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PO Box 117
221 00 Lund
+46 46-222 00 00

Changes in Parents' Time Use and Its Relationship to Child Obesity

Kristina Orban^{1,2}, Anna-Karin Edberg³, Kristina Thorngren-Jerneck^{2,4}, Jenny Önnarfält^{2,4},

Lena-Karin Erlandsson¹

(1) Department of Health Sciences, Lund University, Sweden (2) Vårdalinstitutet, the Swedish Institute for Health Sciences, Lund, Sweden, (3) School of Health and Society, Kristianstad University, Sweden, (4) Department of Pediatrics, Clinical Sciences, Sweden.

Corresponding author:

Kristina Orban, PhD, Reg. OT.
Department of Health Sciences
Faculty of Medicine
Lund University
Sweden
Phone: +46 222 18 98
Kristina.orban@med.lu.se

Abstract

Objective: The aim was to explore any change in the amount of time parents spent together with their children, changes in their perceived occupational value, and its relationship to children's decrease in BMI over the course of a one-year occupation-focused family intervention.

Method: The study sample consisted of participants in one arm of a randomized controlled trial, involving mothers and fathers (n=30) of 17 children aged 4-6 years who were considered obese. Data was collected by time-geographical diaries during the intervention and by measuring the parents' occupational value and the children's BMI before and after the intervention.

Results: At the end of the intervention an increase was shown in the amount of time parents spent together with their children during weekdays ($p=.042$) and the parents perceived occupational value ($p=.013$). Children's BMI z-score changed with $-.11$ units.

Conclusion: Collaboration with parents may be useful in interventions aiming at facilitating a normal weight development among children.

Keywords: childhood obesity, family health, health promotion, human activities, occupational therapy

Changes in parents' time use and its relationship to child obesity

Lifestyle preferences, environmental factors and cultural aspects play crucial roles in the increasing prevalence of childhood obesity (Dehghan, Akhtar-Danesh, & Merchant, 2005). Obesity is a public health concern and practitioners agree that it is necessary to lend support to parents in order to establish a healthier family lifestyle (Ayoob, 2011). The habits of young children are formed when imitating the behaviors of others in their environment. Important factors influencing the development of obesity could be eating patterns and food preferences as well as the level of physical activity in the family (Hood, et al., 2000). Therefore, it is reasonable to suggest that parents represent important role models in the prevention of childhood obesity.

Every day, humans engage in a wide variety of occupations which are influenced and shaped by each individual's abilities, values, possibilities and constraints within his/her environment (Davis & Polatajko, 2010). Daily occupations are central to a family's identity and have particular meaning and value for the family's members (American Occupational Therapy Association, 2008). An essential belief is that health and life satisfaction are promoted and maintained by daily occupations (Wilcock, 2006). From a family perspective, this means that children's daily occupations emanate from those of their parents when they participate in occupations together as a family. Pierce's definition of co-occupation (2003) is used in this study to highlight both mothers' and fathers' interactive participation with children. Co-occupations such as these require the involvement of more than one person, and the interaction of parents and children in shared occupations has been described as imperative to the child's development (Olson, 2004). Co-occupations occurs every day when families spend time together, e.g., having meals, playing or resting. Research shows that families who eat regular meals together are more likely to have children who consume a wider variety of healthy foods and are also less likely to consume foods high in sugar and fat (Neumark-Sztainer, Hannan,

Story, Croll, & Perry, 2003). Thus, parental support and collaboration plays a vital role in attempts to alter a child's pattern of daily occupations for better health (Ziviani, Desha, & Rodger, 2006).

Time use in patterns of daily occupations

Studies have shown that time use differs among individuals at different points in their lifespan (Harvey & Pentland, 2010). A sense of time shortage is common for parents with young children (Statistics Sweden, 2010). Time is regarded as a resource that everyone uses every hour of every day, but the occupations people choose depend on the constraints of the individual and on the social and physical environment (Ellegård, 1999). Previous research has shown that the amount of time spent in shared patterns of daily occupations among cohabitating parents of children aged 4-6 years old with obesity differ with regard to the amount of time spent together in the family (Orban, Ellegård, Thorngren-Jerneck, & Erlandsson, 2012). Some parents in the study had non-parallel patterns, i.e., they seldom or never participated in occupations together with their children at the same time, while in other families, the parents spent time with their children simultaneously in daily routines such as having meals, playing and self-care. Even if the use of time does not differ from other families with children in the same age, it might have a different impact on shared experience and health. An assumption is that lifestyles with certain patterns of daily occupations are more likely to promote health and well-being than others (Erlandsson & Eklund, 2006). Thus, it is relevant to expand our attention so as to view the family as a unit and explore how occupational patterns form family routines and create different family types which may not only contribute to, but also hinder lifestyle changes.

Encouraging a balance between physically active and non-physical occupations and the promotion of healthy behaviors from childhood to old age is an important goal for the occupational therapy profession (Poulsen & Ziviani, 2004). However, there is no consensus about what is required by individuals or in families with children in order to achieve a healthy occupational balance. Furthermore, to achieve such a

balance in families depends upon the parents, since young children have less control over how their time is structured and their immediate environment is largely under adult influence (Ziviani, et al., 2006).

