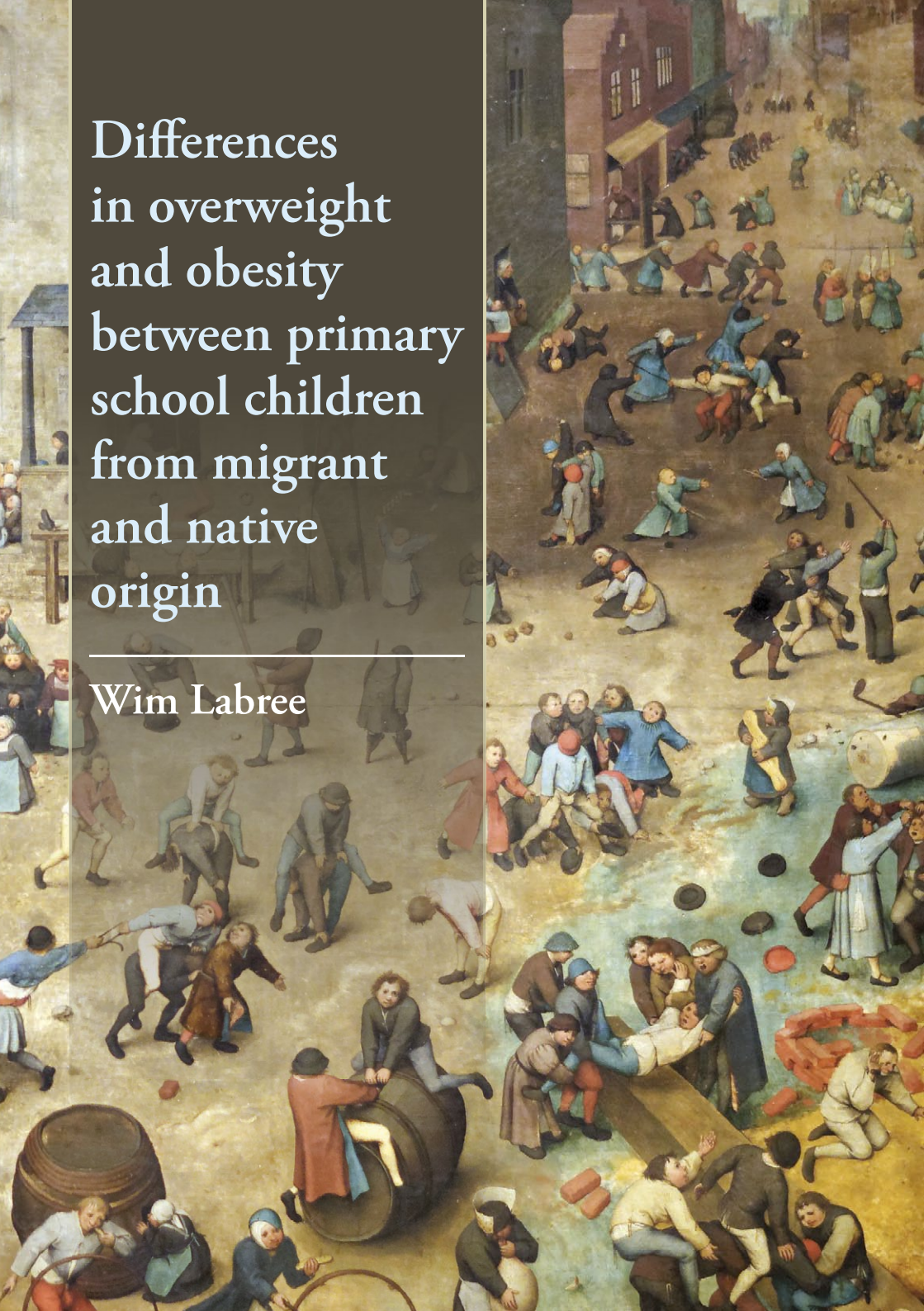
Differences in overweight and obesity between primary school children from migrant and native origin

Wim Labree



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Differences in Overweight and Obesity between Primary School Children from Migrant and Native Origin

Overgewicht en obesitas op de basisschool: verschillen tussen kinderen van migranten en autochtone kinderen

Proefschrift

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CONTENTS

Misschien tot morgen,
misschien ben je weg.
Er zit iets in je dat je zegt of het tijd is,
tijd om weg te gaan.

(BLØF)

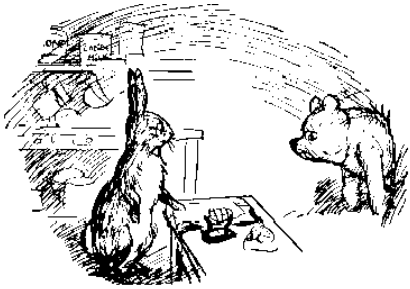
Now, by this time Rabbit wanted to go for a walk too, and finding the front door full, he went out by the back door, and came round to Pooh, and looked at him.

(…)

"The fact is," said Rabbit, "you're stuck."

"It all comes," said Pooh crossly, "of not having front doors big enough."

"It all comes," said Rabbit sternly, "of eating too much. I thought at the time," said Rabbit, "only I didn't like to say anything," said Rabbit, "that one of us was eating too much," said Rabbit, "and I knew it wasn't *me*," he said.



(writing: A.A. Milne; drawing: E.H. Shepard)

Chapter 1

General introduction

(painting: 'Kinderspelen' by Pieter Bruegel – around 1560)

BACKGROUND

The term 'globesity', as once introduced by the World Health Organization (WHO), refers to the escalating global pandemia of obesity, the most severe form of overweight, which is affecting both western, and non-western countries. Worldwide, the prevalence of overweight and obesity has increased dramatically the latest years[1]. According to the WHO, more than one out of ten adults was overweight or obese in the year 2010. If trends continue, by the year 2030, 60% of the world's population, which is about 3.3 billion humans, could be overweight or obese[2].

This growing trend is also seen in Europe[3]. In many European countries, the prevalence of overweight and obesity has tripled since the 1980s. Nowadays, overweight is affecting 50% of the adult population in the majority of countries within the European Region. Additionally, the percentage of affected individuals is still rising[4].

Public health is severely threatened by these rising prevalence rates. Overweight and obesity are one of the most leading causes of illness, disability, and even death, as it is associated with serious health problems, such as cardiovascular diseases and various types of cancer[5-6]. Apart from the negative effects on health and quality of life, overweight and obesity are responsible for a substantial economic burden[7]. Expenses rise curvilinear with increasing Body Mass Index (BMI), as a consequence of direct costs, due to healthcare utilization, and indirect costs, due to productivity loss[8].

The huge overweight and obesity increase is not only restricted to adults[9]. In fact, childhood overweight, including obesity, is recognized by the WHO as a health challenge of the 21st century[10]. Prevalence rates among school age children are high in various countries in Europe and these rates are not rising at a constant level year-on-year, but are accelerating[11].

In addition to the health consequences stated before, overweight and obesity in childhood negatively affect self-confidence, the social development, and the cognitive development of these children[12]. Children with weight problems are more often treated adversely and visit the general practitioner more frequently, which is thought to be related to their weight[13]. Further, symptoms that once were seen primarily in adults, such as hypercholesterolemia, hypertension, and insulin resistance, now are observed more among young people[14]. Over time, childhood overweight often develops into adolescent obesity[15]. To end with, as parental overweight is regarded as a risk factor for overweight in future posterity,

the latter might also develop overweight, once these adolescents have become adults and are raising children of their own[16].

Overall, according to a European review, obesity is more common among Turkish and Moroccan migrant groups than among native populations[17]. Other cardiovascular risk factors, for example high-density lipoprotein cholesterol or diabetes mellitus, also seem to have spread unevenly among ethnic groups. Similarly, both prevalences of overweight and obesity, and BMIs are highest among children from migrant descent, as compared to the native population[18].

Figures from the Netherlands in 2009-2010 point out that 13.3% of Dutch boys and 14.0% of Dutch girls, aged 2-21 years old, is overweight. In the same age category, obesity is seen in 1.8% of boys and 2.2% of girls in the Netherlands[19]. Differences can be seen in overweight and obesity between native Dutch children and children in the two largest migrant groups within this country: those from Turkish and Moroccan origin[20]. Percentages in overweight and obesity among Turkish children (28%) and Moroccan children (26%) are about two times higher than among native children (13%). Although recent rates from the Netherlands show that overweight and obesity prevalence in children, overall, are declining, Turkish children show a stabilising trend[21]. The question arises which underlying mechanisms influence these apparent elevated rates among migrant children, as compared to their indigenous counterparts.

Overweight is the result of an excess of energy intake on energy expenditure, during a longer period of time[22-23]. The etiology of childhood overweight and obesity is regarded as multidimensional, in which genetic, biological, and environmental factors play a key role[24].

In Figure 1, the etiology of childhood overweight and obesity is presented as an ecological model with different layers influencing child weight status[25]. As can be seen, apart from child characteristics, such as gender and age, and child risk factors, for example physical activity and dietary intake, family characteristics in the home environment are involved. These characteristics include weight status of the parents, an important risk factor for overweight in children, and parenting styles, like the role modeling that parents display or policies they practice regarding specific types of lifestyle behavior. Furthermore, characteristics in the community, such as the neighborhood or the school, and demographic and societal characteristics, for example ethnicity and socio-economic status, play a role. Besides the above named characteristics and risk factors, short sleep duration as an independent behavior is also associated with higher frequencies of overweight and obesity[26-27].

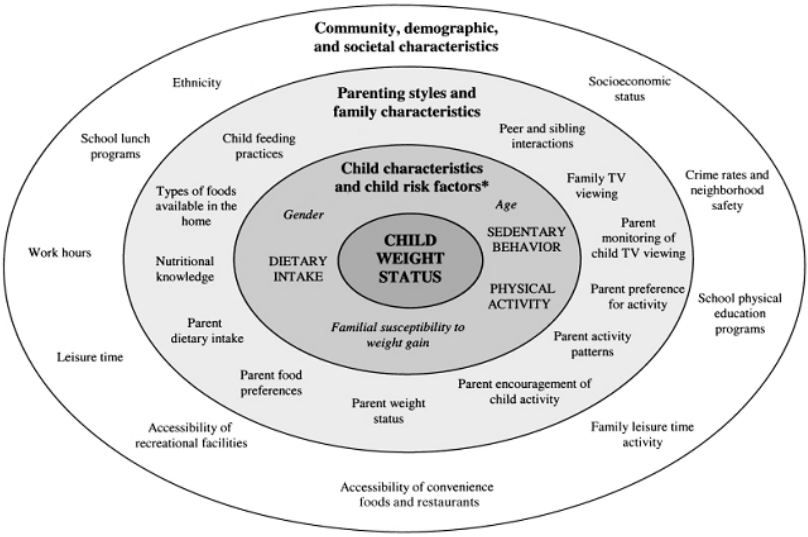


Figure 1. Ecological model: predictors of childhood overweight and obesity

Parental weight status is, as earlier mentioned, an important risk factor for overweight in their children, partly as a result of non-modifiable genetic and biological factors, but it might also be the result of potentially modifiable home environments. Indeed, the home environment is documented as one of the main settings that influences lifestyle behaviors[28]. Caregivers play a key role in the development of the physical and social home environment[29]. In this so-called obesogenic environment, limited physical activity, unhealthy dietary intake, or low sleep duration is probably enhanced. In the physical environment, both availability, and accessibility, for example with regard to food, affect dietary intake[30-31]. In the social home environment, the behavior that the parents display themselves, for example regarding exercise, can be considered as a role model for their children. Besides parental modeling, parental policies and parenting styles are important, for example, by encouraging and prompting children to be physically active[32-33].

Migrants are likely to have lower socio-economic positions, also in the Netherlands, which may shape the physical environment[34]. Socio-economic status can influence lifestyle behaviors both in themselves, as well as in their children, thus, affecting the social home environment[35]. However, some studies show that

the influence of socio-economic factors on overweight and obesity remains unclear, as this association was not consistent within different regions in Europe[36].

In the last decades, many European countries have shifted to immigrant societies and, as a consequence, have experienced large changes in their population structure[37]. These changes may alter lifestyle in migrants as they over time, for example, engage in a more sedentary way of life and adopt westernized dietary patterns[38-39]. Migration to western societies and especially acculturation seems to increase the risk of overweight and obesity[40]. If migrants tend to adopt a western lifestyle, this might offer an explanation why the prevalence of overweight and obesity rises among migrant groups. However, these adaptations do not explain why the percentage of overweight and obese children rises even more among migrant groups, as compared to the native Dutch population.

AIM

Little is known about the ethnic differences in modifiable factors affecting overweight and obesity. This thesis focuses on differences in overweight and obesity between migrant and non-migrant primary school children. Also, this thesis tries to explain these differences by differences in the physical home environments and the social home environments of these children, which may influence behaviors, associated with overweight and obesity.

The conceptual model of this thesis is presented in Figure 2. The explanation of differences in overweight and obesity between native and migrant primary school children in the Netherlands is sought in specific behavior of these children: physical activity, dietary intake, and sleep duration. Migrant background is not considered as a factor that directly can explain possible differences. It is hypothesized that these behaviors differ by migrant status, and can partially explain differences in overweight and obesity among children from migrant and native origin. In addition, as migrants in the Netherlands often have lower socio-economic positions, as stated before, we correct for these positions in our explanation of ethnic difference.

Aim of this thesis is to gain knowledge on modifiable factors affecting overweight and obesity. This knowledge is needed to design effective prevention and treatment programmes, in order to reduce the magnitude of this universal 'globesity' problem.

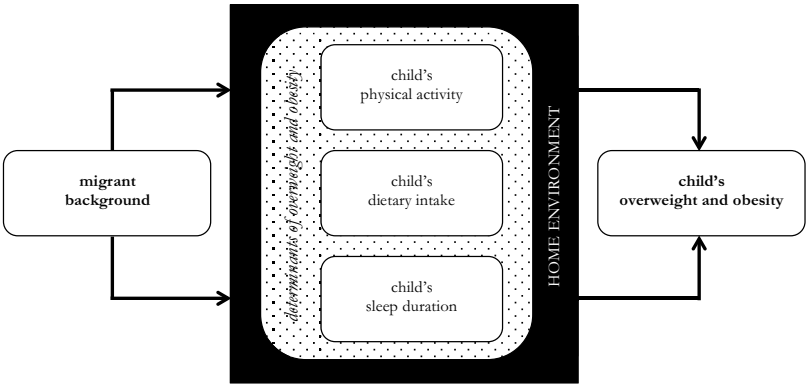


Figure 2. Conceptual model for this thesis

Main research aims are:

1. Are there differences in the prevalence of overweight and obesity between primary school children from migrant and native Dutch origin?
2. Can differences in overweight and obesity between migrant and native Dutch children be explained by differences in the levels of physical activity, dietary intake, and sleep duration of the children?
3. Does the home environment contribute to differences in these behaviors?

METHODS: THE INPACT STUDY

For this thesis, data of the IVO Nutrition and Physical Activity Child CohorT (INPACT) study were used. This study is a collaborative project between the Institute of Health Policy and Management, a department of the Erasmus University Rotterdam, and the IVO Addiction Research Institute in Rotterdam.

In this study, factors in the obesogenic environment within the developmental trajectory of weight are studied. Subjects are Dutch primary school children from the age of 8-9 years old (group 5 of Dutch primary schools). A total of 101 schools took part in the study. Children were followed with another three waves until the age of 11-12 years old (group 8 of Dutch primary schools). All results, described in this thesis, are derived from cross-sectional data of the first wave, during the school year of 2008/2009.

Our study population consisted of children of parent-child dyads. These dyads were recruited from primary schools in two cities and adjacent municipalities in the Netherlands: Eindhoven and Rotterdam. Eindhoven is the fifth largest Dutch city, about 200,000 inhabitants; Rotterdam is the second largest Dutch city, about 600,000 inhabitants. Children from different migrant backgrounds, both western, and non-western descent, live in these cities.

A total of 1943 primary school children and their primary caregiver participated in this study. The study population consisted of 970 boys and 973 girls. Overall, the mean age of the children was 8.2 years old (SD = 0.49). Participation in this study was on the basis of informed consent.

Socio-economic position of the family was based on the educational level of the parent that achieved the highest level within the household and was divided into three categories: 25.9% low (primary school, lower vocational or general education), middle 36.6% (secondary school, intermediate vocational school), and high 37.4% (higher vocational school or university).

The percentage of migrant children within our population was 25.7%. Children were considered as having a migrant background, when at least one of their parents was born outside the Netherlands, according to current Dutch practice[41]. On the basis of this Dutch Statistics classification, we have distinguished five groups in our sample: native Dutch children ($n = 1546$), children among the two largest migrant groups within this country, which have a Turkish background ($n = 93$) and a Moroccan background ($n = 66$), and two supplementary groups, consisting of children from a range of countries, other than Turkey and Morocco, labelled 'other non-western children' ($n = 105$), and from a range of western countries, other than the Netherlands, labelled 'other western children' ($n = 133$).

The children were visited at their primary schools for determining the anthropometric measurements. Weight and height of the children were carried out by trained raters. Afterwards, the BMI was determined. BMI is recognized as a universal measure for ascertaining overweight and obesity and is calculated as weight in kilograms divided by the square of height in meters. Whereas in adulthood a BMI between 25.0 and 29.9 is defined as overweight and a BMI higher than 30.0 as obesity, BMI in childhood changes substantially with age. Therefore, the international reference standard by the International Obesity Task Force (IOTF) was used, based on age and sex related cut-off points[42].

Furthermore, the primary caregiver of the child, mostly the mother, was asked to fill out the questionnaire. The questionnaire included a general part,

in which questions on the child's age and sex, parental educational level, and parental BMI were asked, and a more specific part, in which measure instruments concerning specific behaviors, which are the central issues in this study, were questioned.

The study has received the approval from the medical ethics committee of the Erasmus MC, University Medical Center Rotterdam. Participation in this study was on the basis of informed consent by the primary caregivers of the children.

OUTLINE

This general introduction forms the opening part of this thesis, followed by six chapters, in which the literature findings and the empirical data from the INPACT study are presented, described, interpreted, and discussed.

Each chapter refers to one the following six questions:

A. What is the prevalence of overweight and obesity among children from migrant and native origin in Europe?
B. Are there differences in the prevalence of overweight and obesity and in the BMIs of primary school children from migrant and native origin in the Netherlands? And is socio-economic position, based on educational level of the parents, associated with these differences?
C. Are there differences regarding the levels of physical activity between children from migrant and native Dutch origin? And, if there are differences, which home environment aspects (physical environment: availability, accessibility; social environment: parental role modeling, parental policies) contribute to these differences?
D. Are there differences with regard to dietary intake between children from migrant and native Dutch origin? And, if there are differences, which home environment aspects (physical environment: availability, accessibility; social environment: parental role modeling, parental policies) contribute to these differences?
E. Are there differences regarding the sleep duration between children from migrant and native Dutch origin? And, if there are differences, in which degree do parenting styles (rejecting style, neglecting style, permissive style, authoritarian style, authoritative style) contribute to these differences?

F. Can differences in overweight and obesity among children from migrant and native origin be explained by differences in the levels of physical activity, dietary intake, and sleep duration?

Chapter two is the result of a systematic review of the European literature, which was performed in order to discuss literature about differences in the prevalence of overweight and obesity among children from migrant and native origin within Europe. The subsequent chapters three to seven continue with the results of empirical data, as obtained from the INPACT study, in which each chapter centralizes a separate research question. This thesis ends with a general discussion in chapter eight. In this discussion section, a summary of the results from this project is provided, on basis of the conclusions of the former chapters and in relevance to the main research aims of this thesis. Finally, limitations and implications of these findings are discussed.

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ORBIS TERRARVM NOVA ET ACCVRATISSIMA TABVLA.
auctore
PETRO GOOS.
AMERICA SEPTENTRIONALIS.
Circulus Arcticus.
Tropicus Cancri
MAR DEL NORT.
MAR DEL ZVR.
Circulus Æquinoctialis.
AMERICA MERIDIONALIS.
Tropicus Capricorni.
MARE PACIFICVM.
Circulus Antarcticus.
AVSTRALIS INCOGNITA.
Ladrones
NOVA FRANCIA
LA FLORIDA
MEXICANVS SINVS
GVIANA
Rio de la Plata
Fretum Magellanicum
ZEELANDIA NOVA
Baffins Bay
Laborador
ISLANDIA.
CATHAIA

Chapter 2

Differences in overweight and obesity among children from migrant and native origin: a systematic review of the European literature

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(drawing: 'Orbis terrarum' by Pieter Goos – around 1666)

ABSTRACT

To review the prevalence regarding overweight and obesity among children and adolescents from migrant and native origin within Europe, a systematic review (1999-2009) was performed, using Embase, PubMed, and citation snowballing. Literature research resulted in 19 manuscripts, reporting studies in 6 countries, mostly situated in Western and Central Europe.

From this review, it appears that, in most of the European countries for which data are available, especially non-European migrant children are at higher risk for overweight and obesity than their native counterparts. The prevalence of overweight in migrant children ranged from 8.9% to 37.5%, and from 8.8% to 27.3% in native children. The prevalence of obesity in migrant children ranged from 1.2% to 15.4%, and from 0.6% to 11.6% in native children. Some limitations of the review are discussed, especially the problematic classification of migrant and native children.

Apparently, migrant children display an even more sedentary way of life or adverse dietary patterns, as compared to native children. To what degree these differences can be explained by socio-economic and cultural factors remains to be investigated. As overweight and obese children are at risk for many chronic health problems, further research is urgently needed in order to develop preventive interventions.

Keywords

Child Health; Overweight; Obesity; Transients and Migrants; Europe.

INTRODUCTION

Over the last decade, the prevalence of overweight and obesity among children and adults has risen in the Western world, also in Europe[1-2]. Compared to the increasing overweight prevalence in adults, the international rise in overweight children even seems to have a faster rate[3-4].

Overweight and obesity are associated with various serious health consequences, such as cardiovascular disease, diabetes mellitus, and cancer[5]. With the obesity increase among children and adolescents, conditions that first were seen primarily in adults now are becoming more prevalent among younger people, such as insulin resistance, hypertension, and hypercholesterolemia[6]. Furthermore, child overweight affects self-esteem and influences the social and cognitive development of these children[7]. Apart from these negative effects on health and quality of life, obesity appears to be responsible for a substantial economic burden in many European countries[8].

In general, obesity in childhood is a persisting health problem in adulthood. Already more than a decade ago, Dietz[9] argued that child obesity has a great chance of remaining at a later stage in life. Hence, the persistence of obesity from young ages emphasizes the importance of developing specific interventions at an early life phase to prevent long-term health damage in the future[10].

