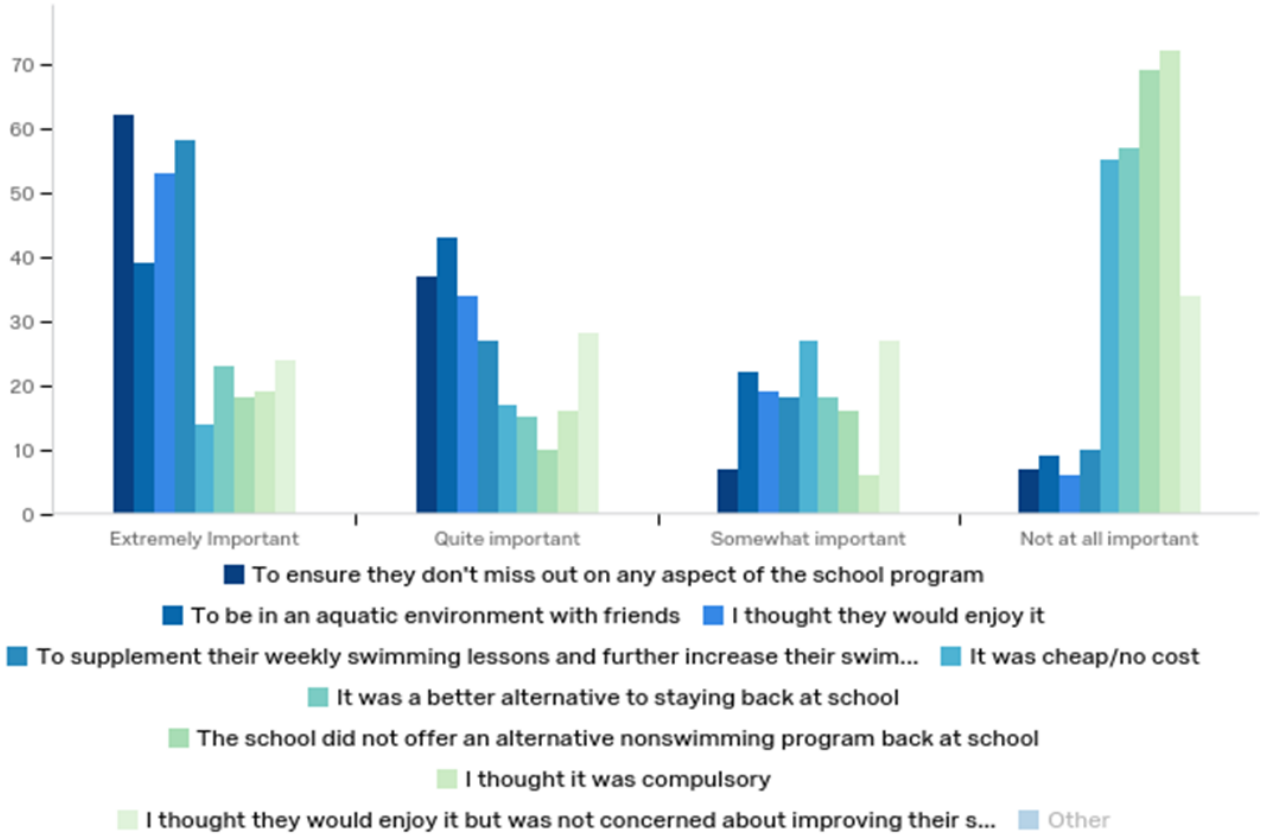


Figure 10: Why did you enrol this child in school swimming (group A and C) by number of respondents.

Of interest to the decision to enrol their children in school swimming, parents/carers indicated it was 'extremely important':

- That their child not miss out on any aspect of the school program (54.87%).
- That school swimming would supplement their weekly learn-to-swim program (group C only) (51.33%).
- Because they thought their child would enjoy it (47.3%).

Furthermore, 48.7% of parents/carers indicated that cost did not have a significant impact on their decision to enrol their child in school swimming.

Parents/carers of weekly participants were also asked what had prompted their decision to enrol their child in a weekly learn-to-swim program (see Figure 11).

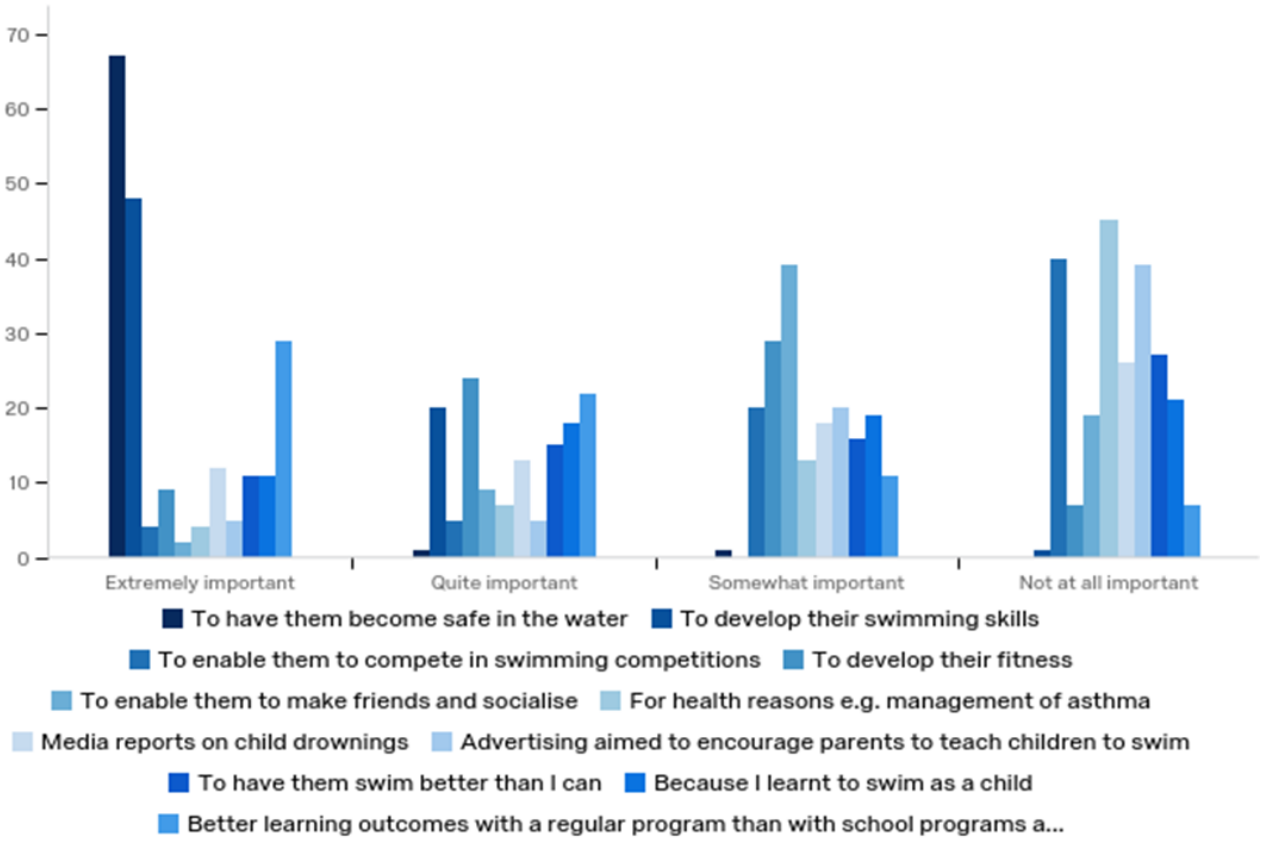


Figure 11: Why did you enrol your child in weekly swimming only (group B) by number of respondents

Of interest in Figure 11 are the top three reasons cited by parents/carers in terms of what was 'extremely important' in prompting them to choose weekly lessons. These were:

- to have them become safe in the water (97%);
- to develop their swimming skills (69.5%);
- the perception that weekly swimming has better outcomes than school swimming alone (42.03%).

Rated 'not at all important' were:

- health reasons e.g. asthma (65%);
- to enable them to compete in swimming competitions (57.9%);
- the impact of advertising aimed to encourage learn-to-swim (56.5%).

Interestingly, media reports on drowning were deemed 'extremely important' for only 17.3% of parents/carers and 'not at all important' for 37.6% of respondents in terms of prompting their decision to enrol their child in weekly swimming.

Further to this, parents/carers responded to the question as to why they chose to enrol their child in weekly swimming over all other forms (Figure 12). Their responses were thematised and grouped into five categories. Responses indicated that parents/carers perceived skill improvement was greater in weekly lessons and that continuity and consistency gained from regular practice can be more readily achieved through regular weekly lessons. We would expect there might be some bias in this decision given their commitment to weekly swimming.

