



Swedish National Institute
of **Public Health**

Child day care center or home care for children 12–40 months of age

– what is best for the child?

A SYSTEMATIC LITERATURE REVIEW

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Foreword

THE SWEDISH NATIONAL Institute of Public Health conducted this literature review on account of the new Swedish family policy called the “child-raising allowance” reform. This family policy reform introduces a voluntary municipal child-raising allowance that makes it easier for parents to stay at home with their children after the standard period of paid parental leave has ended. The aim of this report is to examine what is best for the child from a child health perspective. This is done by way of a systematic literature review that describes how day care centers versus home care affect the cognitive and socio-emotional development of young children.

Mainly responsible for the text and the statistics has been Sara Holmgren, Swedish National Institute of Public Health. Valuable comments have also been contributed by Sven Bremberg, Swedish National Institute of Public Health, Berit Hagekull, Uppsala University, and Jay Belsky, Birkbeck University of London. Finally, a control of the literature search was carried out by Johanna Ahnquist, Swedish National Institute of Public Health.

The statistics on Swedish child care were compiled from data from the Swedish National Agency for Education, and information on Swedish child care policies was collected from the Government Offices of Sweden.

The formal decision to pursue the study was made by director general Sarah Wamala.

Sarah Wamala
Director general

Summary

SWEDISH FAMILY POLICY reforms are world-leading in regard to meeting internationally recommended standards for early childhood care and education (e.g., policy regarding parental leave, child poverty rate, minimum staff-to-children ratio in preschool education, education and training of staff, etc.) that are set to improve children’s health. This is crucial, since many Swedish children attend day care centers. Statistics from the Swedish National Agency for Education show that in 2008, 46 percent of all 12–23 month old children, 85.8 percent of all 24–35 month old children, and 88.8 percent of all 36–48 month old children were enrolled in day care centers. In 2008, the Swedish government introduced a new family policy called the “child-raising allowance”. The purpose of this reform is to enable parents with children aged 12–36 months to stay at home with their children after the end of the standard paid parental leave period. On account of this new family policy reform, the Swedish National Institute of Public Health conducted a systematic overview of disquisitions to present research evidence on the impact of day care centers versus home care on children exposed to these types of care between the ages 12 and 40 months. Child outcomes were captured using measures of cognitive and socio-emotional development.

Prerequisites to be included in the review were that studies must distinguish between child care centers and home care (i.e., parental care) and other types of child care in the statistical analyses, and that the children had some day care experience between ages of 12 and 40 months. International studies were included if the quality of day care centers was comparable to features found in Swedish day care centers.

Four studies that measured cognitive and socio-emotional development fulfilled the quality requirements. In two of these studies, the findings show that day care centers benefit young children’s cognitive development in comparison to home care children. The day care children demonstrated higher cognitive and language skills at age 36 months. Long-term effects of day care centers were demonstrated in both verbal ability and mathematical ability in 8-year old children. In the other two studies, no such effects were detected. In addition to cognitive development, no certain conclusion can be drawn regarding the effect of day care centers on children’s socio-emotional development. One study shows that day care centers increase problem behaviors, and have a negative effect on children’s social skills, at age 36 months. The same study also reports, however, that more time in day care centers is associated with more positive interactions with peers at 54 months of age. In the remaining study, neither center-based day care nor home care was found to be better than the other with respect to personality development.

The overall conclusion is that day care centers enhance children's cognitive development.

From a public health perspective, it can be argued that children at risk, and especially children from poor families, benefit from day care centers. There is a relation between child poverty and poor developmental outcomes that can be reduced with high quality day care centers.

Sammanfattning

Effekter av förskola på barn 12 till 40 månader

SVERIGES FAMILJEPOLITISKA REFORMER är världsledande när det gäller att uppfylla de internationellt rekommenderade normer om omsorg och utbildning för små barn (politik rörande föräldraledighet, andel fattiga barn, lägsta personaltäthet i förskolan, personalens utbildning m.m.) En viktig aspekt är andelen barn som går i förskola. Statistik från Skolverket visar att 46 procent av alla barn i åldern 12–23 månader, 85,8 procent av barnen i åldern 24–35 månader och 88,8 procent av barnen i åldern 36–48 månader var inskrivna i förskolan 2008. Samma år introducerade den svenska regeringen det s.k. vårdnadsbidraget. Syftet med den familjepolitiska reformen var att göra det möjligt för föräldrar till barn i åldern 12–36 månader att vara hemma med sina barn efter föräldraförsäkringens slut.

Med anledning av denna reform har Statens folkhälsoinstitut en systematisk litteraturöversikt över forskningsresultat rörande förskolans effekter på barn i åldern 12–40 månader.

För att en studie skulle inkluderas i översikten måste den ha gjort åtskillnad mellan olika typer av barnomsorg, framför allt mellan förskolan och omsorg enbart i hemmet. Internationella studier inkluderades om förskolornas kvalitet kunde jämföras med kvalitén i svensk förskola.

Fyra studier där kognitiv och socioemotionell utveckling mättes uppfyllde kvalitetskraven. I två av dessa visar resultaten att förskolan gynnar små barns kognitiva utveckling jämfört med barn som får omsorg i hemmet. Förskolebarnen uppvisade bättre kognitiv förmåga och bättre språkkunskaper vid 36 månaders ålder. Långsiktiga effekter av förskolan konstaterades beträffande verbal och matematisk förmåga hos barnen då de blivit 8 år gamla. I de andra två studierna konstaterades inga statistiskt säkerställda effekter. Effekterna av förskola på socioemotionell utveckling är oklara. Studierna gör det inte möjligt att dra några säkra slutsatser. En studie visar att förskolan ökar problembeteendena och har en negativ effekt på barns sociala förmågor vid 36 månaders ålder. I samma studie rapporteras emellertid också att mer tid i förskolan är förknippat med mer positiv interaktion med andra barn vid 54 månaders ålder. I en annan studie konstaterades ingen skillnad mellan förskolebaserad barnomsorg och omsorg i hemmet beträffande personlighetsutveckling.

Den övergripande slutsatsen är att förskolan befrämjar barns kognitiva utveckling.

Studier av förskolans effekter på något äldre barn visar att barn från socialt mindre gynnade familjer drar mest nytta av förskolan. Det är troligt att motsvarande även gäller i åldern 12–40 månader. Detta talar för att förskolan kan bidra till att minska sociala skillnader.

