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Parental Factors That Influence Swimming in Children and Adolescents

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Swimming can be an important source of physical activity across the life-span. Researchers have found that parents influence physical activity behaviors of their children. The purpose of this study was to determine what parental factors influenced the number of days that children swam. Survey respondents ($n = 1,909$) from six cities across the United States were surveyed at local YMCAs. Children were found to swim significantly more if their parents encouraged them to swim, members of the family knew how to swim and swam with them, or their parents were not afraid of the children drowning or afraid of drowning themselves. The number of times that parents swam was the strongest predictor of the number of times children swam and explained 41% of the variance. A cyclical, familial pattern was found which included encouragement, fear of drowning, and swimming frequency. Introducing strategies to reduce fear of drowning may prove to be an effective intervention to increase physical activity in children.

Keywords: swimming, aquatic skills, parent child aquatics, drowning

Physical Activity

Regular physical activity (PA) reduces cardiovascular disease risk factors such as diabetes, high blood pressure, and high cholesterol. It also has been shown to improve pulmonary function, bone density, body image, and self-esteem while it decreases risk of obesity in adulthood and adolescence (Andersen et al., 2006; Biddle, Gorely, & Stensel, 2004; Ferreira et al., 2007; Hind & Burrows, 2007; O'Donovan et al., 2010; Tremblay et al., 2011; Vuori, 2010). The United States Department of Health and Human Services (USHHS) recommends that children

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and adolescents participate in 60 min or more of physical activity daily (Haskell et al., 2007; USHHS, 2008). Recent evidence confirms that this guideline is not being followed by a majority of American youth (CDC, 2010; Troiano et al., 2008).

Swimming as a Source of Physical Activity

Swimming can be a valuable source of physical activity and is the fourth most popular sport activity in the U.S (US Census Bureau, 2012). Benefits of swimming include improved fitness and agility, increase muscle strength and flexibility, improved mood, and decreased depression (Chase, XueMei, & Blair, 2008; Gowans, 2007; Lin, Davey, & Cochrane, 2004; Tomas-Carus et al., 2008). Studies have shown that people experience greater enjoyment and can exercise longer when they engage in aquatic exercise when compared with exercise on land (Broman et al., 2006; Cider, Sveälv, Täng, Schaufelberger, & Andersson, 2006). Swimming and aquatic exercise can be enjoyed across a person's lifespan and is an exercise of choice for people with disabilities or chronic conditions (Bartels et al., 2007; Mactavish & Schleien, 2004).

Swimming skills are not only important for physical activity but they are also necessary to prevent fatal and nonfatal drownings (Brenner et al., 2009; Yang, Nong, Li, Feng, & Lo, 2007). Unintentional drowning is the leading cause of death for children ages 1–4, second leading cause of death for children ages 5–9, and the third leading cause of death for children ages 10–14 (CDC, 2010). Drowning disproportionately impacts racial and ethnic minorities (Laosee, Gilchrist, & Rudd, 2012). African American children have higher rates of drowning than Caucasian children (Laosee, Gilchrist, & Rudd, 2012).

There is limited research concerning swimming skills among U.S. adults and children. In a study of U.S. adults, Gilchrist, Sacks, and Branche (2000) found that 37% were unable to swim/could not swim a pool length. Swimming competence varied by race/ethnicity with African American adults having the lowest level of swimming skills (62% with limited swimming skills) and Caucasian adults having the highest level (only 32% with limited swimming skills). In their study of urban, minority youth from six metropolitans, Irwin et al. found that 51.2% of the youth were unable to swim or were uncomfortable in the deep end of a pool (Irwin, Irwin, Ryan, & Drayer, 2009b). This result also varied by race/ethnicity with African-American and Hispanic youth reporting lower skill levels than Caucasian youth.