Perceptions of value in daily occupations

Creating the conditions for children to experience enjoyment within their families in varied and meaningful daily routines is of concern to everyone involved in promoting good health and welfare of children (Poulsen & Ziviani, 2004). Even though families engage in similar occupations in time and space, the experience of engaging in these occupations differs among the individuals within families (Bagby, Dickie, & Baranek, 2012; Evans & Rodger, 2008). Based on the theoretical framework of the Value and Meaning in Occupations model (ValMO) (Persson, Erlandsson, Eklund, & Iwarsson, 2001), perceptions of daily occupations can be operationalized as occupational values divided into three dimensions: *concrete value* (e.g., completing a task or a newly acquired skill) *symbolic value* (related to gender identity, group or culture) and *self-reward value* (the joy and pleasure in the doing). The three value dimensions represent related, yet distinct ways of understanding the total value of each unique performance of an occupation. Thus, patterns of daily occupation constitute a mixture of value perceptions. Occupational values are related to the perception of overall meaning (Eklund, Erlandsson, & Persson, 2003) and perceived meaning has, in turn, been shown to be associated with subjective health and well-being (Erlandsson, Eklund, & Persson, 2011). The idea that everyday experiences determine the organization of an individual's pattern of daily occupations in time and space is well established within the time-geographical methodology (Ellegård, 1999). There are, however, several factors that have an impact on an individual's ability to influence or control situations when obstacles arise, which in turn determines the individual's sense of agency and perception of meaning. Lifestyle changes affecting family occupations and routines may be difficult to achieve since many external circumstances need to be identified and considered in relation to the whole family; furthermore, the

effect of changes in the use of time spent with children on perceived occupational value has not yet been made clear.

The design of an occupation-focused intervention program

Based on previous research, we designed an occupation-focused family intervention program focusing on health rather than weight, targeting both parents of children aged 4-6 years with obesity. The main content of the Lighter Living program (LiLi) is based on the Redesigning Daily Occupations (ReDO) program (Erlandsson, 2013), initially developed for, and evaluated on women with stress-related illnesses. This program was, in turn, inspired by the ideas behind “The Lifestyle Redesign Program” developed as a community program to promote health among the elderly (Mandel, Jackson, Zemke, Nelson, & Clark, 1999). Clark and associates (Clark, et al., 1997; Clark, et al., 2012) have demonstrated empirically that lifestyle redesign through meaningful occupations can maintain and enhance health and well-being. The specific occupation-focused theoretical framework used in the LiLi-program comes from the research regarding complexity and organization of daily occupations (Erlandsson & Eklund, 2001, 2006) and the ValMO model. It is based on system theory and applies an eco-cultural perspective (Dunn, Brown, & McGuigan, 1994) in order to consider the impact of different environments on the patterns of daily occupations. This perspective is often applied in family interventions (Dunn, 2007; Weisner, 2002).

A manual provided the framework for the intervention program (LiLi), which empowers the parents with the knowledge they need to be able to suggest strategies and set meaningful goals for the family. Charged with these responsibilities, the participants then either redesign their existing habits or build new habits and routines that include engagement in occupations together with their children. The parents were guided by the therapist and encouraged to self-analyze their patterns of daily occupations (in groups of 6-8 parents, 13 sessions during 12 months) in order to reflect and identify what required

modification in order to promote and support a healthier lifestyle in the family. To what extent such change was attained is, however, unknown.

The specific aims of the study were to in a group of parents attending an occupation-focused family intervention:

- explore any change in parents' time use together with their children after one year of intervention; regarding (a) preparing and having meals, (b) physically active occupations, and (c) physically inactive occupations.
- explore if time use in the areas of occupation (a-c) varied, after one year, among four groups of family types and between mothers and fathers
- explore any change in parents' perceived occupational value and children's BMI z-score, after one year, and if possible change varied among the groups of family types.

Method

Study context

This study had an explorative and quasi-experimental design and was part of the Lund Overweight and Obesity Preschool study (LOOPS), a randomized control trial, involving families with children aged 4-6 years who are either overweight or obese (Önnerfält, et al., 2012). The overall aim of LOOPS was to evaluate if a family-focused intervention aimed at parents of preschool children had a long-term positive effect on the weight development of targeted children. To evaluate the effect of various means of support the intervention was divided into two arms, one occupation-focused family intervention (LiLi) and one behavior-focused family intervention. After randomization, all parents were given individual instructions how to access a website (with a unique password) containing general

information about nutrition and exercise, and were invited to attend a 2-hour lecture in which health professionals gave information about overweight and obesity. Both these features were optional for the parents participating in the LOOPS. The intervention was delivered between 2008 and 2012, was approved by the Regional Ethical Review Board, Lund University (Dnr159/2008), and is registered at ClinicalTrials.gov (NCT00916318).