Introduction

MOST SWEDISH PRESCHOOL children attend day care centers since it is very common that both parents work full- or part-time. Today, 46 percent of all 12–23 month old children, 85.2 percent of all 24–35 month old children, and 88.8 percent of all 36–48 month old children attend day care centers (1). In 2008, however, the Swedish government introduced a new family policy called the child-raising allowance reform with the purpose of giving parents the opportunity to spend more time with their children after the standard period of paid parental leave has ended. The child-raising allowance increases the ability of parents to stay at home with their children aged 12–36 months (2). But how will the new family policy reform affect the health of the children? The aim of this review is to present scientific evidence on how day care centers versus home care affects the cognitive and socio-emotional development of children. Since the child-raising allowance is aimed at young children, we are interested in research that examines children exposed to day care centers between the ages of 12 to 40 months. From a public health viewpoint, it is justifiable to identify possible risk factors and protective factors for preschool children related to day care, at a time when it is still not too late to intervene (3).

It is to be expected that day care arrangements affect the health of young children. For instance, the quality of attachment that develops during the first 12 to 18 months of life may be affected (4, 5), although one recent review reports that this is unlikely (6). Cognitive development is also a crucial determinant of health. Word combinations, which are an aspect of language development, may be susceptible to environmental influence at 18 months of age because this stage of language development is starting at that time (7).

The quality of child care is also a factor that has a strong impact on children's health. Earlier evaluative reviews and articles in the literature on access to preschool education are quite consistent, revealing a positive effect of high quality child care (i.e., child per caregiver ratio, child per group ratio, etc.) on children's cognitive development (8, 9). A UNICEF report ranks Sweden as number one in meeting internationally recommended standards for early childhood care and education (i.e., regarding child poverty rate, minimum child per caregiver ratio in preschool education, education and training of staff, etc.) (10). Because our aim is to express our opinion about day care centers that may be of relevance for Swedish conditions, this review includes only studies with a specific minimum child per caregiver ratio.

Finally, another factor that is known to have an impact on children's health is socioeconomic status (11). The relevant studies must therefore include control for socioeconomic status in the statistical analyses.

Background

Swedish child care policy

The Swedish child care system is obligated to provide child care (i.e., day care centers, day mothers and open preschools) for children aged 12 months to 60 months (i.e., up to 5 years of age). In addition to care, the day care center provides educational stimulation and has its own curriculum. Day mothers or family day care are in-home forms of child care provided by municipally licensed childminders encouraged to participate in courses for day mothers. Open preschool provides childminders and stay-at-home parents an opportunity to engage in educational group activities (12). The latter two types of child care (i.e., day mothers and open preschools) will not be examined in this review.

In Sweden, paid parental leave for both mothers and fathers is financed by the national social insurance system and the quality of child care is ensured through state regulation. The parental leave entitles the parents to 480 days of leave (13).

A family policy reform was introduced by the Swedish government in 2008. The new policy involves a voluntary municipal child-raising allowance that offers parents the ability to stay at home with their children beyond the standard period of paid parental leave. The purpose is to increase parents' freedom of choice and to enable parents with children aged 12–36 months to spend more time with their children. The parents are offered 3000 SEK per month, tax-free, as a municipal child-raising allowance (2).

Swedish child care statistics

The child per caregiver ratio in Sweden has been relatively stable over the years and remained high compared to international standards, although the child per group ratio has increased since 1985, when the ratio was 13.4. This figure peaked in 2003 and 2004 at a ratio of 17.2/group, then dropped again in 2005 to 17.0. The average child per group ratio and the average child per caregiver ratio for the years measured are 16.0 and 5.05, respectively (see Table 1). Although, there has been an increase in child per group ratio and child per caregiver ratio, the ratios have remained relatively stable over the years, with only minor changes.

The variation between municipalities is also relatively small (12).

Table 1. Mean ratio for child per group and child per caregiver

Year	Child/Group	Child/Caregiver
1980	-	4.2
1985	13.4	4.3
1990	13.8	4.4
1995	16.7	5.5
2000	-	5.4
2001	-	5.4
2002	-	5.3
2003	17.2	5.4
2004	17.2	5.4
2005	17.0	5.2
2006	16.7	5.1

Note. Data is not reported for every year. This table is a modified version based on statistics from Swedish National Agency for Education (12).

Most children 12 months to 36 months are enrolled in a toddler section of a day care center, where it is relatively rare to have more than 16 children in a group. Almost half (46%) of these groups had 14 to 16 children in each group (see Table 2).

Table 2. Numbers of toddler sections in day care center according to group size

Year	Toddler section (0–3 years) in day care center with			
	– 10 children	11–13 children	14–16 children	17+ children
2003	807 (14.5%)	1724 (30.9%)	2633 (47.2%)	419 (7.5%)
2004	837 (14.2%)	1587 (26.9%)	2917 (49.4%)	569 (9.6%)
2005	842 (13.1%)	1804 (28%)	3125 (48.5%)	667 (10.4%)
2006	982 (13.8%)	2119 (29.9%)	3245 (45.8%)	745 (10.5%)
2007	1080 (13.8%)	2109 (26.9%)	3689 (47.1%)	949 (12.1%)

Note. Modified version of Table 6B: Toddler section according to number of children in section 2003–2007. Number and proportion of all toddler sections (1).

The total number of children enrolled in day care centers has increased from 178,074 in 2002, to 229,600 children in 2007. Regarding 12-month old children, the enrolment numbers have increased from 36,038 to 49,326 (see Table 3). 46 percent of all 12–23 month old children, 85.2 percent of all 24–35 month old children, and 88.8 percent 36–48 month old children attend day care centers.

Table 3. Number of children enrolled in day care centers according to age

Year	Number of children enrolled in day care centers			
	1 year	2 years	3 years	Total
2002	36,938	69,336	71,800	178,074
2003	38,848	73,046	76,418	188,312
2004	41,235	77,714	78,762	197,711
2005	42,866	81,997	83,479	208,342
2006	44,538	85,618	88,373	348,685
2007	49,326	88,217	92,057	229,600

Note. Modified version of Table 3A: Number of day care centers, children per section and children enrolled according to age and sex 2002–2007 (1).

