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Baby swimming: exploring the effects of early intervention on subsequent motor abilities

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Abstract

Aim The aim of the study was to explore the effects of baby swimming on subsequent motor abilities.

Background A range of motor abilities was examined in 4-year-old children who had previously participated in a programme of baby swimming ($n = 19$) and compared with a matched group of coevals who had not had this experience ($n = 19$).

Results As predicted from the nature of the exercises that comprise the programme, the effects of baby swimming were restricted to abilities associated with prehension and balance.

Conclusions Suggestions are made as to how the theme of this hypothesis-generating, demonstration study can be pursued in the future with more rigorous experimental controls and applications to children with disabilities and impairments.

Introduction

Cross-cultural studies have shown that subjecting infants to circumscribed or general forms of physical exercise facilitates the development of fundamental motor abilities or motor milestones (e.g. Hopkins & Westra 1988). There is experimental evidence to support this effect (McGraw 1935; Lagerspetz *et al.* 1971; Zelazo *et al.* 1972).

Are there other forms of physical exercise, not addressed by these studies, that may enhance motor development? One potential candidate is baby swimming. In recent years, there has been an upsurge of interest among parents in providing their infants with this aquatic-based type of early experience, especially in Iceland where there is a long-standing commitment to the benefits of swimming due in part to the ready availability of hot springs.

The present study compares the motor abilities of Icelandic children at 4 years of age who experienced baby swimming exercises at 2 to 3 months age with a matched sample of those who did not. Taking into account that the swimming routine provides vigorous vestibular stimulation as well as promoting eye–hand co-ordination (see below), we predicted that any effects at 4 years would be most clearly manifest in tasks involving balancing and prehensile abilities.

Method

Participants

A questionnaire was sent to the parents of 63 children living in Reykjavik who had participated in a programme of baby swimming lessons for 2 h a week over a period of at least 4 months, some 4 to 5 years previously. Among other things, it requested information about the frequency and length of time the child had received swimming lessons. On this basis, 19 children (10 boys, nine girls) were selected as having received the requisite amount of swimming experience. A similar questionnaire was delivered to all parents of 4-year-old

children ($n = 410$) currently attending the 15 nursery schools from which the swimming experience group was assembled. Accordingly, 19 children with no experience of baby swimming were selected, matched with the previous group for age, sex and parental level of education and socio-economic status. The mean ages for the 'swimming' and 'no swimming' groups were 4.72 years (SD = 0.235) and 4.47 years (SD = 0.241) respectively.

Baby swimming routine

The majority of children taking part in baby swimming do so between the ages of 2 to 7 months, with 1-h sessions carried out in a water temperature of 35°C. A session begins with a 'warm-up' in which the parents sing to their children while moving them through the water and encouraging them to stand supported on a hand. Subsequently, an instructor assists the child in completing somersaults on a thin mattress floating on the water, diving under water, providing encouragement to pick up rings floating on the water and jumping from a supported position on the side of the pool into the water. During the last 10 min, the parents again balance the infants on a hand and bring them into reaching distance of objects floating on the water.

Assessment of motor ability

At 4 years of age, each child was tested on the standardized Movement Assessment Battery for Children in a quiet room in their nursery school for the following abilities (Henderson & Sugden 1992): manual dexterity (posting coins, threading beads, bicycle trail), ball skills (catching bean bag, rolling ball into goal) and balance (one-leg balance, jumping over a cord, walking with heels raised). Raw scores were converted to scale scores according to the norms for children aged 4 to 6 years, with the higher the score the poorer the performance. Comparisons among the two groups of children were made with the Mann–Whitney *U*-test (one-tailed).

Results

There was no difference in overall performance (see Table 1), but there were two significant contrasts between the 'swimming' and the 'no swimming' groups: one involving prehension (Ball skills sub-test, $P < 0.05$) and the other static balance (one-leg balance item on the Balance sub-test, $P < 0.017$). Both outcomes, favouring the swimming group, were in accordance with the predicted effects of being exposed to regular sessions of baby swimming.

Discussion

Children experiencing a regular programme of baby swimming at 2 to 7 months of age manifested superior motor performance on a standardized, age-appropriate test as 4-year-olds relative to

Table 1. Mean values and standard deviations (SD) on Movement ABC items for Icelandic 4-year-old children [19 in the experimental (Exp.) group and 19 in the control group]

	Exp. *n* = 19		**Control *n* = 19**			
	Mean	**SD**	**Mean**	**SD**	***P****	**CI†**
Total score	4.7	3.5	6.5	4.3	ns.	–4.40 to 0.77
Manual dexterity	0.5	1.0	0.4	0.7	ns.	–0.45 to 0.76
Posting coins	0.1	0.4	0.2	0.6	ns.	–0.39 to 0.28
Threading beads	0.4	0.9	0.1	0.3	ns.	–0.16 to 0.79
Bicycle trail	0	0	0.1	0.4	ns.	–0.32 to 0.11
Ball skills	2.8	1.6	3.8	2.5	0.05	–2.38 to 0.38
Catching bean bag	2.2	1.6	2.9	2.0	ns.	–1.87 to 0.50
Rolling ball into goal	0.6	0.9	0.9	1.3	ns.	–1.08 to 0.44
Balance	1.5	2.2	2.3	2.5	ns.	–2.32 to 0.79
One-leg balance	0.02	0.1	0.4	0.8	0.017	–0.80 to 0.01
Jumping over cord	1.5	2.2	1.7	2.0	ns.	–1.60 to 1.17
Walking heels raised	0	0	0.2	0.5	ns.	–0.39 to 0.08

*Mann–Whitney U-test (one tailed).
†CI: 95% confidence interval of the difference between the means.
ns., not significant.

a matched group of coevals without such experience. As predicted from the fact that the programme targets activities promoting eye–hand co-ordination and the provision of vestibular stimulation, outcomes converged on abilities associated with prehension and static balance.

While baby swimming may have rather specific effects in the motor domain, its potential benefits should also be explored in other areas of relevance to child development. Examples are parental attitudes, cardiovascular fitness and physical growth, and expressions of self-esteem. In fact, it may be possible to conceive of a testable scenario in which baby swimming exerts beneficial influences in these respects that in turn promote successful adjustment to the transition from home to formal schooling.

The benefits of aquatic therapy have been extolled with regard to individuals suffering from asthma (Rosimini 2003) and autism (Yilmaz *et al.* 2004), but especially those with cerebral palsy (Kelly & Darrah 2005). Children with the latter disability (as well as typically developing during early childhood) can benefit in two ways from aquatic therapy. First, the buoyancy provided by water has not only the potential for facilitating full or partial range of movement, but also postural control through a reduction in gravitational effects. Second, the density of water (1 g/cm^3) is about 800 times more than that of air, thus serving as a resistive medium to promote muscle power without excessive loading of the joints.

The present study did not involve random assignment of individuals to groups. This limitation, together with relatively small sample sizes and a retrospective design, detracts from the efficacy of the study. Nevertheless, we contend that it serves as an encouraging demonstration project as to the potential benefits of baby swimming. Better understanding of baby swimming and its close cousin aquatic therapy can only be achieved with resort to a greater methodological rigour in future studies that aspires to Sackett's (1981) Level I (randomized controlled trials) or at the very least Level II (non-randomized prospective control study).

Key messages

- Physical exercise facilitates the development of motor skill
- Baby swimming programme may have positive effects on motor skill development
- Baby swimming programme targets activities promoting eye–hand coordination and the provision of vestibular stimulation
- Baby swimming may have rather specific effects in the motor domain, its potential positive benefits should also be explored in other areas of relevance for child development

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