Participants and selection procedure

The children were identified during a regular visit to their local Child Health Centre (CHC). Parents were invited to join the LOOPS and received a referral (primary referral) to the University Hospital. The parents were given oral and written information from a pediatrician describing the intervention, procedures and confidentiality prior to attending the study. Exclusion criteria were that written and spoken Swedish must be understood well enough to participate in group sessions. Once informed consent was obtained, children with obesity were randomly assigned and parents were invited to participate in the LiLi program. Sample size calculations confirmed that a group size of 40 children with obesity would be sufficient to recruit to the LiLi program (Önnerfält, et al., 2012).

For this study, parents who were the primary care-givers (lived with their child/children), who had completed the LiLi program and who in addition had provided the required data at the time of analysis were included. The sample consisted of a total of thirty (n=30) parents of seventeen (n=17) children (11 girls and six boys) with no other known diagnoses, besides obesity. Thirteen children had both of their parents participating (13 mothers and fathers who were parenting the same child with obesity), four children had one parent participating (two mothers and two fathers who were parenting a child with obesity). All the children (17) attended kindergarten or preschool during the weekdays. The parents attended on average 7.7 (range 4-12) of 13 group sessions. Further description and socio-demographic characteristics are given in Table 1.

Table 1 in here

Methods used for data collection

Assessing time use. Since routines and regularities in the parents' daily occupations were of central importance in the LiLi program, time use was detected by using a time-geographical approach. Time-geographical diaries (Ellegård, 1999, 2006), originally developed for empirical studies of everyday life, were used repeatedly during the intervention program to clarify when, where and with whom the parents spent their time during 24 hours. Each parent maintained an open diary, written in a small booklet with headings on each page. Time use in daily occupations were coded and transformed into graphs by using the software program DAILY LIFE, version 2008 (Ellegård & Nordell, 2008). Time use, sequences, and coordination of daily occupations in the family were illuminated in graphs which the parents then used in group sessions where they were encouraged to reflect upon their own patterns. All parents had the opportunity to ensure the validity of the data collected by rating, on a five-point scale (graded from 5 = 'very well' to 1 = 'not at all'), how well the day represented an average day in their current daily life and by approving their graph from each diary. The median rating of the days documented was 4.6. The participants wrote a total of 182 diary entries, an average of six diaries per parent throughout the program, and all seven days of the week were represented. The number of entries written on weekdays, Monday-Friday (n=116), and at weekends, Saturday-Sunday (n=66), were evenly distributed during the intervention. All initial diary entries were written on a weekday. Because of the parents' varying patterns of time use between weekdays and weekends, the diary entries were categorized to weekday and weekend and these categories were analyzed separately.

Occupational Value instrument with pre-defined items (OVal-pd). In order to assess the participants' perceptions of the occupational value linked with daily occupations, the Occupational Value instrument with pre-defined items (OVal-pd) (Eklund, et al., 2003) was used at the beginning and

at the end of intervention. OVal-pd is a self-rating instrument, each item describing separate aspects of perceived occupational value. Items intended to reveal concrete value are, for example, “something important was accomplished”, items with symbolic value “led to other people getting in touch”, and items representative of self-reward value are “true pleasure to do those things”. The respondents were requested to state how frequently he or she had perceived the different aspects of occupational value during the past month by choosing one of four ordered response alternatives: not at all (1) to very often (4). The scale ranges from a minimum of 18 to a maximum of 72 points. Psychometric evaluation of the OVal-pd has been conducted. Convergent validity evidence supported the underlying dimensions of value (Eklund, et al., 2003). The 26-item version was evaluated using a Rasch analysis which resulted in a revision and the exclusion of eight items (Eklund, Erlandsson, Persson, & Hagell, 2009), the remaining 18 item version demonstrated a good fit to the Rasch model and was used in this study. A Cronbach's alpha value of .80 calculated on the current study sample, indicated good internal consistency.

Body mass index. The children's weight and height was measured at the CHC on referral date (primary referral), and in a standardized way by one of two registered pediatric nurses at inclusion, after six months, and at the end of intervention. BMI was calculated as weight (kg) divided by height (m) squared, $BMI = \text{kg}/\text{m}^2$. BMI standard deviation scores were obtained for age- and gender-specific reference values from Swedish children (Karlberg, Luo, & Albertsson-Wikland, 2001, 2002). The terms overweight and obese were defined by iso-BMI according to the definition by Cole et al. (2000).

Data analysis

Repeated measures were utilized in order to capture the parents' time use during the intervention, engagement in those occupations which were assumed to enable opportunities for a healthy lifestyle for the whole family were selected for this study. Codes and time use, describing parents in co-occupations with children in three areas of occupation; (a) preparing and having meals

(PM); (b) physically active occupations such as playing indoors and outdoors, walking, cycling (PA); and (c) physically inactive occupations such as watching TV, using a computer, reading, going somewhere by car (PiA) —were extracted from the data file in the software program DAILY LIFE. Descriptive statistics was carried out to provide time use variables (PM, PA and PiA) for each individual and to calculate how many diary entries were written on weekdays and weekends as well as how many days were collected and analysed from the first to the last diary entry.