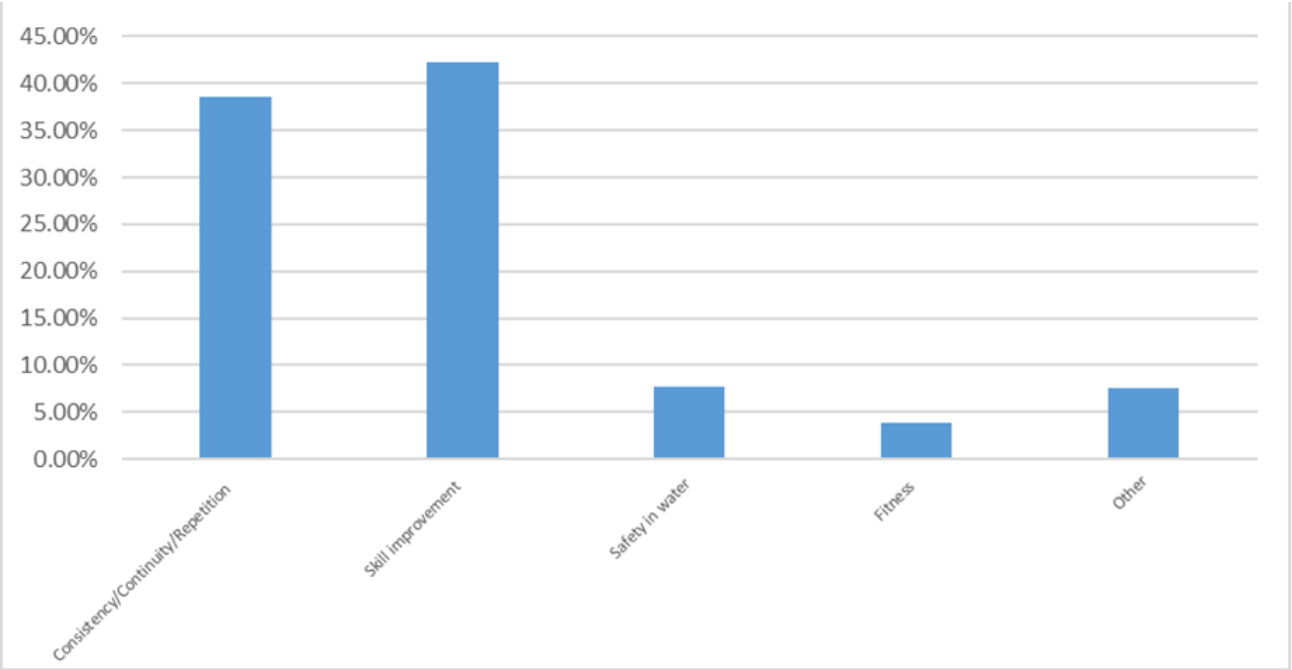


Figure 12: Parent/carer responses as to why they chose to enrol their child in weekly swimming over any other mode (groups B and C)

The parents/carers of children who were not currently enrolled in formal learn-to-swim programs were asked why they had chosen not to engage their child in formal learn-to-swim lessons across the 2018 year. The three most cited reasons out of 46 responses were that:

- their child could already swim.
- they did not have time for swimming lessons.
- their school does not offer swimming lessons.

5.3.2 Parent/carer decisions about continuing weekly learn-to-swim lessons (groups B and C)

Parents/carers were asked at what point they would decide to discontinue swimming lessons for this child. Their responses were ranked from 'extremely important' to 'not at all important' (see Figure 13).

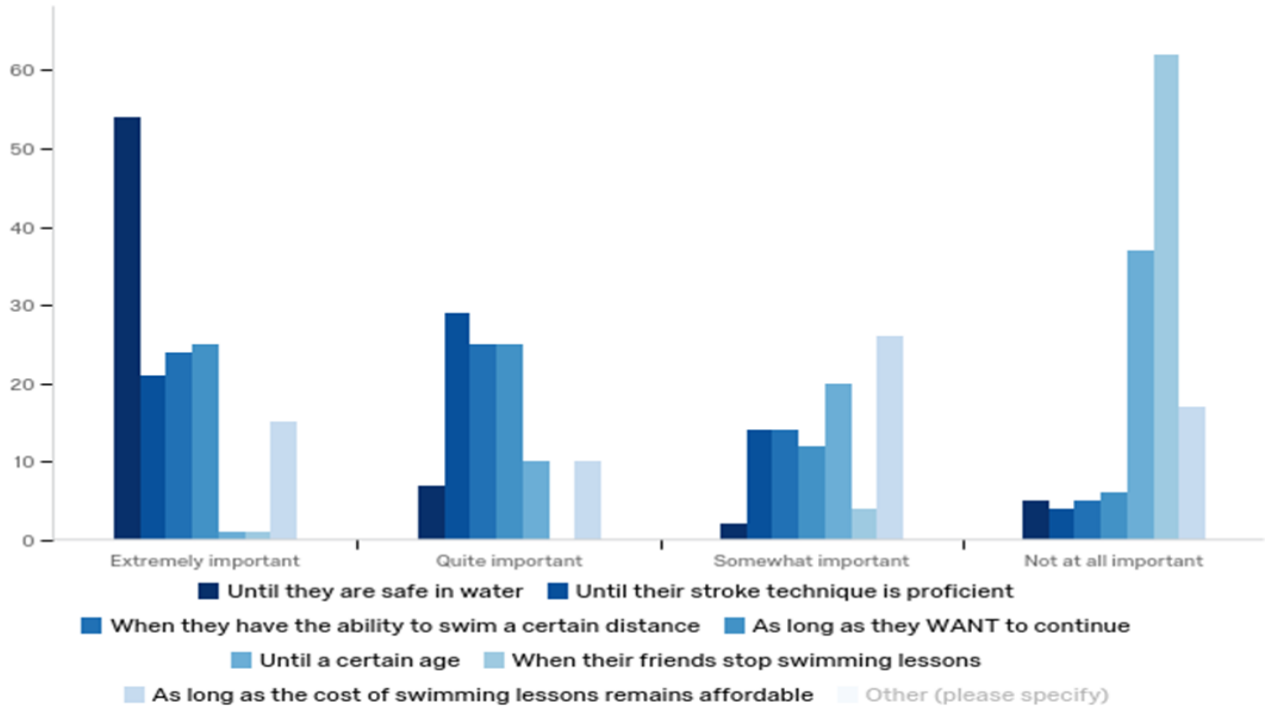


Figure 13: The reasons parents/carers will continue this child's weekly swimming lessons into the future (groups B and C)

Of interest to this question:

- A significant percentage (79.41%) noted as 'extremely important' that their child would continue swimming until they were safe in the water.
- 36.7% of parents/carers intended to persist with swimming lessons as long as the child wanted to continue.
- 35.2% of parents/carers planned to continue with swimming lessons until their child could swim a certain distance.

The seven graphs below (Figure 14) represent the responses parents/carers made when they were asked the importance of the various reasons for continuing learn-to-swim lessons into the future.

Figure 14: The decision to continue your child's swimming lessons in the future (groups B and C)

Figure 14 highlights that parents/carers who send their children to weekly swimming lessons consider being safe in the water to be extremely important; and having a proficient stroke and the capacity to swim a particular distance were also important to their decision-making. Cost, age and friendships are of less importance than the other variables.

5.3.3 Parent/carer reasons for wanting to continue school swimming (groups A and C)

Parents/carers indicated from 'definitely' to 'not at all', the reasons for continuing school swimming in the future (see Figure 15).

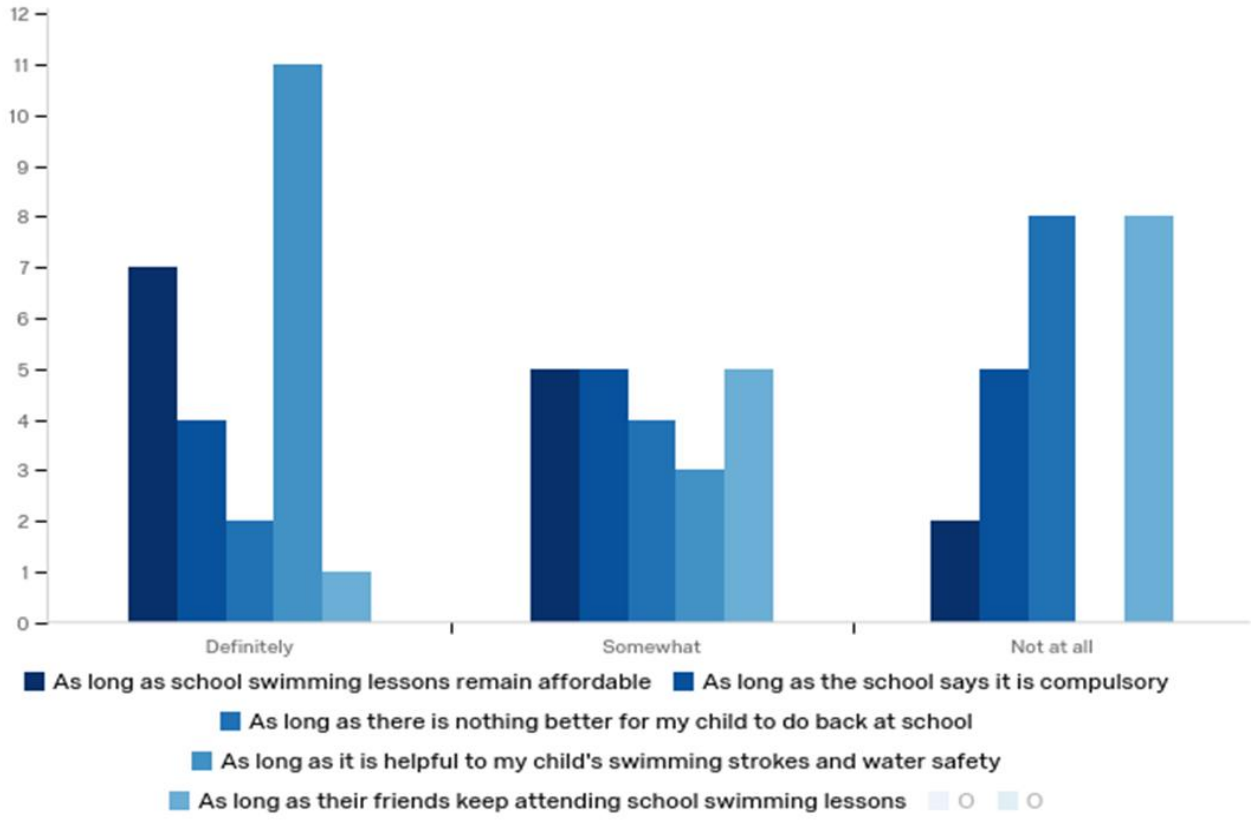


Figure 15: Reasons why parents/carers will choose to continue their child's school swimming lessons in the future (groups A and C)

Of interest to this question:

- Resoundingly (82.1%), parents/carers expressed that as long as learn-to-swim lessons were helpful to their child's swimming strokes and water safety, they would continue school swimming lessons.
- Affordability was 'definitely important' to decision-making to 52.7% of the parents/carers, whilst 14.29% did not rate it as important at all.
- The provision of alternative activities back at school was 'not at all important' to 59.46% of parents/carers.