Objectives

THE OBJECTIVE IS to examine whether day care centers with a quality comparable to Swedish conditions have an effect on the cognitive and socio-emotional development of young children. Day care center is defined as care for children that takes place in a care center setting, provided by trained or untrained caregivers. The comparison group is home care, provided by the parents. The exposure factor is attending a day care center facility or being at home in the parent's care during the age period of 12–40 months. The follow-up period was set to at least 12 months.

Method of the Systematic Review

THE PURPOSE OF a systematic review is to synthesize the results from a large number of studies. Studies are identified through data strings in databases and selected for the study by applying criteria, to include only studies with specific methodological designs and/or with other specified methodological features. One important motive behind the criteria is to identify and include high quality studies that increase the possibility of drawing a credible conclusion.

Selection criteria

- Publication in a scientific peer-reviewed journal.
- Examination of the impact of day care centers versus home care on children's cognitive and/or socio-emotional development.
- Some experience of center-based day care between the age of 12 to 40 months.
- Day care centers must be distinguished from other types of child care in the statistical analyses. Studies that combine all types of nonmaternal care (e.g., nannies, child care centers, childminder, etc.) are excluded.
- The design is a longitudinal, randomized or quasi-randomized controlled trial. Cross-sectional studies will be excluded because it harder to make inferences.
- The follow-up period must be at least 12 months.
- Studies from other countries are included if the quality of the day care centers is comparable to that of Swedish day care centers. Studies that report day care centers with a child per caregiver ratio within 14 to 26 per 100 children, and average child per group ratio of about 17 children, are included.
- Studies that include socioeconomic status in the statistical analyses are included.
- Studies based on the same sample and with similar focus will only be referred to once. We will refer to the publication with the longest follow-up time.

Search method

The studies in this review were identified using electronic databases: PubMed, PsycInfo, and SSCI. The search was performed March 25, 2009, and is based on specified search strings (see Appendix 1).

Descriptions of the included studies

The literature search generated 576 hits of which 62 studies were viewed further. A total of 4 studies fulfilled the inclusion criteria and were included in the systematic review.

All studies included were of quasi-experimental design. The sample size in three studies varies between 122 children to 193 children (14–16), and the fourth study is distinguished from the others by its sample size of 1210 children (17). The attrition rate for the studies varies between 16 percent to 21 percent (14–17). The two Swedish studies are based on the same sample (14, 16) although the child outcomes are not the same.

Results

Cognitive and language development

This literature review shows that day care centers benefit the cognitive development of young children in comparison to home care. More time spent in center care arrangements results in higher cognitive and language skills at age 36 months (17) (see Appendix 3 for more details on this study). Further support is found in that day care center arrangements up to 40 months have long-term effects and favors both verbal skills and mathematical ability in 8-year-old children (14) (see Appendix 4). Finally, there was one study with contradictory findings, which showed no beneficial effects from day care centers over home care for 18-month-old children (15) (see Appendix 2).

Socio-emotional development

Regarding the impact of day care center on young children's socio-emotional development, no certain conclusion can be drawn. The NICHD study shows that day care centers have a negative effect on children's socio-emotional development at age 36 months, including lower scores on social skills and more problem behaviors. They also report, however, that more time in center care is associated with more positive interactions with peers at 54 months of age (17) (see Appendix 3 for more details on the study). However, a Swedish study found no long-term effect of day care centers on children's socio-emotional development. That is, there was no difference between day care center and home care with respect to personality development in 8 year olds (16) (see Appendix 5).

An overview of the results is presented in Table 4, below.

Table 4. Outcomes of day care on child development

Reference	Exposure variable	Age when tested	Child outcome	Effect
Cognitive and language development				
Broberg 1997 (14) Sweden	Day care centers versus home care Exposure time was between 16 months and 40 months of age	28, 40, 80, 101 mths	Cognitive development	Yes Center-based day care arrangement favored both verbal ability and mathematical ability in 8 year olds More months in center-based day care before age of 40 months resulted in higher scores on test of cognitive ability than other children
Melhuish 1990 (15) UK	Day care centers versus home care Exposure time was between 9 months and 18 months of age	18 mths	Cognitive and language development	No No difference between home care and center care
NICHD 2006 (17) US	Proportion of time in center care Children attended center care at least one third of the time by 54 months (i.e., 15 mths to 54 mths)	24, 36, 54 mths	Cognitive development	Yes More time in center care is associated with higher cognitive skills at 24 months, language at 36 months, and memory at 54 months
Socio-emotional development				
NICHD 2006 (17) US	Proportion of time in center care Children attended center care at least one third of the time by 54 mths (i.e., 15 mths to 54 mths)	24, 36, 54 mths	Social-emotional adjustment	Yes More time in center care is associated with more positive interactions with peers at 54 months, but also linked to lower scores on social skills at 36 months and more problem behaviors at 36 months
Wessels 1997 (16) Sweden	Day care centers versus home care Care arrangement at 40 mths	28, 40, 80, 101 mths	Personality development	No No difference between home care and center care

Note. The NICHD study is divided into two different domains in the table, viz. cognitive and language development and socio-emotional development (17).

Discussion

Do day care centers have a positive effect on children's development?

The results show that young children benefit from formal child care (i.e., day care center). Cognitive and language development improve with amount of time (i.e., months) in day care centers. This effect remains later into childhood. This suggests that children at day care centers receive advantages over home care children that remain over time.

The most sensitive question regarding formal day care and preschool children is the possible effect on children's socio-emotional development. But the results of this review show that no certain conclusion can be drawn regarding whether early day care center exposure for children up to 40 months is a benefit or detriment to children's socio-emotional development. We do know, however, that cognitive development is also a crucial determinant of socio-emotional development (18). In order to clarify the possible impact of day care centers on young children's socio-emotional development, more high-quality studies of Swedish conditions, comparing home care children with day care center children, are needed. Of special interest are new high quality longitudinal Swedish studies.

Method discussion – the systematic review

Efforts have been made to reduce possible bias. In order to ensure that all relevant studies have been included, several search strings were applied to ensure in turn as little bias as possible. The search strings were also entered in several databases in order to optimize the search. There is, however, always a risk that relevant studies have not been included in the literature search for several reasons. Firstly, if a study has not been published in English, it is not entered into the databases and consequently not included in the review. Secondly, if a study is poorly indexed, it might not be found by the search engine. Thirdly, several interesting studies were excluded because they were cross-sectional, which makes it harder to make causal inferences.

