Physical activity habits, Body Mass Index, general health, screen-time and education in families within the SALUT Child Health Promoting Intervention Programme in Västerbotten

- results from a pilot study

Master thesis

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ABSTRACT

**Background** Childhood lifestyle has been recognized as important for the immediate health as well as health later in life. Children’s physical activity level and other lifestyle habits are often influenced by their parents.

**Objectives** The first aim of the study was to describe physical activity habits in parents and their 18 month’s children and the second aim was to identify if parents educational level, BMI and perceived health influenced outdoor time and screen-time of the children and physical activity level of the parents.

**Material and Methods** This is a cross-sectional study of children 18 months of age and their parents, who participated in the SALUT Child Health Promoting Intervention Programme in four pilot areas in the county of Västerbotten, Sweden. The programme aimed to improve general health and well-being in children and parents. Data were obtained from a questionnaire filled in by 74 parents at four child health care centres in the county.

**Results** Eighty-nine percent of the children were reported to be outside without using the buggy on weekdays while the corresponding figure for weekends was 96%. Thirty-one percent of the mothers and 39% of their partners met the recommendations on physical activity level. Twenty-five percent of the mothers were classified as overweight or obese compared to 57% of their partners. There were no significant association between the mothers’ and the partners’ BMI, reported general health or educational level (r=0.20; p>0.05). A relationship was found between mothers’ and fathers’ physical activity level (phi=0.4; p<0.01). Mothers’ BMI and childrens’ outdoor time on weekends showed a significant negative correlation (r=-0.40; p<0.01).

**Conclusions** Aiming at studying the physical activity level of families in the Child Health Promoting Intervention Programme, there is a need for further studies with focus on comparisons with untreated reference groups. Health professionals and policy-makers can encourage and facilitate physical activity among this group of people through a health-promoting primary health care in fruitful cooperation with other societal organisations and through creating physical activity-friendly environments for adults and children, in-and outdoors.
INTRODUCTION

In many parts of the world there has been rapid changes in diet and lifestyle habits over the past decades (1) and excess body weight in children, adolescents and adults are on the rise. Physical inactivity is estimated to cause 1.9 million deaths globally and is considered to be the most common risk factor for cardiovascular disease today (2). Other chronic diseases associated with insufficient physical activity are diabetes type 2, osteoporosis, certain forms of cancer and overweight (1). Effects from regular physical activity are increased well-being (3-5), improved aerobic capacity, improved muscle strength, changed body composition, decreased blood pressure, altered blood lipid composition, improved structure and function of blood vessels as well as improved balance, coordination and general functional capacity. Other effects associated with regular physical activity are improved sleeping quality, decrease in depressive symptoms and improved self-esteem (3).

The World Health Organisation (WHO) has recognized childhood lifestyle as important for the immediate health as well as health later in life (1). Both children and adults in Sweden are in general less physically active and have more sedentary lifestyle than inhabitants in most of the other European Union countries (6). The French psychiatrist Jean Piaget showed several decades ago that physical activity is important for the young child’s perceptual, cognitive and emotional development (7).