In the past 50 years many European countries have shifted to immigrant societies. Due to the independence of former colonies, the educational opportunities, and the need for cheap labor forces, sometimes combined with political reasons in the native country, several migration flows, towards and within Europe, took place. Therefore, European countries have experienced large changes in the composition of their populations[11].

Many migrants have ended up in disadvantaged positions with regard to their health[12]. In particular, the risk of diabetes type 2 and coronary heart disease is elevated among certain migrant groups[13-15]. Migration to Western societies seems to increase the risk of overweight and obesity[16], especially as a consequence of alterations in lifestyle. Migrants tend to engage in a more sedentary way of life, abandon their traditional food habits, and adopt westernized dietary patterns[17-19]. Additionally, migrants coming from less developed countries may entail pre-migration cultural preferences for larger body sizes, as these sizes are considered as signs of health and wealth[20-22]. These body preferences may be easier to obtain within the new environment of affluence in the host countries.

A large amount of studies have been published on overweight and obesity, in relation to ethnicity and migration. In a review by Ogden et al.[23] for example, especially African-American and Mexican-American youth in the United States were at increased risk for overweight. No difference was made between more recent migrants and subjects, whose ancestors migrated. In contrast to traditional immigrant societies, such as the United States and Canada, large scale migration to Europe is a post-second World War phenomenon. Consequently, migrant groups residing in these continents may be incomparable.

Study aim

Although overweight and obesity are important research topics worldwide, also in relation to ethnicity and migration, no previous systematic reviews have focused on differences in overweight and obese children and adolescents. Therefore, the aim of this review was to determine the prevalence regarding overweight and obesity among migrant children and adolescents, as compared to the native population, within Europe.

METHODS

Search strategy

The terminology with respect to migrant and ethnic groups is controversial. Classification often reflects the migration history, the political climate concerning migration and integration, and the legislation with regard to citizenship. These definition problems complicate a literature search. Therefore, a qualified librarian helped to design a comprehensive and sensitive search strategy.

Relevant literature was obtained from the following computerized databases: Embase and PubMed. Also, records were identified through citation snowballing. Searches were performed by using the official Medical Subject Headings (MeSH) or Subheadings (Sh). Entry terms were: overweight (MeSH) or obesity (MeSH); transients and migrants (MeSH), ethnic groups (MeSH), or ethnology (Sh); Europe (MeSH).

Although we wanted to involve only children and adolescents, defined as younger than 18 years old, the age of study participants was deliberately not specified in the search strategy. Because some research articles, which may not use children as entry term, do report on both children, and adults, we did not

want to exclude these studies a-priori. Studies that did not report on children and/or adolescents separately were not included.

To ensure high sensitivity when retrieving studies, reference lists of all relevant identified articles were examined to discover other studies that were not indexed by the above databases. No language restrictions were imposed. All entry terms were 'truncated' and 'exploded' to cover as many articles as possible.

Inclusion and exclusion criteria

Manuscripts published between January 1999 and December 2009 were preselected in this review. Only articles, which contained empirical studies regarding the prevalence of overweight and/or obesity, according to migrant status, were included. In order to allow for comparisons, data on the majority group had to be present.

Genetic biomedical literature was excluded, since these studies did not meet the aim of this review. Furthermore, editorials and position statements were not included. Also articles, in which cross-cultural comparisons between countries were conducted, were excluded. Equally excluded, were articles describing specific indigenous ethnic groups, which cannot be considered as migrants (e.g., Sami) or as recent migrants (e.g., Roma). Finally, articles on adoptees or asylum seekers were not included.

Review procedures

This systematic review was performed in two stages. In the first selection phase, two independent reviewers (WL and MF) evaluated each title and abstract applying the inclusion and exclusion criteria. Abstracts were excluded from further analysis if both reviewers agreed that they did not meet the criteria of this review. Studies that did not permit selection or rejection were considered after obtaining the full text. In the second selection phase, full-text articles of included abstracts were obtained and evaluated by both reviewers. Afterwards, Cohen's kappa was calculated to assess interrater agreement during the two phases. Disagreements about inclusion and exclusion were resolved by consensus. When several publications were written by the same (group of) author(s) on base of an identical research sample, the article, which described the results in most detail, was chosen.

Study comparisons

The Body Mass Index (BMI), calculated as weight in kilograms divided by the square of height in meters, was used to assess overweight and obesity. The International Obesity Task Force (IOTF) has developed an international reference standard to define overweight and obesity in children. This standard is based on pooled data from six national growth surveys: sex and age specific cut-off values[24].

Most studies included in this review make use of this IOTF classification. If not, this is indicated in the overview table (see results section). Some studies applied both the IOTF cut-off points, and locally determined cut-off points. In that case, only IOTF results have been included in this review, in order to be comparable with the data from the other studies. In most studies, overweight included obesity. When overweight percentages did not include obesity, overweight percentages, including obesity, were calculated by the first author.

RESULTS

Results of our literature search are presented in Figure 1. After correcting for duplicates, we identified 684 articles using our search criteria.

Based on the information contained within article abstracts, 617 articles were excluded for not meeting the inclusion criteria. Cohen's kappa for stage one of the search was 0.85, which can be regarded as high (92% agreement). A further 48 articles were rejected in stage two of the search, based on a review of the full-text manuscripts by two reviewers. This resulted in 19 manuscripts being retained for evaluation. Interrater reliability for stage two of the search was good (Cohen's kappa 0.76; 89% agreement).

The main results of our review are summarized in Table 1. For each manuscript, besides the country name (column 1), the surname of the first author and relevant years (column 2), the study location, the study setting and the included age group(s) are presented in column 3. Information on study type, sample size, and sampling method is displayed in column 4. Column 5 summarizes the main aim(s) of each study. Most studies had a purely descriptive aim. Studies were considered as descriptive when their aim was to present data on overweight and obesity, according to basic characteristics, such as age, sex, and migrant background. These studies did not intend to explain differences between native and non-native children, even when data on socio-economic position were available.

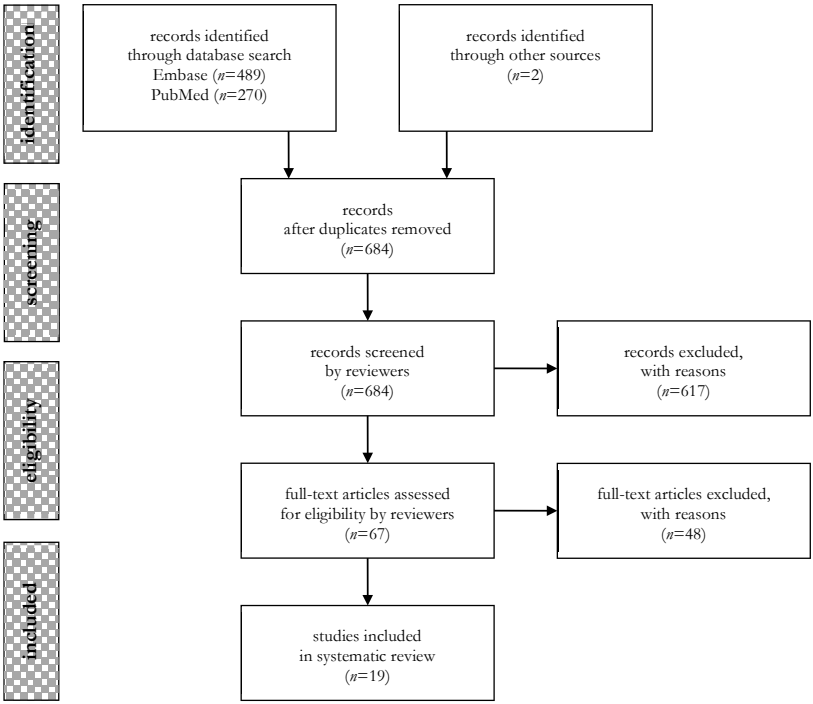

Figure 1. Flow chart of search results

In addition, trend studies, aiming to show differences in time, were also categorized as descriptive. Moreover, most of these studies did not provide longitudinal data, according to migrant status. Therefore, we ultimately extracted cross-sectional data from these studies. Column 6 informs about the applied BMI cut-off classification system. As mentioned before, usually the IOTF standard has been used. However, exceptions are mentioned in this column. In column 7, definitions and criteria, according to which the migrant and ethnic groups have been defined and categorized, are described. Column 8 provides information on the analysis: (a) whether differences between migrant and native groups have been tested and (b) whether overweight and obesity figures have been adjusted for differences in socio-economic status. Finally, column 9 shows the migrant and ethnic groups for which data on overweight and obesity are presented in columns 10 and 11.

Table 1. Overview results European literature (1999-2009)

1	2	3	4	5	6	7	8	9	10			11		
country	**surname first author (date of field-work, date of publication)**	**a. study location b. study setting c. age group(s)**	**a. study type b. sample size c. sampling method**	**main study aim(s)**	**BMI cut-off classification system**	**definition or criteria regarding migrant and ethnic group(s)**	**a. differences between migrants and natives tested? b. differences in socio-economic position adjusted?**	**migrant and ethnic group(s)**	**overweight, including obesity, % (95% CI)**			**obesity, % (95% CI)**		
									overall	**boys**	**girls**	**overall**	**boys**	**girls**
Denmark	Aarup (2002-2003, 2008)	a. city (Aalborg) b. the municipality of Aalborg c. 3 years	a. cross-sectional b. 825 c. all	descriptive, including attitudes of parents towards treatment	International Obesity Task Force	classified into 2 predefined categories (on base of full name)	a. yes b. no	Danes (*n*=802)	7.1[1]	na	na	2.1[1]	na	na
								other ethnic background (*n*=23)	17.4[1,*]	na	na	8.7[1]	na	na
	Billeskov (1999-2004, 2005)	a. city (Ishøj) b. the municipality of Ishøj c. 6-16 years	a. longitudinal (trend) b. 2550 c. all	descriptive	National BMI	classified into 2 predefined categories (on base of mother tongue)	a. no b. no	Danes (*n*=na)	8.4[1]	na	na	na	na	na
								children speaking two languages (*n*=na)	18.6[1]	na	na	na	na	na
United Kingdom	Balakrishnan (1991-1999, 2008)	a district (East Birkshire) b. existing dataset (Child Health Information System) c. 5-7 years	a. longitudinal (trend) b. 29641 c. all	descriptive	National BMI	no information	a. only testing of differences for boys and girls separately b. no	white (*n*=13116)	20.7 (20.0-21.4)	20.1 (19.2-21.1)	21.3 (20.3-22.3)	9.7 (9.2-10.2)	9.7 (9.0-10.5)	9.7 (9.0-10.5)
								Afro-Caribbean (*n*=223)	24.7 (19.2-30.9)	25.2 (17.6-34.2)	24.1 (16.4-33.3)	10.8 (7.0-15.6)	11.3 (6.2-18.6)	10.2 (5.2-17.5)
								South-Asian (*n*=3025)	25.0 (23.5-26.6)	30.9 (28.6-33.3)*	18.9 (16.9-21.0)*	13.6 (12.4-14.8)	6.0 (4.2-17.9)*	11.1 (9.5-12.8)*

Table 1 (continued)

1	2	3	4	5	6	7	8	9	10			11		
	Duncan (na, 2006)	a. city (Birmingham) b. 6 secondary schools c. 11-14 years	a. cross-sectional b. 276 c. stratified	descriptive, including relationships with body satisfaction, body fat, and physical activity	International Obesity Task Force	classified into 2 predefined categories (on base of categorization Department for Education and Skills)	a. no b. no	white (*n* = 176)	26.0[1]	na	na	4.8[1]	na	na
								black (*n* = 33)	23.5[1]	na	na	8.8[1]	na	na
	Harding (2002-2003, 2008)	a. city (London) b. 51 secondary schools c. 11-13 years	a. cross-sectional b. 6407 c. random	explanatory, including impact of overweight on blood pressure, in relation to ethnicity	International Obesity Task Force	self-reported ethnicity in 7 predefined categories	a. yes b. no	white UK (*n* = 629)	na	19.7 (16.6-22.8)	20.2 (16.9-23.5)	na	6.4 (4.4-8.3)	6.6 (4.6-8.6)
								white other (*n* = 392)	na	23.0 (18.8-27.1)	20.6 (16.0-25.1)	na	9.2 (6.3-12.1)	7.2 (4.3-10.1)
								black-Caribbean (*n* = 474)	na	15.4 (12.1-18.7)	28.1 (23.9-32.4)*	na	10.3 (7.6-13.1)	12.6 (9.5-15.7)*
								black-African (*n* = 487)	na	17.5 (14.1-20.8)	27.9* (24.2-31.5)*	na	8.2 (5.8-10.7)	9.9 (7.4-12.3)
								Indian (*n* = 265)	na	18.5 (13.8-23.2)	20.8 (15.3-26.3)	na	6.8 (3.7-9.8)	4.2 (1.5-7.0)
								Pakastani/ Bangladeshi (*n* = 393)	na	19.6 (15.7-23.5)	17.9 (12.8-23.0)	na	8.4 (5.6-11.2)	4.1 (1.5-6.8)
								mixed (*n* = 280)	na	21.4 (16.6-26.3)	25.3 (20.1-30.5)	na	8.2 (5.0-11.5)	8.9 (5.5-12.4)
	Hughes (2005, 2007)	a. city (Glasgow) b. 7 primary schools c. 4-12 years	a. cross-sectional b. 1548 c. all	descriptive, including a process evaluation of an intervention	National BMI	no information	a. yes b. no	white (*n* = 918)	31.0[1]	na	na	17.0[1]	na	na
								black/ ethnic minority (*n* = 630)	32.0[1]	na	na	22.0[1]*	na	na
	Jebb (1997, 2003)	a. country (Great Britain) b. existing dataset (National Diet and Nutrition Survey) c. 4-17 years	a. cross-sectional b. 1836 c. random	descriptive	International Obesity Task Force	no information	a. yes b. no	white (*n* = 1667)	18.9[1]	na	na	3.5[1]	na	na
								Afro-Caribbean (*n* = 47)	23.4[1]*	na	na	na	na	na
								Asian (*n* = 81)	25.9[1]*	na	na	13.6[1]*	na	na

Table 1 (continued)

1	2	3	4	5	6	7	8	9	10			11		
	Saxena (1999, 2004)	a. non-sovereign country (England) b. existing dataset (Health Survey for England) c. 2-20 years	a. cross-sectional b. 5869 c. random	descriptive	International Obesity Task Force	self-reported ethnicity in 7 predefined categories	a. only overall testing of differences b. no	general (n=1866)	na	21.7[1,2]	22.3[1,2]	na	5.8[1,2]	5.8[1,2]
								Afro-Caribbean (n=695)	na	22.6[1]	33.3[1,*]	na	5.1[1]	13.0[1,*]
								Indian (n=571)	na	29.6[1,*]	24.0[1]	na	7.9[1]	2.1[1,*]
								Pakistani (n=894)	na	26.2[1,*]	25.7[1]	na	9.0[1]	8.0[1,*]
								Bangladeshi (n=712)	na	14.2[1,*]	20.7[1]	na	2.8[1,*]	5.8[1]
								Chinese (n=310)	na	14.4[1,*]	13.0[1,*]	na	4.7[1]	1.2[1,*]
								Irish (n=641)	na	17.3[1]	25.6[1]	na	3.3[1]	8.3[1]
	Wardle (1999, 2006)	a. city (London) b. 36 secondary schools c. 11-16 years	a. longitudinal (trend) b. 5863 c. random	descriptive	International Obesity Task Force	self-reported ethnicity in 4 predefined categories	a. yes b. yes	white (n=2607)	na	na	28.0[1,*]	na	na	na
								black and mixed black (n=1036)	na	na	38.2[1,*]	na	na	na
								Asian and mixed Asian (n=428)	na	na	19.8[1,*]	na	na	na
								other/mixed ethnic groups (n=198)	na	na	na	na	na	na
the Netherlands	de Wilde (1999-2007, 2009)	a. city (The Hague) b. existing dataset (Child Health Care Assessments) c. 3-10 and 13-16 years	a. longitudinal (trend) b. 85234 c. all	descriptive	International Obesity Task Force	classified into 4 predefined categories (on base of Dutch Statistics classification)	a. no b. no		3-6 years	3-6 years	3-6 years	3-6 years	3-6 years	3-6 years
								Dutch (n=34009)	na	9.0[1]	12.9[1]	na	1.8[1]	3.0[1]
								Turkish (n=9219)	na	23.4[1]	25.4[1]	na	9.5[1]	8.1[1]
								Moroccan (n=7165)	na	17.4[1]	24.0[1]	na	5.5[1]	6.6[1]
								Surinamese South-Asian (n=6043)	na	8.9[1]	10.0[1]	na	3.3[1]	2.5[1]

Table 1 (continued)

1	2	3	4	5	6	7	8	9	10			11		
									7-10 years	7-10 years	7-10 years	7-10 years	7-10 years	7-10 years
								Dutch (*n* = 11193)	na	15.5[1]	20.0[1]	na	3.6[1]	4.3[1]
								Turkish (*n* = 3354)	na	35.6[1]	37.5[1]	na	11.6[1]	10.8[1]
								Moroccan (*n* = 2509)	na	24.8[1]	30.6[1]	na	7.3[1]	8.6[1]
								Surinamese South-Asian (*n* = 2301)	na	26.0[1]	25.5[1]	na	9.4[1]	6.3[1]
									13-16 years	13-16 years	13-16 years	13-16 years	13-16 years	13-16 years
								Dutch (*n* = 5191)	na	18.1[1]	18.4[1]	na	3.7[1]	3.7[1]
								Turkish (*n* = 1598)	na	34.7[1]	31.5[1]	na	9.3[1]	8.3[1]
								Moroccan (*n* = 1323)	na	23.1[1]	29.8[1]	na	6.9[1]	6.3[1]
								Surinamese South-Asian (*n* = 1329)	na	24.7[1]	18.7[1]	na	7.9[1]	4.9[1]
	Fredriks (1996-1997, 2005)	a. cities (Amsterdam, Rotterdam, Utrecht, The Hague) b. existing dataset (Fourth Dutch Growth Study) c. 0-21 years	a. cross-sectional b. 20259 c. all	descriptive	International Obesity Task Force	classified into 4 predefined categories (on base of birth country of both parents)	a. no b. no	Dutch in large cities (*n* = na)	na	12.6[1]	16.5[1]	na	1.6[1]	2.8[1]
								Dutch in other than large cities (*n* = na)	na	8.7[1]	11.3[1]	na	0.8[1]	1.4[1]
								Turkish (*n* = 2904)	na	23.4[1]	30.2[1]	na	5.2[1]	7.2[1]
								Moroccan (*n* = 2855)	na	15.8[1]	24.5[1]	na	3.1[1]	5.4[1]

Table 1 (continued)

1	2	3	4	5	6	7	8	9	10			11		
	Snoek (2003, 2007)	a. regions (North, South, East, West) b. 55 secondary schools c. 11-16 years	a. cross-sectional b. 10087 c. random	descriptive, including association between overweight, eating behavior, and health-related lifestyle factors	International Obesity Task Force	classified into 5 predefined categories (on base of Dutch Statistics classification)	a. only overall testing of differences b. no	Dutch (n=7239)	na	10.2[1,2]	6.4[1,2]	na	0.8[1,2]	0.6[1,2]
								Surinam/ Antillean (n=319)	na	9.5[1]	13.2[1]	na	0.0[1]	2.2[1]
								Moroccan (n=90)	na	9.1[1]	10.9[1]	na	0.0[1]	2.2[1]
								Turkish (n=298)	na	18.7[1]	15.4[1]	na	1.9[1]	2.8[1]
								other (n=883)	na	15.1[1]	7.6[1]	na	1.7[1]	0.8[1]
	van der Horst (2005-2006, 2009)	a. city (Rotterdam) b. 17 secondary schools c. 12-15 years	a. cross-sectional b. 1206 c. stratified	descriptive	International Obesity Task Force	classified into 2 predefined categories (on base of Dutch Statistics classification)	a. no b. no	western (n=597)	20.0	na	na	na	na	na
								non-western (n=609)	21.4	na	na	na	na	na
Greece	Hassapidou (2006, 2009)	a. city (Thessaloniki) b. 7 schools c. 8-12 years	a. cross-sectional b. 266 c. stratified	descriptive	International Obesity Task Force	no information	a. yes b. no	Greek (n=236)	25.8[1]	na	na	12.7[1]	na	na
								immigrant (n=30)	10.0[1,*]	na	na	3.3[1,*]	na	na
Germany	Kalies (1997, 2002)	a. district (Bavaria) b. existing dataset (School Entry Examination) c. 5-6 years	a. longitudinal (trend) b. 127735 c. all	descriptive	International Obesity Task Force	classified into 2 predefined categories (on base of nationality of the child)	a. yes b. no		5 years	5 years	5 years	5 years	5 years	5 years
								German (n=14472)	na	8.8 (8.3-9.3)	11.9 (11.4-12.4)	na	2.7 (2.5-3.0)	3.1 (2.8-3.4)
								non-German (n=1191)	na	16.5 (14.4-18.7)*	16.5 (14.4-18.8)*	na	6.8 (5.4-8.4)*	5.6 (4.3-7.1)*
									6 years	6 years	6 years	6 years	6 years	6 years
								German (n=45463)	na	9.3 (9.0-9.6)	11.8 (11.8-12.1)	na	2.6 (2.4-2.7)	3.0 (2.8-3.2)
								non-German (n=4371)	na	16.8 (15.7-17.9)*	18.5 (17.3-19.8)*	na	5.9 (5.2-6.7)*	5.8 (5.1-6.6)*

Table 1 (continued)

1	2	3	4	5	6	7	8	9	10			11		
	Koller (2004, 2009)	a. city (Munich) b. existing dataset (School Entry Examination) c. na	a. cross-sectional b. 9353 c. all	descriptive, including participation in vaccination and health check-ups	National BMI	classified into 2 predefined categories (on base of mother tongue)	a. yes b. no	German (*n* = 384)	6.7[1]	na	na	na	na	na
								other (*n* = 513)	17.3[1,*]	na	na	na	na	na
	Kuepper-Nybelen (2001-2002, 2005)	a. city (Aachen) b. existing dataset (School Entry Examination) c. 5-6 years	a. cross-sectional b. 1979 c. all	descriptive, including additional analysis of risk factors	International Obesity Task Force	classified into 2 predefined categories (on base of nationality of the mother)	a. no b. no	German (*n* = 1522)	10.6[1]	na	na	na	na	na
								other (*n* = 452)	19.3[1]	na	na	na	na	na
	Will (2002, 2005)	a. city (Bielefeld) b. 12 primary schools c. 6-7 years	a. cross-sectional b. 525 c. all	descriptive, including additional analysis within migrants	International Obesity Task Force	classified into 2 predefined categories (on base of birth country of both parents)	a. yes b. no	German (*n* = 265)	9.1 (5.6-12.5)	7.6 (3.3-11.9)	10.8 (5.3-16.4)	1.9 (0.2-3.5)	0.7 (–0.7-2.0)	3.3 (0.1-6.5)
								migrant (*n* = 258)	14.7 (10.4-19.1)	10.1 (4.9-15.3)	19.4 (12.6-26.2)	3.1 (1.0-5.2)	1.6 (–0.6-3.7)	4.7 (1.0-18.3)
Austria	Kirchengast (na, 2006)	a. city (Vienna) b. 46 primary schools c. 6, 10, and 15 years	a. longitudinal b. 1786 c. random	descriptive	National BMI	classified into 3 predefined categories (on base of birth country of both parents)	a. yes, but unclear (no results for each migrant group) b. no		6 years	6 years	6 years	6 years	6 years	6 years
								Austrian (*n* = 794)	na	17.8[1]	17.9[1]	na	9.4[1]	7.6[1]
								Turkish (*n* = 437)	na	20.6[1]	20.3[1]	na	10.3[1]	8.8[1]
								former Yugoslavian (*n* = 555)	na	23.1[1]	25.6[1,*]	na	10.3[1]	14.3[1]
									10 years	10 years	10 years	10 years	10 years	10 years
								Austrian (*n* = 794)	na	27.3[1]	24.8[1]	na	11.6[1]	9.4[1]
								Turkish (*n* = 437)	na	20.9[1]	27.7[1]	na	7.9[1]	12.5[1]
								former Yugoslavian (*n* = 555)	na	36.7[1,*]	30.8[1]	na	9.2[1]	15.4[1]

Table 1 (continued)

1	2	3	4	5	6	7	8	9	10			11		
									15 years	15 years	15 years	15 years	15 years	15 years
								Austrian (n = 794)	na	23.1[1]	24.2[1]	na	11.3[1]	8.4[1]
								Turkish (n = 437)	na	25.0[1]	29.2[1]	na	8.9[1]	12.8[1]
								former Yugoslavian (n = 555)	na	28.0[1]	27.6[1]	na	9.2[1]	12.6[1]

[1] 95% CI unknown

[2] only overall testing

* $p < .05$

Overall, with the exception of Greece, only studies from Western and Central European countries were available (see column 1). Most studies investigated migrants coming from overseas. Migrants within Europe were seldom studied (see column 9).