5.3.4 Parent/carer measure of swimming success (groups B and C)

Parents/carers resoundingly believed that their children had improved in skills and confidence in swimming and water safety across the period that they had been enrolled in weekly programs (groups B and C). Over 50% of parents/carers felt confident about their child's ability to swim the length of the pool comfortably (see Figure 16).

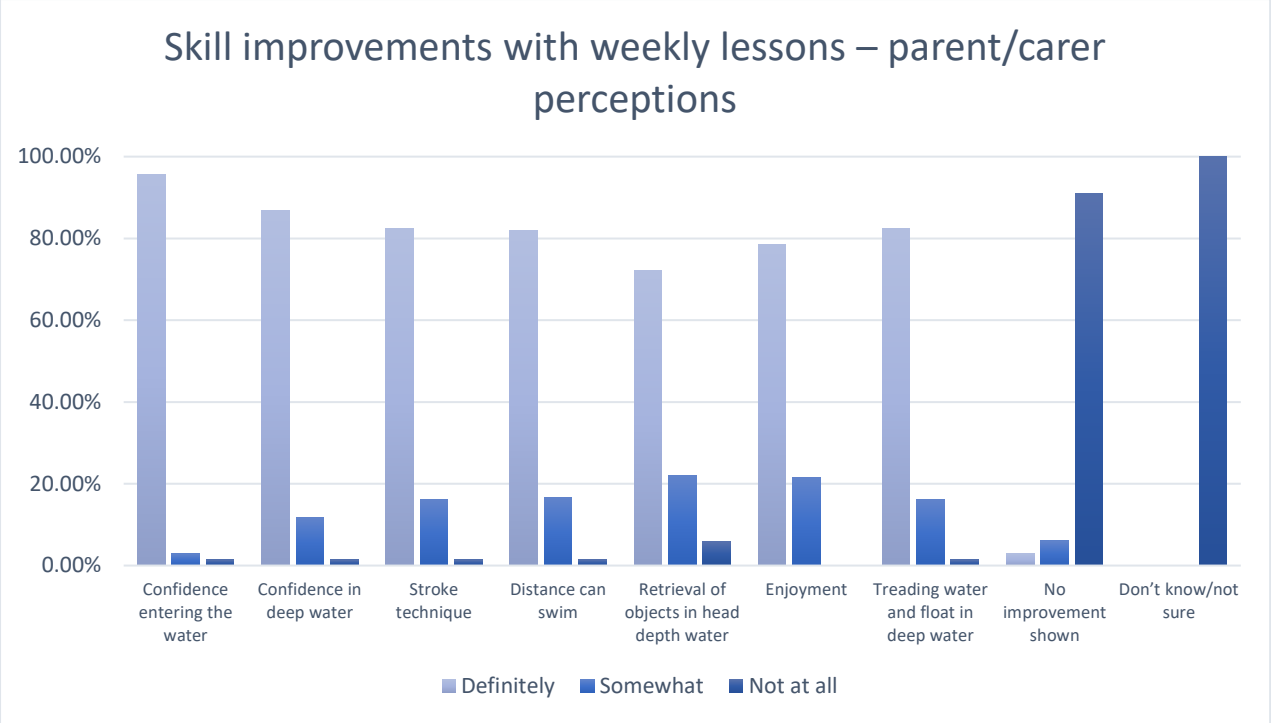


Figure 16: Skill improvements with weekly lessons – parent/carer perceptions

Parents/carers felt that their children had improved the most in the following areas as a result of weekly learn-to-swim lessons:

- Confidence entering the water (95.6%)
- Confidence in deep water (86.8%)
- Treading water and floating in deep water (82.4%)
- Stroke technique (82.4%)
- Distance their child can swim (81.9%)

In the parents'/carers' opinions, weekly swimming lessons at PARC were the most helpful to improving their child's swimming and water safety skills (see Figure 17). Of the 112 who responded to this question, 89 parent/carers selected weekly swimming as the most beneficial.

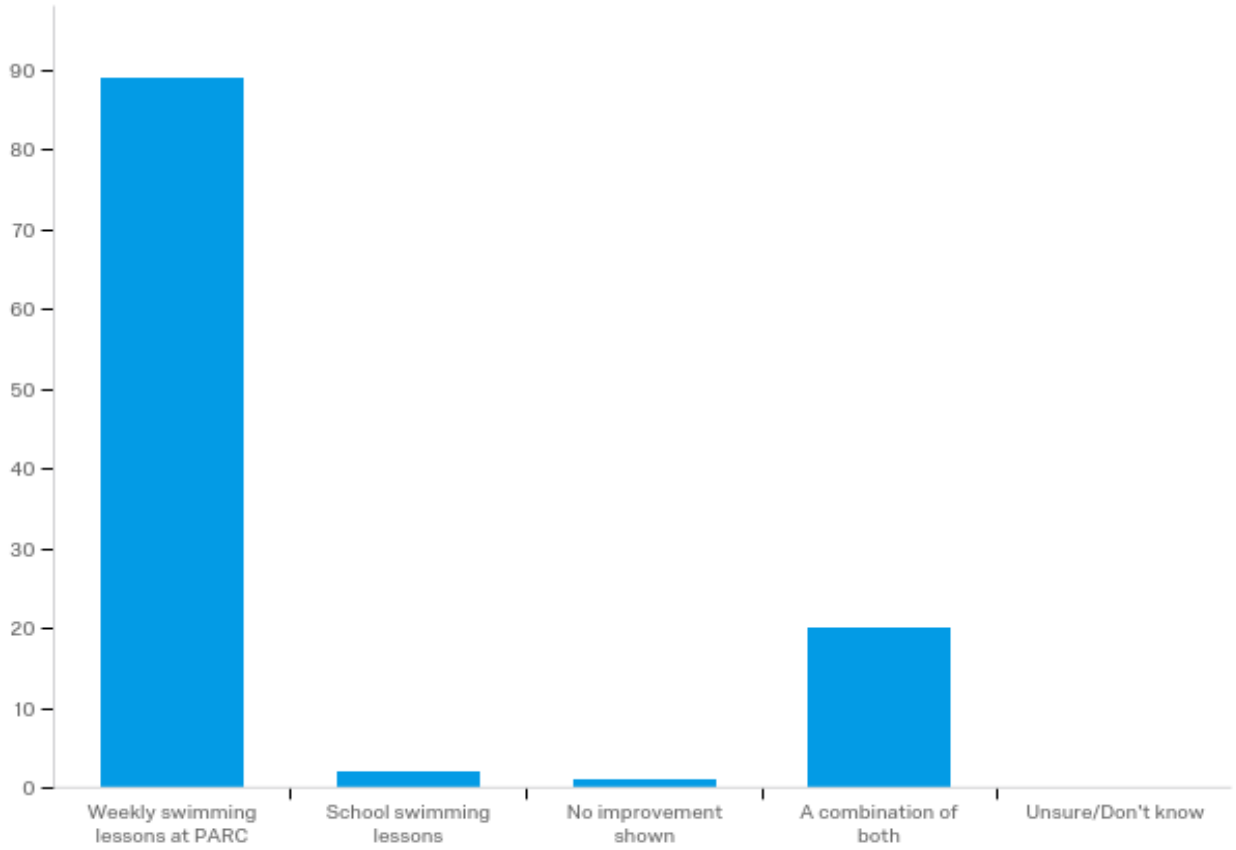


Figure 17: Parent/carer opinion about which type of lesson has helped their child the most in terms of improving their swimming skills and safety in the water (groups B and C) (n=112)

Of the parents/carers of children enrolled in weekly swimming, 50% believed their child could swim the length of the pool confidently, whilst 47% believe their child could swim, but were not confident or able to swim the length of the pool (see Figure 18).

In terms of school intensive programs, 84.6% of parent/carers of those swimmers believed their children could swim the length of the pool confidently, whilst 15.4% suggested that their child could swim, but not the length of the pool (see Figure 19).

Of the parents/carers of children who weren't currently accessing formal learn-to-swim lessons, 70% perceived their children to be able to swim the length of the pool confidently. Less than 2% of parents/carers believed their child could not swim at all (see Figure 20).