In adults, socioeconomic factors, such as low education, to have a blue-collar job and to be on long-term sick-leave are on group level associated with obesity and physical inactivity and also related to lower general health (8-10). According to the current guidelines on physical activity level from the Swedish Public Health Institute 2008 it is recommended that adults should, preferably daily but at least five days per week, be physically active for at least 30 minutes, and the duration can be divided into smaller parts during the day. Intensity should be at least moderate, for example a quick walk (3, 11). Recommendations for adults from the American College of Sports Medicine and the American Heart Association include vigorous-intensity physical activity during at least 20 minutes at least three times per week, or moderate-intensity and vigorous-intensity activities combined through moderate-intensity activity 30 minutes two days per week and vigorous-intensity activity two days per week (12). Moderate-intensity physical activity is here defined as activities that bring the heart rate to
increase noticeably and intense physical activity as activities that increases the heart rate substantially and also causes rapid breathing (11). Additional health effects can be achieved if the daily dose and intensity is increased (3). The Swedish National Public Health Survey in 2006 classified 65 percent of the men and 63 percent of the women as “physically active” (9). Swedish recommendations states children should be physically active for at least one hour daily and include both moderate-intensity and hard intensity (3) and this also corresponds to the Nordic and international recommendations (13-16). Only a few studies have been published on pre-school children’s physical activity habits and body composition. A Scottish study showed 5-year girls to be less active than boys (17), and this is also seen in studies from Sweden with older children (18), but with varying conclusions in the Swedish Public Health reports from 2005 and 2009 (9,10). There is no clear association between physical activity level during childhood and adulthood (19) but it is known that children with overweight often become overweight adolescents and adults (20, 21) and that children of physically active parents are more physically active than children of physically inactive parents (22). A factor often related to physical activity is overweight and a study from 2006 on 4-year old children in the county of Västerbotten claimed 22 percent of the girls and 17 percent of the 4-year old boys to be classified as overweight (23). Corresponding figures for obesity were 4.5 and 3 percent, respectively. The highest prevalence of overweight and obesity among Swedish children are found in areas with low socioeconomic conditions (24).

Several studies show physical activity and TV watching as important predictors of both pre-school- and school-children’s Body Mass Index (BMI) (25-27). A child’s TV- or “screen-time” is often used to determine sedentary behaviour level in children and adolescents but can be misleading if not the total activity is taken into account, for example through accelerometers or heart rate monitors or more advanced questionnaires (3). To ask children and adolescents about their physical activity habits has been shown problematic since they often have problems memorizing activities and because of the activities’ different structure compared to those of adults - children can be intensely active, sedentary and active again within a short time period. Therefore, objective assessment through pedo- or accelerometers is recommended (3). There are no specific recommendations for measuring physical activity in pre-school children but parental-reported outdoor time for their pre-school child is shown to have a good correlation to total physical activity time (28).

In studies from Sweden, Australia and the Netherlands, parental education is positively
associated with the children’s physical activity and negatively associated with the children’s TV-time (29-31). A Canadian study showed parental overweight or obesity to increase the odds of the child being overweight at the age of 4.5 years (32).

Health-promoting programmes for children are encouraged by the National Public Health Institute (10). One such programme is under development in four pilot areas in the county of Västerbotten. It was therefore considered interesting to examine if families who had participated in the programme were being physically active accordance with the recommendations.

**Objectives**

The first aim of the study was to describe physical activity habits in parents and their 18 month’s children and the second aim was to identify if parents educational level, BMI and perceived health influenced outdoor time and screen-time of the children and physical activity level of the parents.

**MATERIAL AND METHODS**

The first cohort of children 18 months of age and their parents, participating in the SALUT Child Health Promoting Intervention Programme in the county of Västerbotten, Sweden, were included in the study. The study was performed with a descriptive cross-sectional design using the answers from parents of 74 children in a pilot questionnaire (Table 1). The families participated in an intervention programme aiming to improve general health and well-being and were offered to families visiting child health care centres in four pilot areas in the county of Västerbotten, Sweden. During the second trimester of pregnancy the expectant parents were offered health counselling meetings at the antenatal care and dental care. During the child’s first 18 months of life about ten visits at the child health care centre were offered, including counselling by primary health care nurses on health and life style practices. The professionals were encouraged to focus to a larger extent than in the “common programme” on life-style practises such as physical activity, dietary habits and psychosocial aspects of importance for the whole family involved. At the childrens’ age of 18 months of age their parents were asked to fill in a comprehensive questionnaire including questions on
anthropometric measures of child and parents, socioeconomic conditions, diet, physical activity habits and other life style issues. The results from the questionnaire formed the basis of the study, with focus on the parents’ physical activity habits, BMI, general health and education along with the childrens physical activity and screen-time habits. The questionnaires as well as other interventions within the SALUT Child Health Promoting Intervention Programme were gradually introduced at the child health care centres as “tests in a small scale” according to the PDSA-cycle (plan-do-study-act) (33).