Parental influence on Child's Physical Activity

Parents can have strong influence over their children's physical activity behaviors. Studies have found a positive association between parent-child physical activity levels (Edwardson & Gorely, 2010; Gustafson & Rhodes, 2006; Pugliese & Tinsley, 2007; Voss & Sandercock, 2013). Parents positively influence their children's physical activity by engaging in physical activity themselves (modeling), encouraging their children to be physically active, and providing support such as transportation to physical activity settings (Edwardson & Gorely, 2010; Voss & Sandercock, 2013).

Parents also can negatively influence their children's physical activity levels by discouraging or preventing them from participating in physical activities (Boufous, Finch, & Bauman, 2004; Telford, Finch, Barnett, Abbott, & Salmon, 2012). Bou-

fous, Finch and Bauman (2004) found that more than 25% of parents discouraged their children from participating in sports or physical activity due to concerns about injury or safety of their children. Telford et al. (2012) found a negative association between parents' perceived of risk of injury to their children and the amount of time their children were moderately physically active.

Irwin et al. found a positive relationship between parental swimming skill levels and their children's skill levels (Irwin, Irwin, Ryan, & Drayer, 2009b). Children who had no or low levels of swimming skill were more likely to report that their parents also had no or low levels of skill (Irwin et al., 2009a). Irwin et al. also found fear of drowning, both for parents and children, to be the strongest predictor of no to low levels of swimming skill in children (Irwin, Irwin, Martin, & Ross, 2010). Fear of drowning was a stronger predictor of lack of skill than inaccessible swimming facilities or lack of family finances.

Research has shown that parents positively and negatively influence their children's physical activity levels. We also know that there is a connection between a parent's swimming skills and their child's swimming skills. The purpose of this study was to examine the parent/child relationships concerning swimming more deeply and to determine what parental factors influence the number of days that children swim. Parental factors we examined included the number of days a parent swims, a parent's self-reported swimming skill level, family income, parent's educational attainment, parental encouragement to swim, frequency of a parent swimming with a child, and a parent's fear of drowning. In addition, we wanted to see if parental factors influenced their child's fear of drowning, which has been shown to be a barrier to swimming (Irwin et al., 2010). Specific research questions for our study included:

- What parental/family factors are associated with the number of days children swim?
- What is the strength of the relationship between the number of days that a parent swims and number of days that the child swims?
- Does a parent's fear of drowning impact their child's swimming (i.e., do parents who fear drowning encourage their children to swim)?
- Do parents who fear drowning also report that their children fear drowning?
- Were parents who feared drowning encouraged to swim when they were children?

Method

Survey Development

The survey instrument used for this study was based on a previously validated questionnaire (Irwin et al., 2009a; Irwin, Irwin, Ryan, & Drayer, 2011; Irwin et al., 2009b). Changes to the questionnaire included clarification of a few items. One revised question was the imperative swimming skills question that was changed from a 5 to a 10 choice item. The revised questionnaire was designed in collaboration with representatives from USA Swimming, a panel comprised of adolescent research experts, aquatic specialists, and consultation from the Center for Disease Control and Prevention (CDC). Once the modified questionnaire was agreed upon,

a pilot study of 100 respondents, ages 12–17, was conducted to determine evidence of content validity.

The questionnaire included demographic questions (age and gender for both parent and child; highest educational attainment and annual household income of parent, and race/ethnicity of the child). A series of questions were asked using 4-point Likert scale on which participants indicated whether they strongly disagreed, disagreed, agreed, or strongly agreed with statements. Statements included fear of drowning, encouragement to swim, and swimming with family member. In addition, participants were asked to rate their swimming skill level (i.e., ability) on a scale of 1 (*cannot swim at all*) to 10 (*can swim many lengths without stopping*). Participants were asked how many days they swim during summer months (Memorial Day through Labor Day) and nonsummer months. For this study, we only used number of days of swimming per summer months because many participants did not have access to a pool year round or during nonsummer months.