It is also of interest to discuss whether the included studies are reliable. A methodological discussion of the included articles will follow. The Broberg study and Wessel's study were both conducted in the 1980s, when the child per caregiver ratio and child per group ratio were lower in comparison to the corresponding figures

for 2006, 5.1 and 16.7, respectively (14, 16). Negative effects of child per caregiver ratio and child per group ratio on psychological problems have not been demonstrated, however, provided that the staff ratio fell in the interval of 14–26 adults per 100 children and group size was 15–20 children per group (14, 19). We therefore expect that the results from the study conducted in 1980s may still be applicable. The strength of both studies lies in their follow-up times, which show effects that remain on children up to 8 years old and 7 years old, respectively (14, 16).

In the study conducted by Melhuish and colleagues, the children's age at entry may be a bias (15). The youngest children were 9 months old when they entered day care. It should be noted that children at day care centers performed at a lower level on word combinations, but this effect disappeared when total language was added to the model. This finding should also be interpreted with some caution as the day care center group comprised only 32 children. Speculatively, the lack of positive effects of day care centers on the language development of preschool children might depend on the time of the test occasion. The children were only 18 months of age when tested. It has been suggested, for example, that word combinations may be susceptible to environmental influence at 18 months of age (15). We therefore expect that positive effects or negative effects of day care center may appear when the children are older.

The NICHD study measured both cognitive development and socio-emotional development (17). In this study, however, it is difficult to separate the effects from center-based day care from other types of care. The results of this study should therefore be interpreted with caution. Nevertheless, it is a well-conducted, large study that controls for several important factors that might otherwise interfere with the results. The study was therefore included. Results from a test occasion at 54 months are reported in this review, but we are primarily interested in the results that fall within day care center exposure before the age of 40 months. In the NICHD study, the children had been in center-based day care for at least one third of the time by 54 months (i.e., 15 months to 54 months).

One common weakness is that all of the studies included other types of child care in the analyses. We would like to distinguish the effect of day care centers and home care from family day care. Otherwise, other questions arise, such as: Do family day cares influence the findings regarding cognitive development in this review? How do we know that a child who is unable to cope in day care centers enters family day care instead, or that children who already have problems enter family day care initially? In two of the studies, children in family day care and home care appear to perform at the same level with similar SD, except for verbal scores where children in family day care receive lower scores (14, 15). But these children make up only about one fourth of both the home care group and the day care center group, so it is unlikely that they affect the results to any substantial degree (14). In the last study, the groups are poorly described (17).

From a public health perspective, day care centers help to reduce child poverty and are significant for vulnerable children

From a public health perspective, it can be argued that preschool care arrangements facilitate parental work, for both women and men. This benefit gender equality and reduces child poverty and indirectly contributes to improved child health. There is a connection between child poverty and poor developmental outcomes. In other words, the assumption is that increased family socioeconomic status will improve the life chances of the children at risk (20), especially for children from poor families (21).

But children vary in sensitivity, so it is likely that the combination of sensitive children and substandard day care center staff may harm individual children. Unfortunately, there is a lack of studies that show how potentially at-risk children can be identified. However, from a population perspective, to expect that high-quality preschool care (i.e., with planned curriculum, educated caregivers, and guidelines for child-caregiver ratios and group sizes) may make a difference in socio-emotional outcomes during the first 3 years of life in children who have not experienced sensitive parental care. Family factors (i.e., maternal sensitivity, quality of environment, income) are more consistent predictors of children's social-emotional and cognitive outcomes than any aspects of early nonmaternal care experiences, but the quality of child care can be of significance for children who do not receive sensitive care at home (22).

Conclusions

THE RESULTS FROM the literature review show that children who attend day care centers perform at a higher cognitive level in comparison to home care children. This suggests that young children benefit in the long term from center-based day care arrangements. However, this review does not settle the debate of socio-emotional development because, here, the literature is inconclusive.

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Appendix 1. Search strings

Search string Database	Date	Number of hits
PubMed		
1. ("Child Care"[Mesh] OR "Child Day Care Centers"[Mesh]) AND ("cohort studies"[Mesh] OR "Time factors"[Mesh]) AND ("Child development"[Mesh] OR "Language development"[Mesh] OR "Social adjustment"[Mesh] OR "Interpersonal relations"[Mesh])	25 March 2009	248
2. ("Child Care"[Mesh] OR "Child Day Care Centers"[Mesh]) AND parenting[Mesh] AND "Child, Preschool"[Mesh]	25 March 2009	112
PsycINFO		
1. "(CHILD-CARE.DE. OR CHILD-DAY-CARE.DE.) AND (LONGITUDINAL-STUDIES.DE. OR (cohort ADJ studies))"	25 March 2009	101
SSCI		
1. "((longitudinal ADJ studies) OR (COHORT-STUDIES. DE.)) AND ((child ADJ care) OR (DAY-CARECENTER. KP. OR DAY-CARE-CENTER.KP.))"	25 March 2009	115

Appendix 2. Included study: Melhuish 1990 (15)

Child Outcomes: Cognitive development and language development

Exposure variables	Sample and design	Assessment	Control variables	Statistics	Findings	Strengths and limitations
<p>Day care centers versus home care.</p> <p>Amount of time: Mean hours/week in non-parental care: Day care center Mean = 35, SD = 6; Home Mean = 6, SD = 2;.</p> <p>Ratio Mean child/adult ratio: Day care center Mean = 4.6, SD = 1.9.</p>	<p>Participants were recruited from private nurseries, employers of women, health care visitors, and hospital maternity units, in UK.</p> <p>The initial response rate was 86% (see preceding paper (7)).</p> <p>Observed number of children: Day care center n = 32, home n = 57.</p> <p>In this paper: T₁ = 5 months of age (prior to starting day care) T₂ = 18 months.</p>	<p>Interviews with mothers: T₁ = Bayley Scales, psychomotor (PDI) and mental development indices (MDI).</p> <p>T₂ = Bayley Scales MDI, and mothers kept diaries of language utterances.</p>	<p>Reynell Developmental Language Scale was distributed to a subsample.</p> <p>Socioeconomic characteristics (i.e., mean income, parental occupational status, and mother's education category) of study groups (i.e., home, relative, child minder/family day care and nursery/day care center).</p>	<p>Fixed MDI scores and day care group F = 2.66 (3,185), p < .05. The day care center group performed at a higher level and the relative group least. Day care group is no longer significant when MDI at 18 months is regressed against MDI at 5 months, gender, parental education and day care group. Both MDI and day care group are associated with mother's education.</p> <p>Number of single words: Not significant.</p>	<p>Type of day care: No impact on cognitive development at 18 months of age.</p>	<p>Limitations: Small number of children in the day care center group (n = 32).</p> <p>Exposure time is between 9 mths and 18 mths.</p> <p>Strengths: Same type of day care from 9–18 mths of age.</p>

Number of word combinations is related to day care center $\chi^2 = 4.65$, d.f. = 1, $p < .05$. Children in this group perform at a lower level. If responsiveness (“the proportion of a child’s communications which were responded to” p. 866) or total language (“number of language utterances per hr” p. 866) were added to the model, the effect for nursery care was no longer significant.

