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REGULAR ARTICLE

Therapy in a subtropical climate for children with cerebral palsy. Evidence of physical and psychosocial effects?

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Abstract

Aim: To assess a possible therapeutic effect in children and adolescents with cerebral palsy of a habilitation programme in a warm sunny climate.

Methods: Fifty-seven children and adolescents with cerebral palsy, all integrated with normal functioning children through mainstream schooling, received an individualized four-week habilitation programme at a habilitation centre in Lanzarote in the Canary Islands. They were clinically assessed before and after treatment, and again after three and six months. The clinical tests included gross motor function measure (GMFM) and the paediatric evaluation of disability inventory (PEDI). Mental health and self-esteem were assessed by using the youth self report (YSR), the child behaviour checklist (CBCL) and the Harter's self-perception profile. We also used focus-group interviews on all 57 parents by the end of the treatment period.

Results: The study revealed some improvements in the level of physical performance. The most striking finding, however, was the lasting effect on behavioural and emotional parameters and the children's self-esteem.

Conclusion: Training in a warm climate may explain some of this positive effect. However, based on the focus-group interviews and its quantitative findings a more plausible explanation may be the interaction in a social setting with others in a similar situation.

INTRODUCTION

For many years, Norwegian patients with certain chronic diseases have qualified for prescribed therapy in a subtropical climate. Children with complicated asthma or certain dermatological diseases and patients suffering from post-polio syndrome have all been accepted for this type of 'climate therapy' as part of the public health service system.

While most therapeutic strategies in temperate climates involve physiotherapy, other medical approaches and social activities may also be included in therapy programmes. The idea is that a different barometric pressure, low humidity, a relatively high average temperature and daily sunshine should be ideal for these patients.

Such subtropical climate treatment has been controversial, mainly because of its high cost and the lack of scientific evidence of its benefits. Very few studies have been published about the physical and psychosocial effects of habilitation in a warm climate. However, there have been a few studies conducted on the outcomes of such therapy for rheumatoid arthritis patients (1–4). In 2003 Strumse et al. documented a positive effect from treating on patients with post-polio syndrome in a warm climate (5). To our knowledge, no studies have been carried out on the psychosocial outcome of habilitation in a warm climate for children and adolescents.

With the exception of patients with post-polio syndrome, there are no neurological diseases among the medical conditions approved by the Norwegian public health system for therapy in a subtropical climate. Over the years however, there have been numerous, single-case reports from patients suffering from chronic neurological disorders that bear witness to the positive effects of such treatments.

The aim of this study was to evaluate the therapeutic effects of a habilitation programme administered in a warm, sunny area on the physical and psychosocial functioning of children and adolescents suffering from cerebral palsy (CP). In addition we wanted to assess whether the interaction between children, suffering from the same medical disorder, had behavioural and emotional effects.

MATERIALS AND METHODS

Patients

A total of 60 patients, assumed to fulfil the criteria for a cerebral palsy (6) were invited to participate in the study. These patients were either chosen from among previously registered children and adolescents with CP who were being treated at the Neuropaediatric Ward at Rikshospitalet or recruited through notices placed in newspapers.

All patients were evaluated and examined by a trained neuropaediatrician. One of the children did not fulfil the

criterion for CP. Two more patients dropped out for different reasons during the follow-up tests. Accordingly, a total of 57 children were included in the study. All four main types of CP were represented. Thirty of the children had spastic diplegia, 22 had spastic haemiplegia, while three suffered from spastic tetraplegia. Two of the children were classified as having dyskinetic CP. This meant there were very significant differences in the children's functional levels.

The sample consisted of 34 girls (59.6%) and 23 boys (40.4%) with an average age of 10.7 years, ranging from six to 18 years. The children and adolescents came from all parts of Norway and all of them had one or two parents during the stay. All had been previously integrated into the mainstream school system and all of them were the only pupils in their class with CP. Several patients had additional clinical handicaps such as epilepsy, learning disabilities, mild visual disturbances or orthopaedic complications. The children were classified according to gross motor function classification system (GMFCS) (7).

Procedures

All the patients were treated at a habilitation centre in Lanzarote in the Canary Islands, known as the Casas Heddy Centre, which is owned by the Red Cross. The climate in Lanzarote is mostly dry and sunny, with temperatures averaging around 25°C, while the climate in Norway during the intervention period was mainly rainy, with temperatures averaging less than 10°C.

The Casas Heddy Centre is well suited for multihandicapped patients. The Centre's infrastructure in terms of physical potential as well as manpower required that most of the physical exercise was done in groups, although some individual exercise was offered, mainly for the children who did not participate in the groups. Engaging in group exercise was a conscious decision intended to promote social interaction among the children. We wanted them to take part in the groups insofar as possible and on their own terms. The children spanned a broad range with regard to physical and cognitive functional levels, from exceptionally highly functioning to non-functioning. The goal was to let each individual child do what he or she could, based on his or her own functional level. This meant that the demands placed on the children differed significantly. The children with the most severe loss of function exercised individually with an assistant.