Data Collection

Data were collected in six metropolitan communities in the U.S. (Atlanta, GA; Boston, MA; Denver, CO; Memphis, TN; Minneapolis/St. Paul, MN; & San Diego, CA). These communities were identified in collaboration with representatives from USA Swimming. Within each community Young Men's Christian Associations (YMCAs) were used as data collection sites. YMCAs were chosen as primary data collection sites because of the organization's access to diverse youth populations and interest in youth swimming and drowning prevention. Data were collected between February 1 and March 31, 2010.

Adolescent respondents (ages 12–17) completed the survey under supervision of at least one trained researcher/YMCA staff member. For children age 4–11 years, a parent or caregiver was asked to complete the survey. A trained researcher/YMCA staff member was also available for the parent/caregiver during the survey.

Data Analysis

All data were entered systematically into the SPSS 20 (Armonk, NY, USA). The data set was checked for complete surveys and incomplete surveys were omitted. Analysis of Variance (ANOVA), odds ratios, and multiple linear regression were used to determine significant differences with an alpha of 0.05. When ANOVA was significant ($p \leq .05$), a Fisher's least significance differences (LSD) post hoc test was used to compare groups. The data did not violate assumption for ANOVA or multiple linear regression.

For statistical analyses involving ANOVAs, the number of days children swim per summer months (Memorial Day through Labor Day) was the dependent variable. Adolescent and parent responses to the 4-point Likert questions were the independent, categorical variables. Categories indicated whether the respondent *strongly disagreed*, *disagreed*, *agreed*, or *strongly agreed* with the statement. The purpose of the ANOVA was to determine if there was a significant difference in the number of days that children swam based on the level of agreement with the statement regarding encouragement to swim from parents, swimming with family members, and parents' fear of drowning (both fear of drowning themselves and fear that their child might drown).

Multiple linear regression was used to analyze the variance in the mean number of days per summer months that children swim. Number of days of swimming was the dependent variable and independent variables included the number of days per summer months parents swim, parent's self-reported swimming skill level, child's swimming skill level as reported by the parent, parent's age, household income, and parent's educational attainment. Because parent's education attainment was a categorical variable, dummy variables were created with college degree as the reference variable. Household income was classified as a categorical variable and dummy variables were created with greater than 100,000 as the reference variable. Variables were entered into SPSS using forced entry.

To analyze parental influences on a child's fear of drowning we calculated odds ratios. For odds ratios, the 4 point Likert scale questions were dichotomized with *agree* and *strongly agree* representing "yes" or 0 and *disagree* or *strongly disagree* corresponding as "no" or 1.

Results

Approximately 2000 surveys were distributed in both English and Spanish which yielded a total of 1,909 useable surveys. Adolescents completed 1305 surveys while parents/caregivers completed 604. Demographic results are displayed in Table 1. The average age of adolescent respondents (12–17 years) was 14.7 years with a *SD* of 2.0 years. When parents completed surveys, the average age of those children (4–11 years) was 7.5 with a *SD* of 2.3 years. Over half (52.3%) of the sample identified as African American and over half (64.8%) of the sample indicated that they were on either free (51.5%) or reduced (13.3%) lunch programming. The majority of the parents reported having either a high school diploma/GED (23.5%) or college or technical school degree (24.9%). Approximately half of all households (50.5%) reported an annual income of less than \$40,000 per year.

ANOVA Analyses—Number of Days of Swimming

Children were found to swim significantly more times per month if their parents encouraged them to swim, if members of the family knew how to swim and swam with them, and if their parents were not afraid of them drowning or afraid of drowning themselves (Table 2 & Table 3). Parents were found to swim significantly more times per month if their parents had encouraged them to swim and if they were not afraid of drowning. In addition, parents who encouraged their children to swim and were not afraid of their child drowning swam more times per month (Table 4 & Table 5).