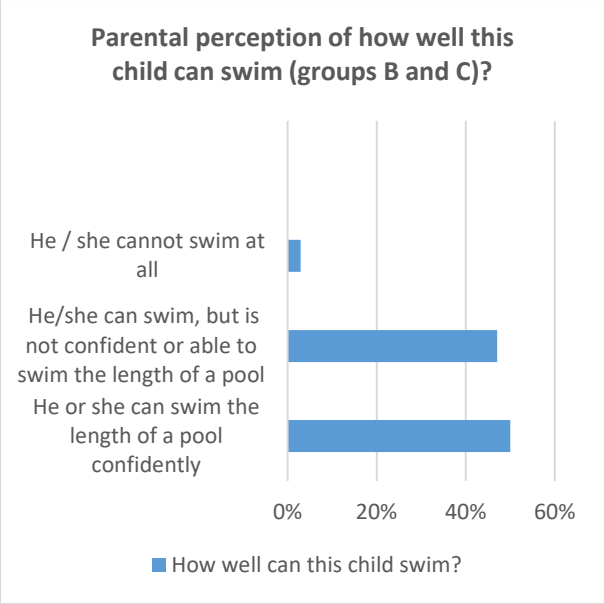


Figure 18: Parental perception of how well this child can swim (groups B and C)

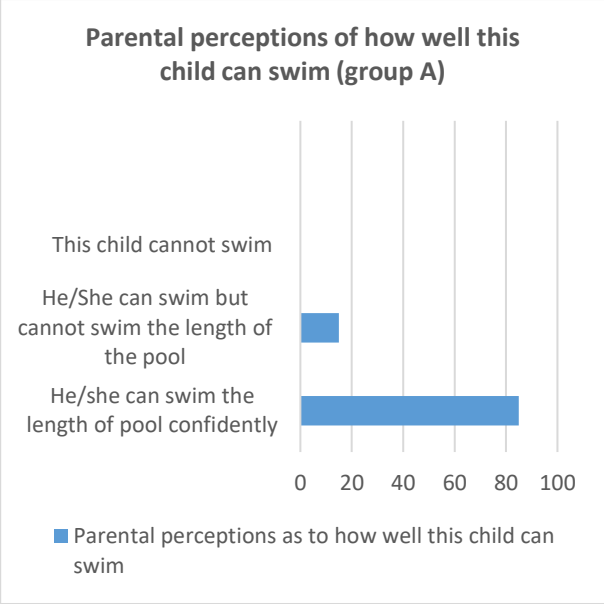


Figure 19: Parental perceptions of how well this child can swim (group A)

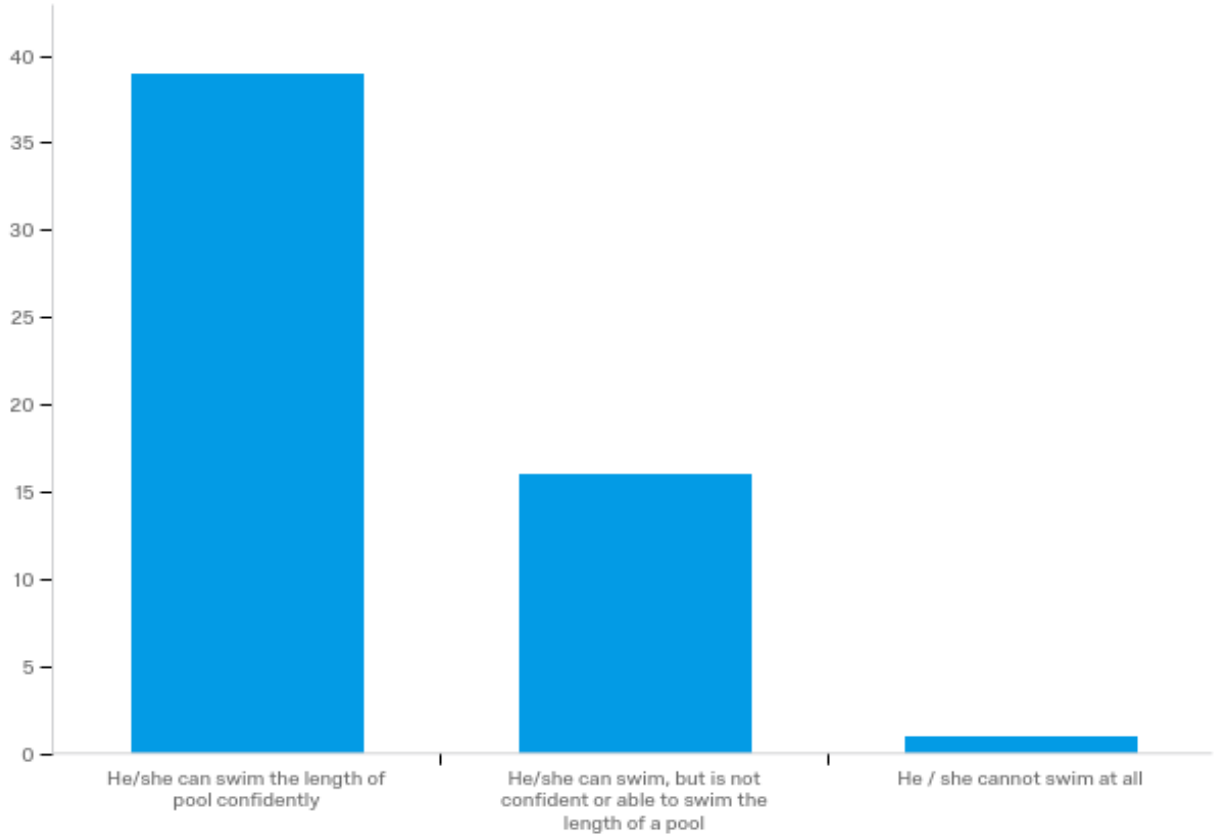


Figure 20: Parental perceptions of how well this child can swim (group D)

5.3.5 Children's family backgrounds

In addition to the demographic data discussed earlier in the report, parents/carers were asked if they had a pool at home (see Figure 21). Approximately 20 to 26% across all groups responded positively. There was no significant association between having a pool and choice of swimming mode.

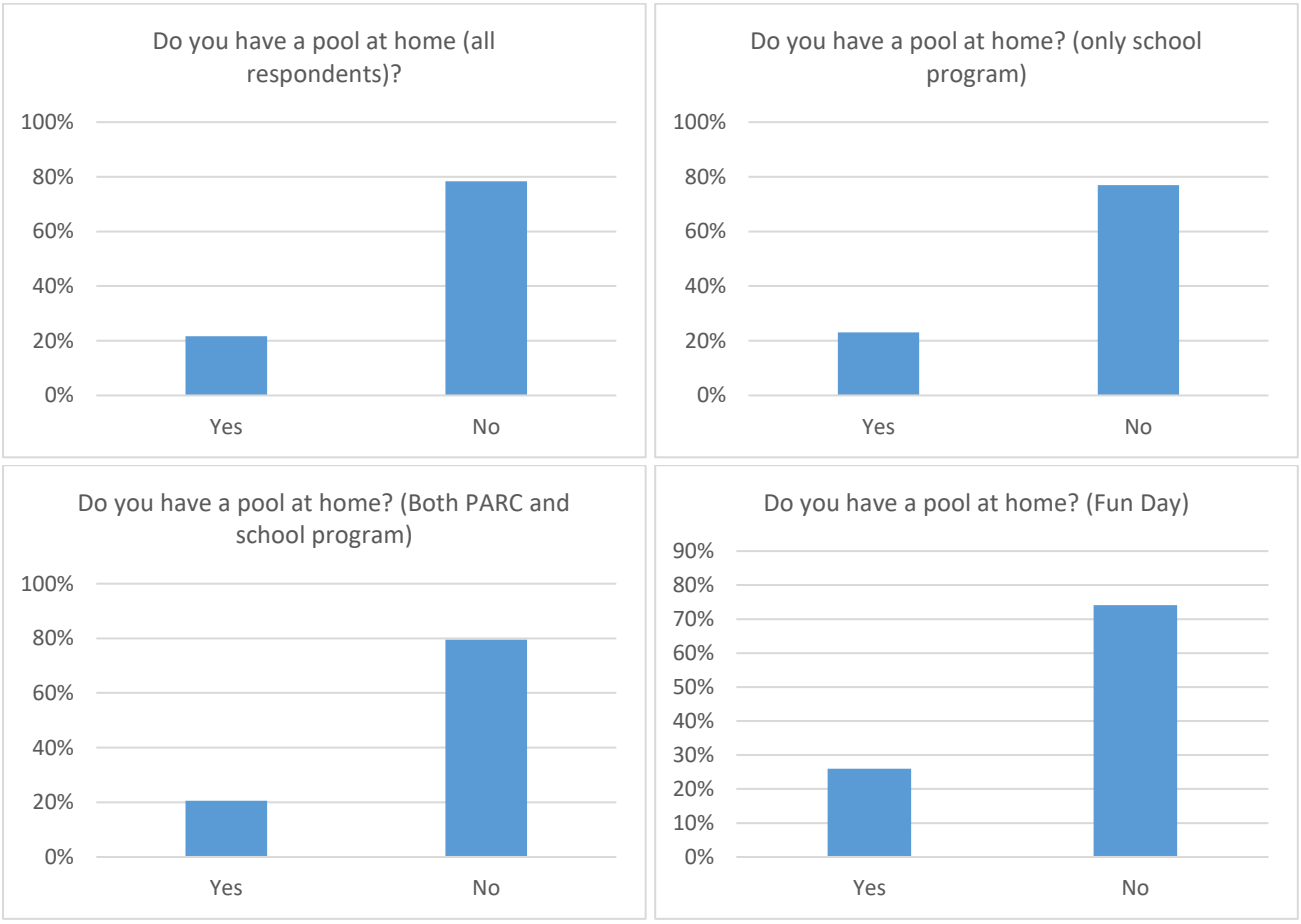
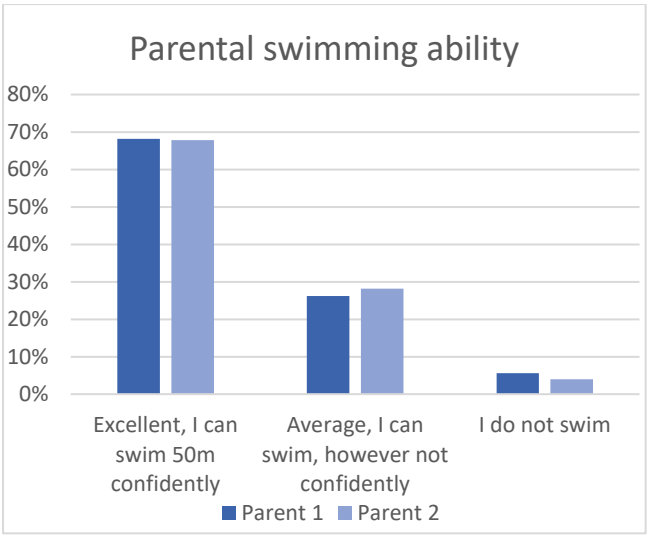
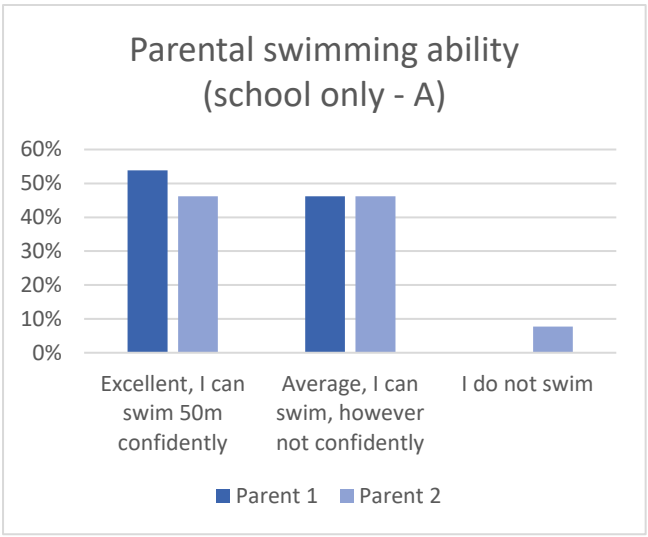