Analyses were made on the group as a whole as well as among mothers (n =15) and fathers (n=15) separately, since previous research has shown significant differences between mothers' and fathers' time use (Craig, 2006). Furthermore, analyses were made of time use considering the characteristics in the four groups of family types, described in and shown to be statistically significantly different, in a previous study (Orban, et al., 2012). The time use of all parents as reported in the first diary entry, an average weekday in their current daily life, that was assumed not to have been affected by the intervention, was analyzed and sorted into five areas of occupations (i.e., parents together with the child in co-occupations, parents doing without but for the child, parents' individual occupations, parents together and sleep). Both parents who were couples and single parents were classified into four different family types: *the togetherness focused family*, in which parents spend time with children as well as time together; *the individual focused family*, in which parents have minimal time for children and togetherness; *the child focused family*, in which parents spend time with children and few minutes together; and *the parent-child focused family*, in which one parent spends time with children and moderate time together. Since the four parents' (participating without a partner) patterns of time use were in accordance with two of the four family types; the parent-child focused and most often the child focused family they were sorted into these groups.

Linear regression analyses were used to find out whether there was a statistically significant trend within each participant's time use differences regarding co-occupations from the first diary entry

to the last (in average six 24 hour diaries). Each of the time use variables, PM, PA, PiA and a fourth variable including total time in the three areas of co-occupations were analysed, respectively and the time use difference for each parent was calculated. The Kruskal-Wallis test was used to explore any statistically significant differences in four periods during the intervention (1-3, 4-6, 7-9 and 10-12 months), since it seemed worthwhile to determine both if and when change occurred.

All 18 items of the OVal-pd instrument were summarized into a general occupational value variable, and the separate value dimensions were summarized into three variables indicating the sum of concrete, symbolic and self-reward values. Mothers' and fathers' perceptions of value were compared with Mann-Whitney analyses and no significant differences were found at inclusion. The Wilcoxon signed-rank test was used to evaluate any differences in the perception of occupational values between inclusion and the end of the intervention.

The paired-samples t-test was used to compare the children's BMI z-score before and after the intervention. Repeated measure ANOVA was used to measure a linear trend of child BMI z-score from primary referral to the end of the intervention and whether there were differences in children's BMI z-score according to the family types. All statistical analyses were performed by using SPSS statistics, 18.0. The level of significance was set at $p < 0.05$.

Results

Parents' time use

The total time use in the three areas of occupation demonstrated a statistically significant increase ($p=.042$) for both mothers and fathers together with their children during weekdays. For example, parents spent an average of 107 minutes (min) together with their children during a weekday at the beginning of the intervention, and an average of 160 min at the end (Table 2). The result showed that mothers spent more time with their children than fathers did, both at the beginning and at the end of intervention. There was a statistically significant increase ($p=.040$) in PiA together with children during

the weekdays and a decrease during weekends for mothers. The analysis of different time periods during the intervention (1-3, 4-6, 7-9 and 10-12 months) showed a statistically significant increase in PM ($p=.017$) for fathers together with children on weekdays and there was also an increase in fathers' total time use with children ($p=.035$) on weekdays (Table 3).

Table 2 and 3 in here

Time use according to different family type

Parents in the togetherness focused family group displayed a statistically significant increase in time use with regard to PM on weekdays ($p=.049$). Parents in this group were also more physically active (PA) together with their children at weekends ($p=.018$). The child focused family group increased its time use by a statistically significant amount with regard to PA ($p=.011$) at weekends and PiA ($p=.043$) during the weekdays (Table 4).

Perceptions of value in daily occupations

Parents' perceptions of value in daily occupations demonstrated statistically significant changes during the intervention ($p=.013$). The sum of occupational values is illustrated in Table 2. The median occupational value in the total sample was 47 at baseline and 51 at the end of the intervention. The analyses showed a statistically significant increase in mothers' perception of self-rewarding value ($p=.021$) and in fathers' perceptions of symbolic value ($p=.027$).

Children's weight status

A change was shown in the children's BMI z-scores from 2.93 (SD .97) at inclusion to 2.82 (SD 1.08), $-.11$ units (SD .61), ranging from $(-.20$ to $.42)$ at the end of intervention, although, it was not significant. Children in the togetherness focused families changed their BMI z-scores from 2.90 (SD .69) to 1.70 (SD .09), $-.20$ units and children in the individual focused families changed from 3.54 (SD .03) to 3.27 (SD .16) $-.24$ units. In the child focused families the children's BMI z-score changed with -

11 units and children in the parent-child focused families did not change their BMI z-scores at group level.

Children's BMI z-score decreased from primary referral 3.35 (SD .70) to the end of intervention 2.82 (SD 1.08) ($p=.008$), resulting in a mean decrease of $-.53$ units (SD .72), ranging from $(-.16$ to $-.90)$. The distribution of change in children's BMI z-score differed between the family types (see Figure 1). The children in the togetherness focused family decreased their BMI z-scores, statistically significantly more than those in the other family types ($p=.002$). As shown in Figure 1, a statistically significant trend of decreasing BMI was shown from primary referral to end of intervention ($p=.022$). Note that some of this decrease occurred before the start of intervention.