In one English study[32], it was not possible to exclude adolescents above the age of 18 (see column 3). We did not exclude these results, as this age group was rather small, as compared to the younger children and adolescents.

Our search procedure resulted in the inclusion of manuscripts using very divergent criteria to define migrant populations (see column 7). In some studies, neither any definition was given, nor any criteria to delineate migrant from native children.

Studies based their percentages of overweight and obese children upon measurements by trained raters. Only in one Danish and one Dutch study, data were based on reports by the parents[25] or self-report[37]. In this particular Dutch study, the percentages of overweight and obese children are considerably lower in this study than in the other – even the other Dutch – included studies. Apart from that, there was no large difference between the two included Danish studies.

Leaving these two studies out of consideration, the prevalence of overweight in migrant boys ranged from 8.9% (3-6 years old Surinamese South-Asian in the Netherlands) to 35.6% (7-10 year old Turkish in the Netherlands), and in migrant girls from 10.0% (3-6 years old Surinamese South-Asian in the Netherlands) to 37.5% (7-10 years old Turkish in the Netherlands). In the natives, the prevalence of overweight in boys ranged from 8.8% (5-6 years old in Germany) to 27.3% (10 years old in Austria), and in native girls from 11.8% (6 years old in Germany) to 24.8% (10 years old in Austria).

Further, the prevalence of obesity in migrant boys ranged from 2.8% (2-20 years old Bangladeshi in the United Kingdom) to 11.6% (7-10 years old Turkish in the Netherlands), and in migrant girls from 1.2% (2-20 years old Chinese in the United Kingdom) to 15.4% (10 years old former Yugoslavians in Austria). In the natives, the prevalence of obesity in boys ranged from 0.7% (6-7 years old in Germany) to 11.6% (10 years old in Austria), and in native girls from 0.6% (11-16 years old in the Netherlands) to 9.7% (5-7 years old in the United Kingdom).

Although differences were not always statistically significant, most studies do indicate an elevated risk on overweight and obesity among migrant populations. In the United Kingdom some exceptions could be noticed: lower percentages of overweight in both Chinese and Bangladeshi boys, and in Chinese girls, as

well as lower percentages of obese in both Bangladeshi boys, and in Chinese and Indian girls. This opposite pattern is also found in Greece, where migrant children are less likely to suffer from overweight and obesity.

Turkish children seem to be the group most at risk. The percentages overweight and obesity in Turkish children were highest in the Netherlands, Germany, and Austria.

DISCUSSION

Conclusions

The prevalence of overweight in migrant children ranged from 8.9% to 37.5%, and from 8.8% to 27.3% in native children. The prevalence of obesity in migrant children ranged from 1.2% to 15.4%, and from 0.6% to 11.6% in native children. Overall, we may conclude that migrant children are at increased risk for overweight and obesity, as compared to native children. There were slight differences in overweight between boys and girls, in favor of the boys (lower BMI scores). American data point into the same direction, although European migration history is more recent than in the United States[23].

It is important to point out that overweight and obesity also increase rapidly in many non-western and developing countries. Already in 2000, de Onis and Blössner[44] noticed a most marked increase in the Northern African countries, such as Morocco, and in some countries in South Africa. In the countries of origin, prevalence of overweight and obesity among these children reaches the level of native children in Europe. In a study by Pirinçci et al.[45] among 6-11 years old children in an Eastern Turkish city 14.8% was overweight, of which 1.6% obese. Data for 6-16 years old children in a Western Turkish city were similar: 15.9% was overweight, of which 3.7% obese. Similarly studies in Indian cities found an overweight prevalence of 16%, including obesity, in 13-18 years urban children[46]. This also applies to Pakistan where the prevalence of overweight was 14%, including obesity, in Karachi[47]. However, comparing these figures with those of the migrant children originating from these countries in Europe makes clear that overweight and obesity were even more prevalent among the latter. Data from Surinamese South-Asian children[48], aged 12-17 years, show a somewhat lower prevalence of overweight among girls, as compared to their counterparts in the Netherlands (13.6% versus 17.1%), but a somewhat higher prevalence of overweight among boys (24.4% versus 19.9%).

Physical exercise and dietary patterns are principal causes of overweight and obesity, but it remains unclear how this increased risk of overweight and obesity in many migrant groups can be explained. Indeed, migration may entail a more sedentary lifestyle and other nutritional habits[18-19]. Although this may explain an increase in risk when migrating, it does not account for a higher risk in migrants, as compared to native children.

Limitations

Most studies included in this review did not allow assessing to what degree ethnic differences could be explained by socio-economic factors. Also, the interaction between migrant background and socio-economic position needs consideration. In developed countries overweight and obesity are more prevalent among children in lower socio-economic strata, whereas in developing countries the opposite is true. The majority of the studies only presented non-adjusted data, even those that had information on socio-economic position at their disposition. However, the study by Kuepper-Nybelen et al.[41] showed that educational level of the mother explains much of the differences between the two groups of children. Furthermore, the study by Will et al.[42] indicated that in German children overweight is most prevalent in families with a low socio-economic status, whereas in non-German children the reverse is true. Apart from that, none of the studies included took into consideration differences in generational status, although data in some of the Dutch studies might have allowed such analyses. Additionally, only one study investigated length of stay: the study by Will et al.[42] associated migration duration with overweight in migrant children.

The 19 studies in this review cover only 6 European countries, all but one situated in Western and Central Europe. Although we did not include language limitations in our search, no information was available for countries, which have a longer immigration history, such as Sweden, Norway, and Belgium. This also applies to most Southern European countries, such as Italy, Spain, and Portugal, which are more recent immigrant societies, as compared to Northern and Western European countries[11]. The prevalence of overweight and obesity in native children is high in Greece, as appeared in our review. These Greek results are contrasting with those from all other studies. This finding probably can be explained by the fact that Greece attracted migrants more recently than the other countries included in this review. Therefore, most migrants are first generation. It can be expected that this also applies to other countries in Southern Europe.

As a consequence, including more of these countries might change the overall conclusion of increased risk of overweight and obesity in migrant children.

Furthermore, the classification of children as migrant or native is problematic, because different criteria have been applied making comparisons between countries difficult. In 3 out of 7 studies from the United Kingdom no information at all is provided on how migrant status was defined. In 3 studies self-reported ethnicity was used. As a result, the ethnic groups may include both recent migrants, and descendants from migrants in previous generations. Contrary, some studies on the European continent use a more direct indicator of migrant status by applying country of birth as criterion. This indicator has the advantage of being objective and stable, better allowing for comparisons over time and between studies[49]. However, this is only the case when an indicator is applied uniformly in all studies, which does not seem the case. For example, most Dutch studies consider children as migrants when at least one parent is born abroad, thus including both first, and second generation migrants, whereas studies from other countries only apply country of birth of the child. Apart from that, more indirect indicators have been used, such as full name, mother tongue, or nationality. These indicators have limited value, because migrants may have double nationality. Besides, it hinders comparisons between countries, as there may be differences between countries in the possibilities to adopt the nationality of the receiving country. A final remark in this respect concerns the use of the seemingly simple and straightforward distinction between native and non-native, masking the diversity within migrant groups. For example, in most studies migrants of Asian or African descent are grouped into a few categories without further description. This incomparability may be part of the explanation why even within one country, in this case the United Kingdom, it remains unclear which groups are more at risk: migrants with a South-Asian or with an African descent. Indeed, as appeared from the study by Saxena et al.[32], distinguishing between Pakistani, Bangladeshi, and Indian migrant children makes differences between these groups visible. In this review, differences concerning Black-Caribbean and Black-African children are small. Overall, notwithstanding these classification problems, this review provides evidence that, at least in Western Europe, migrant children are at increased risk for overweight and obesity.

Next, the included studies in this review cover a wide age range comprising children from the age of 2 until adolescents of 18 and even 20. Depending on the study, sometimes broad and sometimes limited age ranges are included, again

making comparisons difficult. Nevertheless, it appeared that, irrespective of age, migrant children are generally at increased risk for overweight and obesity.

Furthermore, differences in response rates between native and migrant children may lead to bias, at least when these rates are influenced by overweight and obesity. Unfortunately, we were not able to assess this possible source of bias. Part of the studies included BMI measurements, collected during health examinations in school or at school entry. Although the articles are not completely clear on this matter, we have the strong impression that these examinations are obligatory. In the Netherlands, Child Health Care authorities have information on almost all children. Some of the studies included in this review are based on these data. In the case of health surveys, the authors often did not mention response rates, or, if they did, they did not provide separate data, in relation to ethnicity and migration. In these cases, response is not an issue.

As a final limitation, we used the IOTF cut-off points, if available, in this review. The use of this classification system sometimes is subject of criticism, because it is based on data from only 6 countries. However, applying references of the receiving or the home countries is also questionable, as they disregard either possible genetic factors, or changes in lifestyle, related to migration.

From this review, it appears that, in most of the European countries for which data are available, especially non-European migrant children are at higher risk for overweight and obesity than their native counterparts. As overweight and obese children are at risk for many chronic health problems, prevention is urgently needed. However, little is known why these children are at an even higher risk as native children. So, future research needs to investigate why these children apparently display an even more sedentary way of life or adverse dietary patterns, as compared to their native counterparts, in order to initiate effective prevention and intervention activities in these specific migrant and ethnic groups. Not only socio-economic disadvantage, generational status, and length of stay should be taken into account, but also cultural factors, such as specific exercise and food habits, combined with parental factors. This is especially important in children and adolescents, as they constitute a major part of the migrant populations in Europe.

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Chapter 3

Overweight and obesity in primary school: native children versus migrant children

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(photography: unknown artist)

ABSTRACT

Aim

To compare the means of Body Mass Index (BMI) and the prevalences of overweight and obesity between native Dutch and migrant primary school children and to assess to what degree differences between these children could be explained by socio-economic position and BMI of the mother and the father.

Subject and methods

A cross-sectional survey was performed among children at the age of 8-9 years old. Subjects were a total of 1943 children and their primary caregiver. Outcome measures were BMI and the prevalence of overweight, including obesity. Main independent variables were migrant background, based on country of birth of the parents, socio-economic status, as indicated by educational level, and parental BMI. Other independent variables: age and sex of the child.

Results

Overall, our findings show that overweight and obesity are significantly more prevalent among migrant children from non-western descent, as compared to native children and children from western descent.

Conclusion

Parental BMI is an important predictor of child's BMI. However, socio-economic position is not. Because children from non-western migrant origin are at higher risk for overweight and obesity, insight in differences in both physical activity, and energy intake, and how these behaviors relate to cultural contrasts in parental beliefs and practices, is needed.

Keywords

Child Health; Overweight; Obesity; Transients and Migrants; Social Class; Netherlands.

INTRODUCTION

The global rise of overweight and obesity has become a major public health concern as a consequence of the serious impact on morbidity, quality of life, and mortality[1-2]. Overweight is associated with an increased incidence of many contemporary diseases, such as diabetes mellitus, several types of cancer, and heart disease[3-4]. Consequently, obesity is related with various disabilities and impairments, often as a result of metabolic syndrome, and leads to a higher mortality risk[5-6].

In the United States, the prevalence of overweight and obesity in adults has increased over several decade[7]. Yet, recent evidence shows that this obesity trend is stagnatin[8]. In European countries however, the overweight and obesity prevalence rates are still growing rapidly[9]. Similarly, childhood obesity is increasing worldwide. In Europe, with an estimated prevalence of overweight and obesity in children and adolescents of about 20%, overweight and obese children are a matter of growing concern[10-11].

Nowadays, symptoms that once were seen primarily in adults are becoming also more prevalent among young people, such as hypercholesterolemia, hypertension, and insulin resistance[12]. Furthermore, child overweight affects self-esteem, cognitive development, and health-related quality of life in these children[13-14]. As an implication of these long-lasting adverse physical, psychological, and social health consequences, childhood obesity is responsible for a substantial economic burden[15].

During the last century, many European countries have shifted to migrant societies and, as a result, have experienced large changes in the composition of their population[16]. Contrary to more traditional migrant societies, such as Canada and the United States, large scale immigration to European countries is a post-second World War phenomenon. Due to the need for cheap labor forces, the educational opportunities, and the independence of former colonies, occasionally combined with political reasons in the native country, multiple immigration flows took place, towards and within Europe. Migration to developed countries may alter lifestyle, as migrants engage in a more sedentary way of life[17]. Also, they tend to abandon their traditional food habits and adopt westernized dietary patterns[18]. As a consequence, migration seems to increase the risk of overweight and obesity[19-20].

According to a systematic review of the European literature, migrant children are also more at risk of overweight and obesity, as compared to their indigenous

counterparts[21]. In the Netherlands, prevalence rates of overweight and obesity are especially alarming among the two largest migrant groups: individuals with a Turkish or Moroccan background[22]. The prevalence of overweight and morbid obesity is still higher among Moroccan and especially among Turkish children, as compared to their native counterparts, although the rate of growth is declining and stabilising. Nevertheless, obesity prevalences are still increasing among children from Turkish descent[23]. The children in these families are most often second generation children, as they were born in the Netherlands, but at least one of their parents was born in Turkey or Morocco.

Childhood overweight progresses in adolescent obesity[24]. Ultimately, once adolescents have reached adulthood and are raising children of their own, the latter may also develop weight problems, as parental overweight is regarded as an important risk factor predicting overweight and obesity of their children[25].

Most studies in Europe do not take into account to what degree Body Mass Index (BMI) differences between native and migrant children could be explained by socio-economic factors. However, in developed countries overweight and obesity seem to be disproportionally present among persons with a lower socio-economic status[26]. This also applies to children[27-28]. Nevertheless, in multiple studies conducted in the United States, migrant background was associated with BMI, independent of socio-economic position[29-31]. The question arises whether this association also applies to a European country.

Study aim

First aim of this study is to compare the mean BMI scores and the prevalences of overweight and obesity between native and migrant primary school children in the Netherlands.

A second study aim is to assess to what degree differences between these children can be explained by socio-economic position, as indicated by parental educational level, and BMI of the biological parents, taking into account age and sex of the children.

METHODS

Background study

A cross-sectional study was performed in the framework of the IVO Nutrition and Physical Activity Child CohorT (INPACT) study. The INPACT study

is a collaborative project between the IVO Addiction Research Institute, and the Institute of Health Policy and Management, a department of the Erasmus University Rotterdam.

In this four year longitudinal project, the developmental trajectory of weight in Dutch primary school children from 8-9 years old to 11-12 years old is addressed. For the present manuscript, data collected at baseline were used (2008/2009).

Study population

Data have been collected from parent-child dyads at primary schools, located in the Rotterdam and Eindhoven areas. Rotterdam is the second largest city and Eindhoven is the fifth largest city in the Netherlands. Children from many different migrant backgrounds live and attend to school in these cities.

Schools were invited for participation in the INPACT study by means of a letter in which the research aim and relevance were explained. Schools were excluded if they were participating in current prevention programmes, as this might influence the measurements. All parents received a letter, which provided information about this research project. Finally, of the 3162 invited parent-child dyads, 1943 dyads (61.5%) decided to participate in the study. Subjects at baseline were 8-9 years old primary school children (group 5 of Dutch primary schools).

Participation in this study was on the basis of informed consent of the primary caregivers. The study was approved by the medical ethics committee of the Erasmus MC, University Medical Center Rotterdam.

In this study, we have tried to stimulate participation among the two largest migrant groups. Therefore, Turkish and Moroccan parents received a letter in their native language. Also, they could receive assistance in this language by interpreters, while filling out the questionnaires, during specific consultation hours or by phone.

Measurements

Outcome measures are BMIs and percentages of overweight children, including obese children. The BMI, calculated as weight in kilograms divided by the square of height in meters, was used to assess overweight and obesity. Anthropometric measurements for the children were carried out by trained raters.

The International Obesity Task Force (IOTF) has developed an international reference standard to define overweight and obesity in children. This standard

is based on pooled data from six national growth surveys: age and sex specific cut-off values[32]. We used the IOTF standard to divide the children into two categories: (1) overweight, including obesity, and (2) obesity.

All other information has been collected by questionnaires. The primary caregiver of the child, mostly the mother, was asked to fill out the questionnaire. The questionnaire included questions on the child's age and sex. Also, migrant background was asked. Children were classified as migrant, when at least one of their parents was born outside the Netherlands, according to Dutch Statistics[33]. Also on base of this Dutch Statistics classification, we have distinguished five groups in our sample: native Dutch children ($n = 1546$), children with a Turkish background ($n = 93$), children with a Moroccan background ($n = 66$), and two additional groups, containing children from a variety of countries, one with children from non-western origin ($n = 105$) and one with children from western origin ($n = 133$).

Apart from that, the questionnaire consisted of questions both regarding the weight and height of the biological parents, and regarding their socio-economic status, as defined by educational level. Questions were included on the education of both the mother, and the father. We determined the educational level by that of the parent that achieved the highest level, divided into three categories: low (primary school, lower vocational or general education), middle (secondary school, intermediate vocational school), and high (higher vocational school or university).

Analysis

First, the characteristics of the study population have been calculated for each group. BMI was normally distributed. Additionally, to compare BMI scores and the prevalences of overweight and obesity between native Dutch and migrant children, differences were analysed with a t-test, an ANOVA, or a chi-square test. Secondly, to explore possible correlations between age, sex, educational level of the parents, parental BMI, and child BMI, Spearman and Pearson correlation coefficients were determined. Finally, we used multivariate linear regression to investigate whether the relation between migrant background and child BMI could be explained by differences in educational level of the parents. Similarly, we used logistic regression to examine whether differences in the prevalence of overweight, including obesity, could be explained by differences in parental education. Data were analysed using the SPSS program (version 14.0).

RESULTS

Sample characteristics of all children ($n = 1943$) are presented in Table 1. The upper part of this table shows the mean age of the children, the percentages of boys and girls, parental educational level, and maternal and paternal BMI, in each group. Overall, the mean age of the children was 8.2 years old (SD = 0.49). The educational level of the parents of Turkish, Moroccan, and of the other non-western children is lower than that of the native Dutch children and the non-native western children. BMIs of the biological mothers and fathers of Turkish and Moroccan children are also higher than that of the other groups.

In the lower part of Table 1, the mean BMIs and the prevalences of overweight, including obesity, and obesity are presented (both as percentages). Overall, mean BMI scores differed between the native Dutch and other western children and the groups of other non-western children ($p < .05$). Dutch children resemble the other western children. Both native Dutch children, and the other

Table 1. Sample characteristics

	Dutch (*n* = 1546)	**Turkish (*n* = 93)**	**Moroccan (*n* = 66)**	**non-western (*n* = 105)**	**western (*n* = 133)**
age, M (SD)	8.2 (0.45)	8.6 (0.67)	8.5 (0.61)	8.4 (0.63)	8.3 (0.52)
[missing]	[4]	[1]	[1]	[3]	[2]
boys, *n* (%)	778 (50.3)	38 (40.9)	36 (54.5)	44 (41.9)	74 (55.6)
girls, *n* (%)	768 (49.7)	55 (59.1)	30 (45.5)	61 (58.1)	59 (44.4)
educational level parents, %					
- low	12.5	42.4*	34.5*	26.4*	13.9*
- medium	39.7	37.6*	37.9*	35.2*	32.8*
- high	47.9	20.0*	27.6*	38.5*	53.3*
[missing]	[23]	[8]	[8]	[14]	[11]
BMI mother,					
M (SD)	24.2 (3.9)	25.5 (4.4)*	25.7 (4.0)*	24.5 (4.0)	23.5 (3.1)
[missing]	[194]	[15]	[16]	[39]	[33]
BMI father,					
M (SD)	25.7 (3.1)	27.3 (3.3)*	26.8 (2.9)*	25.2 (3.2)	26.1 (3.2)
[missing]	[194]	[15]	[16]	[39]	[33]
BMI child,					
M (SD)	16.4 (2.1)	19.0 (3.5)*	17.5 (2.6)*	17.6 (2.9)*	17.0 (2.7)*
overweight, including obesity, %	13.3	40.2*	24.2*	31.1*	22.0*
obesity, %	2.3	18.4*	8.1*	10.0*	6.8*

* $p < .05$

Table 2. Predictors of BMI child: results of multivariate regression analyses

Variables	Model 1		Model 2		Model 3	
	β	SE	β	SE	β	SE
intercept	12.16*	0.98	12.64*	1.01	6.67*	1.07
age	0.49*	0.12	0.46*	0.12	0.41*	0.11
sex girl	0.31*	0.11	0.30*	0.11	0.31*	0.10
background						
- Turkish	2.74*	0.29	2.66*	0.29	2.34*	0.28
- Moroccan	1.37*	0.35	1.32*	0.35	1.05*	0.33
- non-western	0.95*	0.33	0.93*	0.33	1.03*	0.32
- western	0.37*	0.26	0.39*	0.26	0.39*	0.25
educational level parents						
- middle			–0.24	0.18	–0.15	0.17
- high			–0.32	0.18	–0.08	0.17
BMI mother					0.11*	0.01
BMI father					0.14*	0.02
adjusted R^2	0.09		0.09		0.18	
R^2 change	0.09*		0.00		0.09*	

* $p < .05$

western children had the lowest BMI scores (mean = 16.4; SD = 2.1; mean 17.0; SD = 2.7). Also, among these groups the prevalences of overweight and obesity were lowest. All other migrant children had higher BMI scores and the prevalences of overweight and obesity were higher. Especially among Turkish children, the BMI score (mean = 19.0; SD = 3.5) and the prevalences of overweight and obesity were highest. The other groups had an intermediate position.