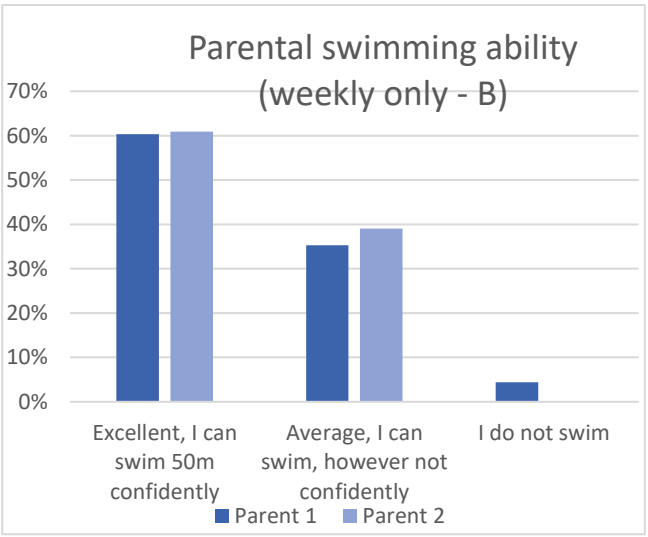
Figure 21: Families who have a pool at home (all groups)

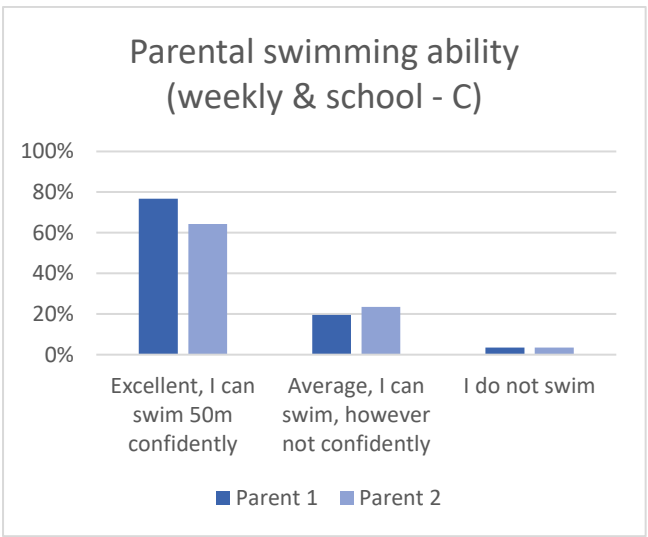
Parents/carers were asked to assess their own swimming ability (see Figure 22). Overall, the majority of parents/carers suggested they could swim 50 metres confidently (68%). In addition, 27% suggested they could swim, but not confidently, whilst only 5% of the entire sample identified as non-swimmers.

When considering this data at group level, parents/carers who chose to send their children to either weekly (group B) or weekly and school (group C) programs, assessed themselves more highly (61% and 73% respectively) than those who only accessed school swimming lessons (group A) (50%). Of parents/carers who did not access any formal swimming lessons (group D), 70% also assessed themselves as confident swimmers, whilst 11% indicated they were non-swimmers, which was higher than in any other group. Separating this sample to indicate which parents/carers had previously accessed learn-to-swim programs for their children and those who had never done so, was not possible.









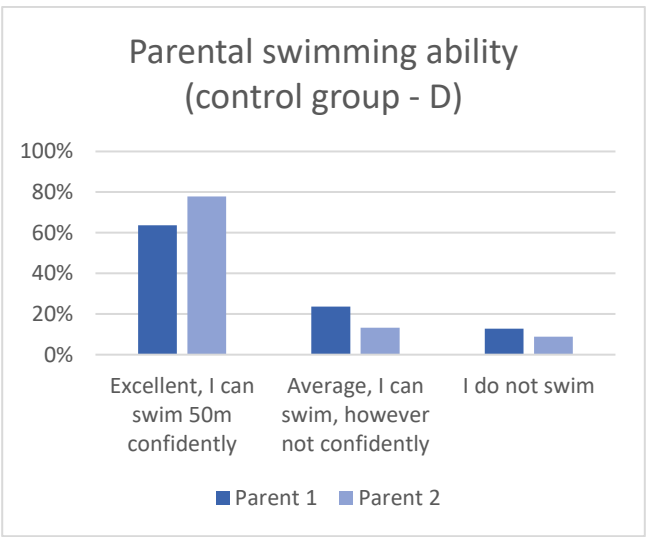


Figure 22: Parental swimming ability (all groups)

6. Discussion

6.1 School intensives (group A)

This study aimed to explore a range of learn-to-swim models to assess their effectiveness and impact on the development and retention of swimming and water safety skills of primary school-aged children. The findings suggested that school swimming programs were the perfect opportunity to capture almost all primary school students. Parents/carers indicated that they value school swimming highly, with the overwhelming majority taking up the opportunities offered in schools. They chose school swimming intensives primarily so that their child did not miss out on any aspect of the school program. Parents/carers perceive that school swimming programs work and they will continue to enrol their child in school swimming intensives so long as it is helpful to their child's swimming strokes and water safety. In line with other studies (e.g. Moran 2009; Morrongiello et al. 2013), parents/carers in this group tended to over-estimate their child's swimming ability, which has significant implications with regard to both their safety in aquatic environments, and the parents'/carers' decision making around accessing learn-to-swim tuition beyond the school setting.

6.1.1 Structure

The school intensive programs in this study were five days of consecutive lessons, each 45 minutes in length and with a ratio of no more than 1:8 staff to students. Students were from grades three and four. The 45-minute lesson appears to be advantageous to what can be achieved in terms of learning time and opportunities to practise. PARC staff attest to the value of having longer lessons with school groups.

'It's really good [45 min lessons] and I think that is part of the reason why we see a lot of the kids progress so much within the 5 days'. Justin

This appears to be particularly helpful from level 3 upwards.

'I reckon maybe with the lower levels, 45 mins can be a little bit too long. I guess that is probably a little bit of a barrier to it. But after Level 3, I think it works really well'. Justin

6.1.2 Improvement

School intensive programs were deemed in this study to be effective at improving the swimming ability and water safety of children at every level, from 2 to 9. These improvements are indicative of the repetitive nature of practice across the five days of the intensive school program and the propensity for skill learning to occur markedly in middle childhood (Nagel & Scholes 2016) – in this case, grades three and four. Significant research confirms that foundational motor skill interventions at primary school age are effective in improving the skills of young people (Austin, Haynes & Miller 2004; Cliff et al. 2011; Logan et al. 2011; Sprinkle et al. 1997). However, many interventions within these studies were longer than the five days of learning undertaken by the participants of this learn-to-swim program, and none of these studies focused on swimming or water safety skills, therefore retention rates cannot be compared.