Appendix 3. Included study: NICHD 2006 (17)

Child Outcomes: Cognitive development and social-emotional development

Exposure variables	Sample and design	Assessment	Control variables	Statistics	Findings	Strengths and limitations
<p>Proportion of time in center care: Compared children with no experience of day care center, with children that had experience of center care at 15, 24 and 36 mths, and with children that had experienced center care arrangement at least one third of the time by 54 mths.</p> <p>Amount of time: Hours in child care: at 15 mths = 18.2 hrs; at 24 mths = 20.1 hrs; at 36 mths = 21.6 hrs; and at 54 mths = 23.7 hrs.</p>	<p>Children were recruited from hospitals located in or near 10 cities, in 1991.</p> <p>15 mths n = 1245; 24 mths n = 1202; 36 mths n = 1210; 54 mths n = 1095.</p> <p>Test occasion: T1 = 15 mths T2 = 24 mths T3 = 36 mths T4 = 54 mths.</p>	<p>Cognitive skills (at 15 and 24 months): Bayley Scales of Mental Development.</p> <p>Language (at 24 and 36 months): Reynell Developmental Language Scales and Preschool Language Scale.</p> <p>School readiness (at 36 months): Bracken Basic Concept Scale School Readiness Composite, Woodcock Johnson Achievement and Cognitive Batteries.</p>	<p>Family background: Ethnicity, maternal education level, income-to-needs ratio (i.e., total family income divided by poverty level income for that family size), partner in household, and maternal psychological adjustment (i.e., maternal depression).</p> <p>Individual characteristics: Child gender.</p>	<p>Cognitive outcome: 15 mths of age: MDI ns; 24 mths of age: MDI d = .20, p < .05; 36 mths of age: school readiness ns; receptive language d = .21, p < .01; expressive language ns; 54 mths of age: memory d = .19, p < .05.</p> <p>Emotional development: 24 mths of age: M social skills ns; M behavior problems ns; CG social skills d = -.28, p < .01; CG behavior problems ns.</p>	<p>More time in center care is associated with modestly higher cognitive skills at 24 months, better receptive language at 36 months, but it was also linked to lower scores of social skills at 24 months and 36 months and related to more behavior problems at 36 months.</p> <p>More time in center care was also associated with better memory and more positive interactions with friends at 54 mths of age.</p>	<p>Limitations: The center care variable was skewed toward zero because many children had little or no time in center care between birth and either 24 or 36 months.</p> <p>* Can not explicitly distinguish day care experience from other types of child care experiences.</p>

Child-adult ratios in centers $M = 5.5$
 Group sizes in centers $M = 10.5$
 (NICHD Early Child Care Research Network. Characteristics and quality of child care for toddlers and preschoolers. *Applied Developmental Science* 2000;4:116-35.).

Social competence (at 24, 36 and 54 mths): Adaptive Social Behavior Inventory, Social Skills Questionnaire, and California Preschool Social Competency Scale.

Behavior problems: Child Behavior Checklist.

Peer relations (at 36 and 54 mths): Observation of three structured play episodes.

Peer relations:
 54 mths of age: positive with friend $d = .21$, $p < .05$.

At 36 mths of age:
 M social skills ns; M behavior problems ns; CG social skills $d = -.18$, $p < .05$; CG behavior problems $d = .20$, $p < .05$.

Peer relation:
 Positive interaction ns; negative interaction ns.

Strengths:
 Adjustment for crucial covariates such as income-to-needs ratio and maternal psychological adjustment.

Large sample.

Appendix 4. Included study: Broberg 1997 (14)

Child Outcomes: Cognitive development						
Exposure variables	Sample and design	Assessment	Control variables	Statistics	Findings	Strengths and limitations
<p>Day care centers versus home care.</p> <p>Amount of time: The total number of months, whether full-time or part-time, spent in center-based day care, family-based day care, and home care. Exposure time up to and including 40 months of age.</p>	<p>In 1982 and 1983, 146 children between 12 and 24 months of age were recruited from waiting lists for public child care in Gothenburg.</p> <p>Recruited: day care centers n = 54; home care n = 59</p> <p>Attrition: n = 24 (12 from day care centers, and 9 from home care).</p> <p>Test occasion: T₁ = 16 months T₂ = 28 months T₃ = 40 months T₄ = 80 months T₅ = 101 months.</p>	<p>Verbal abilities: Objective tests, Griffiths Developmental Scales, and standardized school readiness test.</p> <p>Mathematical abilities: Numerical subscales of the standardized school readiness test, standardized test of mathematical ability.</p>	<p>Family background: Number of siblings, socioeconomic status (Hollingshead scores), quality of the home environment (Caldwell's HOME inventory), paternal involvement (Parental Responsibility Questionnaire).</p> <p>Individual characteristics: Gender, temperament, prior cognitive abilities.</p>	<p>Type of care: ANOVAs on three levels: Home care, family day care, center day care. Revealed significant differences between types of care favoring children in day care center arrangements.</p> <p>Tukey post hoc tests showed that day care center children in phase I (p = .04) and phase II (p = .05) performed at a higher level on the verbal ability tests at 101 months of age than home care children. The same pattern was seen in mathematical ability at 8 years of age.</p> <p>Amount of time: Stepwise regression analyses and predictors are previous verbal and mathematical abilities, inhibition, the quality of home care.</p>	<p>More months in center-based day care before 40 months of age resulted in higher scores on test of cognitive ability than other 8-year old children.</p> <p>There are positive sleeper effects on cognitive development.</p>	<p>Limitation: There is a narrow sampling of social class. The authors suggest that SES is of less predictive importance in Sweden.</p>

Quality of alternative care: A summary measure for the assessments at 16, 28 and 40 months was constructed regarding the group size, child-caregiver ratio and average numbers of hours spent in out-of-home care.