Figure 1 in here

Discussion

The first part of the study aim was to explore parents' time use as reported via the time-geographical diary method during an occupation-focused intervention. The results showed that both mothers and fathers increased the time spent together with their children in daily occupations, particularly on weekdays. A further aim was to explore the perception of occupational values at the beginning and end of the intervention, and the results indicate that the parents' perception of occupational value had increased. Based on these results it is possible that parents who changed their lifestyle to include more time with their children in preparing and having meals and in physically active occupations (the togetherness focused family and the child focused family) positively affected children's weight.

Analyses of the parents' time use diaries revealed that on weekdays, mothers spent in average one hour more in co-occupation with children as fathers did. At weekends, the time spent together with children was more equally divided between the parents. This result is in line with previous studies from

the US that claim that a “new father” role is emerging especially during weekends (Yeung, Sandberg, Davis-Kean, & Hofferth, 2001), meaning it is mainly at weekends that fathers have time for co-occupations with children. Nevertheless, the result also shows that fathers increased their time with children during weekdays, particularly in the interval between 7-9 months in the intervention. When analyzing time use in different family types, parents who spent more time together with their children at the beginning of the intervention seemed to have had better opportunities to change their patterns of daily occupations and find time for, e.g., physical activities during weekends. It is thus possible to assume that parents' co-occupations with children may have led to children's BMI z-score was reduced in especially these families. The result also shows, however, that parents in the individual focused family, who spent less time together with their children at inclusion, changed their amount of time spent in co-occupations with children with almost two hours per day. Subsequently, their children's BMI z-score decreased. One interpretation of these results reinforces the importance of parental collaboration in facilitating joint family time together, as emphasized by Evans and Rodger (2008).

Occupational experiences have been studied in family life and it is considered an important aspect in parenthood and family routines (Rönkä & Korvela, 2009). Craig (2006) showed that mothers and fathers experienced the time they spent with their children differently. This study indicates that mothers who spent more time together with their children in PM and in PA also perceived more self-rewarding value. For example, mothers spent in average 129 min more together with their children at a weekend day at the end of the intervention mainly in PM and PA. According to the ValMO-model, enjoyment is a main characteristic of the self-reward occupational value dimension and it refers to the immediate experiences inherent in certain occupations (Persson, et al., 2001). Thus, alterations in time use in PM and PA occupations might generate a general increase in perceived enjoyment and in overall occupational value, of significant importance for experience of meaning and health (Erlandsson, et al., 2011).

The focus was not on reducing the weight of the child during the LiLi intervention; instead a clear focus was kept at encouraging parents to change daily routines in favour for a long-term reduction in the velocity of weight gain that in the long run may normalize the child BMI. However, for several participants the length of the intervention (12 months) may have posed difficulties in focusing on the process of change. Most parents were unable to participate in all group sessions. There was however no particular pattern of absence. Even if the intervention lasted over 12 months the parents attended on average 70% of the 12 sessions. The reasons given for not being able to attend a session were usually of practical nature such as their own or child's illness, working night shift, unable to find a babysitter or transportation problems. The original ReDO intervention lasted 16 weeks (Erlandsson, in press), in comparison to the Lifestyle redesign program, which was implemented over a nine months period (Mandel, et al., 1999). The optimal length for a lifestyle change intervention is under debate in current literature. There is evidence that a 10 week program is successful in altering lifestyle habits (Barnes, et al., 2008), and significant weight-loss has been reported from a six month intervention (Epstein, Paluch, Gordy, & Dorn, 2000). The result from this study showed that there was a statistically significant decrease in children's BMI from primary referral to inclusion, prior to the intervention when parents became aware of the health risks of child obesity. This decreasing slope in BMI was not maintained. However the aim to stop further unhealthy weight gain was reached for most of the children. The intervention was focusing on long-term changes and the effects were monitored over time, for example, the parents decreased their total time use (except for mothers in PA) and most of the children's BMI z-score increased during months 4-6, while a positive change comes during months 7-9. Changing routines and habits takes time, however, the result in this study shows that it is possible and the length of the LiLi program seems to have been suitable for some of the families included in this study. For example, parents in the togetherness focused family and the child focused family reported a significant increase in time use in PA together with their children at weekends and child BMI z-score decreased at the end of the intervention. To what extent the identified

changes in time use and children's weight status are sustained after ending the LiLi-program is unknown, and studies exploring any remaining changes, e.g., one year after ending the program seem urgent.

Parents are the main actors in preventing childhood obesity (Lindsay, Sussner, Kim, & Gortmaker, 2006), but previous research have indicated that mothers are both more likely to be involved in interventions (Ylvén, Björck-Åkesson, & Granlund, 2006) and more likely to take greater responsibility for raising their children (Wells & Sarakdi, 2011). This pattern was not upheld in the LiLi program since both mothers and fathers participated equally in the program. The results showed that fathers significantly increased the time they spent together with children both at meals (PM) and in total time use. Fathers also perceived more symbolic occupational value in the end of intervention. This dimension of occupational value signifies identity and belonging and an increase might even be of importance for fathers' experience of overall meaning. Studies from around the world indicate that the involvement of fathers is important for the development and welfare of children (Sarkadi, Kristiansson, Oberklaid, & Bremberg, 2008). However, participation in a program for lifestyle change may be dependent on schedules that are beyond the parent's control. In our study, almost all the fathers as well as one mother worked full time, and a central challenge facing families today seems to be the coordination of the time available (Korvela & Keskinen, 2008). Families have to combine the rhythms of the parents' working schedules with day-care and school schedules while also allowing sufficient time for sleep, meals and children's activities. Thus, in the development of future family-based interventions, it seems important to recognize that parents organize their time differently and may face challenges like irregular working hours. It is therefore important to offer occupation- focused group sessions at various times.