Rates of improvement at level 2 were slower than at other levels, reflecting the increased time required to learn new skills as the learner integrates the various task components (Coker 2018). This phase is indicated by the plateau in skill improvement that occurs during this period (Coker 2018). The types of skills being developed at level 2 include front push and glide with a board, front torpedos, submerge and retrieve objects and starfish float on back. Staff report that the skill that takes the longest to master is the front torpedo.

Level 3 extends these skills with the introduction of basic single-arm freestyle and kick with a board; basic back paddle with horizontal body position; and an unassisted front push and glide. There was a statistically significant ($p<0.01$) improvement in the number of competencies achieved across the week. Staff describe the basic back paddle as the most challenging skill, though, and the data reflects the back paddle as having the poorest level of improvement and retention. Only 27% of participants had achieved competency in the skill at post-testing, suggestive of the requirement for more consistent practice at this early stage of learning foundational movement skills. Booth et al. (1999) and the Department of Education (1996) maintain that repeated practice of at least one hour per week in early primary school will aid in consolidating learning of a new skill and allow a child to move towards mastery, which speaks to the need for more frequent and repetitive exposure to the skill at this early phase.

'Demonstrate basic back paddle with horizontal body position is usually the last competency to be ticked off'. Angela

Beyond level 3, the improvements are indicative of participants having the opportunity to consolidate previously learned skills. Level 4 presents more complex aspects of the strokes as participants are introduced to an alternate arm action in both freestyle and backstroke. At level 5, participants attempt breaststroke arm and leg action, basic butterfly kick and a standing dive. The cognitive requirements of these complex skills are more demanding, however, the previously discussed notion of repetition and the volume of practice across five days and 45 minutes per session resulted in more immediate skill improvements from baseline to post-testing. Resultantly, at both levels 4 and 5, there was a statistically significant ($p<0.01$) difference between baseline and post-testing. Basic butterfly kick, which is introduced at level 5, demonstrates this improvement, with only 25% of cohort in the level able to perform the kick competently at baseline, whereas 70% achieved this at post-testing.

At level 6, students are on the verge of becoming a swimmer, according to PARC 'can swim' criteria. The greatest improvement at this level was their capacity to tread water for two minutes, moving from 42% at baseline to 88% at post-testing. Examples of competencies within this level include swimming freestyle and backstroke for 25 metres, demonstrating both breaststroke for 10 metres and basic butterfly arms. Data from this study indicates a significant improvement ($p<0.01$) in skills between baseline and post-testing.

Level 7 indicates that participants have achieved 'can swim' status. Competencies within this level include basic butterfly swim of ten metres and 50 metres of backstroke. Basic sidestroke is also introduced. There was a statistically significant ($p<0.01$) improvement in all competencies between baseline and post-testing.

Within levels 8 and 9, participants demonstrated steady improvements, but this was not statistically significant due to the low numbers in this cohort at those levels. At level 8, students are asked to swim 100 metres of freestyle, backstroke and breaststroke, and survival backstroke is introduced. At level 9, students complete continuous swims of 200 and 400 metres, and an individual medley of 100 metres, and float whilst clothed for 30 seconds. Despite none of the participants being able to achieve any of these skills at baseline testing, by the completion of the intensive program, all skills had been accomplished, except for one child being unable to complete the individual medley requirement.

The intensive nature of a five-day program lends itself towards steep improvements for those swimmers who have established foundational motor skills upon which to refine and combine

skills to perform the more complex movement patterns characteristic of levels 4 to 9.

6.1.3 Retention

Despite the relatively consistent gains in skills across participants of all levels, many of these gains were lost across the school year. Levels 3, 4 and 5 experienced regression between post-testing and review. Notably, this lack of retention of skills since the swimming intensive program in levels 3 and 4 was significant ($p<0.01$).

Learners at PARC are still considered beginners between levels 1 and 3 and improvers from levels 4 to 6, and not surprisingly, at these swimming levels, participants require consistent and regular practice in order to consolidate and retain what has been learned. One hour per week is considered ideal practise of a foundational motor skill (Booth et al. 1999) which was experienced during the swimming intensive across one week, however, the necessary repeated practice over time (Department of Education 1996; Logan et al. 2011; McKenzie et al. 1998) was not facilitated through this short-term intervention. As these participants are still in the development phase, if there is a break in the practice or 'retention interval' (Magill & Anderson 2017, p. 265), it is likely that when they return from a break in swimming, there will be a regression in the previously learned skill.

As specified in the limitations section of this report, the extent to which children had further opportunities to engage in swimming practice informally was not clear, however, the lack of formal swimming lessons between post-test and review appears to have significant implications for skill retention at the beginning swimming levels (levels 1 to 6) where participants are attempting to consolidate these foundational motor skills.

Between levels 6 and 9, there was little to no regression, suggesting that the skills being learned and tested had been consolidated and perhaps mastered. Mastery of foundational skills is believed to occur at about age ten (Gallahue, Ozmun & Goodway 2012), although this occurs at varying ages for different children and some skills are mastered earlier than others. Mastery doesn't ever occur for some children, but for those who do master a range of foundational motor skills, many are still working towards proficiency up until and beyond year seven (Eather et al. 2018).

School intensive programs offered participants improvements in skills and water safety, however, there were also some notable regressions between post-testing and review. There was improvement between baseline and review testing at every level, with the least improvement at the lower levels, which would suggest that achievement and retention is level-dependent. School intensive programs would appear to be most productive for participants who have already established foundational skills, for example, levels 5 and above.

6.2 Weekly program (group B)

Parents/carers of weekly participants spoke of the time and financial commitment that regular weekly swimming required. However, they believed it was worth it and overwhelmingly suggested they would continue these lessons until their child was safe in the water. It was evident that water safety and swimming skills were considered vital by this group of parents/carers, who also believed that weekly swimming had better outcomes than any other mode, stating the consistency and continuity that repetition provided as being important. These parents/carers noted that skill improvement was greater in weekly lessons. It was interesting to note that these parents/carers were more realistic in relation to their child's swimming and water safety ability, possibly due to their presence on-deck and communication with deck supervisors and swim teachers.

6.2.1 Structure

The weekly learn-to-swim programs in this study were of 30 minutes duration at levels 1 to 7, 45 minutes at level 8 and one hour at level 9. The ratio of staff to students was also different between levels: 1:4 in levels 1 to 4, through to 1:12 at level 9 (see Table 3). Participants were from grades 3 to 6. The swimming level of participants was recorded at the commencement of term one and the conclusion of term four. Once participants had demonstrated achievement of every competence at a level, they were promoted to the next level.

Despite the shorter lesson length, the staff to student ratio is also higher, enabling similar work to be done each lesson due to increased time for practice and feedback. Staff also indicated, that at the lower levels, 30 minutes is sufficient as younger children tire more easily. Both cognitive and physical capacity can be limited by fatigue, especially when learning a new skill (Branscheidt

et al. 2019; Coker 2018), therefore, shorter learning timeframes are most appropriate to successful learning experiences in children at lower levels of swimming ability.

6.2.2 Improvement/Retention

During the developmental phase of children's learning, frequent practice is required to shift a child's skills towards permanence. Any breaks in the practice schedule can result in a 'retention interval' (Magill & Anderson 2017, p. 265). For this reason, weekly learn-to-swim lessons enable sufficient regular practice to consolidate skills towards relative permanence.

The significant improvement at level 3 and 4, attests to the importance of regular swimming prior to mastery in order to establish both skill and confidence in the water. As described earlier, level 3 consolidates previously learned skills and level 4 presents more complex aspects of the strokes. The progress that the majority (80%) of participants made can be attributed to a regular cycle of consistent instruction, practice and feedback.

The percentage of participants who did not progress at level 5 (27%) and 6 (55%) was higher than earlier levels. It is important to note that although those participants did not progress a level, advances were made within levels. Staff report that level 5 is challenging and is the level at which participants spend an extended period of time due to the demands of learning new and complex skills.

'Level 5 is where kids get stuck'. Ellen

After having established basic freestyle and backstroke techniques, the requirements of level 5 include the introduction of breaststroke, and by level 6 they need to demonstrate correct timing of breaststroke. Often a plateau occurs at this stage as the participant resolves the integration of the various components of breaststroke (Coker 2018). Moving from skills, such as, freestyle and backstroke, which have been practised in degrees since level 3, to more complex skills, such as, breaststroke (Komar et al. 2014), renders level 5 a hurdle in relation to these new patterns of movement. The breaststroke arm and leg action are learned separately due to the complexity of the skill and do not resemble any previously learned swimming skills. Mastery of breaststroke is important as it can be used as a survival stroke (RLSSA n.d.). The standing dive is also introduced at level 5.

Level 6 is described by PARC staff as the natural drop-off point for weekly participants because beyond this level, they are deemed swimmers, and so many progress to the 'advanced swimmer' program. As such, the competencies within this level form an important milestone. According to PARC staff, it is not uncommon for parents/carers to withdraw their children from learn-to-swim lessons at levels 5 or 6, prior to reaching this milestone, as it appears to them that swimming competency has been achieved.