In the regression analyses, using multivariate regression techniques (with respect to BMI) and logistic regression techniques (with respect to overweight and obesity), we tested three models (see Table 2 and Table 3). The first model tested the influence of age, sex, and migrant background. Taking into account these variables, Turkish, Moroccan, other non-western, and other western children showed higher BMIs and more overweight and obese children, as compared to the native Dutch group. Age was positively associated with BMI and BMI scores among girls were higher. The total variance is explained by 9% (BMI) and 8% (overweight and obesity).

In the second model, parental educational level was included. We did not find a significant association between parental education and BMI, as well as

Table 3. Predictors of overweight and obesity: results of logistic regression analyses

Variables	Model 1		Model 2		Model 3	
	B	OR (95% CI)	B	OR (95% CI)	B	OR (95% CI)
intercept	–3.84*	0.02*	–3.20*	0.04*	–8.46*	0.00*
age	1.78*	1.19* (0.86-1.65)	1.37*	1.15* (0.83-1.59)	0.54*	1.06* (0.75-1.48)
sex girl	0.63*	1.88* (1.36-2.60)	0.62*	1.86* (1.35-2.56)	0.67*	1.94* (1.39-2.71)
background						
- Turkish	1.76*	5.80* (3.23-10.42)	1.67*	5.30* (2.92-9.63)	1.50*	4.50* (2.42-8.36)
- Moroccan	1.02*	2.77* (1.30-5.90)	0.95*	2.59* (1.21-5.55)	0.79*	2.21* (1.01-4.83)
- non-western	1.14*	3.13* (1.50-6.53)	1.13*	3.08* (1.47-6.44)	1.27*	3.54* (1.66-7.58)
- western	0.55*	1.74* (0.88-3.44)	0.60*	1.82* (0.92-3.62)	0.67*	1.95* (0.97-3.94)
educational level parents						
- middle			–0.24	0.79 (0.49-1.25)	–0.12	0.89 (0.55-1.47)
- high			–0.42	0.65 (0.41-1.04)	–0.17	0.84 (0.51-1.37)
BMI mother					0.10*	1.10* (1.06-1.15)
BMI father					0.13*	1.14* (1.08-1.19)
Nagelkerke R^2	0.08		0.08		0.16	
R^2 change	0.08*		0.00		0.08*	

* $p < .05$

overweight and obesity, although the relation was in the expected direction (negative). Age, sex, and migrant background still remained associated. However, the explained variance did not increase.

In the third model, maternal BMI and paternal BMI were included in the regression analysis. Once again, age, sex, BMI of the mother, BMI of the father, and migrant background were significant variables in the model, but educational level of the parents was not. The total explained variance is 18% (multivariate regression) and 16% (logistic regression).

DISCUSSION

Findings from this study show that the mean BMIs, as well as the prevalences of overweight and obesity, were significantly higher in all groups of non-western migrant children. Turkish children were most at risk. These results are in line with a previous European systematic review, where children from migrant origin, in particular Turkish children, were also at higher risk for overweight

and obesity[21]. Contrary to the majority of the studies in Europe, our study was not carried out in secondary school children, but in primary school children, an important target group for intervention activities.

This study is one of the first European studies that examined to what degree variations in the BMI of primary school children with a native Dutch and a migrant background could be explained by socio-economic position. In our study this was not the case. Similar results were found in former studies[31-33].

In our study population, the Turkish and Moroccan primary school children are mainly second generation children. These children were born in the Netherlands, but at least one of their parents was born in Turkey or Morocco. Unfortunately, we cannot yet investigate whether the situation will change over time, because, at this moment, third generation children are still very rare in the Netherlands.

Strength of this study was the assessment of child weight and height by measurement, rather than by parental report. Also, unlike many other studies, we could control for BMI of the mother and the father. Unfortunately, parental weights and heights were assessed by self-reports, which may lead to socially desirable answers. As reporting discrepancies appear to be related to ethnic differences, this may have influenced our results[34].

In addition, for the most part, our samples were drawn from schools in urban areas. Thus, we cannot generalize to the Dutch population, especially not to children living in more rural areas. However, most migrant children live in urban areas.

We assessed migrant origin by the country of birth of the parents, because it has the advantage to be objective and stable[35]. We could distinguish two well defined groups: children with a Turkish and a Moroccan background. Children with these backgrounds belong to two of the largest groups of migrants in the Netherlands. The classification of other non-native children into two heterogeneous groups was necessary, because the number of children in separate groups was too small. As a consequence, these two groups have a more heterogeneous composition, and it was not possible to separately analyse children from other large Dutch migrant groups, such as Surinamese and Antillean. They have been added to the group of non-western children. The classification into western and non-western migrants is subject to critique, also in the Netherlands. Our results nevertheless suggest that, concerning BMI and weight status, western children resemble more the native Dutch, whereas the non-western children resemble more the Turkish and Moroccan children.

Further, we assessed socio-economic position only by educational level, although it is a multidimensional concept. Discrepancies may exist between several indicators. Previous research showed that the relationship between socio-economic position on ethnic differences in health may differ, according to the applied indicators[36]. We decided to choose this indicator because of the following reasons. First, educational level determines the level of knowledge on healthy exercise and dietary habits. Most of the parents of the children in this study are first generation migrants and they relatively often experience little formal education[37]. As appeared in our study, this was especially the case among Turkish and Moroccan children. Another indicator, for example income level, also affects obesity, as low income levels might make it more difficult to make healthier, but usually more expensive, food choices. Although information on the income level of the families was available, the amount of missing values was considerable, especially among the migrant respondents, while questions concerning the highest obtained educational degree were filled out adequately by the parents.

Concluding, in our study we did not find evidence that BMI differences between native Dutch and migrant children were related to the parental level of education. Because migrant children are at higher risk, insight in the factors contributing to this risk is necessary to design effective treatment strategies and prevention programmes. Although lack of physical activity and too much energy intake are the direct causes of overweight, variations in this respect among migrant and native children have not yet been investigated, neither how they relate to cultural contrast in beliefs and practices about exercise and food. For example, parenting styles may vary between different groups of migrants. Migrant parents may differ in their parenting style by using food as a reward, in order to obtain specific behavior by their children. Additionally, the presence of abundant food is considered as a sign of hospitality among families from Turkish and Moroccan descent[38]. However, the availability and accessibility of food abundance may be a risk factor for overweight and obesity. Furthermore, being thicker (higher BMIs – higher percentages of overweight and obesity) may be considered as a sign of prosperity and being healthy; being lean (lowers BMIs – lower percentages of overweight and obesity) may be considered as a sign of poverty and being unhealthy. Therefore, it is recommended that parenting styles, for example role modeling and supportive parental policies regarding exercise and food, combined with cultural factors, such as attitudes regarding exercise and food, should be taken into account in future research.

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Chapter 4

Physical activity differences between children from migrant and native origin

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(sculpture: 'Discobolus' by Myron of Eleutherae – around 450 BC)

ABSTRACT

Background

Children from migrant origin are at higher risk for overweight and obesity. As limited physical activity is a key factor in this overweight and obesity risk, in general, the aim of this study is to assess to what degree children from migrant and native Dutch origin differ with regard to levels of physical activity and to determine which home environment aspects contribute to these differences.

Methods

A cross-sectional survey among primary caregivers of primary school children at the age of 8-9 years old ($n = 1943$) from 101 primary schools in two urban areas in the Netherlands. We used bivariate correlation and multivariate regression techniques to examine the relationship between physical and social environment aspects and the child's level of physical activity. All outcomes were reported by primary caregivers. Outcome measure was the physical activity level of the child. Main independent variables were migrant background, based on country of birth of the parents, and variables in the physical and social home environment which may enhance or restrict physical activity: the availability and the accessibility of toys and equipment, as well as sport club membership (physical environment), and both parental role modeling, and supportive parental policies (social environment). We controlled for age, sex of the child, and socio-economic status.

Results

In this sample, physical activity levels were significantly lower in migrant children, as compared to children in the native population. Less physical activity was most often seen in Turkish, Moroccan, and other non-western children ($p < .05$).

Conclusions

Although traditional home characteristics in both the physical, and the social environment are often associated with child's physical activity, these characteristics provided only modest explanation of the differences in physical activity between migrant and non-migrant children in this study.

Keywords

Child Health; Transients and Migrants; Physical Activity; Parenting; Netherlands.

BACKGROUND

Globally, the increase of overweight and obesity has reached epidemic proportions[1]. As overweight and obesity lead to numerous chronic diseases, morbidity, quality of life, and mortality are strongly affected both in adults, and in children[2-3].

Specific symptoms, such as hypertension, hypercholesterolemia, and insulin resistance, which were seen primarily in adults in the last decade, now are becoming more common among children and adolescents[4]. In addition, child overweight affects self-esteem and influences the cognitive and social development of these children[5]. Apart from damaging physical, mental, and social health consequences, the obesity epidemic results in a major economic burden[6]. Furthermore, childhood overweight may develop over time into adolescent obesity and, subsequently, adulthood obesity. Also, parental obesity is an important predictor of obesity in future posterity[7].

Obesity among children is still increasing worldwide and the World Health Organization (WHO) has recognized childhood obesity as one of the most serious public health challenges of the 21st century[8].

It is generally agreed that the etiology of childhood overweight and obesity is complex and multifactoria[9]. Although environmental, genetic, and biological factors play a key role in the energy (im)balance, recent studies show that the increase of overweight and obesity is more likely due to changes in environmental features, referred to as the obesogenic environment, such as changes in physical activity levels and changes in food intake habits[10-11].

Overweight and obesity are the outcome of an excess of energy intake on energy expenditure, for a longer period of time[12]. In order to design effective prevention programmes, knowledge is needed on modifiable factors in this obesogenic environment, affecting physical activity and nutritional intake[13].

From a systematic review of the European literature, it appeared that migrant children are at higher risk for overweight and obesity than their native counterparts[14]. Often, it is assumed that Body Mass Index (BMI) differences between native and non-native children can be explained by socio-economic position. However, several studies in the United States and Europe showed that migrant or ethnic background remained associated with BMI, independent of socio-economic status[15-16]. Differences in overweight and obesity between migrant and native children thus require further investigation.

Previous studies have indicated lower levels of physical activity among adult migrant and ethnic groups, as compared to the native population[17]. Limited physical activity may be the result of attitudes regarding the importance of physical activity, as some studies from the United States suggest that in some minority groups physical activity is considered as 'a waste of time' or as a 'luxury'[18-19]. Although these attitudes are not subject of the present study, they may influence characteristics related to physical activity in the home environment.

In the present study, we focus on differences between migrant and native children regarding participation in physical activity in the home environment. Physical activity in children is influenced by their physical and social home environment[20]. In the physical environment, both availability, and accessibility of resources are important determinants. More specific: active toys and exercise equipment, such as skip rope or rollerskates, which are physical present and within reach, may stimulate physical activity. This also applies to membership of sport clubs. On the other hand, the ease of access to passive toys, such as television or computer, may restrict physical activity[21-22]. In the social environment, parents play a leading role. The physical activity level they display themselves can be considered as a role model for their children. Besides parental modeling, parental policies are important, in the form of encouraging and prompting children to be physically active or providing transportation to physical activity[23-25].

In this study, we focus on differences in the levels of physical activity between migrant and native Dutch children and on the role of the physical and social home environment in these differences. In Figure 1, the conceptual model of this study is presented. Migrant background is not considered as a factor that directly can explain possible physical activity differences. We hypothesize that potential differences between migrant and native children can be explained to some degree by differences in the home environment.

Socio-economic position may also influence the physical activity level of the child[26]. Because, in general, the socio-economic status of migrants is lower than that of the native population, we will adjust for the parental socio-economic position. Finally, we will take into account age and sex of the child, because these variables affect physical activity levels[27].

Study aim

The first aim of this study is to compare the level of physical activity between children from migrant and native origin in the Netherlands. The second study aim is to investigate to what degree differences in the physical activity level

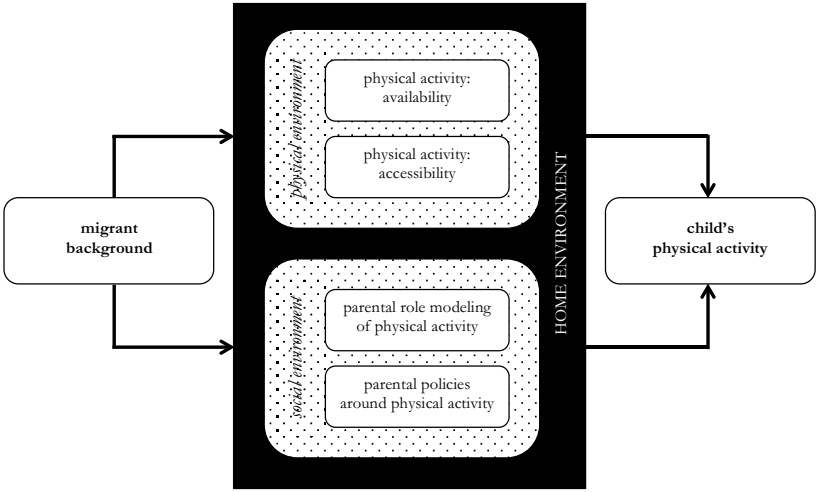

Figure 1. Conceptual model for the influence of the home environment on physical activity

between these children can be explained by differences in their physical and social home environments.

METHODS

Design study

To achieve our research aim, we performed a cross-sectional study, as part of the longitudinal IVO Nutrition and Physical Activity Child CohorT (INPACT) study. The INPACT study is a shared research project conducted by the IVO Addiction Research Institute, and the Institute of Health Policy and Management, a department of the Erasmus University Rotterdam, with approval of the medical ethics committee of the Erasmus MC, University Medical Center Rotterdam.

This four year observational study focuses on modifiable factors affecting overweight and obesity in Dutch primary school children aged 8-9 years to 11-12 years. The present study was based on the first wave of data collection in the school year of 2008/2009.

Study population

We approached parents of primary school children from 8-9 years old. Collaborating primary schools in this project were located in two cities and adjacent areas in the Netherlands: Rotterdam and Eindhoven. Many children from migrant and non-migrant origin attend school and live in one of these cities.

In a letter, in which our research goals were explained, schools were invited for participation in the INPACT study. Schools were excluded if they were participating in prevention activities, at the time of the study, as this could influence the measures. A total of 101 schools took part in the study. Parents received an information letter. Out of 3162 parent-child dyads, 1943 (61.5%) dyads decided to contribute to this study. Subjects at baseline were children in group 5 of Dutch primary schools (8-9 years old). Participation was on the basis of written informed consent by the parent.

All information was derived from questionnaires. The primary caregiver of the child, mostly the mother, was asked to fill out the questionnaire. Therefore, measures were proxy-reported outcomes. In order to stimulate participation among the two largest migrant groups, parents from Turkish and Moroccan origin, received a letter in their native language. Also, they could ask for assistance in this language by interpreters, while filling out the questionnaire.

Measurements

The general part of the questionnaire included questions on the child's age, sex, migrant background, and socio-economic position.

Children were considered as having a migrant background, when at least one of their parents was born outside the Netherlands, which is in accordance with current practice in the Netherlands. If both parents were born in different foreign countries, the maternal country of birth was used to define the child's country of origin[28].

Based on this current Dutch practice, we have distinguished five groups in our sample: native Dutch children ($n = 1546$), children with a Turkish background ($n = 93$), children with a Moroccan background ($n = 66$), and two additional groups, containing children from a variety of countries, one with children from non-western origin ($n = 105$) and one with children from western origin ($n = 133$).

Socio-economic position was determined by the educational level of the parent that achieved the highest level, classified into categories: low (primary school, lower vocational education, general education), middle (secondary

school, intermediate vocational school), or high (higher vocational school, university).

Outcome measure: child's physical activity

To assess the children's physical activity level, we used a questionnaire, to be filled out by the primary caregiver of the child. This instrument has been developed by the National Institute for Public Health and the Environment and by the local Public Health Services, based on previous studies in other countries[29]. This assessment followed suggestions of Welk et al.[30], who advised to assess various types of physical activity in specific key times and places, in order to enhance the validity. We asked how often, based on a normal week, children (1) went to school by foot or by bicycle (active transport), (2) played inside or outside, and (3) participated in a sport or at a sport club. Physical activity was asked in terms of duration (minutes) and of frequency (times per week).

Based on the questions, we calculated the amount of minutes that the child spends on physical activity per week and divided the total number of minutes by 7 to assess the mean number of minutes of physical activity per day (mean = 64.7; SD = 21.2).

Physical environment: availability and accessibility

Availability of resources in the home environment (physical presence) was assessed by means of a checklist with 14 items that referred to availability of active toys and exercise equipment, which could be scored by presence (score "1") or absence (score "0") of these aspects. This list was based on a measuring instrument developed by Gattshall and colleagues[31] and was adapted for application in the Netherlands.

Similarly, the primary caregiver had to score whether the child joined 16 types of specific sport clubs (e.g., tennis, soccer). A sum score, ranging from 0 to 14 for toys and equipment (mean = 6.5; SD = 2.1) and ranging from 0 to 16 for sport clubs (mean = 1.3; SD = 0.7), was calculated for analysis.

The accessibility or the possibility in the home environment (ease of access) regarding toys and equipment were assessed by 3 questions concerning active toys (e.g., skip rope, rollerskates) and 4 questions concerning passive toys (e.g., television, computer). Respondents could answer on a 5-point Likert scale. Each item scale ranged from 1 (never within reach) to 5 (always within reach). Regarding active toys, the mean accessibility score was 12.9 (SD = 1.8; range = 3-15) and regarding passive toys, this score was 15.0 (SD = 2.9; range = 5-20). Reliability

and internal consistency of this instrument were high. Cronbach's alpha for the accessibility total score is .81 for active toys and .77 for passive toys.

Social environment: parental role modeling and parental policies

Physical activity of the primary caregiver was used as an indicator of parental role modeling and was measured by the Short Questionnaire to Assess Health-enhancing physical activity (SQUASH) by Wendel-Vos and colleagues[32]. This instrument consists of various physical activities, of which the number of reported days, the duration (minutes), and the level (light activity, moderate activity, and vigorous activity) were assessed.

At the end, we calculated the amount of minutes that the primary caregiver spends on moderate and vigorous activities per week and divided the total number of minutes physical activity by 7 to assess the mean number of minutes of physical activity per day (mean = 65.0; SD = 22.8).

Parental policies to support the child's physical activity were assessed by survey questions developed by Gattshall and colleagues[31]. These policies, as a part of the social environment, consisted of 5 questions, using a 5-point Likert scale. The total scale ranged from 1 (always supportive) to 5 (never supportive). For descriptive purposes, we distinguished between two groups, based on the data distribution: lower scores suggesting more supportive policies (47%) and higher scores suggesting less supportive policies (53%). Cronbach's alpha for the parental policies total score is .64, which can be considered as moderate.

Analysis

The characteristics of the study population have been calculated for each group. To compare the mean level of physical activity between migrant and native Dutch children, differences were analysed with an ANOVA. Our reference group consisted of native Dutch children. Additionally, to compare other group differences, we analysed scores using a t-test, an ANOVA or a chi-square test.

In accordance with our conceptual model, bivariate correlations were performed to determine the relationships between all independent variables (age, sex, educational level, home environmental characteristics) and the dependent variable (child's level of physical activity).

Subsequently, we used multivariate linear regression to investigate whether the relation between migrant background and level of child's physical activity could be explained by aspects in the physical and social home environment. Because age, sex, and educational level have an independent effect on the child's

physical activity level, we have controlled for these variables in the analysis. Three models were tested. In the first model, we adjusted for age, sex, migrant background, and the parental educational level. In the second model the resources in the physical environment were included: both the availability of active toys and equipment, sport club membership, and the accessibility of active and passive toys. In the final model (model 3), the features in the social environment were included: parental role modeling and supportive parental policies. Missing values were excluded from the analyses. Data were analysed using the SPSS program (version 19.0).

RESULTS

Sample characteristics of all children ($n = 1943$) are presented in Table 1. The first part of this table shows the mean age of the children, the percentages of boys and girls, and parental educational level, in each group. The educational level of the parents of the native Dutch children and the other western children is higher than that of the Turkish, Moroccan, and the other non-western children.

The mean number of minutes of physical activity per day, is displayed in Table 1. Overall, mean scores differed between the groups of children ($p < .05$). Dutch children had the highest physical activity score (mean = 67.9; SD = 21.0). All migrant children had lower physical activity scores. Turkish children displayed the lowest scores, followed by other non-western and Moroccan children.

Availability of active toys and equipment and membership of sport clubs was highest among native children, compared to migrant children. Scores between the groups of children differed significantly ($p < .05$). Furthermore, children from native Dutch and other western origin did show higher scores regarding accessibility to active toys (significant) and lower scores regarding accessibility to passive toys (not significant).

With regard to parental role modeling, as expressed in the mean number of minutes of physical activity per day, only migrant parents from Turkish origin show lower means. Other western, other non-western, and Moroccan parents have higher means, even compared to native Dutch parents (mean = 64.6; SD = 22.5). Regarding parental policies, parents of Turkish, Moroccan, and non-western children are less supportive (40.2%, 45.3%, and 46.5%). Parents of western children show even more supportive parental styles than native Dutch parents (52.8%).