When designing the study, we decided to only analyze the time that parents spent together with their children in the three areas of occupation (PM, PA and PiA). However, in the course of the intervention, the parents explored their entire patterns of daily occupations. This means that they may

have gained awareness through reflections, alterations that may later lead to involving the children in new varieties of daily occupations. According to the family system theories, parents are active role models for facilitating change in the home and family environment (Hill & Mattessich, 1979), even small changes are of importance (Nowicka & Flodmark, 2010). It is important to recognize the mothers' and fathers' individual competencies since childhood obesity occurs within a familial context (Davison & Birch, 2001). Mothers and fathers engagement in physical activity has been positively correlated to girls' ability to change their BMI (Davison & Birch, 2001). Thus, changes in one individual's behavior can lead to profound differences in the behavior of other individuals involved in the system. Furthermore, there might be other changes in parental time use that could facilitate lifestyle changes that have not been explored in this study.

The study has some limitations. First and foremost, it is a disadvantage that we did not use a comparison group for comparisons of time use changes over the course of one year. However, there are other studies of time use among parents of preschool aged children (i.e., Craig, 2006; Statistics Canada, 2005) that mirror the patterns displayed by parents participating in the LiLi program. Further, the extent to which parents in general change their time use on their own initiative over the course of one year also remains unknown. It is also important to bear in mind that measuring interactions and co-occupations is not equivalent to measuring the quality of parenting within a family.

The assessment of time use by using time-geographical diaries could be considered biased by the participants, but it is important to clarify that the diary writers in this study did not know what aspects of their diaries that were going to be included in the analyses. Several studies have confirmed the reliability of time-geographical diaries (e.g., Kroksmark, et al., 2006; Liedberg, Hesselstrand, & Henriksson, 2004). In this study, the validity of the data collected was supported by the parents' rating of the documented days as highly representative (4.6) on a five point scale.

The use of parametric tests on a sample as small as the one in this study is challenging. Since the use of numerical values (minutes) allowed for the computation of means and differences, a parametric test was chosen for the linear regression. Although, the study's small sample size may not be sufficient and without adjustment of the significant level the results should be considered with precaution. The participants were mostly Swedish, high school-educated, middle-income parents, which limits the ability to generalize the findings to other ethnic groups and more diverse sample groups. Parental influences on a child's weight seem to be universal, eventual impact of cultural attitudes and socio-demographic factors needs however to be addressed in future studies. Nevertheless, this study provided an insight into whether or not the intervention delivered, using standard protocols and a single trained facilitator to enhance internal study validity, produced a desired impact on children's weight status.

Conclusions and future prospects

The result highlights the importance of taking the whole family context into consideration when designing occupation-focused family interventions. If parents are encouraged to be engaged in co-occupations together with their children, and family strengths are identified, it may have a positive impact on children's weight. The findings suggest it is possible to change parents' time use patterns and both mothers and fathers contributed to the change. Future studies should continue to examine the occupation-focused intervention (LiLi), its effect on children's weight and parental involvement using a larger sample with a control group.

Declaration of Interest

The authors report no conflict of interest. The authors alone are responsible for the content and writing of this paper.

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Table 1: Socio-demographic characteristics among the participants ($n = 30$)

Characteristic	Participants
Gender (male/female)	15/15
Age mean, years (range)	39 (31-59)
Mothers' BMI mean (range)	29 (22-47)
Fathers' BMI mean (range)	28 (22-40)
Children's BMI z-score mean (range)	3.35 (1.3-4.5)
Ethnic origin	
Native of Sweden	28
Europe	1
South America	1
Marital status	
Married	20
Cohabiting	7
Single	3
Children in the household	
One child	6
Two children	8
Three children	3
Type of housing	
Apartment	6
House	24
Level of education	
Compulsory School	3
High School	18
College/University	9
Employment status	
Working full-time	15
Working part-time	13
Parental leave	2

Table 2. Parents' time use in minutes with children and perceived occupational value at start to end of the LiLi intervention