Inclusion criteria for the present study were all families belonging to the child health care centres in the four districts of Ersboda, Lycksele, Robertsfors and Byske and responding to the questionnaire. Available data from the questionnaire on duration of screen-time and physical activity for children in weekdays was excluded from the analysis because of major differences in how much time the children spent with their parents on weekdays, due to differences in child day care habits.

**Statistical methods**

All individual data obtained from the questionnaires were processed by the SPSS software (16.0 SPSS, Chicago, IL, USA). Physical activity level for parents was identified as fulfilling or not fulfilling one of the following recommendations;

- Moderate-intensity physical activity for at least in total 30 minutes daily, at least five days per week.
- Vigorous-intensity physical activity during at least 30 minutes and at least three times per week.
- Moderate and intense activity combined, through moderate activity 30 minutes two days per week and intense activity two days per week.

BMI was calculated as body weight in kg/(height in meters)$^2$. The following intervals were used for BMI-scoring; underweight $\text{BMI} \leq 18.49$, normal weight $18.5-24.9$, overweight $25-29.9$ and obese $\geq 30$. The statistical significance level was set at 5%. As the study group was relatively small were the data for boys and girls analysed together. Pregnant mothers were excluded from the analysis. Data were reported as median and interquartial range for all variables and rounded off to one decimal. Valid percent were used in the text presentation of data while total percent were used in figures and tables. In the presentation of data normality
was assumed for parents’ BMI and parents’ educational level were dichotomized with the cutting point above upper secondary level. All other variables were treated as continuous and skewed. Statistical tests are given in table 1. To not exclude anyone and to try to give a fair picture of how the society and family structure may look like were those who filled in the questionnaire together with the presumed mother named “partners” in the text.

Table 1: Overview of variables and statistical tests used in the present study.

<table>
<thead>
<tr>
<th>Independent</th>
<th>Dependent</th>
<th>Statistical test</th>
</tr>
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<tbody>
<tr>
<td>Parents’ education*</td>
<td>Parents’ BMI*</td>
<td>Independent samples t-test</td>
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<tr>
<td>Parents’ education*</td>
<td>Parents physical activity level*</td>
<td>Chi-square</td>
</tr>
<tr>
<td>Parents’ education*</td>
<td>Parents general health*</td>
<td>Chi-square</td>
</tr>
<tr>
<td>Parents’ education*</td>
<td>Children’s outdoor time</td>
<td>Mann-Whitney U test</td>
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<tr>
<td>Parents’ education*</td>
<td>Children’s screen-time</td>
<td>Mann-Whitney U test</td>
</tr>
<tr>
<td>Parents’ BMI*</td>
<td>Parents physical activity level*</td>
<td>Independent samples t-test</td>
</tr>
<tr>
<td>Parents’ BMI*</td>
<td>Parents general health*</td>
<td>One-way ANOVA</td>
</tr>
<tr>
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<td></td>
<td>Spearman’s rank order</td>
</tr>
<tr>
<td>Parents’ BMI*</td>
<td></td>
<td>correlation</td>
</tr>
<tr>
<td>Children’s screen-time/</td>
<td></td>
<td>Spearman’s rank order</td>
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<tr>
<td>Parents’ BMI*</td>
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<td>Parents physical activity</td>
<td>Parents general health*</td>
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</tr>
<tr>
<td>level*</td>
<td>Children’s outdoor time</td>
<td>Mann-Whitney U test</td>
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<tr>
<td>Parents physical activity</td>
<td>Children’s screen-time</td>
<td>Mann-Whitney U test</td>
</tr>
<tr>
<td>level*</td>
<td>Parents general health*</td>
<td>Kruskal-Wallis test</td>
</tr>
<tr>
<td>Parents general health*</td>
<td>Children’s outdoor time</td>
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<td>Children’s screen-time</td>
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<tr>
<td>children’s screen-time</td>
<td></td>
<td>correlation</td>
</tr>
<tr>
<td>Mothers/partners BMI</td>
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<td>Pearson’s product-moment</td>
</tr>
<tr>
<td>Mothers/partners general</td>
<td></td>
<td>Chi-square</td>
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<td>health</td>
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<td>Chi-square</td>
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<tr>
<td>Mothers/partners physical</td>
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<td>Chi-square</td>
</tr>
<tr>
<td>activity level</td>
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<td>Chi-square</td>
</tr>
<tr>
<td>Mothers/partners education</td>
<td></td>
<td>Chi-square</td>
</tr>
</tbody>
</table>