Table 1. Sample characteristics

	Dutch (*n* = 1546)	**Turkish (*n* = 93)**	**Moroccan (*n* = 66)**	**non-western (*n* = 105)**	**western (*n* = 133)**
age, M (SD)	8.2 (0.45)	8.6 (0.67)	8.5 (0.61)	8.4 (0.63)	8.3 (0.52)
[missing]	[4]	[1]	[1]	[3]	[2]
boys, *n* (%)	778 (50.3)	38 (40.9)	36 (54.5)	44 (41.9)	74 (55.6)
girls, *n* (%)	768 (49.7)	55 (59.1)	30 (45.5)	61 (58.1)	59 (44.4)
educational level parents, %					
- low	12.5	42.4*	34.5*	26.4*	13.9*
- medium	39.7	37.6*	37.9*	35.2*	32.8*
- high	47.9	20.0*	27.6*	38.5*	53.3*
[missing]	[23]	[8]	[8]	[14]	[11]
availability (toys)					
M (SD)	6.9 (1.8)	3.9 (2.1)*	4.3 (2.2)*	5.6 (2.5)*	5.8 (2.2)*
[missing]	[5]	[3]	[3]	[9]	[7]
availability (sport clubs)					
M (SD)	1.4 (0.6)	1.2 (0.8)*	1.0 (0.7)*	1.1 (0.8)*	1.3 (0.9)*
[missing]	[86]	[4]	[9]	[13]	[11]
accessibility (active)					
M (SD)	13.1 (1.6)	10.8 (2.1)*	12.4 (2.4)*	12.2 (2.0)*	12.8 (1.9)*
[missing]	[14]	[3]	[4]	[11]	[9]
accessibility (passive)					
M (SD)	14.9 (2.9)	15.6 (3.0)	15.8 (3.2)	15.6 (2.9)	14.8 (2.9)
[missing]	[57]	[13]	[14]	[12]	[10]
role modeling					
M (SD)	64.6 (22.5)	59.1 (24.6)*	70.6 (25.8)*	73.7 (25.5)*	65.1 (22.9)*
[missing]	[190]	[28]	[24]	[24]	[65]
supportive parental policies					
%	47.0	40.2*	45.3*	46.5*	52.8*
[missing]	[4]	[1]	[2]	[6]	[6]
child's physical activity, minutes					
M (SD)	67.9 (21.0)	38.0 (18.7)*	56.9 (26.8)*	41.1 (18.7)*	62.0 (21.4)*
[missing]	[8]	[2]	[4]	[3]	[3]

* $p < .05$

Table 2 presents bivariate correlations (Pearson's and Spearman's correlation coefficients, and chi-square values) between all independent variables and the dependent variable. Apart from sex, positive relationships are found with regard to availability (toys), availability (sport clubs), accessibility (active), role modeling, and supportive parental policies.

Table 2. Bivariate correlations

	child's physical activity		
age, Pearson correlation coefficient	–.005 ($p = .830$)		
sex, *t* value	5.829* ($p = .000$)	boys, M (SD)	73.8 (22.9)
		girls, M (SD)	55.9 (19.1)
educational level parents, Spearman's rho	.004 ($p = .521$)	low, M (SD)	62.8 (23.2)
		middle, M (SD)	61.6 (20.9)
		high, M (SD)	63.4 (20.5)
availability (toys), Pearson correlation coefficient	.084* ($p = .001$)		
availability (sport clubs), Pearson correlation coefficient	.280* ($p = .000$)		
accessibility (active), Pearson correlation coefficient	.059* ($p = .046$)		
accessibility (passive), Pearson correlation coefficient	.001 ($p = .961$)		
role modeling, Pearson correlation coefficient	.122* ($p = .000$)		
supportive parental policies, chi-square value	88.845* ($p = .000$)	non-supportive, M (SD)	56.3 (19.7)
		supportive, M (SD)	74.9 (22.4)

* $p < .05$

In the multivariate regression analyses, taking into account age, sex, and migrant background, Turkish, Moroccan, and other non-western children showed significantly lower physical activity scores than native children (see Table 3). Non-native children with a western background did not differ from native Dutch children. Age was not associated with physical activity; sex was associated. We did not find a significant association between educational level of the parents and physical activity level. The total explained variance is 3% in the first model.

When adding the indicators of the physical environment to our model (second model), the previously observed ethnic differences hardly changed. Membership of sport clubs was related to the child's physical activity level. Furthermore, only access to active toys was associated. The relationships between ethnicity, the other independent variables, and the dependent variable remained the same. The total explained variance increased (13%).

Finally, ethnic differences, expressed as β, did not change when indicators of the social environment were added (third model). Role modeling and sup-

Table 3. Predictors of child's physical activity: results of multivariate regression analyses

Variables	Model 1			Model 2			Model 3		
	β	*t*	*p*	β	*t*	*p*	β	*t*	*p*
age	0.02	0.67	0.08	0.02	0.85	0.40	0.02	0.57	0.57
sex girl	−0.11*	−3.80	0.00	−0.17*	−6.23	0.00	−0.17*	−6.00	0.00
background									
- Turkish	−0.11*	−3.84	0.00	−0.12*	−4.21	0.00	−0.12*	−4.24	0.00
- Moroccan	−0.07*	−2.44	0.02	−0.05*	−1.80	0.04	−0.05*	−1.87	0.04
- non-western	−0.05*	−1.85	0.04	−0.04*	−1.57	0.05	−0.04*	−1.56	0.05
- western	−0.02	−0.71	0.48	−0.02	−0.72	0.47	−0.02	−0.84	0.39
educational level									
- middle	0.02	0.49	0.63	0.01	0.29	0.77	0.00	0.09	0.93
- high	0.03	0.62	0.54	0.02	0.62	0.53	0.00	0.01	0.99
availability (toys)				0.00	0.15	0.88	0.00	0.01	0.10
availability (sport clubs)				0.33*	11.80	0.00	0.33*	11.78	0.00
accessibility (active)				0.05*	1.82	0.05	0.05*	1.75	0.05
accessibility (passive)				0.04	1.46	0.15	0.04	1.47	0.14
role modeling							0.07*	2.74	0.00
supportive parental policies							0.10*	3.73	0.00
adjusted R^2	0.03			0.13			0.15		
R^2 change	0.03*			0.10*			0.02*		

* $p < .05$

portive parental policies were significantly related to the child's physical activity level. The contribution of all other variables did not change. The total explained variance is 15%.

DISCUSSION

Results from this study show that physical activity levels in children were significantly lower among migrant children, as compared to children in the native population. Especially, Turkish children show a very low level of physical activity.

Our results are difficult to compare with previous studies conducted in the United States and in Europe, for example, England, because the migrant groups in these studies cannot be compared with the specific migrant groups in our study[33-35]. However, a recent Dutch study among preschool children showed

similar results with our findings, at least to some degree[36]. In this study, children with a non-western migrant background played less often outside, as compared to their native counterparts. Unfortunately, non-western migrant groups were not further specified. Similar results are seen in a Swiss study, which aimed to assess physical activity in preschool children from different multicultural backgrounds[37]. Migrant children showed more sedentary behavior, as compared to children in the native population, although no specific migrants groups were distinguished in this study. To our knowledge, our study is the first that also aimed to explain differences in physical activity levels between migrant and native primary school children. This also appears from recent reviews on determinants of physical activity and sedentary behavior in young people[38-39]. In these reviews, few studies were selected that included ethnicity as a determinant of physical activity. However, none of the examined studies concentrated on explaining these ethnic differences.

Although the clear differences in levels of physical activity in our study between children from migrant and native Dutch origin, traditional physical and social characteristics of the home environment provided only modest explanation of these differences. Also, we did not find a significant association between parental education and physical activity level. In the earlier mentioned study by van Rossem and colleagues[36] this was also the case: no physical activity differences were found, according to the mother's educational level. Nevertheless, some of the included determinants, such as membership of sport clubs, accessibility of active toys and equipment (physical environment), and role modeling and supportive parental policies (social environment), did contribute to the explained variance in physical activity levels in our sample. However, the explained variance remained modest.

Unfortunately, we can only speculate why we were not successful in explaining the lower levels of physical activity, especially among Turkish, Moroccan, and other non-western children, although our point of departure was an explanatory model based on existing literature. The independent variables included in our study were all based on validated instruments.

We did only include the availability of active toys, and not the availability of passive equipment such as televisions, and (game) computers. Although a question was included in the survey, also more active game computers, such as the Wii, were included, and it was not possible to distinguish between these computer systems. However, access to this passive equipment did not contribute to differences in activity levels.

Contrary to our expectation, the physical activity level of Moroccan, other non-western, and other western parents was higher than that of the native Dutch parents. Therefore, it could only contribute to the explanation of the relatively lower levels of physical activity among Turkish children. We assessed the physical activity level of the primary caregiver, which in most cases was the mother. Assessing the physical activity level of the father might be more adequate as an indicator of role modeling for boys.

In this study, we assessed physical activity of the children by means of parental reports. We did not use self-reports by the children because they have more difficulty with cognitive tasks of recalling at this age than adults[40]. Due to concerns of expense, this method is most often used in observational studies. More direct methods such as observations might be more valid. No information is available on ethnic differences in proxy reports on physical activity levels of children. Concerning adults, our physical activity questionnaire is considered to be a valid measure[41]. Nevertheless, we recommend further evaluation of the validity of parental reports.

Furthermore, we assessed socio-economic position, although it is a multidimensional concept, only by educational level. A recent study showed that the relationship between socio-economic status and ethnic differences in health can differ, according to which indicators are applied[42]. Educational level as main indicator was chosen because most parents in this study are first generation migrants. These migrants relatively often experience little formal education[43]. Educational level determines the level of knowledge on healthy exercise. Although income level also affects the physical activity level, as low income levels might make it more difficult to participate in sport clubs, the amount of missing values on the income level of the families was enormous.

Also, we assessed migrant origin by the country of birth of the parents, because it has the advantage to be objective and stable[44]. Despite the classification into two well-defined groups, children with a Turkish and a Moroccan background, the classification of other non-native children into two heterogeneous groups, other western and other non-western children, was necessary, because of the limited number of children within the separate groups, but subject to critique. Nevertheless, our findings suggest that, concerning physical activity level, western children resemble more the native Dutch, whereas the non-western children resemble more the Turkish and Moroccan children.

It is important to point out that our study has a cross-sectional design. Therefore, we can only describe differences between groups at a single point of time. Causal conclusions cannot be drawn from this study.

Concluding, we did find differences in physical activity levels between children from migrant and native Dutch origin. However, our hypothetical model provided a modest explanation of these differences. Therefore, the question arises whether interventions aimed at reducing overweight and obesity should have to focus on traditional home characteristics with regard to participation in physical activity. Instead, we suggest further exploring parental attitudes regarding the importance of physical activity for children from migrant origin, since other studies found that some minority groups hold negative attitudes toward physical activity[18-19]. Furthermore, physical activity is an important determinant of BMI, as are sedentary habits. We also recommend that future studies should investigate differences in sedentary behavior among primary school children from migrant and native Dutch origin.

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Chapter 5

Dietary intake differences between children from migrant and native origin

Submitted.

(mosaic: 'Opus vermiculatum' by unknown artist – beginning of the 1st century BC)

ABSTRACT

Objective

To assess to what degree children from migrant and native Dutch origin differ with regard to dietary intake (fruit, vegetables, sweet beverages, snacks) and to determine which aspects in their physical and social home environments contribute to these differences.

Methods

A cross-sectional design. Subjects were children and their primary caregivers ($n = 1943$). Mean child age was 8.2 years (SD = 0.5). Data were collected from primary schools in the Netherlands.

Results

Consumption of fruit and vegetables is lowest in native children, as compared to children in migrant populations, and consumption of sugar-sweetened beverages and snacks is higher in natives ($p < .05$).

Conclusions and implications

In particular, parental role modeling can explain differences between migrant and native children. As children from migrant origin are at higher risk for overweight and obesity and dietary intake is a key factor in this risk, the implications for future intervention programmes aimed at influencing parental behavior are discussed.

Keywords

Child Health; Transients and Migrants; Dietary Intake; Parenting; Netherlands.

INTRODUCTION

Worldwide, overweight and obesity have reached epidemic proportions and have become a major public health concern as a consequence of the serious impact on mortality, quality of life, and morbidity in both adults, and children[1-2]. In Europe, the prevalence of overweight and obesity is still growing fast[3].

According to a systematic review of the European literature, children from migrant origin are at higher risk for overweight and obesity than their native counterparts[4]. Migrants tend to adopt food patterns from host countries and abandon their traditional eating habits[5]. In a review from the United Kingdom for example, migrants adopted westernized dietary intake, such as an increase of fat consumption and a reduction of vegetables, fruit, and pulse consumption[6]. Migration to developed countries seems to increase the risk of overweight and obesity[7-8]. In several Western European countries, many migrants from Turkey and Morocco have settled, also in the Netherlands. Overweight and obesity is especially high in these groups[9].

The etiology of childhood overweight and obesity is considered to be multidimensional[10]. Lack of physical activity and too much energy intake are the direct causes of overweight[11-12]. Variations in this respect among migrant and native children have not yet been investigated in Europe. Effective prevention and treatment strategies can only by designed, if determinants are identified that predict engagements in these lifestyle behaviors among migrant and native children[13].

Dietary intake is influenced by the physical and social home environment[14-15]. In the physical environment, both availability, and accessibility of food affect food consumption[16-17]. In the social environment, parents can promote consumption of fruit and vegetables, but also discourage consumption of sweet beverages and snacks. Their own dietary intake can be considered as a role model for their children[18].

The conceptual model of this study (Figure 1) is based on Gattshall and colleagues[14]. Migrant background is not considered as a factor that directly can explain dietary intake in this model. Dietary intake is hypothesized to be partially explained by differences in the physical and social home environment. Age and sex of the child, and education of the parents are considered as additional independent factors that affect the dietary intake of children.

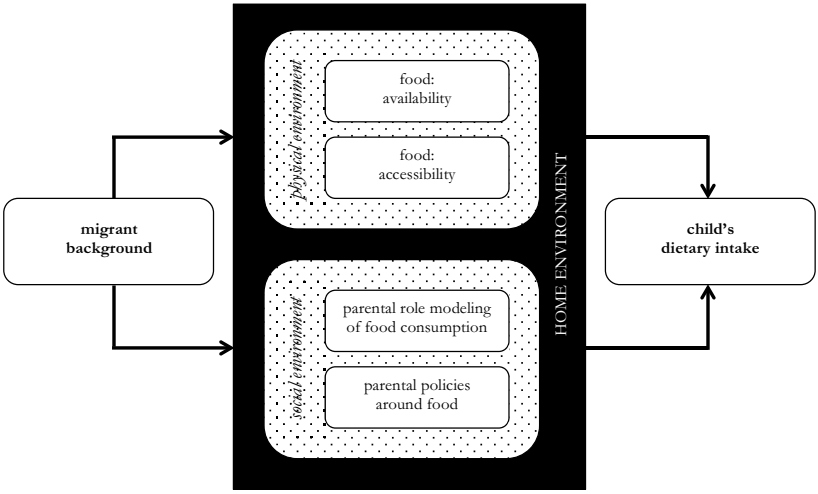

Figure 1. Conceptual model for the influence of the home environment on dietary intake

Study aim

The first aim of this study is to compare the dietary intake between migrant and native primary school children in the Netherlands. The second study aim is to determine to what degree dietary intake differences between migrant and native children are associated with differences in their home environments: availability and accessibility of food (physical environment), parental role modeling and parental policies (social environment).

METHODS

Background study

Data are derived from the IVO Nutrition and Physical Activity Child CohorT (INPACT) study. This study is a collaborative project between the IVO Addiction Research Institute and the Institute of Health Policy and Management, a department of the Erasmus University Rotterdam.

In this project, the focus is on obesogenic environment factors influencing weight of Dutch primary school children.

Study population

Data were obtained from parent-child dyads at primary schools in two large cities in the Netherlands: Rotterdam and Eindhoven. Rotterdam is the second largest Dutch city (about 600,000 inhabitants) and Eindhoven is the fifth largest Dutch city (about 200,000 inhabitants). Children from many different migrant backgrounds attend school in these cities. Participation in this study among the two largest migrant groups, migrants from Turkish and Moroccan descent, was stimulated by offering assistance in their native tongue by interpreters.

Schools were excluded if they were participating in any prevention activities, as this was expected to influence the measures. Out of 3162 invited parent-child dyads, 1943 dyads (61.5%) decided to participate in the INPACT study. Children were 8-9 years old (group 5 of Dutch primary schools).

For the present manuscript, data collected at baseline were analysed (2008/2009). The study was approved by the medical ethics committee of the Erasmus MC, University Medical Center Rotterdam.

Measurements

The general part of the questionnaire included questions on the age and sex of the children and on the education and migrant background of the parents. The other part concerned dietary intake of the child, food availability, food accessibility, parental role modeling, and parental policies.

Educational level of the parent was divided into three categories: low (primary school, lower vocational or general education), middle (secondary school, intermediate vocational school), and high (higher vocational school or university).

Children were considered as having a migrant background, when at least one of their parents was born outside the Netherlands, in accordance with Dutch current practice[19]. Five groups are distinguished: native Dutch children ($n = 1546$), children with a Turkish background ($n = 93$), children with a Moroccan background ($n = 66$), and two supplementary groups, containing children from a range of countries, one with children from non-western origin ($n = 105$) and one with children from western origin ($n = 133$).

The child's dietary intake was assessed by Food Frequency Questionnaires[20-21]. Dietary intake concerned four categories: fruit (fresh, bottled and/or canned), vegetables (raw and/or cooked), sugar-sweetened beverages and snacks (e.g., chocolates, candies, chips).

The primary caregiver had to report how many days a week, based on a normal week, their children consumed products in these categories. The answering scale included 8 categories, ranging from "none or less than 1 day a week" to "7 days a week". Further, these caregivers had to report the number of pieces of fruit, spoons of vegetables (one spoon equals 50 grams), glasses of sweet beverages (one glass equals 0.2 litres), and quantities of snacks (chocolates, candies, chips), as consumed by their children on such a day. Afterwards, total weekly food consumption of the child was calculated by multiplying frequency with quantity.

Food availability was measured with a single item referring to the physical presence of a specific type of food within the home environment. Respondents could answer on a 5-point Likert scale, on which each item scale ranged from 1 (always available) to 5 (never available).

Food accessibility was measured by a scale consisting of 2 questions referring to the ease of access of this food. On a 5-point Likert scale, items ranged from 1 (always within reach) to 5 (never within reach). At the end, a sum score was calculated, ranging from 2 (high accessibility) to 10 (low accessibility). Cronbach's alpha for the accessibility scale was moderate: .77 for fruit, .69 for vegetables, and .63 for both sweet beverages, and snacks.

Dietary intake of the primary caregiver was used as indicator of parental role modeling and was measured by the same Food Frequency Questionnaires[20-21].

Parental policies, aimed to their child's dietary intake, were assessed by 5 questions on a 5-point Likert scale developed by Gattshall and colleagues. The scale ranged from 1 (always supportive) to 5 (never supportive). Two groups were distinguished, based on distribution of the data: supportive policies (scores > 2.2) and non-supportive policies (scores < 2.2).

Analysis

Study population characteristics have been calculated for each of the five groups. Differences between migrant and native Dutch children were analysed using a t-test, an ANOVA, or a chi-square test. Our reference group consisted of native Dutch children.

Multivariate linear regression was used to investigate whether the relation between migrant background and child's dietary intake could be explained by aspects in the physical and social home environment, as presented in the hypothetical model. Three models were tested regarding the four categories of food. All models were adjusted for age, sex, and education. The first model tested the

relation between migrant background and child's dietary intake. The next model (model 2) added resources in the physical environment: availability and accessibility of food. Finally, in the third model, features in the social environment were included: parental role modeling and parental policies. Missing values, which were spread randomly among the different groups were excluded from the analyses (range 1.1% in Dutch, $n = 17$ out of $n = 1546$, to 4.5% in Moroccan, $n = 3$ out of $n = 66$). Data were analysed using the SPSS program (version 19.0, SPSS Inc., Chicago, IL, USA, 2010).

RESULTS

Table 1 presents the sample characteristics of all children ($n = 1943$). All children ate less fruit and less vegetables than suggested in current public guidelines advocating 2 pieces of fruit and 150 grams of vegetables per day. Dutch children showed the lowest intake of fruit and vegetables. All migrant children had higher scores. Moroccan children scored highest in fruit intake per week and vegetables intake per week. Also, consumption of sugar-sweetened beverages and snacks was lower in the migrant children than in native children ($p < .05$).

Table 1. Sample characteristics

	Dutch ($n = 1546$)	**Turkish ($n = 93$)**	**Moroccan ($n = 66$)**	**non-western ($n = 105$)**	**western ($n = 133$)**
age, M (SD)	8.2 (0.45)	8.6 (0.67)	8.5 (0.61)	8.4 (0.63)	8.3 (0.52)
[missing]	[4]	[1]	[1]	[3]	[2]
boys, *n* (%)	778 (50.3)	38 (40.9)	36 (54.5)	44 (41.9)	74 (55.6)
educational level parents, %					
- low	12.5	42.4*	34.5*	26.4*	13.9*
- medium	39.7	37.6*	37.9*	35.2*	32.8*
- high	47.9	20.0*	27.6*	38.5*	53.3*
[missing]	[23]	[8]	[8]	[14]	[11]
availability (fruit), M (SD)	1.1 (0.3)	1.1 (0.4)	1.1 (0.3)	1.3 (0.6)	1.2 (0.4)
[missing]	[2]	[0]	[1]	[1]	[2]
availability (vegetables), M (SD)	1.2 (0.5)	1.1 (0.4)	1.1 (0.4)	1.3 (0.6)	1.2 (0.4)
[missing]	[23]	[7]	[1]	[1]	[8]
availability (sweet drinks), M (SD)	1.5 (0.9)	1.6 (0.9)*	1.9 (1.0)*	1.8 (1.1)*	1.9 (1.1)*
[missing]	[12]	[1]	[1]	[3]	[3]
availability (snacks), M (SD)	1.2 (0.5)	1.7 (0.8)*	1.9 (0.9)*	1.8 (1.0)*	1.6 (0.8)*
[missing]	[22]	[4]	[2]	[2]	[5]

Table 1. Sample characteristics (continued)

	Dutch (*n* = 1546)	**Turkish (*n* = 93)**	**Moroccan (*n* = 66)**	**non-western (*n* = 105)**	**western (*n* = 133)**
accessibility (fruit), M (SD)	2.9 (1.4)	2.4 (1.1)	2.4 (0.9)	2.6 (1.2)	2.6 (1.4)
[missing]	[37]	[5]	[1]	[7]	[3]
accessibility (vegetables), M (SD)	2.9 (1.5)	2.7 (1.2)	2.4 (0.9)	2.6 (1.2)	2.8 (1.5)
[missing]	[36]	[4]	[2]	[5]	[3]
accessibility (sweet drinks), M (SD)	4.9 (2.2)	3.7 (2.0)*	4.2 (2.1)*	3.9 (2.0)*	4.6 (2.3)*
[missing]	[80]	[5]	[2]	[9]	[10]
accessibility (snacks), M (SD)	5.8 (3.7)	5.0 (3.7)*	7.4 (3.2)*	4.5 (3.7)*	6.0 (3.8)*
[missing]	[49]	[3]	[7]	[7]	[8]
role modeling (fruit), M (SD)	7.2 (5.0)	9.2 (7.6)*	9.3 (5.9)*	8.6 (6.1)*	8.1 (6.2)*
[missing]	[9]	[2]	[2]	[1]	[3]
role modeling (vegetables), M (SD)	773.3 (316.9)	594.8 (449.8)*	813.9 (438.3)*	832.7(471.6)*	843.2 (378.6)*
[missing]	[14]	[1]	[1]	[1]	[4]
role modeling (sweet drinks), M (SD)	4.4 (3.4)	5.9 (4.6)*	5.8 (3.3)*	5.6 (4.6)*	4.8 (3.5)*
[missing]	[6]	[4]	[2]	[1]	[3]
role modeling (snacks), M (SD)	8.7 (4.2)	7.9 (6.8)*	4.6 (3.5)*	6.7 (3.5)*	6.3 (3.3)*
[missing]	[11]	[2]	[2]	[3]	[3]
supportive parental policies, %	47.0	40.2*	45.6*	46.5*	52.8*
[missing]	[4]	[1]	[2]	[6]	[5]
child's fruit intake, M (SD)	7.3 (4.0)	8.3 (7.7)*	9.8 (6.4)*	7.6 (5.2)*	8.3 (5.2)*
in pieces [missing]	[6]	[1]	[3]	[2]	[2]
child's vegetables intake, M (SD)	472.9 (244.1)	531.8 (502.1)*	593.9 (401.2)*	508.7 (330.7)*	506.5 (300.0)*
in grams [missing]	[12]	[1]	[1]	[1]	[3]
child's sweet drinks intake, M (SD)	9.6 (5.6)	7.0 (4.3)*	10.1 (8.1)*	8.5 (6.4)*	8.7 (5.9)*
in glasses [missing]	[3]	[2]	[1]	[1]	[3]
child's snacks intake, M (SD)	14.6 (7.9)	11.0 (8.2)*	10.5 (6.9)*	10.9 (8.1)*	13.3 (9.9)*
in quantities [missing]	[17]	[2]	[2]	[4]	[2]

* $p < .05$ (significance level); M = mean; SD = standard deviation; % = percentage

Availability and accessibility of fruit and vegetables did not differ, while availability and accessibility of sweet beverages and snacks did differ between the groups of children ($p < .05$). Sweet beverages and snacks were least available and least accessible in migrant families.