	First diary	Last diary	Time difference on average during a year*	95% CI		p-value
	Weekday Weekend	Weekday Weekend		LL	UL	
PM						
Mothers	56 (10-180)	66 (20-165)	17	-25	59	.422
	125 (0-245)	154 (30-360)	76	-8	160	.074
Fathers	39 (0-124)	56 (0-95)	24	-7	56	.127
	116 (0-290)	132 (15-270)	20	-64	104	.629
Both parents	47 (0-180)	61 (0-165)	24	-4	51	.092
	121 (0-290)	142 (15-360)	45	-13	102	.127
PA						
Mothers	39 (0-200)	74 (0-159)	8	-40	56	.749
	91 (0-420)	99 (0-465)	72	-67	211	.299
Fathers	17 (0-110)	41 (0-175)	9	-24	41	.596
	66 (0-240)	69 (0-220)	13	-75	100	.772
Both parents	28 (0-200)	57 (0-175)	11	-19	41	.470
	79 (0-420)	83 (0-465)	39	-40	117	.329
PiA						
Mothers	42 (0-115)	53 (0-205)	22	-13	57	.205
	75 (0-170)	46 (0-170)	-19	-76	38	.497
Fathers	22 (0-100)	30 (0-121)	21	-5	47	.119
	52 (0-245)	59 (0-245)	36	-29	102	.269
Both parents	32 (0-115)	42 (0-205)	23	1	46	.040
	64 (0-245)	52 (0-180)	11	-31	54	.599
Total time**						
Mothers	137 (25-329)	193 (45-422)	47	-35	129	.257
	291 (0-690)	298 (30-690)	129	-59	318	.172
Fathers	78 (0-240)	127 (0-290)	53	-10	117	.097
	234 (0-500)	259 (33-555)	69	-95	233	.397
Both parents	107 (0-329)	160 (0-422)	58	2	114	.042
	264 (0-690)	278 (30-690)	94	-26	214	.121
Occupational value***						
	Start of LiLi	End of LiLi	Change			
Mothers	47 (39-55)	52 (35-71)	5 (-5 - +23)			.024
Fathers	48 (32-58)	51 (39-68)	1 (-11 - +20)			.163
Both parents	47 (32-58)	51 (35-71)	2,5 (-11 - +20)			.013

Note: Time use is presented in terms of mean (min-max), PM=preparing and having meals, PA=physically active occupations, PiA=physically inactive occupations.* Time difference = the calculated average change during 1 year of intervention, CI=confidence interval; LL=lower limit; UL=upper limit. ** Including PM, PA and PiA. ***Including sum of concrete, symbolic and self-reward value from the Oval-pd, median (min-max).

Table 3. Parents' time use (minutes) in four time periods during the intervention

	1-3 months	4-6 months	7-9 months	10-12 months	p-value
	Weekday	Weekday	Weekday	Weekday	Weekday
	<i>Weekend</i>	<i>Weekend</i>	<i>Weekend</i>	<i>Weekend</i>	<i>Weekend</i>
PM					
Mothers	77 (10-225)	70 (20-165)	98 (20-200)	89 (20-250)	.439
	<i>121 (0-245)</i>	<i>114 (10-240)</i>	<i>146 (30-240)</i>	<i>186 (80-360)</i>	<i>.757</i>
Fathers	42 (0-195)	28 (0-85)	74 (30-150)	56 (0-90)	.017
	<i>120 (0-290)</i>	<i>114 (15-270)</i>	<i>137 (30-255)</i>	<i>132 (20-270)</i>	<i>.914</i>
PA					
Mothers	50 (0-270)	62 (0-165)	84 (0-205)	48 (0-130)	.420
	<i>55 (0-310)</i>	<i>82 (0-420)</i>	<i>244 (0-465)</i>	<i>56 (0-105)</i>	<i>.338</i>
Fathers	22 (0-110)	40 (0-175)	40 (0-115)	24 (0-60)	.496
	<i>73 (0-240)</i>	<i>39 (0-120)</i>	<i>140 (40-200)</i>	<i>72 (0-260)</i>	<i>.403</i>
PiA					
Mothers	42 (0-160)	24 (0-100)	46 (0-120)	62 (0-205)	.129
	<i>74 (0-170)</i>	<i>48 (0-135)</i>	<i>35 (0-80)</i>	<i>70 (0-120)</i>	<i>.336</i>
Fathers	20 (0-100)	9 (0-30)	42 (0-90)	37 (0-121)	.146
	<i>47 (0-159)</i>	<i>62 (0-245)</i>	<i>53 (0-120)</i>	<i>87 (0-180)</i>	<i>.571</i>
Total time*					
Mothers	169 (25-455)	157 (20-370)	229 (50-378)	199 (32-422)	.230
	<i>249 (0-540)</i>	<i>244 (100-690)</i>	<i>425 (30-690)</i>	<i>312 (80-510)</i>	<i>.335</i>
Fathers	83 (0-275)	77 (0-290)	156 (95-350)	116 (0-201)	.035
	<i>240 (0-500)</i>	<i>215 (33-470)</i>	<i>330 (110-555)</i>	<i>291 (35-540)</i>	<i>.722</i>

Note: Kruskal-Wallis test (df=3), comparing differences in minutes spent in co-occupations during the intervention; weekends is presented in italics. Time use is presented in terms of mean (min-max), PM=preparing and having meals, PA=physically active occupations, PiA=physically inactive occupations. * Including PM, PA and PiA.