Multiple Linear Regression—Factors Influences Number of Days Children Swam per Month

Multiple linear regression was used to analyze the number of times that children swam per summer months (dependent variable). Independent variables included the reported number of times per summer months that a parent swam, parent's self-reported swimming skill level, the child's swimming skill level as reported by the parent, parent's age, reported household income, and parent's educational

Table 1 Demographic Characteristics of Children and Adolescents

	12–17 years (adolescent) <i>n</i> = 1,305	4–11 years (parent) <i>n</i> = 604	Total <i>n</i> = 1,909
Sex			
Male	43.6%	47.8%	45.0%
Female	56.4%	52.2%	55.0%
Child's race			
African-American	52.2%	52.5%	52.3%
Hispanic/Latino	19.3%	14.7%	17.9%
Caucasian	6.7%	17.7%	10.2%
Multiracial	7.0%	6.6%	6.9%
Asian	7.1%	4.1%	6.1%
American Indian/Alaska Native	2.0%	1.6%	1.9%
Native Hawaiian/other Pacific Islander	3.8%	1.1%	3.0%
Other	1.9%	1.6%	1.8%
Parent education			
Some elementary / middle school	23.5%	3.6%	17.2%
Some high school but did not finish	20.8%	6.0%	16.1%
High school diploma–GED	19.8%	31.4%	23.5%
College or technical school degree	14.7%	47.1%	24.9%
Advanced college degree–masters/PhD	21.1%	11.6%	18.1%
Unknown	0.1%	0.4%	0.2%
Lunch program status			
Free lunch	54.8%	44.4%	51.5%
Reduced lunch	13.0%	14.0%	13.3%
No lunch program	20.9%	36.1%	25.7%
Annual household income—parent/caregiver survey only			
Less than \$20,000		18.8%	
\$20,000–\$29,999		16.4%	
\$30,000–\$39,999		15.3%	
\$40,000–49,999		7.6%	
\$50,000–\$74,000		11.2%	
\$75,000–\$99,999		6.1%	
\$100,000 or more		5.4%	
Would rather not say		14.3%	

Table 2 ANOVA Results –Number of Times Children Swim per Summer Months

	Sum of squares	df	Mean Square	F	Sig.
My parents encourage me to swim. ^{††}	14485.05	3	4828.35	18.45	.00
Most of my family members know how to swim. ^{††}	6735.78	3	2245.26	8.39	.00
My parents can swim.* [†]	2553.55	3	851.18	3.40	.02
I swim with members of my family.* ^{††}	11211.46	3	3737.15	15.33	.00
I [parent] encourage my child to swim.** ^{††}	4013.38	3	1337.80	7.55	.00
I [parent] am afraid that my child will drown when he or she is swimming.** ^{††}	4706.78	3	1568.93	8.40	.00
I [parent] don't swim because I am afraid of drowning.**	1304.79	3	434.93	2.39	.07

Note. *Adolescent only survey. **Parent/caregiver only survey. † = significant $p \leq .05$. †† = significant $p \leq .01$.

Table 3 Mean Number of Times Children Swim per Summer Months—LSD Post Hoc for Significant Difference

	Strongly disagree	Disagree	Agree	Strongly agree
My parents encourage me to swim.	6.5	6.5	8.6	14.6 ^{††}
Most of my family members know how to swim.	5.9	7.6	8.4	12.4 ^{††}
My parents can swim.*	6.5	6.8	8.9	10.8
I swim with members of my family.*	5.5	5.8	8.2	14.9 ^{††}
I [parent] encourage my child to swim.**	7.0	7.9	7.3	13.1 ^{††}
I [parent] am afraid that my child will drown when he or she is swimming.**	13.9 ^{††}	7.8	8.2	6.2
I [parent] don't swim because I am afraid of drowning.**	11.5 [†]	8.3	8.3	8.2

Note. *Adolescent only survey. **Parent/caregiver only survey. † = significant $p \leq .05$. †† = significant $p \leq .01$.

Table 4 ANOVA Results –Number of Times Parents Swim per Summer Months

	Sum of squares	df	Mean square	F	Sig.
My parents encouraged me to swim when I was a child.** ††	2759.77	3	919.92	9.59	.00
I encourage my child to swim.** ††	2560.01	3	853.34	8.81	.00
I [parent] don't swim because I am afraid of drowning.** †	967.01	3	322.34	3.23	.02
I [parent] am afraid that my child will drown when he or she is swimming.** ††	2885.38	3	961.79	10.08	.00

Note. **Parent/caregiver only survey. † = significant $p \leq .05$. †† = significant $p \leq .01$.