In line with the behavior of their children, Dutch parents showed a lower intake of fruit and vegetables. Exceptions however, were the parents of Turkish children eating the least vegetables. Also, Dutch parents consumed least glasses of sweet beverages per week, whereas migrant parents, in contrast with the behavior of their children, had higher scores.

Regarding parental policies, parents of Turkish, Moroccan, and non-western children seemed to be less supportive (40.2%, 45.6%, and 46.5%). Parents of western children showed even more supportive parental styles (52.8%).

Results of the multivariate regression are presented in Table 2. Concerning fruit intake, Turkish, Moroccan, and other western children showed a significantly higher fruit intake, as compared to native children, taking into account age, sex, and education (model 1). The availability and – to a lesser extent – the accessibility of fruit were associated with the child's fruit intake (model 2). Adding these variables did not explain differences between migrant and native children. Particularly, role modeling, but also supportive parental policies were significantly associated with the consumption of fruit (model 3). Adding these variables explained the differences in Turkish children (in model 1 $\beta = 0.05$, in model 3 $\beta = 0.01$) and partly explained the differences in the other children, as β in these children decreased, but still remained significant. The total explained variance was 24%.

With regard to vegetables intake, all non-native children, except from the other western children, showed a higher vegetables intake than native children, when taking into account age, sex, and education (model 1). Availability and accessibility of vegetables were significantly associated with the vegetables intake of the child (model 2), but did hardly explain differences between migrant and native children. Role modeling was clearly associated with children's vegetables intake, whereas parental support was not (model 3). Adding the other independent variables did explain the differences in other non-western children (in model 1 $\beta = 0.05$, in model 3 $\beta = 0.01$) and did partly explain the differences in Moroccan children. Explained variance was 29%.

In the first model of sweet beverages intake, only Turkish children consumed less sweet beverages, as compared to the other children, taking into account age, sex, and education. The availability and the accessibility were significantly associated with child's sweet beverages intake (model 2), but did not explain differences between Turkish and other non-native children. Role modeling was associated with the use of sweet beverages, whereas parental support was not associated (model 3). Again, differences (β) between Turkish children and other migrant children were not explained. The total explained variance was 14%.

Finally, regarding snacks intake, Turkish, Moroccan, and other non-western children showed a lower snacks intake than native children, when taking into account age, sex, and education (model 1). Availability and accessibility were associated with snacks intake of the child (model 2). Adding these variables

Table 2. Predictors of child's dietary intake: results of multivariate regression analyses

Variables	fruit intake			vegetables intake			sweet drinks intake			snacks intake		
β (*t*)	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
age	−0.08* (−3.19)	−0.07* (−2.81)	−0.07* (−3.50)	−0.01 (−0.47)	−0.00 (−0.07)	−0.02 (−1.04)	−0.02 (−0.81)	−0.03 (1.42)	−0.03 (−1.41)	−0.03 (−1.26)	−0.01 (−0.54)	−0.01 (−0.66)
sex girl	0.01 (0.29)	0.01 (0.21)	0.01 (0.63)	−0.01 (−0.48)	−0.01 (−0.49)	−0.02 (−1.05)	−0.01 (−0.56)	−0.01 (−0.41)	−0.02 (−0.77)	−0.03 (−1.16)	−0.02 (−0.99)	−0.02 (−0.71)
background												
- Turkish	0.05* (2.22)	0.04* (1.87)	0.01 (0.54)	0.05* (2.04)	0.04* (1.94)	0.05* (1.73)	−0.07* (−2.85)	−0.07* (−2.99)	−0.08* (−3.38)	−0.10* (−4.13)	−0.06* (−2.58)	−0.07* (−3.04)
- Moroccan	0.11* (4.80)	0.11* (4.72)	0.08* (4.00)	0.08* (3.31)	0.07* (2.99)	0.05* (2.49)	0.03 (1.18)	0.04 (1.65)	0.03 (1.45)	−0.09* (−3.81)	−0.04 (−1.82)	−0.03 (−1.37)
- non-western	0.02 (0.65)	0.02 (1.19)	0.00 (0.09)	0.05* (2.15)	0.03 (1.66)	0.01 (0.31)	−0.03 (−1.21)	−0.03 (−1.16)	−0.03 (−1.50)	−0.12* (−5.15)	−0.09* (−4.10)	−0.09* (−3.97)
- western	0.07* (3.16)	0.07* (3.42)	0.06* (3.01)	0.01 (0.52)	0.00 (0.39)	0.00 (0.37)	−0.02 (−0.78)	−0.01 (−0.24)	−0.01 (−0.47)	−0.02 (−0.84)	0.01 (0.47)	0.02 (1.17)
educational level parents												
- middle	0.02 (0.45)	0.01 (0.17)	0.01 (0.46)	0.01 (0.31)	0.01 (0.27)	0.02 (0.77)	0.01 (0.40)	0.02 (0.62)	0.04 (1.42)	0.01 (0.25)	0.01 (0.32)	0.02 (0.57)
- high	0.06* (1.59)	0.03 (0.73)	0.02 (0.51)	0.10* (2.76)	0.08* (2.18)	0.02 (0.71)	0.04 (1.39)	0.01 (0.02)	0.04 (1.37)	−0.13* (−3.51)	−0.11* (−3.05)	−0.14* (−4.17)
availability		0.24* (10.42)	0.15* (6.99)		0.13* (5.41)	0.03* (1.30)		0.18* (7.50)	0.13* (5.43)		0.26* (10.88)	0.20* (8.80)
accessibility		0.08* (3.31)	0.06* (2.93)		0.09* (3.68)	0.05* (2.62)		0.13* (5.15)	0.10* (4.26)		0.13* (5.65)	0.11* (5.24)
modeling			0.41* (19.14)			0.53* (25.17)			0.28* (12.07)			0.33* (15.08)
policies			0.08* (3.69)			0.01 (0.55)			0.03 (1.57)			0.03 (1.44)
adjusted R^2	0.02	0.08	0.24	0.01	0.04	0.29	0.01	0.07	0.14	0.04	0.13	0.23
R^2 change	0.02*	0.06*	0.16*	0.01*	0.03*	0.25*	0.01*	0.06*	0.07*	0.04*	0.09*	0.10*

* $p < .05$ (significance level); R^2 = explained variance

explained the differences in Moroccan children (in model 1 β = 0.09, in model 2 β = 0.04) and partly explained the differences in the other children. Role modeling was significantly associated with the child's snacks intake, but parental policies were not (model 3). Apart from the explained differences in Moroccan children, β did decrease in Turkish children (in model 1 β = 0.10, in model 3 β = 0.07) and in other non-western children (in model 1 β = 0.12, in model 3 β = 0.09). Explained variance was 23%.

DISCUSSION

Results from this study show that migrant and native children differ in their dietary intake. Dutch children consume the least fruit, the less vegetables, and higher amounts of sweet beverages and snacks, as compared to their non-native counterparts. Particularly, parental role modeling contributes to the explanation of differences in dietary intake between groups of children.

This study is one of the first that, apart from examining possible dietary intake differences between natives and non-natives, also aimed to explain these differences by means of the home environment. Previous studies from the Netherlands with regard to dietary intake were only aimed to describe differences between non-native and native Dutch children, without differentiating between specific migrant groups[22-23]. Outcome measures in both studies were limited to intake of fruit and vegetables. Also, the mean age of the included children was higher and dietary intake in children was assessed differently. In spite of these differences, results of one study are in line with this study: higher intake of fruit and vegetables among non-native children than native children[23]. The other study only found a higher fruit intake among non-Dutch girls[22]. Apart from the intake of fruit and vegetables, differences regarding intake of sweet beverages and snacks between natives and non-natives were only assessed among adolescents[24]. Results do point into the same direction.

Results from studies outside Europe are difficult to compare with this study. The United States for example, show a different migration history and dissimilar composition of migrant and ethnic groups[25].

The use of Food Frequency Questionnaires is quite common in international comparable studies and has yielded positive results on reproducibility and validity[20-21]. However, food estimates of parents might not always agree with the actual intake, due to unawareness or recall problems[26]. In addition, it may evoke

social desirability bias[20]. The intake of sweet beverages and snacks may have been underestimated, whereas the intake of fruit and vegetables may have been overestimated, as fruit and vegetables are perceived as healthy and socially acceptable food, compared to sugar-sweetened beverages and snacks[21]. Observations might be more valid, but practically difficult to use in surveys.

Another limitation is that in the literature no evidence was found about cross-cultural validity. Actually, migrants and non-migrants may differ in their answering patterns, leading to cultural bias. Specific questionnaires validated for specific groups might be necessary.

Implications for research and practice

Many studies point out that dietary intake is an important predictor of BMI. Literature shows that migrant children have an increased overweight and obesity risk[4]. In this study, migrants show a higher intake of fruit and vegetables, suggesting that this aspect of dietary intake is less important in reducing this risk. However, promoting the intake of fruit and vegetables still has other positive health effects. As a systematic review points out that the literature is inconclusive about the association between intake of fruit and BMI[27], it is recommended that future studies should further investigate the complexity of this issue. The fact that in this study the social environment, especially parental role modeling, contributes more to the explanation of dietary intake differences between children from migrant and native origin than the physical environment, availability and accessibility, adds new insight to the literature. Therefore, this may be an important focus of interventions aimed at stimulating healthy dietary habits, in order to decrease overweight and obesity among all children.

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Chapter 6

Sleep duration differences between children from migrant and native origin

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(photography: unknown artist)

ABSTRACT

Aim

To explore whether primary school children from migrant and native Dutch origin differ regarding their sleep duration per night, a risk for overweight and obesity, and to determine in which degree differences in parenting styles contribute to these differences.

Subjects and methods

A cross-sectional survey, including 1943 children at the age of 8-9 years old and their primary caregivers, was performed. Data were collected from primary schools in cities and adjacent municipalities in the Netherlands: Eindhoven and Rotterdam. Outcome measure was mean sleep duration per night. Main independent variable was migrant background, based on country of birth of the parents. Possible mediating variable was parenting style (rejecting, neglecting, permissive, authoritarian, authoritative). Age and sex of the child, and parental socio-economic status, as indicated by educational level, were added as confounders.

Results

Dutch children have the highest sleep duration: more than 11 hours (mean = 670.1; SD = 27.7). All migrant children show less than 11 hours of sleep per night. Migrant children from non-western origin, especially Turkish and Moroccan children, show the lowest sleep duration per night. Parenting styles do not contribute to these differences.

Conclusion

Migrant background is associated with sleep duration. As children from migrant origin are, in general, at higher risk for overweight and obesity and sleep duration is regarded as a risk factor for overweight and obesity, further investigation of this association is needed.

Keywords

Child Health; Transients and Migrants; Sleep; Parenting; Netherlands.

INTRODUCTION

All over the world, the overweight and obesity epidemic has become an enormous threat for public health as a consequence of the severe impact on quality of life, morbidity, and even mortality[1-2]. Both obese adults, and obese children may experience such negative consequences in the short or long run[3].In the European Region, the prevalence rates of overweight and obesity are still growing rapidly, especially in young people[4]. Childhood overweight may develop over time into adolescent obesity[5]. Also, parental overweight is regarded as an important risk factor predicting weight problems of their children[6].

In spite of multiple risk factors, the increase of childhood overweight and obesity is generally the result of energy balance disorders. Factors that affect childhood overweight and obesity include lifestyle behaviors, which in turn are shaped by parenting practices. These practices are also influenced by child characteristics, such as age and gender, which are also risk factors for overweight and obesity[7]. In addition, according to a systematic review of the European literature, migration seems to play a role, as migrant children are even more at risk of overweight and obesity than their indigenous counterparts[8]. Indeed, immigration to high income European countries may alter lifestyle, such as alterations in physical activity and dietary intake[9-10].

Apart from the more traditional risk factors of overweight and obesity, short sleep duration is regarded as an independent risk factor for overweight and obesity[11-12], both in adulthood, and in childhood[13-14]. This association can be explained by the fact that, in order to counterbalance additional energy expenditure resulting from increased time awake, a higher food intake than needed is consumed by the human body[15]. Another explanation for this association is that short sleep duration may disrupt hormones regulating appetite, which may increase appetite for carbohydrate-rich foods[16]. Finally, sleep deprivation is associated with a decreased glucose tolerance, which is also regarded as a potential risk for overweight and obesity[17].

Short sleep duration can be due to several factors. Multiple persons sleeping in one room, the presence of daylight, and room temperature negatively affects sleep duration[18]. Additionally, there is evidence in the literature that children with socially disadvantaged backgrounds and low levels of sleep duration are associated[18-19]. Furthermore, ethnicity seems to play a role. Wong and colleagues[20] found that primary school children from underserved minorities, living in the United States and belonging to ethnic minority groups, showed an increased

overweight and obesity risk, when the suggested guidelines from the National Sleep Foundation were not followed. These guidelines recommend a sleep duration of 10-11 hours per night for these children.

In Europe, differences in sleep duration between specific migrant groups, both in adults, and in children, have, to our knowledge, not been studied. Given the fact that overweight and obesity are more prevalent among migrant children, as compared to the native population, we hypothesize that migrant children show less sleep than non-migrant children.

Further, parents have a key role in stimulating optimal sleep duration[21]. Therefore, it is hypothesized that parenting styles, showing more behavioral control, influence the child's sleep in a positive way, as this type of control reflects the regulation of the child's behavior through a firm and consistent discipline by strict house rules.

METHODS

Study aim

The main aim of this study is to compare the sleep duration per night between migrant and native primary school children in the Netherlands. An additional study aim is to determine whether differences between these children can be explained by parenting styles of the primary caregivers, taking into account parental socio-economic position, and age and sex of the children. The conceptual model is presented in the figure beneath (Figure 1).

Background study

In the context of the IVO Nutrition and Physical Activity Child CohorT (INPACT) study, a cross-sectional study was performed. This study is a collaborative project between the Institute of Health Policy and Management, a department of the Erasmus University Rotterdam, and the IVO Addiction Research Institute.

In this four-year longitudinal project, factors in the obesogenic environment within the developmental trajectory of weight are studied. Subjects are Dutch primary school children from the age of 8-9 years old. For the present manuscript, data collected at baseline have been analysed (2008/2009).

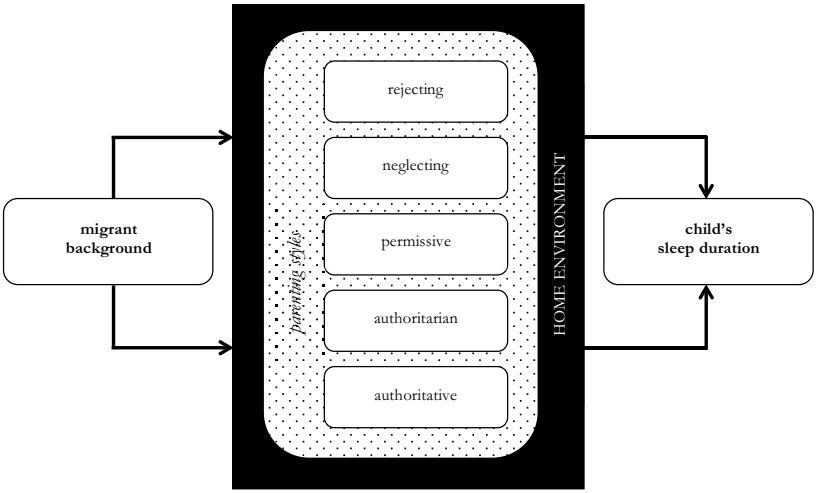

Figure 1. Conceptual model for the influence of parenting styles in the home environment on sleep duration

Study population

Our study population consists of parent-child dyads. These dyads were recruited from primary schools in two large cities In the Netherlands and adjacent municipalities around these cities: Eindhoven and Rotterdam. Eindhoven is the fifth largest city and Rotterdam is the second largest city. Children from different migrant backgrounds, western descent or non-western descent, attend to school in these cities.

In this study, 1943 dyads (61.5%) decided to participate. Schools decided for participation in the INPACT study on base of a letter in which the aim and relevance of this study were explained.

Schools were excluded if they were participating in any prevention programmes, because these programmes were expected to influence our measures. Participation in this study was on the basis of informed consent of the primary caregivers of the children.

The study has received the approval from the medical ethics committee of the Erasmus MC, University Medical Center Rotterdam.

Measurements

The general part of the questionnaire included questions on the age and sex of the children and the socio-economic position and migrant background of the parents.

Socio-economic status was assessed by the highest educational level achieved by one of the parents, divided into three categories: low (primary school, lower vocational or general education), middle (secondary school, intermediate vocational school), and high (higher vocational school or university). Children were considered as having a migrant background, when at least one of their parents was born outside the Netherlands, according to current Dutch practice[22]. Also, based on this classification, five groups in our sample were distinguished: three homogeneous groups, consisting of native Dutch children ($n = 1546$), children with a Turkish background ($n = 93$), and children with a Moroccan background ($n = 66$). Also, two supplementary groups were included, containing more heterogeneous groups of children. In these groups, we discerned children from a variety of non-western countries, other than Turkey and Morocco, labelled 'other non-western children' ($n = 105$), and from a variety of western countries, other than the Netherlands, labelled 'other western children' ($n = 133$).

Outcome measures: sleep duration

Sleep duration was measured by two questions. The primary caregiver had to report the time, based on an average school day, their children went to sleep and awoke. The answering scales of these questions consisted of several time categories with intervals of half an hour, of which two more broader time categories concerning a specific time in the evening or in the morning (e.g., "earlier than 6 am" or "later than 10.30 pm").

Based on the answers, we calculated the mean amount of minutes that the child sleeps per night during a normal school week. In case a primary caregiver made use of the broader time categories, we added or subtracted an extra half an hour to the total duration of sleep.

Parenting styles

The parenting style of the primary caregiver was determined on base of the Dutch translation of an instrument by Steinberg and colleagues[23-25]. This instrument consisted of 22 items which assessed three parenting style dimensions: support, behavioral control, and psychological control. Respondents could answer on a Likert scale ranging from –2 (completely disagree) to +2 (completely agree).

Support was measured with seven items, for example: "When my child gets a low grade in school, I offer to help him/her." At the end, these items were combined into a single variable by summing the item scores, ranging from –14 (low) to + 14 (high). Behavioral control was also measured with seven items, for example: "I know exactly what my child does in his/her free time." A sum score was determined, also ranging from –14 (low) to +14 (high). Psychological control was measured with eight items, for example: "I make my child feel guilty, when he/she gets a low grade in school." This sum score ranged from –16 (low) to +16 (high).

In each of the dimensions, we distinguished between two groups, based on the data distribution, as a result of a median split: low scores and high scores. On base of these three parenting dimensions, five parenting styles have been established: rejecting (low support, low behavioral control, high psychological control), neglecting (low support, low behavioral control, low psychological control), permissive (high support, low behavioral control, low psychological control), authoritarian (low support, high behavioral control, low psychological control), and authoritative (high support, high behavioral control, low psychological control). Based on this common typology, other possible combinations were left out. As our hypothesis emphasizes the influence of behavioral control, it is hypothesized that authoritarian and authoritative parenting styles (high behavioral control) lead to higher sleep durations.

Analysis

First, our study population characteristics ($n = 1943$) have been calculated for each of the five migrant groups. In addition, to compare sleep duration of native Dutch and migrant children and to compare parenting styles within these groups, differences were tested with a t-test or a chi-square test. Our reference group consisted of native Dutch children. Secondly, to explore possible correlations between age, sex, educational level of the parents, and parenting styles (independent variables), and child sleep duration (dependent variable), Spearman and Pearson correlation coefficients were determined. Finally, multivariate linear regression was used to investigate whether the relation between migrant background and child's sleep duration could be explained by differences in parenting styles, as presented in our hypothetical model. We have controlled for age, sex, and socio-economic position. Missing values were excluded from the analyses. Data were analysed by means of the SPSS program (version 19.0).

RESULTS

Characteristics of all children in the sample ($n = 1943$) are presented in Table 1. In the upper part of this table, the age of the children (mean and SD), the percentages of boys and girls, and parental educational level, in each group, are presented. The educational level of the parents of the native Dutch children and the non-native western children is higher than this level in the parents of the other children ($p < .05$).