Belsky and Walker (1980) Spot Observation Checklist.

Alternative care, the number of mths in each type of care, children's gender and sibling status.

The analyses will identify the variables that explain the variance in cognitive abilities.

Previous verbal ability (at 40 and 80 mths), higher paternal involvement, and total number of months, accounted for a squared multiple correlation of .36 in verbal ability.

Each variable's contribution: verbal abilities at 40 mths R^2 (.219); verbal abilities at 80 mths (.071); number of mths spent in day care center (.042); and paternal involvement (.037). Model fit of $X^2(5, N = 122) = 4.89, p = .429$.

Mathematical ability at 80 mths, quality of alternative care, inhibition, Checklist.

Strength:
In order to isolate the effect of the day care experience regarding both time and type, children that received both center- and family-based care were studied. There was a control of later group experience, that is, all home care children spent some time in preschool before entering elementary school.

Appendix 5. Included study: Wessels (16)

Child Outcomes: Personality development						
Exposure variables	Sample and design	Assessment	Control variables	Statistics	Findings	Strengths and limitations
<p>Day care center versus home care.</p> <p>Amount of time in day care center (mean hours/week): age 16 mths – mean = 35.69, SD = 5.43; age 28 mths – mean = 35.26, SD = 7.91; age 40 mths – mean = 32.63, SD = 3.52.</p> <p>Caregiver per child ratio: age 16 mths – mean 2.95, SD = .62; age 28 mths – mean = 3.75, SD = 2.34; age 40 mths – mean = 4.29, SD = 2.54.</p>	<p>Participants were recruited from waiting list for public child care facilities, in Gothenburg, Sweden, 1982/1983.</p> <p>Attrition: 16% of total 145 children.</p> <p>Age at test occasion: T₁ = 16 months T₂ = 28 months T₃ = 40 months T₄ = 80 months T₅ = 101 months.</p>	<p>California Child Q-set (i.e., ego-resilience ego-undercontrol, field independence).</p>	<p>Family background: Socioeconomic status (Hollings-head scores which is weighted sum of education and occupation of parents), home environment (HOME Inventory), paternal involvement (full-day diary recalls, and Parental Responsibility Questionnaire).</p> <p>Individual characteristics: Child temperament (Infant Behavior Questionnaire).</p>	<p>Group differences in developmental trends:</p> <p>Figures 1–3 reveal no significant differences between center-based day care and home care.</p>	<p>There was no difference in personality development (i.e., field independence, ego-resilience, ego-undercontrol) between children in home care and children in day care center.</p> <p>Factors such as socioeconomic status, family background, quality of home and out-of-home care did not moderate these results.</p>	<p>Limitation: Only 71 children had stable care arrangement at T₃.</p> <p>Strengths: Pilot test of measurements. Pilot tested the Early Childhood Environment rating Scale in Sweden. Results showed ceiling effects. Counter-balanced with structural interviews and observational measures. Pilot research on Belsky and Walker spot observation checklist revealed sensitivity to enduring aspects of quality.</p>

Number of children in day care center:
age 16 mths – mean = 11.12, SD = 1.88;
age 28 mths – mean = 11.41, SD = 1.95;
age 40 mths – mean = 13.05, SD = 3.63.

Quality of alternative care: number of children, number of care providers, amount of time in out-of-home care, and length of the longest regular day in day care.

Belsky and Walker checklist was distributed at 16, 28 and 40 months of age.

Appendix 6. Excluded studies: With the reasons why these studies did not meet the criteria

Reference	Reason	Database
Albers EM, Riksen-Walraven JM, de Weerth C. Infants' interactions with professional caregivers at 3 and 6 months of age: A longitudinal study. <i>Infant Behav Dev</i> 2007;30:631-640.	Incorrect time period. Examines children 3- and 6 months of age.	SSCI
Aldous J, Mulligan GM. Fathers' child care and children's behavior problems – A longitudinal study. <i>J Fam Issues</i> 2002;23:624-647.	Incorrect focus. Examines the role of the father.	SSCI
Andersson BE. Effects of public day-care: A longitudinal study. <i>Child Dev</i> 1989;60:857-866.	Not possible to separate the effects of center care from family day care. The data on day care arrangement was collected retrospectively.	PubMed Psyc
Andersson BE. Children's development related to day-care, type of family and other home factors. <i>Eur Child Adolesc Psychiatry</i> 1996;5:73-75.	Incorrect focus. Examines the age of entry into day care. No figures or statistics stated. The data is collected retrospectively.	PubMed Psyc
Andersson G. A longitudinal study of children in care. <i>Int J Psychol</i> 2000;35:30-30.	Meeting abstract.	SSCI
Belsky J. Quantity of nonmaternal care and boys' problem behavior/adjustment at ages 3 and 5: Exploring the mediating role of parenting. <i>Psychiatry</i> 1999, 62, 1-20.	Incorrect focus. Examines quantity of nonmaternal care and the mediating role of parenting.	PubMed
Belsky et al. Are there long-term effects of early child care? <i>Child Dev</i> 2007;78:681-701.	Incorrect time scale. Three aspects of child care were measured from birth through 54 months. Too long exposure period.	PubMed
Belsky J. Classroom composition, child-care history and social development: are childcare effects disappearing or spreading? <i>Social Development</i> 2009;18:230-238.	Incorrect focus. Core findings of NICHD studies are summarized and debated. No report of statistical analysis.	SSCI