Table 4. Parents' changes in time use (minutes) according to family types over the course of a one year intervention

Family type	Average change in Total time			Average change in PM			Average change in PA			Average change in PiA		
	Mean	95 % CI	p-value	Mean	95 % CI	p-value	Mean	95 % CI	p-value	Mean	95 % CI	p-value
Togetherness focused (n=4)	86	-159, 332	.048									
Weekday				79	0, 158	.049	6	-83, 70	.863	-22	-77, 33	.406
Weekend				194	-84, 472	.133	269	69, 468	.018	14	-224, 252	.886
Child focused (n=11)	77	-121, 275	.441									
Weekday				15	-35, 64	.556	41	-26, 109	.226	42	1, 82	.043
Weekend				20	-136, 175	.795	355	91, 619	.011	-25	-107, 57	.533
Individual focused (n=4)	110	-121, 341	.333									
Weekday				49	-31, 129	.206	6	-19, 30	.612	12	-26, 50	.492
Weekend				28	-125, 181	.690	-55	-201, 92	.421	58	-44, 159	.232
Parent-child focused (n=11)	32	-99, 163	.625									
Weekday				3	-46, 51	.911	4	-45, 52	.881	32	-11, 74	.141
Weekend				30	-60, 121	.496	14	-65, 94	.715	-30	-99, 40	.387

Note: PM = Preparing and having Meals; PA = Physically Active occupations; PiA = Physically inactive occupations.
 Average change = Mean time use change in minutes per day (during one year of intervention).
 95% CI = 95 % Confidence interval of the average change during one year of intervention.

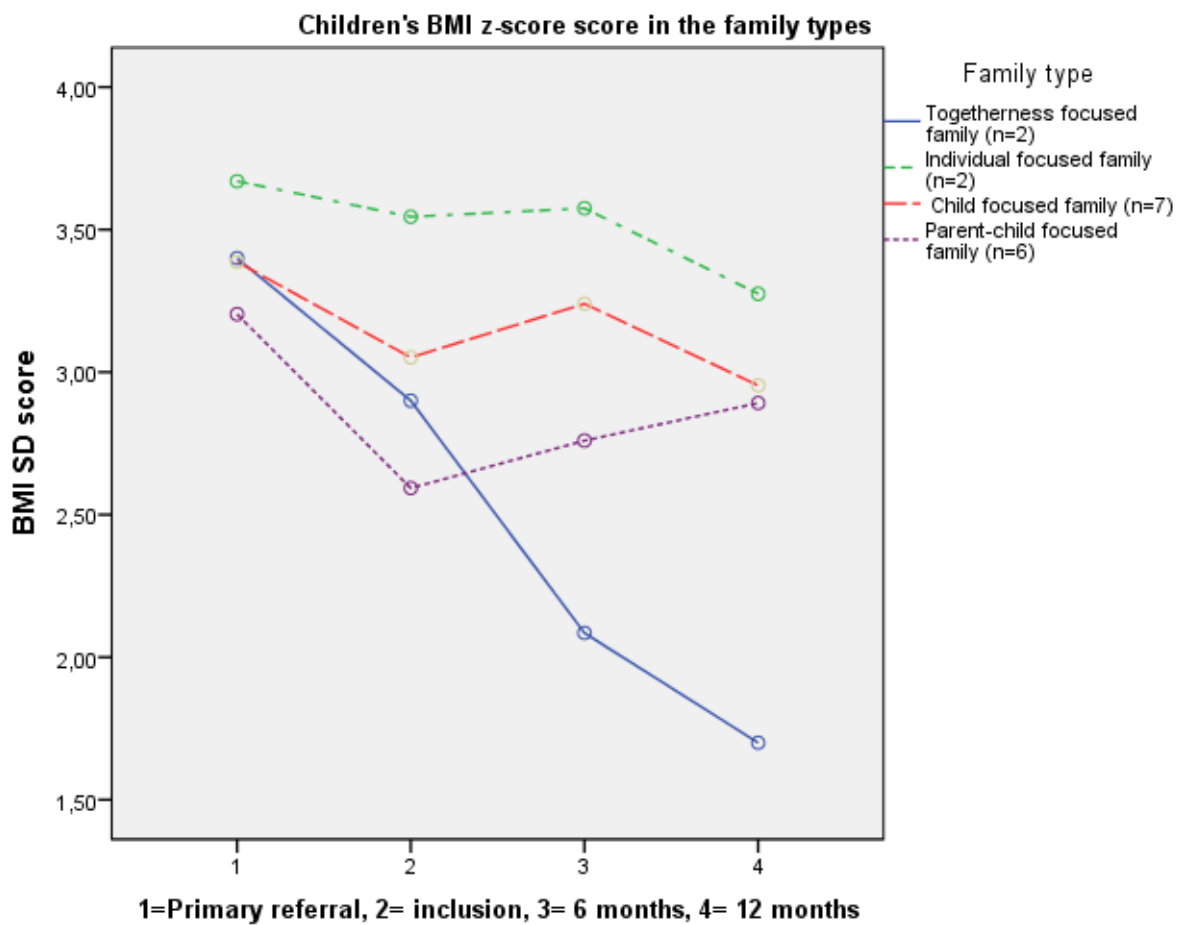


Figure 1. Children's BMI z-score in the four family types, from primary referral, inclusion, 6 months to 12 months (end of intervention).