*Education, BMI, physical activity and general health were tested for mothers and partners separately and physical activity also as a collective variable, that is, if mothers and fathers together were meeting or not meeting the recommendations on daily physical activity level.
RESULTS

The majority of the questionnaires came from the child health care centre in Robertsfors and the smallest proportion came from the child health care centre in Byske. Figure 1 presents the distribution of the respondents and their child health care centres. It is estimated that approximately 250 children were born in the study areas 18 months before this investigation corresponding to a participation rate of 30% (range: 17%-61%).

![Figure 1. Number of families by child health care center](image)

Characteristics of the children

The median age of the children was 18.6 months. There were 32 boys and 42 girls, born from May 2006 to June 2007 living in the county of Västerbotten, Sweden. Table 2 show descriptive data of the children concerning age, weight and height at birth and at 18 months and exclusive breastfeeding. Figure 2 and 3 show screen-time and active outdoor time on weekends. Ten percent of the parents reported a functional disorder or chronic disease of their child. Eighty-nine percent of the children were reported to be outside without a buggy on weekdays while corresponding figures for weekends were 96%. Fifty-seven percent of the parents reported their child to have screen-time during weekdays and 63% on weekends. Among the children, 38% had screen-time of one hour or more on weekdays and the
corresponding figure for weekends were 46%. The answer rate concerning screen-time was 63%. The answer rate on estimated maximum walking distance and maximum walking time for the children was 31% and 51%. Among those who reported the maximum walking distance the median was 300 meters and the interquartile range was 400 meters with a median walking time of 30 minutes and an interquartile range of 26.3 minutes.

Table 2. Basic characteristics of the 74 children, their non-pregnant mothers and their partners

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>1\textsuperscript{st} quartile</th>
<th>2\textsuperscript{nd} quartile (median)*</th>
<th>3\textsuperscript{rd} quartile</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Children</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age, months</td>
<td>18.1</td>
<td>18.6</td>
<td>19.1</td>
</tr>
<tr>
<td>Birth weight, g</td>
<td>3225</td>
<td>3575</td>
<td>3870</td>
</tr>
<tr>
<td>Birth height, cm</td>
<td>49.0</td>
<td>51.0</td>
<td>52.0</td>
</tr>
<tr>
<td>Weight at 18 months, kg</td>
<td>10.6</td>
<td>11.3</td>
<td>12.4</td>
</tr>
<tr>
<td>Height at 18 months, cm</td>
<td>81.0</td>
<td>83.0</td>
<td>85.0</td>
</tr>
<tr>
<td>Duration only breastfed, months</td>
<td>4.0</td>
<td>5.0</td>
<td>6.0</td>
</tr>
<tr>
<td>**Mothers *, **</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>26.0</td>
<td>31.0</td>
<td>34.0</td>
</tr>
<tr>
<td>BMI</td>
<td>21.0</td>
<td>22.8</td>
<td>25.2</td>
</tr>
<tr>
<td>**Partners *</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age, years</td>
<td>28.5</td>
<td>32.0</td>
<td>36.0</td>
</tr>
<tr>
<td>BMI</td>
<td>23.0</td>
<td>25.7</td>
<td>29.3</td>
</tr>
</tbody>
</table>

*Response rate 85-97 %

** Non-pregnant mothers (n=64, 86% of total)

Figure 2. Reported screen-time for children 18 months of age on weekends in hours per day.
Figure 3. Distribution of reported weekend outdoor time per day for children 18 months of age without using the buggy (as an indirect measure of “active” outdoor time).