The lower part of Table 1 shows both the parenting styles of the primary caregivers, and the mean sleep duration per night of the children. Overall, migrants show other parenting styles than non-migrants. Rejecting parenting styles are less prevalent among native parents, compared to migrant parents, whereas neglecting parenting styles, and also parenting styles focusing on high behavioral control (authoritative style and authoritarian style) are more prevalent

Table 1. Sample characteristics

	Dutch ($n = 1546$)	**Turkish ($n = 93$)**	**Moroccan ($n = 66$)**	**non-western ($n = 105$)**	**western ($n = 133$)**
age, M (SD)	8.2 (0.45)	8.6 (0.67)	8.5 (0.61)	8.4 (0.63)	8.3 (0.52)
[missing]	[4]	[1]	[1]	[3]	[2]
boys, *n* (%)	778 (50.3)	38 (40.9)	36 (54.5)	44 (41.9)	74 (55.6)
girls, *n* (%)	768 (49.7)	55 (59.1)	30 (45.5)	61 (58.1)	59 (44.4)
educational level parents, %					
- low	12.5	42.4*	34.5*	26.4*	13.9*
- medium	39.7	37.6*	37.9*	35.2*	32.8*
- high	47.9	20.0*	27.6*	38.5*	53.3*
[missing]	[23]	[8]	[8]	[14]	[11]
parenting style parents, %					
- rejecting	21.1	62.3*	46.3*	58.1*	32.1*
- neglecting	20.9	3.8*	9.8*	5.4*	13.2*
- permissive	22.6	28.3*	22.0*	13.5*	20.8*
- authoritarian	10.9	1.9*	4.9*	8.1*	9.4*
- authoritative	24.4	3.8*	17.1*	14.9*	24.7*
[missing]	[42]	[4]	[4]	[6]	[12]
child's sleep duration, minutes per night					
M (SD)	670.1 (27.7)	645.5 (35.4)*	645.3 (34.9)*	654.8 (33.2)*	657.5 (32.5)*
[missing]	[42]	[4]	[4]	[6]	[12]

* $p < .05$

among native parents, compared to parents from migrant origin. Additionally, Dutch parents resemble the western parents with regard to authoritarian and authoritative styles, thus, higher scores on behavioral control, as compared to non-western parents.

Further, mean sleep duration, expressed in minutes per night, between the groups of children differs ($p < .05$). Dutch children have the highest sleep duration, more than 11 hours (mean = 670.1; SD = 27.7). All migrant children show less than 11 hours of sleep per night. Especially among Turkish children (mean = 645.5; SD = 35.4) and Moroccan children (mean = 645.3; SD = 34.9), the minutes of sleep per night are lower. Differences between migrant and non-migrant children vary from 24.8 minutes to 12.6 minutes.

Table 2 presents bivariate correlations (Pearson's and Spearman's correlation coefficients, t-test) between all independent variables and the dependent variable. Besides age and sex of the child, as well as parental educational level, the other variables did not correlate with the child's level of sleep duration.

In the regression analyses, using multivariate regression techniques, we tested two models (see Table 3). The first model tested the influence of migrant background on sleep duration, adjusted for age, sex, and educational level. Turkish, Moroccan, and other non-western children showed lower sleep durations than native children. This was not the case for other western children. The total variance is explained by 5%.

Table 2. Bivariate correlations

	child's sleep duration		
age, Pearson correlation coefficient	–.114* ($p = .000$)		
sex, *t* value	–2.718* ($p = .007$)	boys, M (SD)	665.78 (30.36)
		girls, M (SD)	669.56 (29.67)
educational level parents, Spearman's rho	.090* ($p = .000$)	low, M (SD)	660.18 (31.34)
		middle, M (SD)	668.30 (30.39)
		high, M (SD)	669.94 (29.05)
parenting style parents Spearman's rho	.033 ($p = .203$)	rejecting, M (SD)	667.80 (34.60)
		neglecting, M (SD)	670.25 (28.08)
		permissive, M (SD)	669.27 (28.72)
		authoritarian, M (SD)	667.99 (28.08)
		authoritative, M (SD)	669.29 (27.23)

* $p < .05$

Table 3. Predictors of child's sleep duration: results of multivariate regression analyses

Variables	Model 1		Model 2	
	β	*t*	β	*t*
age	−0.08*	−3.04	−0.08*	−2.98
sex girl	0.08*	2.93	0.08*	2.94
background				
- Turkish	−0.07*	−2.02	−0.06*	−2.26
- Moroccan	−0.12*	−4.59	−0.12*	−4.56
- non-western	−0.09*	−3.60	−0.09*	−3.48
- western	−0.03	−0.97	−0.02	−0.93
educational level parents				
- middle	0.11*	2.65	0.11*	2.63
- high	0.13*	3.19	0.13*	3.16
parenting style				
- rejecting			−0.01	−0.34
- neglecting			0.01	0.32
- authoritarian			−0.01	−0.44
- authoritative			−0.00	−0.03
adjusted R^2	0.05		0.05	
R^2 change	0.05*		0.00	

* $p < .05$

In the last model, parenting styles were included in the regression analysis. Our reference group consisted of parents with a permissive parenting style. Once again, age, sex, migrant background, and educational level were significant variables in the model. However, the parenting styles were not and adding them did not explain the differences in sleep duration between the migrant groups. The explained variance did not increase.

DISCUSSION

Findings from this study show that migrant children showed lower levels of sleep per night, as compared to their indigenous counterparts. Despite the absence of specific guidelines in the Netherlands, both children from migrant origin, and children from native Dutch origin do follow the guidelines from the National Sleep Foundation in the United States. These guidelines do not differentiate

between specific ages and advocate a total of 10-11 hours of sleep per night, overall, for children at school age[20].

Dutch children had significantly the highest sleep duration, more than 11 hours, whereas all migrant children showed less than 11 hours of sleep per night. Differences between migrant and non-migrant children varied from 24.8 minutes (native Dutch children compared to Moroccan children), to 12.6 minutes (native Dutch children compared to other western children). Further, migrants showed other parenting styles than non-migrants. Rejecting parenting styles were less prevalent among native parents, whereas neglecting, authoritarian, and authoritative parenting styles were more prevalent among native parents. Parenting styles neither explained differences in sleep duration, nor did they explain ethnic differences.

As mentioned before, sleep differences between migrants and non-migrants within European countries have, to our knowledge, not been investigated. Therefore, it is impossible to make a comparison with earlier research.

This study has some limitations. First of all, it is important to point out that our study makes use of a cross-sectional design. Therefore, it is only possible to describe differences between groups at a single point of time. Causality cannot be determined by cross-sectional studies.

Secondly, our questionnaire only measured sleep duration by two questions: the time children went to sleep and the time children awoke on a normal school day. Also, answering scales of both questions consisted of several time categories with intervals of half an hour. We did not use exact times, nor did we use self-reports by the children. Instead, primary caregivers had to fill out the questions. Although these caregivers often know what time the child goes to bed, they may not know whether the child actually is asleep or is awake. Awake, as a result of not being able to sleep, or awake, as a result of not wanting to sleep, for example reflected in secretly reading a book or listening to music. A more objective method might have been the use of physiological measurements, such as wrist actigraphy, hip accelometry, or polysomnography[13]. However, high costs of these measurements prevent them from being utilized in large-population studies.

Further, it is not known, apart from the sleep duration at night, how much time the children in our population sleep in daytime, although primary school children in the Netherlands are obliged to go to school on such an average day. Further, contrary to the information with regard to sleep during the week, we have no information about the sleep duration of these children during the week-

end. As a result, our methodology only leads to an estimation of sleep duration, based on a normal school day. However, a recent study concluded that weekday sleep duration is more strongly associated with body composition in European school children than weekend day sleep duration[26].

Apart from sleep duration, it would be interesting to take into account differences in sleep quality, as both duration, and quality may affect the development of overweight and obesity in children[27]. However, no questions with regard to sleep quality were included in the questionnaire.

The utility of country of birth of the parents, in order to classify migrants in our sample, has the advantage to be objective and stable[28]. The classification of other non-native children into heterogeneous groups, other western and other non-western children, was needed, despite the classification into the other two homogeneous groups, children with a Turkish and a Moroccan background, due to the number of children within the separate groups. Notwithstanding this heterogeneity, we find that, concerning sleep duration level, western children resemble more the native Dutch children and the non-western children resemble more the Turkish and the Moroccan children.

There might not be a direct relationship between parenting style and sleep duration, as behavior of children in their bedrooms is often out of sight of the parents. Perhaps features in the child's home environment offer a better explanation, such as temperature, light, or noise[12]. Therefore, further investigation for the association between sleep duration and migrant background and insight in factors affecting the sleep duration and the sleep quality is needed.

Apart from the need for research, tackling overweight and obesity is only possible by identifying specific risk factors, followed by developing adequate prevention programmes[29]. Therefore, our findings might have important clinical implications for the prevention and treatment of overweight and obesity in children, because sleep duration is a risk factor for overweight and obesity that is regarded as potentially modifiable, as it is relatively easy for parents to control in their homes[30]. However, sleep duration is not often included in policy and environmental strategies[31]. We emphasize the importance of sleep duration in prevention activities.

In general, it is advised that interventions should pay attention to cultural aspects of the targeted population[32]. The results of this study, discerning migrants from non-migrants, do support this advice. Also, current prevention programmes can be more effective, if preventive interventions are aimed to improve the community[33], for example regarding migrant families that often

spend much time together. However, none of the common interventions seems to discern migrant from non-migrant children.

According to this study, differences do exist between these children with regard to sleep duration. Additionally, the prevalence of overweight and obesity is significantly higher in migrant children. Our results strongly emphasize the need of more attention in research and policy to cultural and community aspects, not only to prevent overweight and obesity among children from migrant origin, but in order to decrease overweight and obesity among all children.

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Chapter 7

Differences in overweight and obesity among children from migrant and native origin: the role of physical activity, dietary intake, and sleep duration

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(photography: unknown artist)

ABSTRACT

A cross-sectional survey was performed to examine to what degree differences in overweight and obesity between native Dutch and migrant primary school children could be explained by differences in physical activity, dietary intake, and sleep duration among these children.

Subjects ($n = 1943$) were primary school children around the age of 8-9 years old and their primary caregivers: native Dutch children ($n = 1546$), Turkish children ($n = 93$), Moroccan children ($n = 66$), other non-western children ($n = 105$), and other western children ($n = 133$).

Multivariate regressions and logistic regressions were used to examine the relationship between migrant status, child's behavior, and BMI or prevalence of overweight, including obesity (logistic). Main explanatory variables were physical activity, dietary intake (fruit, vegetables, sweet beverages, snacks), and sleep duration. We controlled for age, sex, parental educational level, and parental BMI.

Although sleep duration, dietary intake of fruit, and dietary intake of energy-dense snacks were associated with BMI, ethnic differences in sleep duration and dietary intake did not have a large impact on ethnic differences in overweight and obesity among children from migrant and native origin.

It is suggested that future preventive strategies to reduce overweight and obesity, in general, consider the role of sleep duration. Also, cross-cultural variation in preparation of food among specific migrant groups, focusing on fat, sugar, and salt, deserve more attention. In order to examine which other variables may clarify ethnic differences in overweight and obesity, future research is needed.

Keywords

Child Health; Overweight; Obesity; Transients and Migrants; Physical Activity; Dietary Intake; Sleep; Netherlands.

BACKGROUND AND OBJECTIVE

Overweight and obesity have become a major concern for public health[1]. Disease symptoms that once were only present in overweight adults, nowadays are becoming more common at young age[2]. Overweight in childhood often develops into obesity in adulthood. In addition, when overweight parents are nurturing children of their own, these children have a higher chance of developing overweight or obesity themselves, as parental Body Mass Index (BMI) is a predictor of their child's BMI[3].

Due to the growing prevalence of childhood overweight and obesity, worldwide, and due to the fact that obesity is the fifth leading risk for global deaths, the World Health Organization (WHO) has recognized childhood obesity as one of the most serious challenges in public health of the 21st century[4]. Besides the long-lasting adverse physical, psychological, and social health consequences, childhood obesity is also responsible for a substantial economic burden[5-6].

In general, overweight is the result of an excess of energy intake on energy expenditure, during a longer period of time[7-8]. However, whereas this definition looks quite simple, the etiology of overweight and obesity is complex and makes it challenging to develop effective preventive programmes and strategies[9]. Although the energy balance is determined by biologic, genetic, environmental, and behavioral factors, recent studies indicate that the overweight epidemic is more likely due to the latter[10-12]. Examples of these behaviors are physical exercise or sedentary behavior, food habits or dietary intake, and sleep duration.

According to a European review of the literature, children from migrant origin are more at risk of overweight and obesity than native children[13]. A recent study from the Netherlands showed that overweight and obesity are significantly more prevalent among migrant children from non-western descent than among native children and children from western descent[14]. Dutch prevalence rates of overweight and obesity are especially alarming among children in the two residing largest migrant groups: those from Turkish and Moroccan descent[15].

Effective prevention programmes and treatment strategies are necessary for these specific migrant groups. These particular interventions can only be adequately designed, if specific lifestyle behaviors that influence the elevated risk among these migrants are identified[16].

It is generally agreed that migration to developed countries seems to increase the risk of overweight and obesity[17]. The socio-economic status of migrants is

lower than that of the native population, which may influence this risk[18]. Also, this increased risk can be caused by alterations in physical activity, for example, leading to a more sedentary way of life, and changes in dietary intake, resulting in westernized dietary patterns[19]. Additionally, recent attention has been paid to the independent influence of sleep on overweight and obesity[20-22]. Differences in sleep duration between primary school children from migrant and non-migrant origin have not been investigated earlier. However, a recent study among pre-school children in Italy shows higher sleep durations in natives, as compared to migrants[23].

In the Netherlands, percentages in overweight and obesity among Turkish children (28%) and Moroccan children (26%) are about two times higher than among native children (13%). Although recent rates from the Netherlands show that overweight and obesity prevalences in children, overall, are declining, Turkish children show a stabilising trend[24].

This study focuses on differences in overweight and obesity between native and migrant primary school children in the Netherlands. Migrant background is thought to explain ethnic differences in overweight and obesity among children through differences in behaviors, associated with overweight and obesity, which might be modifiable: physical activity, dietary intake (fruit, vegetables, sweet beverages, snacks), and sleep duration. The conceptual model of this study is presented in Figure 1.

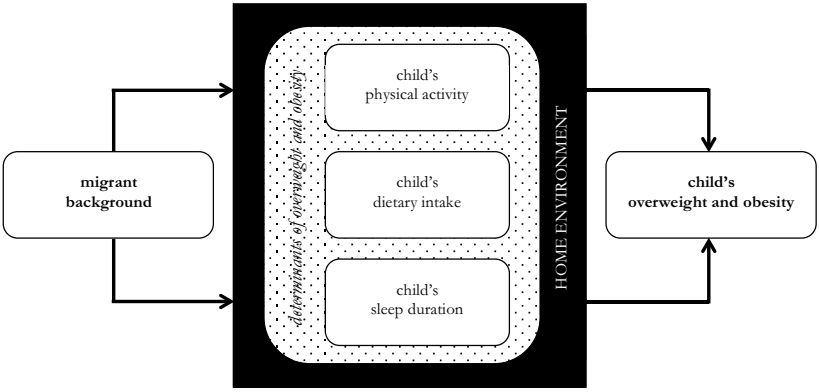

Figure 1. Conceptual model for the influence of physical activity, dietary intake, and sleep duration on child's overweight and obesity

METHODS AND PROCEDURES

Background study

A cross-sectional study was performed in the framework of the IVO Nutrition and Physical Activity Child CohorT (INPACT) study. The INPACT study is a collaborative project between the IVO Addiction Research Institute, and the Institute of Health Policy and Management, which is a department of the Erasmus University Rotterdam. In this project, the developmental trajectory of weight in Dutch primary school children was addressed, starting when they were 8-9 years old. The current study was based on the first data collection in the school year of 2008/2009.

Study population

Data have been collected from parent-child dyads at primary schools, located in the cities and adjacent areas of Eindhoven and Rotterdam. Eindhoven is the fifth largest city in the Netherlands with about 200,000 residents and Rotterdam is the second largest Dutch city with about 600,000 residents. Children from different migrant backgrounds live and attend to school there.

Schools were invited for participation in this project by means of a letter in which research aim, background, and relevance were explained. Schools were excluded if they were participating in a current prevention program, aimed at overweight, as this might influence the measurements.

All parents received a letter, which provided information about this research project. In order to stimulate participation among the two largest migrant groups, Turkish and Moroccan parents received a letter in their native language. Also, they could receive assistance in this language by interpreters, while filling out the questionnaires, during specific consultation hours or by phone. Finally, of the 3162 invited parent-child dyads, 1943 dyads (61.5%) decided to participate in the study. Subjects at baseline were 8-9 years old school children. Participation in this study was on the basis of informed consent of the primary caregivers.

The study was approved by the medical ethics committee of the Erasmus MC, University Medical Center Rotterdam.

Measurements

The primary caregiver of the child, mostly the mother, was asked to fill out the questionnaire. The questionnaire included questions on the child's age and sex. Also, migrant background was asked. Children were considered as having a mi-

grant background, when at least one of their parents was born outside the Netherlands, according to current practice in the Netherlands by Dutch Statistics[25]. Similar, based on this practice, five groups in our sample can be distinguished: native Dutch children ($n = 1546$), children with a Turkish background ($n = 93$), children with a Moroccan background ($n = 66$), and two supplementary groups, containing children from a range of countries, one with children from non-western origin ($n = 105$) and one with children from western origin ($n = 133$).

Apart from that, the questionnaire consisted of questions both regarding the weight and height of the parents, and regarding their socio-economic status, as defined by educational level. Questions were included on the education of both the mother, and the father. We determined the educational level by taking into account the parent that achieved the highest level, divided into three categories: low (primary school, lower vocational or general education), middle (secondary school, intermediate vocational school), and high (higher vocational school or university).

Outcome measures

Outcome measures are the mean BMIs of the children and the prevalence of overweight, including obesity, in each of the five groups. BMI, calculated as weight in kilograms divided by the square of height in meters, was used to assess weight status. Anthropometric measurements for the children were carried out by trained raters. Children were measured at school according to standard procedures in light clothing without shoes, to the nearest 0.1 kg and 0.1 cm. Weight was measured with an electronic flat scale (Seca 840; Beenhakker, Rotterdam, the Netherlands) and height was measured with a mobile measuring ruler (Seca 214; Beenhakker, Rotterdam, the Netherlands). Apart from inclusion in our descriptive statistics, we excluded children with missing BMI scores and parent-child dyads of underweight children ($n = 120$), categorized on base of the International Obesity Task Force (IOTF) standard. The IOTF has developed an international reference standard to define weight categories in children[26]. This standard was used to divide the children into three categories: (1) underweight, (2) normal weight and (3) overweight, including obesity.

Child's physical activity

To assess the children's physical activity level, a questionnaire was used, based on a recognized method by the National Institute for Public Health and the Environment and by the local Public Health Services[27]. This questionnaire fol-

lowed Welk and colleagues[28], who suggested to ask for various types of physical activity in specific key places, in terms of duration, and in terms of frequencies.

The primary caregiver had to write down how often, based on a normal week, children (1) went to school by foot or by bicycle (active transport), (2) played inside or outside, and (3) participated in a sport or at a sport club.

Based on the answers, as expressed in durations and frequencies, we calculated the amount of minutes that the child spends on physical activity per day.

Child's dietary intake

To ascertain the children's dietary intake with regard to specific food categories, we made use of Food Frequency Questionnaires[29-30]. Four food categories were included: fruit (fresh, bottled, canned), vegetables (raw, cooked), sugar-sweetened beverages, and energy-dense snacks, such as potato crisps, candies, or chocolates.

The primary caregiver had to write down, based on an average week, how many days their children consumed products in these food categories. The answering scale included 8 categories, ranging from "none or less than 1 day a week" to "7 days a week". Also, these caregivers had to score on such a day the number of fruit pieces, vegetable spoons (one spoon equals 50 grams), sweet beverage glasses, and snack pieces.

Total food consumption of the child with regard to these four food categories has been calculated and expressed in portions per day (pieces, grams, glasses, pieces).

Child's sleep duration

The children's sleep duration was measured by two items. The primary caregiver had to fill in the time that their children went to bed and awoke on an average school day. The answering scales of both questions consisted of time categories with intervals of half an hour. Also, two more broader time categories were used with an option "earlier than" or "later than" a specific time (e.g., "earlier than 6 am" or "later than 10.30 pm"). An extra half an hour was added or subtracted, in case a primary caregiver made use of these categories. The amount of minutes that the child sleeps per night during a normal school week has been calculated.

Analysis

Bivariate correlations (Pearson and Spearman correlation coefficients) were calculated to determine the relationships between behaviors (child's physical activity, dietary intake, and sleep duration) and the dependent variables (child's

BMI and prevalence of overweight, including obesity), as well as the relationships between behaviors.

Multivariate linear regression was used to examine whether the relation between migrant background and child's BMI could be explained by physical activity, dietary intake, and sleep duration. Additionally, logistic regression was used to investigate whether ethnic differences in the prevalence of overweight, including obesity, could be explained by differences in behavior. Because both age and sex of the child, and educational level and BMI of the parents might influence overweight and obesity, the analyses controlled for these variables.

Four models were tested. In the first model, we tested the association between migrant status and BMI, adjusting for age, sex, parental educational level, and parental BMI. In the following three models, we included sleep duration, dietary intake, and physical activity. The order of adding these variables depended on the bivariate correlations, starting with the child's behavior, which correlated most with BMI and the prevalence of overweight, including obesity, and ending with the behavior, which correlated least with these dependent variables. Missing values were omitted. Data were analysed by means of SPSS (version 19.0).

RESULTS

Table 1 displays the characteristics of our research sample per group ($n = 1943$). The upper part of this table shows mean age, percentages of boys and girls, educational level of the parents, and maternal and paternal BMI, in each group. The educational level of the parents of Turkish, Moroccan, and of the other non-western children was lower than that of the native Dutch children and the non-native western children. In addition, BMIs of the mothers and fathers of Turkish and Moroccan children were significantly higher than those of the other parents ($p < .05$).