Reference	Reason	Database
Bowes JM, Wise S, Harrison L, Sanson A, Ungerer J, Watson J, Simpson T. Child care choices: A longitudinal study of children, families and child care in partnership with policy makers. <i>Aust Educ Res</i> 2004;31:69-86.	Incorrect focus. Examines, for example, care arrangement changes and their impact on child development.	SSCI
Broberg A, Hwang CP, Lamb ME, Bookstein FL. Factors related to verbal abilities in Swedish preschoolers. <i>Brit J Dev Psychol</i> 1990;8:335-349.	The same sample and focus as in Broberg, Wessels, Lamb & Hwang (1997) which is included in the review. The latter study is judged to be more robust since it has a longer follow-up time.	Psyc
Brosco JP. Day care for preschool children. <i>Arch Pediatr Adolesc Med</i> 2003;157:956-	Non systematic review. No report of statistical analysis.	PubMed
Burchinal MLM, Ramey C. Type of day-care and preschool intellectual development in disadvantaged children. <i>Child Dev</i> 1989;60:128-137.	Disadvantaged children.	PubMed
Burchinal MR, Clarke-Stewart KA. Maternal employment and child cognitive outcomes: The importance of analytic approach. <i>Dev Psychol</i> 2007;43:1140-1155.	Incorrect approach. Compared two conclusions and discussed the applied method.	PubMed
Burchinal MR, Roberts JE, Nabors LA, Bryant DM. Quality of center child care and infant cognitive and language development. <i>Child Dev</i> 1996;67:606-620.	Incorrect focus. Examines child care quality. Incorrect time period.	PubMed
Burchinal MR, Roberts JE, Riggan R.Jr, Zeisal SA Neebe E, Bryant D. Relating quality of center-based child care to early cognitive and language development longitudinally. <i>Child Dev</i> 2000;71:339-357.	Incorrect approach. Examines how quality of center-based child care affects cognitive and language development.	PubMed
Chin-Queer DS, Scarr S. Lack of early child-care effects on school-age children's social competence and academic achievement. <i>Early Development Parenting</i> 1994;3:103-112.	Incorrect focus. Examines quality of day care.	SSCI
Deater-Deckard K, Pinkerton R, Scarr S. Child care quality and children's behavioral adjustment: A four-year longitudinal study. <i>J Child Psychol Psychiatry</i> 1996;37:937-948.	Incorrect focus. Examines quality of day care.	PubMed Psyc SSCI

Reference	Reason	Database
Deynoot-Schaub MG, Riksen-Walraven JM. Child care under pressure: The quality of Dutch centers in 1995 and in 2001. <i>J Genet Psychol</i> 2005;166:280-296.	Incorrect focus. Examines quality of day care.	PubMed
Deynoot-Schaub MG, Riksen-Walraven JM. Peer interaction in child care centres at 15 and 23 months: stability and links with children's socio-emotional adjustment. <i>Infant Behav Dev</i> 2006;29:276-288.	Incorrect focus. Examines stability of peer interaction. No documentation of caregiver ratio and group size?	PubMed SSCI
Driessen GWJM. A large-scale longitudinal study of the utilization and effects of early childhood education and care in The Netherlands. <i>Early Child Dev Care</i> 2004;174:667-689.	Incorrect focus. Examines special parent-child programs, day care centers and preschools.	Psyc
Duncan GJ, Gibson DCM. Connecting child care quality to child outcomes – Drawing policy lessons from nonexperimental data. <i>Eval Rev</i> 2006;30:611-630.	Incorrect approach. Discusses method and strategies for controlling for biases.	SSCI
Egeland B, Hiester M. The long-term consequences of infant day-care and mother-infant attachment. <i>Child Dev</i> 1995;66:474-485.	Incorrect time scale, i.e., wrong age. Disadvantaged children.	Psyc
Hagekull B, Bohlin J. Day care quality, family and child characteristics and socioemotional development. <i>Early Child Res Q</i> 1995;10:505-526.	Incorrect focus. Examines effects of day care quality in interaction with family characteristics.	Psyc
Haskins R. Public school aggression among children with varying day-care experience. <i>Child Dev</i> 1985;56:689-703.	Disadvantaged children. No documentation of caregiver ratio and group size.	PubMed
Hickman LN. Who should care for our children? The effects of home versus center care on child cognition and social adjustment. <i>J Fam Issues</i> 2006;27:652-684.	Poor control of day care quality. Group size is included in the analyses but the mean size is not reported. In addition, lack of caregiver ratio. The age is not specified (the year prior to kindergarten).	SSCI
Howell MC. Effects of maternal employment on the child. II. <i>Pediatrics</i> 1973;52:327-343.	Review from 1973. The studies are too old.	PubMed
Howes C. Can the age of entry into child care and the quality of child care predict adjustment in kindergarten? <i>Dev Psychol</i> 1990;26:292-303.	Incorrect focus. Examines the effect of age of child-care entry and the quality of care.	Psyc

Reference	Reason	Database
Howes C. A comparison of preschool behaviors with peers when children enrolled in child-care as infants or older children. <i>J Reprod Infant Psychol</i> 1991;9:105-115.	Incorrect focus. Examines age enrolled in child care.	Psyc
Howes C. Social-emotional classroom climate in child care, child-teacher relationships and children's second grade peer relations. <i>Soc Dev</i> 2000;9:191-204.	Incorrect focus. Examines social-emotional classroom climate.	SSCI
Keane SP, Calkins SD. Predicting kindergarten peer social status from toddler and preschool problem behavior. <i>J Abnorm Child Psychol</i> 2004;32:409-423.	Incorrect focus. Examines kindergarten peer social status.	PubMed
Lamb ME, Hwang C-P, Broberg A, Bookstein FL. The effects of out-of-home care on the development of social competence in Sweden: A longitudinal study. <i>Early Child Res Q</i> 1988;3:379-402.	The variables we are interested in are cross-sectional.	Psyc
Loeb S, Bridges M, Bassok D, Fuller B, Rumberger RW. How much is too much? The influence of preschool centers on children's social and cognitive development. <i>Econ Educ Rev</i> 2007;26:52-66.	No documentation of caregiver ratio and group size. Cross-sectional.	SSCI
Maccoby EE, Lewis CC. Less day care or different day care? <i>Child Dev</i> 2003;74:1006-1020.	Incorrect approach. Policy options are examined.	PubMed
Magnuson KA, Ruhm C, Waldfogel J. Does prekindergarten improve school preparation and performance? <i>Econ Educ Rev</i> 2007;26:33-51.	Incorrect focus. Examines various kindergartens. No documentation of caregiver ratio and group size.	SSCI
Magnuson KA, Ruhm C, Waldfogel J. The persistence of preschool effects: Do subsequent classroom experiences matter? <i>Early Child Res Q</i> 2007;22:18-38.	Incorrect focus. Examines class size and the level of academic instruction provided.	SSCI
Melhuish EC, Mooney A, Martin S, Lloyd E. Type of childcare at 18 months—I. Differences in interactional experience. <i>J Child Psychol Psychiatry</i> 1990;31:849-859.	No follow-up.	PubMed