Characteristics of the mothers and their partners
Table 2 and Figures 4-7 show parental characteristics and distribution of educational level, BMI self-reported general health and physical activity level. The median age of the mothers and their partners’ was 31 and 32 years respectively (table 2). 10 mothers were pregnant and were excluded from the analysis. Compared to the recommendations from The National Public Health Institute (3, 10), 31% of the mothers and 39% of their partners met any of the recommendations on physical activity level. Twenty-eight percent of the mothers and 19% of the fathers had secondary school or higher. Twenty-five percent of the mothers were classified as overweight or obese compared to 57% of their partners but the difference was not significant (p>0.05). Eighty-nine percent of the mothers and 82% of their partners stated that their general health was very good or good. One pregnant mother classified her general health as very bad and 2 fathers as bad.
Figure 4. Distribution of educational level of the mothers and the partners.

Figure 5. Distribution of body mass index in mothers and partners.
**Figure 6.** Self-reported general health for mothers and partners.

**Figure 7.** Proportion of mothers and partners who met or did not meet any of the recommendations on physical activity level.
**Associations within the families**

There were no significant association between the mothers’ and her partners’ BMI, \( r = 0.20, p > 0.05 \), reported general health or educational level. A relationship was found between mothers’ and fathers’ physical activity level \( \phi = 0.4; p < 0.01 \). There were no association between parents’ education, parents’ physical activity, parents’ general health, childrens’ outdoor time or childrens’ screen-time. Mothers’ BMI and childrens’ outdoor time on weekends displayed a significant negative correlation \( r = 0.40; p < 0.01 \).

**DISCUSSION**

The parents and children in the present study were participants in a pilot intervention project to gain long term health and healthy life-style habits through additional health support to families. The investigation is based on data from a questionnaire that parents to 18 months old children were asked to fill in.

Educational level is seen to be a strong marker of life style habits, but in this study no association between parental educational level and the other variables were found. The result could indicate that the individuals in the sample were not representative of the general population but it might also indicate that the intervention was effective in reducing differences between groups with different educational level. The same reasoning might be valid for the fact that no association was found between physical activity level in parents and their child; the intervention might have removed the potential association between parents and childrens’ physical activity habits but can also be due to validity challenges in the measurements. The results on physical activity level in children could aswell be seen as a little deceptive since only the measures on outdoor time on weekends without using the buggy could be used in the analysis. Those can only have potential to indirectly reflect the physical activity level.

The physical activity level among the parents did not correspond so well to data of the physical activity level in the Swedish population. In this study as low as 31 % of the mothers met any of the recommendations on daily physical activity in comparison to the general populations 63 % although there might be measurement biases, partly because of different
measurement methods but also due to the lack of knowledge on the physical activity level in the part of the population consisting of families with small children. This group of individuals is heterogeneous but might as well have many things in common such as lack of time, stress and/or down prioritizing one’s own leisure time and is perhaps a “too special” group to be assumed to spend their time in similar ways as the general population. Parents are role-models for their children and it can be seen as important to facilitate the best possible life-style habits out of the sometimes stressful life situation as a parent.

A recent study from Umeå displayed an association between BMI at 18 months and the BMI in fathers (34). Interestingly, the low physical activity in 18 months children whose mothers have a high BMI shown in this study may indirectly reflect the finding with parental influence on childrens’ BMI. It also should be added that the mothers and her partners’ physical activity level were associated in this study and approximately two thirds of the parents did not reach the recommended level of physical activity in spite of that they had been subjected to the intervention programme. Increased physical activity level was the most common wish from the parents (data not shown) and this might be useful information for the actors working close to the families such as the primary health care professionals as well as public health planners on government level to encourage and facilitate physical activity among these groups.