Table 5 Mean Number of Times Parents Swim per Summer Months—LSD Post Hoc for Significant Difference

	Strongly disagree	Disagree	Agree	Strongly agree
My parents encouraged me to swim when I was a child.**	3.5	3.4	4.5	9.0 ††
I encourage my child to swim.**	5.2	2.7	3.7	8.0 ††
I [parent] don't swim because I am afraid of drowning.**	6.9 †	4.2	3.9	4.4
I [parent] am afraid that my child will drown when he or she is swimming.**	8.5 ††	4.3	2.3	3.6

Note. **Parent/caregiver only survey. † = significant $p \leq .05$. †† = significant $p \leq .01$.

attainment. The model was significant ($p < .01$, $F = 135.6$), with number of times a parent swam ($p < .01$), parent's self-reported swimming skill level ($p = .01$), and child's reported swimming skill level ($p < .01$) being significant predictor variables. This model explained 44% ($R^2 = .438$) of the variance in the number of days that children swam. Of the three predictor variables, the self-reported number of times that parents swam explained almost 41% of the variance ($R^2 = .407$) in the number of times that children swam. The most parsimonious model (i.e., the model that explained the most variance with the fewest predictor variables) included only the self-reported number of times that parents swam ($p < .01$, $F = 375.6$) and is represented by the following equation:

$$\text{Number of times children swam} = 4.82 + 0.86 (\text{number of times parents swam})$$

Odds Ratios—Fear of Drowning

Parents who reported that they were encouraged to swim when they were children had a lower odds ratio (OR) for fear of drowning than parents who did not report being encouraged to swim as children. In addition, parents who encouraged their children to swim were less likely to fear drowning (Table 6). Parents who were afraid that their child would drown and do not swim because they were afraid of drowning themselves were more likely to report that their children were afraid of drowning (higher OR) and less likely to encourage their children to swim (lower OR; Table 7).

Table 6 Parent/Caregiver’s Fear of Drowning—Odds Ratios

	B	Wald	Sig.	Exp(B)	95% C.I. for EXP(B)	
					Lower	Upper
I don’t swim because I am afraid of drowning.						
I encourage my child to swim.** ††	-.61	9.06	.00	.55	.37	.81
My parents or caregiver encouraged me to swim when I was a child.** ††	-.47	7.45	.00	.62	.44	.88

Note. **Parent/caregiver only survey.

Table 7 Children’s Fear of Drowning—Odds Ratios

	B	Wald	Sig.	Exp(B)	95% C.I. for EXP(B)	
					Lower	Upper
My child doesn’t swim much because he/she is afraid of drowning						
I [parent] am afraid that my child will drown when he or she is swimming.** ††	2.02	89.75	.00	7.55	4.97	11.47
I [parent] don’t swim because I am afraid of drowning.** ††	1.25	38.20	.00	3.49	2.35	5.19
I encourage my child to swim.** ††	-.62	7.92	.00	.54	.35	.83

Note. **Parent/caregiver only survey. † = significant $p \leq .05$. †† = significant $p \leq .01$.

Discussion

The most interesting finding from this study was the cyclical, familial pattern found among reported encouragement to swim by parents, fear of drowning, and reported swimming frequency. Parents who were not encouraged to swim as children indeed swam less, were more afraid of drowning, were more afraid of their children drowning and were less likely to encourage their children to swim. In turn, these same parents reported that their children were more likely to fear drowning and swam less. In addition, parents and children who were encouraged to swim by their families had a lower OR for fear of drowning. Children of parents who had fear of drowning had a higher OR for fear of drowning themselves. We believe it is important to identify this familial pattern so that attempts to break the cycle might lead to improved swimming skills and lower drowning rates for children.