The exercise groups were put together on the basis of age, cognitive function and motor skills, with emphasis on ensuring that as many as possible could identify with someone else in the group. The exercise sessions were supervised by three physiotherapists and one sports health teacher from Norway and Casas Heddy. A doctor was also part of the team (OHS). The facility had two swimming pools, one indoor pool with a water temperature of 36°C and an outdoor pool with a temperature of 24 to 27°C during the swimming sessions. There were also several excellent outdoor areas featuring playgrounds and space for games, a beach, paths and a large common area. All these facilities were well suited for the physically challenged.

In general, the physiotherapy consisted of conditioning, coordination, balance and strength exercises with about 2 h of training per day, as well as group activities for learning how to interact and to build up team spirit. Most of the children also took daily treatments in the swimming pool (45 min). They also exercised on weekends. Between exercise periods, the subjects kept busy with schoolwork and the school groups constituted a social learning arena on a par with the groups for physical exercise.

Tests/Evaluations

The patients received treatment on Lanzarote for four weeks. A complete test procedure was administered during the first two days (baseline) and a new test procedure was administered on the last two days (four weeks later). Further, to identify possible long-term effects, the patients were re-tested three and six months after returning home.

The gross motor function measure (GMFM) (8) and paediatric evaluation of disability inventory (PEDI) (9) tests were performed by two well-qualified physiotherapists. The results were intended to cover the three stages of the World Health Organization's (WHO) definitions for the consequences of disease: impairment, disability and handicap (10). Mental health and self-esteem were assessed by internationally acknowledged, standardised questionnaires that were completed by the patients and their parents. The mental assessment was based on the youth self-report (YSR) (11) completed by the patients aged 10 or more, and for those under age 10, the child behaviour checklist (CBCL) was completed by the parents (12). Both forms score the questions from 0 (no), 1 (sometimes) and 2 (often). These standardised questionnaires provide a combined score for behaviour and emotional problems and assess both internalised behaviour (anxiety, depression, withdrawal and somatic complaints) and externalised behaviour (aggressive behaviour and delinquency).

Patients' self-perception was measured by revised versions of the Harter's self-perception profile for adolescents (SPPA) (13). The Harter's scales are the only measures based on a developmental theory featuring scales tailored to children of different ages. The SPPA addresses the patient's self-perception in domains of competence known to be important to the majority of children and adolescents. It applies seven subscales: global self-worth, scholastic competence, athletic competence, social acceptance, close friendship, physical appearance and romantic appeal. Since the romantic appeal subscale was not presented to or answered by patients under age 14, this subscale is not reported here. Each subscale contains four items, each of which has four options ranging from 1 (describes me very poorly) to 4 (describes me very well).

The control group for the mental and psychosocial assessments in this study was a sub-sample of 60 children consisting of 24 boys and 36 girls with a median age of 12, randomly selected from a Norwegian epidemiological study of mental health (14).

Interviews

All children had one or two parents during their stay. Focus-group interviews were conducted with parents to the 57 children by the end of their stay. They were asked whether they had observed specific mastery gains or changes in the children during their stay. The parents' statements were recorded. Recorded statements were also taken from children and parents during and immediately after their stay. Collectively, this constitutes methodological triangulation. Statements from the interviews were subsequently systematised and sorted into four categories: Social mastery, self-mastery, parental mastery and parental scepticism. Since the interaction between children with the same problems could be a factor for behavioural and emotional effects, this topic was also included in the qualitative interview.

Ethical considerations

The regional committee of medical ethics of Norway has given its approval with a view to the ethics involved in this project.

Statistics

Quantitative results are reported as mean values. The SD is reported for the GMFM and PEDI investigations, while medians and range are reported for the CBCL, YSR and SPPA tests. Nonparametric statistics were used (Mann–Whitney test/Wilcoxon matched pairs signed rank sum test) (15). A two-tailed P value of less than 0.05 was considered statistically significant. All analyses were performed with the statistical package SPSS 15.0 for Windows (Lead Technologies. Inc., Chicago, IL, USA).

RESULTS

The GMFM test

Table 1 shows the results of the GMFM tests administered before and after the intervention. As illustrated by the table, the distribution was exceptional, but it was relatively constant from one point in time to the next. Generally speaking, both the mean and median values increased steadily from t_1 to t_4 and, when comparing t_1–t_2, t_1–t_3 and t_1–t_4, statistically significant differences ($p \leq 0.001$) were found. However, it is important to be aware that the improvement described represents a maximum of no more than 3 to 4 per cent.