Reference	Reason	Database
McCutcheon B, Calhoun KS. Social and emotional adjustment of infants and toddlers to a day care setting. <i>Am J OrthoPsychiatry</i> 1976;46:104-108.	Incorrect focus. Examines adjustment to day care.	PubMed
NICHD Early Child Care Research Network. Child care in the first year of life. <i>Merrill Palmer Q</i> 1997;43:340-360.	Incorrect time period. Examines child care in the first year of life.	Psyc
NICHD Early Child Care Research Network. Relations between family predictors and child outcomes: Are they weaker for children in child care? <i>Dev Psychol</i> 1998;34:1119-1128.	Incorrect focus. Examines family factors as predictors of child outcomes.	PubMed
NICHD Early Child Care Research Network. Child care and children's peer interaction at 24 and 36 months: The NICHD Study of Early Child Care. <i>Child Dev</i> 2001;72:1478-1500.	Combined all types of nonmaternal care. No control group.	PubMed
NICHD Early Child Care Research Network. Nonmaternal care and family factors in early development: An overview of the NICHD Study of Early Child Care. <i>J Appl Dev Psychol</i> 2001;22:457-492.	All non-maternal care is combined in the analyses.	SSCI
NICHD Early Child Care Research Network. Early child care and children's development prior to school entry: Results from the NICHD Study of Early Child Care. <i>Am Educ Res J</i> 2002;39:133-164.	Incorrect age span. Combined 3 months of age up to 4-5 years in the analyses.	SSCI
NICHD Early Child Care Research Network. Does quality of child care affect child outcomes at age 4(1/2)? <i>Dev Psychol</i> 2003;39:451-469.	Incorrect focus. Examines the quality of care.	PubMed SSCI
NICHD Early Child Care Research Network. Does amount of time spent in child care predict socioemotional adjustment during the transition to kindergarten? <i>Child Dev</i> 2003;74:976-1005.	Does not distinguish different types of child care. Examines time in a variety of nonmaternal care situations.	PubMed
NICHD Early Child Care Research Network. Nonmaternal care and family factors in early development: An overview of the NICHD Study of Early Child Care. <i>J Appl Dev Psychol</i> 2003;22:457-492.	No statistics are stated.	SSCI

Reference	Reason	Database
NICHD Early Child Care Research Network. Social functioning in first grade: Associations with earlier home and child care predictors and with current classroom experience. <i>Child Dev</i> 2003;74:1639-1662.	The outcome variable is insufficient and there is no control group. Examines time spent in day care.	PubMed
NICHD Early Child Care Research Network. Are child developmental outcomes related to before- and after-school care arrangements? Results from the NICHD Study of Early Child Care. <i>Child Dev</i> 2004;75:280-295.	Incorrect focus. Examines leisure time activities before and after school.	SSCI PubMed
NICHD Early Child Care Research Network. Predicting individual differences in attention, memory, and planning in first graders from experiences at home, child care, and school. <i>Dev Psychol</i> 2005;41:99-114.	Proportion of time in center care (i.e., three periods of center care, from 6-15, 15-24, to 24-36 months where the primary care was center care). Does not distinguish the effects of center care. Hours in child care (nonmaternal care).	PubMed
Peisner-Feinberg ES et al. The relation of preschool child-care quality to children's cognitive and social developmental trajectories through second grade. <i>Child Dev</i> 2001;72:1534-1553.	Incorrect focus. Examines how child-care quality affect children's cognitive and social development.	PubMed
Pfizer L. The critical issue of quality child care. <i>W V Med J</i> 2005;101:206-207.	Incorrect focus. Examines day care quality.	PubMed
Pierrehumbert B, Ramstein T, Karma-niola A, Halfon O. Child-care in the preschool years – Attachment, behavior problems and cognitive development. <i>Eur J Psychol Educ</i> 1996;11:201-214.	Does not distinguish different types of nonmaternal child care. No documentation of caregiver ratio and group size.	SSCI
Pinol-Douriez M, Hurtig MC, Colas A. Interactions of infants with adults in day care centers. Evolutive dependencies vs. counter-evolutive risks and characteristics of the mother-infant relationship. <i>Psychiatr Enfaut</i> 1993;36:177-252.	Article in French.	PubMed
Rezende MA, Beteli VC, dos Santos JL. Follow-up of the child's motor abilities in day-care centers and pre-schools. <i>Rev Lat Am Enfermagem</i> 2005;13:619-25.	Incorrect focus. Examines motor abilities in day care centers.	PubMed
Rubenstein JL, Howes C, Boyle P. A two-year follow-up of infants in community-based day care. <i>J Child Psychol Psychiatry</i> 1981;22:209-218.	Lack of full text.	PubMed

Reference	Reason	Database
Schwartz P. Length of day-care attendance and attachment behavior in eighteen-month-old infants. <i>Child Dev</i> 1983;54:1073-1078.	Incorrect focus. Examines the length of daily separation.	PubMed
To T, Cadarette SM, Liu Y. Child care arrangement and preschool development. <i>Can J Public Health</i> 2000;91:418-422.	Cross-sectional.	PubMed
Votruba-Drzal E, Li-Grining CP, Maldonado-Carreno C. A developmental perspective on full- versus part-day kindergarten and children's academic trajectories through fifth grade.	Incorrect approach. Compare full- versus part-day kindergarten.	PubMed
Wessels H, Lamb ME, Hwang CP. Cause and causality in daycare research: An investigation of group differences in Swedish child care. <i>Eur J Psychol Educ</i> 1996;11:231-245.	Incorrect approach. Discusses how to avoid the misinterpretation of group differences due to pre-selection effects or confounding variables.	Psyc SSCI

In Sweden it is common that both parents work, full- or part-time. Most children whose parents work are enrolled in day care centers. In 2008, the Swedish government introduced a child-raising allowance to enable parents to stay at home with their children after the standard period of paid parental leave has ended. With this as a background, the Swedish National Institute of Public Health conducted a literature review in order to examine what is the best for the child in the preschool years between 12-40 months of age. Child outcomes from day care centers versus home care experiences were captured using measures of cognitive and socio-emotional development.

This report is written mainly for politicians in municipalities, heads of day care centers and/or people working with or administrators of preventive health care. It is hoped that this report may also be of interest to voluntary associations and parents as well.

The Swedish National Institute of Public Health develops and conveys knowledge for better health



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