Relatively few studies have investigated the relationship between swimming skill levels and drowning. At least one even suggested that slightly higher swimming skill levels among young children might increase drowning risk (Brenner, 2003). Brenner et al. (2009) and Yang et al. (2007) found a positive association between reported lack of swimming skill or lack of instruction and drowning in young children. In their case control study, Brenner et al. showed an 88% reduction in drowning risk for children ages 1–4 years who had formal swim instruction (Brenner et al., 2009). Yang and colleagues (2007) found a lack of adequate swim instruction and limited experience around water were significant risk factors for drowning in children. They suggested that helping parents overcome their fear and encouraging their children to participate in formal swim lessons could reduce the risk of drowning among children.

We found that children swam more when their parents or family swam with them (i.e., modeling swimming behavior), encouraged them to swim, and were not afraid that their children would drown. Our findings about swimming as a physical activity support previous studies regarding the influence of parents on children's physical activity behaviors (Edwardson & Gorely, 2010; Gustafson & Rhodes, 2006; Pugliese & Tinsley, 2007; Voss & Sandercock, 2013). Parents who model physical activity behaviors and encourage physical activity behaviors are more likely to have physically active children.

We also found parents who fear drowning were less likely to encourage their children to swim and had children who swam less. Parents who were afraid that their child would be injured during sport or physical activity were more likely to discourage their child from participating in that sport/physical activity, thus leading to lower levels of physical activity (Boufous et al., 2004; Telford et al., 2012). Introducing strategies to reduce fear of drowning may prove to be an effective family-based intervention to increase swimming physical activity in children. Strategies could include water safety education and formal swimming instruction for parents as well as educating parents about importance of water safety and swimming skills for their children as tactics for drowning prevention (Centers for Disease Control and Prevention, 2012).

The strongest predictor of the reported number of times per month that a child swam was the self-reported number of times per month that their parent swam. This variable explained 41% of the variance in the parent-reported number of times

per month that children swam. Swimming maybe different from other forms of sport or physical activity in which children participate in that it is an activity that a family can do together and can be enjoyed across a lifespan (Bartels et al., 2007; Mactavish & Schleien, 2004). In this study, children were more likely to swim if their parents modeled swimming behavior.

Limitations

This study has several limitations. It was a single time survey of self-reported activities. No causal relationships could be determined (Aschengrau & Seage, 2003), only correlations and associations. Since participants were asked to self-report, there is the strong possibility of self-report bias. The participants may have under- and/or over-reported estimates if they perceived the response (e.g., fearing drowning, frequent swimming) to be socially undesirable or desirable (Adams, Soumerai, Lomas, & Ross-Degnan, 1999). In an effort to reduce this bias, trained staff members were used to help participants with the survey. Although data were gathered in six different and geographically diverse cities, results might not be representative of the entire U.S. Lastly, this study employed a convenience sample of parents and adolescents who participated in activities at their local YMCA. Although parents and adolescents who enrolled in activities other than swimming were the target population, they may have been more conscious of swimming based on the environment the YMCA than people in general. They also may have represented a slightly more affluent sample due to being able to afford membership at the YMCA. Despite these potential limitations, the results of this study potentially add valuable insight into our understanding of swimming behaviors in children and adolescents and the potential impact parental influences have on those behaviors.

Conclusion

Results from this study showed that parental factors have a strong influence on the frequency of swimming in which children engage. Importantly, parents who swim more have children who swim more. In addition, this study highlights the complex, but very real cyclical familial pattern between encouragement to swim, fear of drowning and swimming frequency which might reveal a generational pattern that either encourages or discourages children and parents from swimming. Our results suggest that strategies to reduce fear of drowning may prove to be an effective family-based intervention to increase swimming and physical activity in children and their parents as well as indirectly reduce the risk of drowning as a consequence.

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hopefully will encourage more disenfranchised youth to be safe in and out of the water and to decrease drowning incidents for all individuals.

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