The PEDI test

Table 2 shows the results of the PEDI test. It also showed a slight increase in the scores during the test period. This is especially evident in the segment on functional skills. The increases in scores between t_1–t_2, t_1–t_3 and t_1–t_4 are significant ($p \leq 0.001$) for several functions but, like the GMFM test, it appears that the 'improvement' only represents a few per cent for each individual sub-test. As seen in Table 2, it appears that the improvement in this context continued to apply at the 6-month follow-up.

Table 1 Results of the GMFM test (total score). Mean values (SD) (range)

	Before	During	3 months after	6 months after
Total score	94.1 (26.4)	96.0 (25.2)***	96.1 (26.2)***	97.1 (22.1)***

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

Mental health and self-esteem

There were no statistically significant differences between the patients and the controls in terms of age, gender or socio-demographic characteristics.

Before the treatment on Lanzarote, there were significant differences between the scores of the patients and the controls on the CBCL and YSR. More behavioural and emotional problems were reported by the parents (CBCL; $z = -3.14$, $p < 0.001$) as well as by the children (YSR; $z = -1.85$, $p < 0.05$) in the patient group (Table 3).

There were significant differences in the CBCL, YSR and SPPA scores reported before and at the end of the treatment period on Lanzarote. During the treatment period, there were significantly fewer behavioural and emotional problems reported by the parents (CBCL; $z = -5.44$, $p < 0.001$) and by the children (YSR; $z = -2.88$, $p < 0.01$). Self-esteem SPPA scores also improved, e.g. scholastic competence ($z = -3.2$, $p < 0.001$), athletic competence ($z = -3.04$, $p < 0.01$), social acceptance ($z = -1.9$, $p < 0.05$) and physical appearance ($z = -2.14$, $p < 0.05$).

The results revealed that this improved mental health and self-esteem persisted even after habilitation treatment was over. There were no significant differences in the improved CBCL, YSR and SPPA scores reported during the treatment on Lanzarote and the scores reported three and six months after returning home (Table 3).

Qualitative findings

The interview survey showed that the children gained very substantial benefits with a view to social and personal mastery. Their social mastery consisted in making friendships through spending time with others in a similar situation and where, for once, the individual child did not stand out. Some also made sweethearts for the first time. Personal mastery for the individual child involved having a good scholastic experience for the first time, as well as not having to strive for a 'normal functional level' relative to others. This relieved them of the stress that most of them felt in their everyday lives from being integrated into the mainstream school system. Frequent access to a heated swimming pool gave them an opportunity to develop on their own terms, something that was usually difficult for most of them. Spending time with the group allowed many of the subjects to cope better because they saw others toiling with the same problems as themselves. In other words, they felt a sense of fellowship and community. In summary, one might say the Centre was the 'safe haven' these children lack in their everyday lives. And in that safe haven, they did not feel like they stood out as different in any way. The parents also expressed the deep appreciation they felt at meeting people in the same situation as it gave them more courage to deal with their own adversities.

Table 2 Results of the PEDI test. Mean values (SD)

	Before	During	3 months after	6 months after
Functional skills				
-Self-care	70.0 (16.8)	73.1(16.5)***	73.6 (17.2)***	75.9 (14.5)**
-Displacement	79.8 (20.3)	85.2 (20.4)***	85.2 (20.8)***	89.2 (17.9)***
-Social functioning	82.2 (16.8)	89.1 (15.8)***	89.1 (15.8)***	89.1 (13.6)***
Need for help				
-Self-care	67.5 (21.2)	72.7 (22.5)	71.4 (19.9)	74.5 (16.3)
-Displacement	86.0 (23.1)	94.7 (23.0)	100.0 (23.3)	100.0 (19.1)
-Social functioning	83.0 (19.6)	90.0 (19.3)	90.0 (18.4)	100.0 (12.7)

*p < 0.05, **p < 0.01, *** p < 0.001.

Table 3 Mental health (CBCL, YSR) and self-esteem (SPPA) in patients with CP before, during, three months after and six months after treatment on Lanzarote and healthy controls. Median values (range)