Encouragingly, there seems to be a shift coming. A study from the south-west of Sweden suggests the increase in prevalence of overweight in 10-11 year aged children to ease off and perhaps even be reversed among girls (35). Raustorp found that Swedish school children’s physical activity level has increased from 2000 to 2006 (36) and we can hope for further studies pointing in the same direction. Nevertheless, more efforts are definitely needed to support individuals and families to adopt healthy behaviours.

The present data can be seen as descriptive cross-sectional data on estimations of physical activity level, education, BMI and perceived health and associations between these variables in a group of families who had been subjected to an intervention. The effect of the intervention program is difficult to estimate without a control group or other measures and as the questionnaire was new and launched gradually the drop-out rate is a little hard to determine. The responsible nurses in the four pilot areas explained the low answer frequency mainly with delays in the introduction of the questionnaires at the child health care centres.
The low frequency with parents born outside of Sweden (5.5%), indicate a relatively high internal drop out rate for these groups. For 25-34 year-olds born outside Sweden corresponding values stretches from 10% in the smaller municipalities in the study to 20% in the city of Umeå (37). Reasons may be linguistic challenges, cultural challenges or lack of time for the professionals to explain the reasons behind the questionnaire. In a national survey, 6% of the girls and 7 percent of the boys 0-2 years of age were reported with long term illness which is slightly lower than in this study (10%) (38). It seems though difficult to draw any comprehensive conclusions based on this fact.

It is reasonable to discuss the point in time when the data was collected from the families. It might be possible that things might have changed a lot when the child is just a little older and can participate and come along more easily in activities with family members, both parents and siblings. It might even be so that the age of 18 months is too early to see any potential association with parents’ education, parent’s BMI and other variables. It would be interesting to see what results the measure instrument would yield in the same families later on. The questionnaires were collected during a time period of 11 months and it is also possible that the time of the year affected the results in physical activity and screen-time measures for both children and parents. No such analysis have however been made.

The families in the intervention programme were all subjected to the health promotion activities and it is not known to what extent they also influenced each other. They lived in the same four areas and many of them probably took part in the same activities for families with small children arranged by non-governmental organisations and other associations. The study design could therefore be considered to violate the assumption of independence, that is, that each observation or measurement must not be influenced by any other observation or measurement. If one suspects violation this assumption one should set a more stringent p-value, that is p<0.01, according to Stevens (39). The findings with a negative correlation between mothers BMI and childrens’ outdoor time could therefore be seen as valid for the present material but due to the high drop-out rate the finding could not be generalized.

In a questionnaire questions can be standardized and all questions and alternative answers are presented in the same way for all the respondents, but leave no room for correction of misunderstandings. The validity of data is not known but it is possible that unhealthy behaviours were underreported. It is also possible that the length of the questionnaire
contributed to missing data in some questions. There was no data collection on if both the mother and the father/partner attended the health counselling meetings together or if any of them attended alone, or if they missed out on any meeting. Thus is this also an issue to take into account when trying to estimate if the resulting data was the cause of the intervention or something else. One solution might be to ask the professionals to hand in attendance lists to the research team.

It seems very interesting to try to find out what was the effect of the intervention and what was there with or without it. To get more knowledge about the impact from the intervention in further comparative studies it would be interesting to focus on comparisons with untreated reference groups and with data collection from a point in time before the start of the intervention programme. Validity studies on the used measurements of direct and indirect physical activity would be very valuable. It would also be interesting to follow up the families later on in time to see if any patterns evolve from the material.

**CONCLUSION**

Aiming at studying the physical activity level of families in the SALUT Child Health Promoting Intervention Programme, there is a need for further studies with focus on comparisons with untreated reference groups. Health professionals and policy-makers can encourage and facilitate physical activity among this group of people through a health-promoting primary health care in fruitful cooperation with other societal organisations and through creating physical activity-friendly environments for adults and children, in-and outdoors.
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