'Because Mum or Dad can probably see them swimming freestyle without a kickboard and their backstroke and then go OK, that's fine – they can do 20-25m pretty comfortably. We don't need to them to keep coming swimming'. Justin

It is unlikely that these children are safe in a range of aquatic environments without achievement of the level 5 and 6 competencies such as survival strokes, stride entry, recovering an object deeper than head height, float without an aid, and tread water for two minutes.

All weekly participants progressed in their swimming and water safety skills. Level 6 was the level at which the lowest progression rates occurred. With regular weekly swimming, the impact was greatest at levels 3 and 4, during a period when participants are establishing skills and require repetitive practice.

6.3 Both school and weekly programs (group C)

Parents/carers of participants who accessed both school and weekly learn-to-swim programs selected this combination as they believe school intensive programs supplement their weekly swim program. They noted that they will choose to continue additional school intensive swimming as long as it is helpful to their child's swimming strokes. Over 50% indicated that continuing affordability of these supplementary lessons was important to ongoing participation, given their commitment to weekly swimming.

As indicated for group B, parents/carers of this group were also more realistic in relation to their child's swimming and water safety ability.

6.3.1 Structure

This group undertook weekly swimming, structured as per group B, and accessed school swimming in a variety of modes. The most commonly experienced school program was a one week intensive, similar to group A. Participants' weekly swimming records were accessed at the beginning of term one and the conclusion of term four. Progression across levels was quantified as per group B.

6.3.2 Improvement/retention

As expected, with the additional exposure that weekly swimming and a school program provide, there was improvement across all levels in group C. At level 3, previously described, 91% progressed one or more levels, suggesting that at this important early learning phase, the increased opportunity to practise has substantial effects on swimming and water safety skill improvement. The impact of additional practice was also experienced at level 6. Considering the difficulty of achieving all of the level 6 competencies, it appears that swimming and water safety skills were further enhanced by supplementary opportunities.

Level 4 was the only level at which progression rates were lower than group B, which appears as somewhat an anomaly, given the additional practice opportunities offered by two modes of swimming.

With regular weekly swimming boosted by a school program, participants in every level experienced improvement.

6.4 Control group (group D)

Within the control group, almost half of the children could not swim 50 metres at either testing point. It is evident that parent/carers overestimate their child's water safety and swimming ability as nearly three quarters of parents/carers (70%) believed their child could do this confidently.

7. Reliability of testing protocols

To ensure reliability of the testing protocols, a number of measures were taken. It is important to note that these measures are sustained and consistent practices for PARC, which meant that swim teaching staff could undertake their regular practice, without being placed under undue stress as a result of the research. These protocols included:

- Where possible the same teachers were used for the baseline, post- and review testing protocols. Despite the casual nature of learn-to-swim staffing and high staff turnover in the industry more generally (Stallman 2018), consistency was sought in staffing through selective use of longer-term, ongoing staff members with thorough knowledge of, and extensive experience with, the swimming competencies, PARC progressions and testing procedures.
- Moderation processes were guided and overseen by senior staff. As part of this process, swim teachers were provided with real-life examples of swimming skills and senior staff engaged in discussions with them in order to clarify competency-levels.
- All testing was overseen by experienced deck supervisors to ensure consistency in results. Intensive swim programs always had more than one staff member engaging with the learn-to-swim teacher in the testing protocol.
- Staff undertake three hours of PARC-led professional development each quarter to ensure consistency in both their teaching and assessment procedures. In addition, staff are required to undertake at least 40 hours of teaching and ten hours of recognised (AUSTSWIM or other) professional development in every three-year period in order to maintain their swim teaching registration.
- Competencies were clearly and consistently communicated to learn-to-swim staff and a transparent, uniform message was provided that to achieve competency, swimmers must be comfortable (relaxed throughout, not strained) and consistent (must be seen for more than a few seconds) in each skill being tested.
- As Fun Days (control group D) were not a regular aspect of the PARC learn-to-swim program, testing protocols were reinforced in line with normal procedures, but to an abridged version of weekly and school protocols (see Table 4).

8. Limitations of the study

There are limitations to the methodology used in this research. Although consistency in staff involved in the teaching and testing of learn-to-swim programs was sought, and all staff had regular professional development, the casual nature of the learn-to-swim teacher workforce (Stallman 2018), and the various timings of school programs resulted in slight inconsistencies in the specific staff involved in baseline, post- and review testing. This was not unexpected in a longitudinal study and as described previously, PARC's standard practice to seek consistency in teaching and testing ensured clarity and uniformity around testing protocols.

The seasonal nature of swimming in Frankston, and Melbourne more generally, means that there are numerous limitations to studies of learn-to-swim programs more generally, and more specifically, to the collection of data in this study. Data from weekly swimmers was removed from the study if participants chose to withdraw from weekly lessons during winter or took significant breaks from their weekly learn-to-swim routine, despite parent/carer indications that their child enrolled in four terms of a learn-to-swim program. This was done to ensure a level of consistency in weekly learn-to-swim data. Similarly, of the parents/carers who indicated that their child engaged in weekly learn-to-swim lessons only, 22 participants were found in PARC records to also be participating in school intensive programs, therefore these participants were moved to group C. A further three were not engaged in regular weekly swimming at post-test.

Challengingly, there was also some difficulty in monitoring the external practice of swimmers, especially across warmer months, which may impact swimming ability. Bradley, Parker and Blanksby (1996) reported this seasonal impact as a limitation to studies that were longitudinal in nature, and especially noted this in regard to the lack of access of lower socioeconomic groups to pools. As this research was based in the bayside area of Frankston, though, there was greater opportunity for all participants, regardless of socioeconomic status, to access water in the form of a local beach. However, the additional advantage of access to heated pools at home, public pools external to their weekly lessons, and swimming at the beach, provided challenges to collecting unblemished data. It was established that 20% of families within the research swam frequently in a pool at home and 30% swam frequently at a beach, lake or river.

Due to the varied nature of the four programs (e.g. timing and dosage), data collection protocols for each group also varied. The data from the school-only swimming group (group A), was quantified by the number of skills they were competent at within each level at each time point. These competencies varied in number and progressed in difficulty across the levels. There were small numbers at levels 2, 8 and 9, limiting the capacity of the data at these levels to indicate statistical significance. The weekly (group B) and school and weekly (group C) swimmers, were quantified by shifts across these swim levels. The control group (group D) was quantified using achievement against three particular competencies and were scored against a scale of 0 to 3. The varying data collection renders comparisons across groups difficult, which can be considered a limitation of this study as it makes attempting to rank models of learn-to-swim, problematic. This study was not intended to be a comparison between models though, rather an investigation of efficacy and retention within each model.

A further limitation related to using the learn-to-swim levels as a measure of progress was the

inability to know how close to progressing a level an individual was at any one testing time point. For example, a Snapper 5 may have recently come up from level 4 and another may have been on level 5 for some time prior. These two learn-to-swim participants were therefore measured at the same level. Although this was not available in the data of each particular participant, the number of levels they achieved over the school year was.

A final limitation was experienced with the control group (group D), as it became evident that 50% of the participants recruited as non-swimmers had previously completed learn-to-swim tuition, many with significant prior instruction, including up to squad level. We would therefore expect this subgroup to demonstrate retention of skill as they would already have been at mastery level. The impact to the study was a) a limited representation of non-swimmers in the control group, and b) potentially misleading data. We have attempted to overcome this through the analysis of particular sub-groups within this data set.

9. Conclusion

This study concludes that there is a positive correlation between the number of opportunities a primary school-aged child has to engage in formal swimming lessons and skill improvement.

School swimming intensives resulted in steep improvement of swimming and water safety skills for all children. For those with established foundational swimming ability, intensive school swimming provided a great opportunity to extend swimming and water safety skills. They also retained the newly-learned skills, which was evident at review testing, at least nine months later.

This mode also assisted the skill development of children in the earlier stages of learning swimming and water safety skills, however, there was a significant regression for many of these children which can be attributed to the nature of a short-term intensive program. These learners do not yet have the 'persistence characteristic' (Magill & Anderson 2017, p. 269), and require regular practice in order to develop that, therefore, a considerable amount of the gains for these early developers were lost. At these levels, regular and frequent learn-to-swim lessons are more beneficial in order to shift a child's skills towards permanence. The retention of skills learned in school intensive programs was level-dependant.

Regular weekly swimming provided positive skill learning outcomes across all levels. Interestingly, in contrast to the school swimming intensives, the greatest impact of weekly swimming was experienced by early learners. The regular and frequent instruction and practice associated with weekly learn-to-swim lessons was advantageous to this group.

The lowest progression rates were at levels 5 and 6 within the weekly learn-to-swim program. Particular complex skills require a more protracted learning period. At this time, it was

evident that learners experienced a learning plateau, consistent with the time taken to resolve the integration of the components of the skill (Coker 2018). It is common for there to be no evident development at this stage, however, children are still learning (Rose & Christina 2006).

With the opportunity to participate in both weekly learn-to-swim lessons and an intensive school program, children experienced a boost to their swimming and water safety development. Aside from one level, all groups experienced additional success as a result of the supplementary practice.

This research also indicated that parents/carers value and are highly supportive of school swimming, but those who rely on school swimming alone appear to overestimate their child's swimming and water safety ability. Likewise, parents/carers who did not access learn-to-swim lessons over the study period, also overestimated their child's water safety and swimming ability.