	Before	During	3 months after	6 months after	Controls
CBCL (n = 57)					
-total score	26 (3–73)	15.5 (0–55)***	13 (1–67)	11.5 (1–53)	11 (0–65)***
-internal score	7 (0–28)	2 (0–20)***	3 (0–19)	3 (0–19)	4 (0–28)*
-external score	7 (0–28)	3 (0–16)***	2 (0–29)	3 (0–18)	3 (0–20)**
YSR (n = 26)					
-total score	29 (12–62)	19 (3–51)**	21 (3–46)	16.5 (3–74)	22 (0–86)*
-internal score	7.5 (1–18)	6 (0–18)*	6 (1–17)	4.5 (0–15)	5 (0–30)
-external score	8 (0–20)	4 (0–14)**	4 (1–19)	4 (1–31)	7 (0–45)
SPPA (n = 51)					
-global score	2.8 (1–4)	2.8 (1–4)	3.0 (1–4)	3.2 (2–4)	2.9 (1–4)
-scholastic	2.8 (1–4)	3.4 (2–4)***	3.0 (2–4)	3.2 (1–4)	2.8 (1–4)
-athletic	1.7 (1–3)	2.0 (1–4)**	2.0 (1–3)	2.0 (1–3)	2.5 (1–4)
-social	3.3 (1–4)	3.5 (1–4)*	3.5 (1–4)	3.8 (2–4)	3.1 (1–4)
-close friendships	3.2 (1–4)	3.4 (1–4)	3.4 (1–4)	3.4 (1–4)	3.2 (1–4)
-phys. appearance	3.4 (2–4)	3.6 (2–4)*	3.6 (2–4)	3.6 (2–4)	2.6 (1–4)

*p < 0.05, ** p < 0.01, *** p < 0.001.

DISCUSSION

It is well known that children with multifunctional handicaps intergrated in the main school system have a higher risk of behavioural and emotional problems than healthy children. The present multimodal outcome study confirmed this, and also revealed that a substantial number of children and adolescents with CP reported a higher rate of and more behavioural and emotional problems than the general Norwegian child and youth population (14) Our findings correspond with the findings of other Norwegian studies of chronic diseases, congenital malformations and physical disabilities, e.g. meningomyelocele, anorectal anomalies (16) and severe congenital heart defects (17).

However, our most important finding was that significantly fewer behavioural and emotional problems were reported during the habilitation programme, and that the children reported a higher level of self-esteem in areas such as scholastic competence, athletic competence, social acceptance and physical appearance. These improvements remained stable after returning home. Our findings were also corroborated by the study's interview data. Neurological disabled children, like those included in our study, are normally integrated in the mainstream school system together with normal functioning children. The focus-group interview and its qualitative data suggest that the psychosocial improvement was due to the interaction between children with the same problems. The statements from the parents revealed that most of the children in the test sample had found peers with whom they identified. Spending time with the group allowed many of the subjects to cope better because they saw others toiling with the same problems as themselves. In other words, they felt a sense of fellowship and community. This was in contrast to the ordinary school system where they always felt like losers.

In summary, one might say the centre was the 'safe haven' these children lack in their everyday lives. And in that safe haven, they did not feel like they stood out as different in any way. Thus, it appears that the children flourished due to the combination specially adapted facilities, trained personnel and general conditions that provided a safe framework and fellowship with individuals in similar situations. It is important to note that the climate factor on the psychosocial improvement was not stressed in the interview by the parents

To the best of our knowledge, this is the first time mental health and self-esteem have been investigated using standardised methods before, during and after a therapeutic habilitation in a warm climate for children with CP. The project appears to have helped enhance children's mastery of their own lives and to have bolstered participants' sense of identity as physically challenged. In addition, parents benefited greatly from meeting other families who share the same type of problems. This translates into empowerment on both the individual and the group level for children and parents alike.

As regards physical health as examined by GMFM and PEDI, the results are more uncertain. For practical reasons, it turned out to be impossible to include a control group in this part of the project. The group members were therefore compared only with themselves before and after the treatment. Despite this methodological weakness, it was nevertheless interesting to note that even though the improvement was often no more than three to five per cent, the median values increased steadily throughout the term of the study (Tables 1 and 2). The improvement obtained was in many cases significant. In our opinion, the modest increase in the GMFM test may be explained by the formidable functional range among our subjects. Because of this wide distribution, the therapists had to adapt exercise sessions to the type of CP each child had, meaning the time available for each individual child was reduced compared with what it would have been if the children had had a more uniform functional level. It is therefore tempting to conclude that a more homogeneous CP group would probably have had a positive effect on the results.

CONCLUSION

In this study, consisting of 57 children with various forms of cerebral palsy, it appears that there was a certain improvement in the subjects' level of physical performance after undergoing an intense habilitation programme in a warm climate. However, the motorical progress was not very convincing and in fact more and less clinical nonimportant. The most striking finding was the lasting effect the stay had on behavioural and emotional parameters and the children's self-esteem. This improvement of the psychosocial parameters was apparent six months after the stay. It is far from certain that the stay in a warm climate was the only factor that impacted these conditions. In fact it may very well be so that the warm summer climate had a minor role on the effect of the psychosocial parameters. Due to the information from the focus-group interview and its qualitative data it was the setting with the social interaction with others in the same situation that was decisive and most important.

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