School swimming is the ideal platform for all young people learning to swim, particularly in lower socioeconomic areas where parents/carers are less likely to access weekly swimming lessons for their child. The sample of weekly (group B) and school and weekly (group C) participants in this study, shows parents/carers who make the decision to take up regular weekly lessons are primarily from professional occupations and from suburbs with SEIFA codes above 1000. This indicates that potentially, the financial investment in weekly regular swimming lessons might be prioritised within these groups.

In conclusion, this study indicates the importance of school intensive swimming programs, but also the value of extending accessibility beyond those programs, particularly to specific phases of learning where consistent and repetitive instruction is key to consolidating significant swimming and water safety skills.

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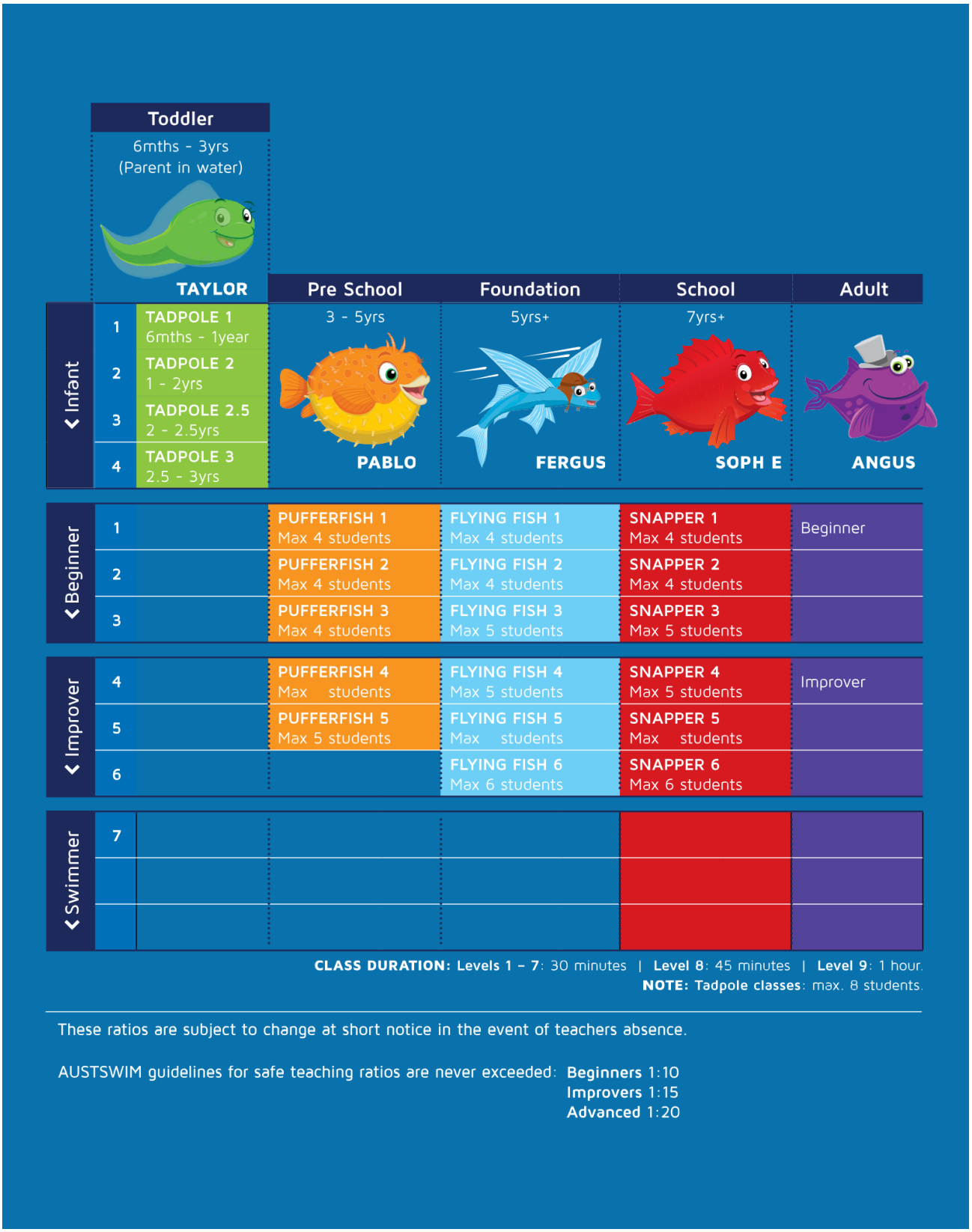
11. Appendices

Appendix 1 – PARC Progression Chart



Appendix 2 – Parent survey

The following indicative questions were used in the parent survey. Please note that each of group A to D received slightly different surveys:

1. What is your relationship to the child attending swimming lessons or School Fun Day at PARC? - mother/father/guardian/grandparent/other _____ Please circle.
2. Child's age as of 1/1/17 _____years _____months
3. Child's gender _____
4. Child's school _____
5. Was your child born in Australia? Yes/No If not, where _____
6. What was the country of birth of the child's parents?
    - Mother_____
    - Father_____
7. Is the child of Aboriginal or Torres Strait Islander descent? Yes/No
8. What is your postcode _____
9. When did your child first begin swimming lessons at any venue (month and year)?
10. How long has your child been attending swimming lessons? (years or months)
11. Have they had any 'breaks' from swimming lessons Yes/No If yes, why? _____
12. Do you have a pool at home? Yes/No
13. Does your child have regular access to a swimming pool for recreational swimming?
    a. Weekly/Summer only/Rarely/Never
14. Does your child have access to swimming at the beach?
    a. Weekly/Summer only/Sometimes/Rarely/Never
15. Does your child have access to other places to swim e.g. dam, lake, river?
    a. Weekly/Summer/Sometimes/Rarely/Never
16. Do you holiday at the beach?
    a. Annually/more often/less often
17. If your child attends a weekly swimming program at PARC, how many terms do you regularly enrol for?
    a. One/two/three/four

Appendix 3 – Staff survey

Interview questions – PARC staff

Swim Teacher

1. What is your role at PARC?
2. How long have you been teaching swimming? At PARC?
3. What do you understand the goal of PARC's junior learn-to-swim programs to be?
4. How important do you believe it is for young children to be able to swim, be happy and be safer in water?
5. How similar is your teaching style to the other teachers at PARC?
6. What support does PARC management provide to ensure consistency in their approach to swim teaching?
7. What support does PARC management provide to ensure consistency in assessment of children's swimming abilities?
8. What are the challenges, enablers and barriers associated with teaching swimming to primary school-aged children? (Prompts: parents, time, timing, training, support)
9. Are there any differences that you notice between teaching weekly lessons to teaching school groups? (Prompts: time, timing, weather, ratios, parent/teacher impact)
10. What do you think the differences in the outcomes of the various teaching models may be?
11. What other observations can you offer us in relation to being a teacher of swimming and water safety to primary school-aged children?

Administrative staff or management

1. What is your role at PARC?
2. How long have you been involved in administration or management of aquatic programs at PARC or elsewhere?
3. What do you understand the goal of PARC's junior learn-to-swim programs to be?
4. How important do you believe it is for young children to be able to swim, be happy and be safer in water?
5. What support does your team provide to ensure consistency in your swim teachers' approaches to swim teaching?
6. What support does your team provide to ensure consistency in assessment of children's swimming abilities?
7. What are the challenges, enablers and barriers associated with teaching swimming to primary school-aged children? (Prompts: parents, time, timing, training, support)
8. Are there any differences that you notice teaching weekly lessons to teaching school groups? (Prompts: time, timing, weather, ratios, parent/teacher impact)
9. What do you think the differences in the outcomes of the various teaching models may be?
10. How do you think swimming staff turnover impacts the learn-to-swim experience of primary school-aged children?
11. What other observations can you offer us in relation to being a teacher of swimming and water safety to primary school-aged children?

Appendix 4 – School intensive program (group A) swimming skills' development

Baseline and Post-test

	Baseline	Post-test	p Value
Level 2	4 [3-4]	5.5 [5-6]	0.06
Level 3	3 [2-6]	6 (1.7)	<0.01
Level 4	4 [2-6]	9 [7-9]	<0.01
Level 5	2 [1-3]	7 [5-8]	<0.01
Level 6	3 [2-3]	4.5 (1.6)	<0.01
Level 7	1 [0-1]	3 (1.7)	<0.01
Level 8	1 [0-1]	6 [3-6]	0.18
Level 9	0 [0-0]	3 [2-4]	0.06

Baseline and Review

	Baseline	Review	p Value
Level 2	4 [3-4]	6 (1.5)	0.06
Level 3	3 [2-6]	4 (1.4)	0.61
Level 4	4 [2-6]	6 (1.6)	<0.01
Level 5	2 [1-3]	5.5 [3-7]	<0.01
Level 6	3 [2-3]	6 (1.6)	<0.01
Level 7	1 [0-1]	5 (1.5)	<0.01
Level 8	1 [0-1]	8 [6-8]	0.16
Level 9	0 [0-0]	4 [4-4]	0.04

Post-test and Review

	Post-test	Review	p Value
Level 2	5.5 [5-6]	6 (1.5)	0.41
Level 3	6 (1.7)	4 (1.4)	<0.01
Level 4	9 [7-9]	6 (1.6)	<0.01
Level 5	7 [5-8]	5.5 [3-7]	0.06
Level 6	4.5 (1.6)	6 (1.6)	0.01
Level 7	3 (1.7)	5 (1.5)	0.01
Level 8	6 [3-6]	8 [6-8]	0.06
Level 9	3 [2-4]	4 [4-4]	0.10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