In the lower part of Table 1, the mean BMIs of the children, the percentages of overweight, including obesity, the percentages of underweight, the child's physical activity, dietary intake with regard to our four food categories, and sleep duration are presented. Overall, mean BMI scores differed between the groups of children ($p < .05$). Dutch children had the lowest BMI score (mean = 16.4 kg/m^2; SD = 2.1). All children from migrant descent had higher BMI, especially Turkish children (mean = 19.0 kg/m^2; SD = 3.5). Also, among migrant groups the prevalence of overweight, including obesity, were highest. Turkish and

Table 1. Sample characteristics

	Dutch (*n* = 1546)	**Turkish (*n* = 93)**	**Moroccan (*n* = 66)**	**non-western (*n* = 105)**	**western (*n* = 133)**
age, M (SD)	8.2 (0.45)	8.6 (0.67)	8.5 (0.61)	8.4 (0.63)	8.3 (0.52)
[missing]	[4]	[1]	[1]	[3]	[2]
boys, *n* (%)	778 (50.3)	38 (40.9)	36 (54.5)	44 (41.9)	74 (55.6)
girls, *n* (%)	768 (49.7)	55 (59.1)	30 (45.5)	61 (58.1)	59 (44.4)
educational level parents, %					
- low	12.5	42.4*	34.5*	26.4*	13.9*
- medium	39.7	37.6*	37.9*	35.2*	32.8*
- high	47.9	20.0*	27.6*	38.5*	53.3*
[missing]	[23]	[8]	[8]	[14]	[11]
mother's BMI (kg/m^2),	24.2 (3.9)	25.5 (4.4)*	25.7 (4.0)*	24.5 (4.0)	23.5 (3.1)
[missing]	[194]	[15]	[16]	[39]	[33]
father's BMI (kg/m^2),	25.7 (3.1)	27.3 (3.3)*	26.8 (2.9)*	25.2 (3.2)	26.1 (3.2)
[missing]	[194]	[15]	[16]	[39]	[33]
child's physical activity per day, minutes					
M (SD)	67.9 (21.0)	38.0 (18.7)*	56.9 (26.8)*	41.1 (18.7)*	62.0 (21.4)*
[missing]	[8]	[2]	[4]	[3]	[3]
child's fruit intake per day, pieces					
M (SD)	1.1 (0.6)	1.3 (1.0)*	1.4 (0.9)*	1.2 (0.7)*	1.3 (0.7)*
[missing]	[6]	[1]	[3]	[2]	[2]
child's vegetables intake per day, grams					
M (SD)	67.6 (34.8)	75.9 (71.7)*	84.9 (57.3)*	72.7 (47.2)*	72.4 (42.8)*
[missing]	[12]	[1]	[1]	[1]	[3]
child's sweet beverage intake per day, glasses					
M (SD)	1.4 (0.8)	1.0 (0.6)*	1.5 (1.1)*	1.2 (0.9)*	1.3 (0.8)*
[missing]	[3]	[2]	[1]	[1]	[3]
child's snack intake per day, pieces					
M (SD)	2.1 (1.1)	1.6 (1.2)*	1.5 (0.9)*	1.6 (1.2)*	1.9 (1.4)*
[missing]	[17]	[2]	[2]	[4]	[2]
child's sleep duration per night, minutes					
M (SD)	670.1 (27.7)	645.5 (35.4)*	645.3 (34.9)*	654.8 (33.2)*	657.5 (32.5)*
[missing]	[42]	[4]	[4]	[6]	[12]
child's BMI (kg/m^2),					
M (SD)	16.4 (2.1)	19.0 (3.5)*	17.5 (2.6)*	17.6 (2.9)*	17.0 (2.7)*
overweight, including obesity, %	13.3	40.2*	24.2*	31.1*	22.0*
underweight, %	6.5	4.4*	1.6*	7.1*	8.2*

* $p < .05$

Moroccan children show the lowest prevalence of underweight, as compared to the other groups of children.

Child's physical activity level in native Dutch children was higher than the physical activity level in migrant children ($p < .05$). Overall, Turkish children showed the lowest levels of physical activity, followed by other non-western, Moroccan, and other western children.

Although differences in dietary intake between children were relatively small, child's fruit and vegetables intake was significantly lowest in Dutch children. Children in all migrant groups displayed higher fruit and vegetables consumption. Moroccan children scored highest in fruit intake per day (mean = 1.4 pieces per day; SD = 0.9) and vegetables intake per day (mean = 84.9 grams per day; SD = 57.3). Also, the consumption of sugar-sweetened beverages and energy-dense snacks was lower in migrants than in natives, except in Moroccan children.

Child's sleep duration between the groups of children differed significantly ($p < .05$). Dutch children had the highest sleep duration, more than 11 hours (mean = 670.1 minutes per night; SD = 27.7). Also, all migrant children slept less than 11 hours per night, especially Turkish and Moroccan children. Differences between groups of children varied from 24.8 minutes to 12.6 minutes sleep per night. Table 2 presents bivariate correlations between the behaviors and the dependent variable, as well as correlations between the behaviors. Less sleep, low fruit intake, and more energy-dense snack consumption correlated with higher BMIs and higher prevalence of overweight and obesity. Only dietary intake between some food categories correlated. Positive relationships were found between fruit and vegetables, and between sweet beverages and energy-dense snacks. Negative relationships were found between fruit and sweet beverages, and between vegetables and energy-dense snacks.

In the regression analyses, we tested four models (see Table 3 and 4) with sleep duration added in model 2 (highest coefficient), dietary intake added in model 3 (intermediate coefficient), and physical activity (lowest coefficient) added in model 4.

The first model tested the influence of migrant status, controlled for age, sex, parental educational level, and parental BMI. Taking into account these variables, Turkish, Moroccan, and non-western children, showed higher BMIs and prevalences of overweight and obesity, as compared to Dutch natives. This was not the case for western children.

Adding sleep duration (model 2) has led to a significant R^2 change in both regressions. Ethnic differences between migrant children, compared with their

Table 2. Bivariate correlations

	physical activity	dietary intake (fruit)	dietary intake (vegetables)	dietary intake (sweet beverages)	dietary intake (energy-dense snacks)	sleep duration
physical activity	1					
dietary intake (fruit)	.042 (p=.088)	1				
dietary intake (vegetables)	.035 (p=.156)	.268* (p=.000)	1			
dietary intake (sweet beverages)	–.009 (p=.713)	–.083* (p=.000)	–0.38 (p=.094)	1		
dietary intake (energy-dense snacks)	–.040 (p=.110)	–.007 (p=.765)	–.103* (p=.000)	.172* (p=.000)	1	
sleep duration	.001 (p=.968)	.017 (p=.458)	.009 (p=.687)	–.005 (p=.835)	–.023 (p=.323)	1
BMI child	–.047 (p=.056)	–.049* (p=.033)	–.040 (p=.086)	.019 (p=.410)	.094* (p=.000)	–.158* (p=.000)
overweight, including obesity	–.042 (p=.054)	–.046* (p=.049)	–.006 (p=.786)	.038 (p=.103)	.072* (p=.002)	–.091* (p=.000)

* $p < .05$; (n=1823)

indigenous counterparts, as expressed in a constant or slightly diminishing β (multivariate regression) and B (logistic regression) between model 1 and 2, were hardly explained. The unstandardized coefficient (B) of sleep duration in the multivariate regression was –0.008 (not in table), implying that, for example, an extra half an hour of sleep, which is about the highest observed mean difference across groups of children, will lead to a BMI decrease of 0.24 (30 minutes*–0.008). Similarly, the OR shows that more sleep slightly decreases the probability of overweight, including obesity.

Dietary intake of snacks (model 3) has led to a significant R^2 change in the multivariate regression and not in the logistic regression, whereas β and B of migrant children, as compared to native children, did not change substantially. The unstandardized coefficient (B) of snack intake in the multivariate regression was 0.014 (not in table), implying that one more snack each day will lead to a BMI increase of 0.01. The impact of sleep duration (B and OR) did not change.

After including physical activity level (model 4) in the regression analysis, there was no significant R^2 change and β and B did not change substantially. The impact of sleep duration (B and OR) and snack intake (B) did not change.

Table 3. Predictors of BMI child: results of multivariate regression analyses

Variables	Model 1		Model 2		Model 3		Model 4	
	β	*t*	β	*t*	β	*t*	β	*t*
age	0.08*	3.12	0.07*	2.75	0.08*	2.81	0.07*	2.77
sex girl	0.06*	2.20	0.06*	2.45	0.07*	2.53	0.07*	2.65
background								
- Turkish	0.24*	9.01	0.24*	9.05	0.23*	8.60	0.23*	8.65
- Moroccan	0.09*	3.14	0.08*	2.96	0.07*	2.44	0.07*	2.50
- non-western	0.05*	2.03	0.04	1.53	0.03	1.21	0.03	1.23
- western	0.00	0.01	0.01	0.45	0.01	0.51	0.01	0.52
educational level parents								
- middle	−0.03	−0.72	−0.02	−0.43	−0.02	−0.46	−0.02	−0.48
- high	−0.00	−0.10	−0.01	−0.12	−0.01	−0.29	−0.02	−0.33
BMI mother	0.17*	6.11	0.16*	6.09	0.17*	6.16	0.17*	6.21
BMI father	0.18*	6.78	0.18*	6.74	0.18*	6.67	0.18*	6.66
sleep duration			−0.12*	−4.46	−0.12*	−4.66	−0.12*	−4.71
dietary intake (fruit)					−0.04	−1.28	−0.03	−1.23
dietary intake (vegetables)					−0.04	−1.47	−0.04	−1.50
dietary intake (sweet beverages)					0.01	0.40	0.01	0.38
dietary intake (snacks)					0.05*	1.96	0.06*	2.04
physical activity							−0.03	−1.20
adjusted R^2	0.17		0.19		0.20		0.20	
R^2 change	0.17*		0.02*		0.01*		0.00	

* $p < .05$

DISCUSSION

Objective of this study was to explain differences in overweight and obesity among children from migrant and native origin. We found that low sleep duration, low fruit intake, and high snack intake were associated with higher BMIs and higher prevalence of overweight and obesity. Both sleep duration, and snack intake explained BMI to some extent. However, ethnic differences in sleep duration and dietary intake only slightly contributed to explaining the observed ethnic differences in BMI or in the prevalence of overweight and obesity between native Dutch and migrant children.

Table 4. Predictors of overweight and obesity: results of logistic regression analyses

Variables	Model 1		Model 2		Model 3		Model 4	
	B	OR (95% CI)	B	OR (95% CI)	B	OR (95% CI)	B	OR (95% CI)
intercept	–8.47*	0.00*	–4.66*	0.01*	–4.08*	0.02*	–4.09*	0.02*
age	0.57*	1.59* (0.72-1.55)	0.37*	1.38* (0.70-1.51)	0.35*	1.36* (0.70-1.53)	0.34*	1.34* (0.70-1.53)
sex girl	0.61*	1.83* (1.26-2.66)	0.62*	1.86* (1.28-2.71)	0.62*	1.86* (1.28-2.70)	0.63*	1.87* (1.28-2.74)
background								
- Turkish	1.62*	5.07* (2.48-10.36)	1.61*	4.99* (2.42-10.30)	1.40*	4.05* (1.92-8.54)	1.41*	4.09* (1.94-8.66)
- Moroccan	0.89*	2.42* (0.99-5.87)	0.87*	2.32* (0.93-5.60)	0.86*	2.29* (0.76-4.94)	0.84*	2.23* (0.77-4.98)
- non-western	0.94*	2.56* (1.01-6.54)	0.82	2.18 (0.88-5.92)	0.66	1.93 (0.73-5.08)	0.66	1.94 (0.73-5.13)
- western	0.23	1.26 (0.51-3.10)	0.13	1.14 (0.46-2.84)	0.05	1.05 (0.42-2.66)	0.06	1.06 (0.42-2.68)
educational level parents								
- middle	–0.29	0.75 (0.43-1.31)	–0.24	0.79 (0.45-1.38)	–0.22	0.80 (0.45-1.41)	–0.23	0.80 (0.45-1.41)
- high	–0.22	0.80 (0.46-1.38)	–0.19	0.83 (0.48-1.43)	–0.28	0.76 (0.43-1.33)	–0.28	0.76 (0.43-1.32)
BMI mother	0.08*	1.08* (1.03-1.13)	0.08*	1.08* (1.03-1.13)	0.08*	1.08* (1.03-1.13)	0.08*	1.08* (1.03-1.13)
BMI father	0.15*	1.16* (1.09-1.23)	0.15*	1.16* (1.09-1.23)	0.14*	1.15* (1.09-1.22)	0.14*	1.15* (1.09-1.22)
sleep duration			–0.01*	0.99* (0.98-1.01)	–0.01*	0.99* (0.98-1.00)	–0.01*	0.99* (0.98-1.00)
dietary intake (fruit)					–0.02	0.98 (0.97-1.06)	–0.02	0.98 (0.97-1.06)
dietary intake (vegetables)					–0.00	1.00 (0.99-1.01)	–0.00	1.00 (0.99-1.01)
dietary intake (sweet beverages)					0.02	1.02 (0.96-1.06)	0.02	1.02 (0.96-1.06)
dietary intake (snacks)					0.02	1.02 (0.95-1.04)	0.02	1.03 (0.95-1.14)
physical activity							–0.00	0.99 (0.99-1.00)
Nagelkerke R^2	0.14		0.16		0.16		0.16	
R^2 change	0.14*		0.02*		0.00		0.00	

* $p < .05$

Children from migrant descent showed the lowest sleep duration. Also, migrant children displayed significantly lower levels of physical activity. In this study, sleep duration was associated with BMI and with overweight and obesity prevalence. In contrary to our expectations, physical activity was not associated with BMI and with the prevalence of overweight and obesity. The results with respect to sleep duration are in line with recent European research, which indicates that sleep duration is associated with BMI in children, independent of physical activity of the children, and demographic variables, such as socio-economic position[31]. Still, ethnic differences in sleep did hardly explain overweight and obesity differences.

Our counterintuitive findings concerning the role of physical activity can be put into perspective by a recent systematic review, in which the relationship between physical activity level and overweight and obesity is discussed. Results point out that, apart from other health benefits, higher physical activity levels do not always result in lower BMIs, at least among adolescents[32]. Perhaps, therefore, it is not surprising we were unable to explain ethnic overweight and obesity differences. More research is needed at this point.

Concerning dietary intake, differences between groups of children were significant. All migrant groups displayed higher fruit and vegetables intake and lower energy-dense snack consumption. In this study, high fruit intake and low energy-dense snack intake did lead to lower BMIs. However, ethnic variations in overweight and obesity were hardly explained by ethnic variations in dietary intake.

Similar to physical activity, the relationship between fruit intake and the development of overweight and obesity is subject to discussion. The Mediterranean diet pattern, consisting of more vegetables, more fish, and more olive oil, is often regarded as healthy. However, dietary habits of some ethnic groups in Europe are likely to become less healthy as individuals increase consumption of processed foods that are energy dense and contain high levels of fat, sugar, and salt. Therefore, particular preparation methods among specific migrant groups, focusing on fat, sugar, and salt, deserve more attention, as such products often are added to the healthy dietary components of the native diet[33]. These mixed food habits are emerging mainly amongst younger people, probably as the consequence of acculturation processes, which increases the risk of overweight and obesity[34]. Therefore, overweight and obesity research in relation to dietary intake should also include energy density, energy content, and preparation methods of food.

Further, the use of specific terms in our questionnaires may have influenced our results. For example, the different units of measure (pieces, grams, glasses,

pieces) may have caused some confusion, both among natives, and among migrants. At the same time, it is difficult to determine a standard unit of measure for various food categories. In addition, the use of the words sugar-sweetened and energy-dense may evoke social desirability bias.

As said before, the etiology of overweight and obesity is complex. This study only focused on behaviors associated with overweight and obesity, leaving out genetic and biological aspects. Apart from the role of our studied behaviors, physical activity, dietary intake, and sleep duration, we did not include sedentary behavior, such as watching television or playing computer games. Research should also include this more passive behavior.

Concerning the measurements of the behaviors in this study, the cross-cultural validity of our instruments may be questioned. Migrants and non-migrants may differ in their answering patterns, leading to cultural bias. In the literature, no evidence on the validity of these questionnaires among migrants was found. Therefore, we strongly recommend that future research should pay attention to this specific issue.

Strength of this study is the measurement of child weight and height by trained raters, rather than by parental report. We could also control for parental BMI. Unfortunately, parental weights and heights were assessed by self-reports, which may lead to socially desirable answers. Our results may have been biased by these self-reports.

In this study, we assessed physical activity, dietary intake, and sleep duration of the children by means of parental reports. Apart from the latter, validated instruments to measure these behaviors were used. We did not use self-reports by the children because they experience more problems with memory tasks regarding physical activity at this age, as compared to adults[35]. However, estimates of child's intake of food by parents might not always agree with the actual dietary intake, as parents may not know what their children eat outside the home environment. Perhaps, it would have been better to ask children themselves to fill out this questionnaire, as some authors suggest that children aged 8-11 years are more accurate reporters of Food Frequency Questionnaires than their parents[36].

Further, our questionnaire only measured sleep duration by two questions: the time children went to bed and the time children awoke. Primary caregivers had to fill out the questions. We did not use self-reports by the children. Although these caregivers often know what time the child goes to bed, they may not know if the child actually is asleep. A more objective method might have been the use of physiological measurements[37].

As sleep duration is related to BMI and overweight and obesity prevalence, we suggest that future overweight and obesity strategies include the role of sleep duration in their prevention activities. This is a potentially modifiable risk factor for overweight and obesity, which is relatively easy for parents to implement and to control in their home environments, in order to prevent overweight and obesity, not only among children from migrant origin, but among all children.

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Chapter 8

General discussion

(painting: 'Kinderspelen' by Pieter Bruegel – around 1560)

BACKGROUND AND AIM

Globally, overweight and obesity have increased enormously. Rising prevalence rates among adults and children form a threat for public health, as overweight is regarded as one of the most leading causes of morbidity, disability, and mortality. Besides the negative effects on health and quality of life, overweight and obesity are responsible for a major economic burden.

Migrant children are at increased risk for overweight and obesity. Also, risk factors seem to have spread unevenly among ethnic groups. Therefore, migrants are an important target group for intervention activities.

As one of the first European studies, this thesis aimed at examining differences in overweight and obesity between primary school children with a migrant and a native background. Overweight and obesity differences were explained by differences in behaviors, which are associated with overweight and obesity: physical activity, dietary intake, and sleep duration. Because the home environment influences such behaviors, we have investigated which aspects in the physical home environments and in the social home environments of these children contribute to differences in these behaviors. The home environment of migrant children may be different than the home environment of native children, as a result of migration-related factors and cultural factors.

The findings of this thesis might help to design effective prevention and treatment programmes, in order to reduce the magnitude of this universal 'globesity' problem, focusing on modifiable factors affecting overweight and obesity among primary school children.

Main research aims were:

1. Are there differences in the prevalence of overweight and obesity between primary school children from migrant and native Dutch origin?
2. Can differences in overweight and obesity between migrant and native Dutch children be explained by differences in the levels of physical activity, dietary intake, and sleep duration of the children?
3. Does the home environment contribute to differences in these behaviors?

In this thesis, each chapter refers to one the following six questions, in accordance with these research aims.

A. What is the prevalence of overweight and obesity among children from migrant and native origin in Europe? (Chapter 2)

B. Are there differences in the prevalence of overweight and obesity and in the BMIs of primary school children from migrant and native origin in the Netherlands? And is socio-economic position, based on educational level of the parents, associated with these differences? (Chapter 3)
C. Are there differences regarding the levels of physical activity between children from migrant and native Dutch origin? And, if there are differences, which home environment aspects (physical environment: availability, accessibility; social environment: parental role modeling, parental policies) contribute to these differences? (Chapter 4)
D. Are there differences with regard to dietary intake between children from migrant and native Dutch origin? And, if there are differences, which home environment aspects (physical environment: availability, accessibility; social environment: parental role modeling, parental policies) contribute to these differences? (Chapter 5)
E. Are there differences regarding the sleep duration between children from migrant and native Dutch origin? And, if there are differences, in which degree do parenting styles (rejecting style, neglecting style, permissive style, authoritarian style, authoritative style) contribute to these differences? (Chapter 6)
F. Can differences in overweight and obesity among children from migrant and native origin be explained by differences in the levels of physical activity, dietary intake, and sleep duration? (Chapter 7)

SYSTEMATIC REVIEW OF THE LITERATURE

At first, a systematic review was performed regarding the prevalence of overweight and obesity among children from migrant and native origin in Europe. Results of this review can be found in the second chapter of this thesis.

Based on publications from six countries, mostly situated in Western and Central Europe, it appeared that especially non-European migrant children are at higher risk for overweight and obesity than their native counterparts. The prevalence of overweight in migrant children ranged from 8.9% to 37.5% and from 8.8% to 27.3% in native children. The prevalence of obesity in migrant children ranged from 1.2% to 15.4% and from 0.6% to 11.6% in native children. In general, Turkish children seemed to be the group most at risk.

Notwithstanding methodological differences and problems, the overall picture was clear. As most studies included in this review were of a descriptive

nature, it remained unclear how this increased risk of overweight and obesity in migrant children in Europe could be explained. Effective prevention requires detailed insight into modifiable factors responsible for this increased risk. Whether ethnic differences in the physical and social home environment may explain ethnic differences in overweight and obesity, still remained to be investigated.

EMPIRICAL STUDY: THE INPACT STUDY

In addition to the systematic review, our other research questions were studied in the framework of the IVO Nutrition and Physical Activity Child CohorT (INPACT) longitudinal study, a collaborative project between the IVO Addiction Research Institute, and the Institute of Health Policy and Management, a department of the Erasmus University Rotterdam. For all studies, data collected at baseline (2008/2009) were used. The study was approved by the medical ethics committee of the Erasmus MC, University Medical Center Rotterdam.

Study population

Data have been collected from parent-child dyads at primary schools in the Rotterdam and Eindhoven areas, two large Dutch cities and adjacent areas, where children from many different migrant backgrounds live and attend school. Schools were excluded if they were participating in current prevention programmes, as this might influence the measurements.

Of the 276 invited schools, 101 schools (36.6%) took part in the study. Furthermore, of the 3162 invited parent-child dyads at these schools, 1943 dyads (61.5%) decided to participate in the study. Children at baseline were 8-9 years old (group 5 of Dutch primary schools). Overall, the mean age of the children was 8.2 years old (SD = 0.49). The study population consisted of 970 boys and 973 girls. Participation in this study was on the basis of informed consent.

Socio-economic position of the family was based on the educational level of the parent that achieved the highest level within the household and was divided into three categories: 25.9% low, middle 36.6%, and high 37.4%.

Children were considered as having a migrant background, when at least one of their parents was born outside the Netherlands, according to current practice in the Netherlands by Dutch Statistics[1]. The percentage of migrant children within our population was 25.7%. Five groups in our sample could be distinguished, based on this practice: three homogeneous groups, consisting of

native Dutch children ($n = 1546$), children with a Turkish background ($n = 93$), and children with a Moroccan background ($n = 66$), as well as two more heterogeneous groups of children, one labelled 'other non-western children' ($n = 105$), containing children from a range of non-western countries, other than Turkey and Morocco, and one labelled 'other western children' ($n = 133$), containing children from a range of western countries, other than the Netherlands.

Measurements

Measurements are thoroughly described in the preceding chapters. To summarize, the *BMI*, calculated as weight in kilograms divided by the square of height in meters, was used to assess overweight and obesity. Weight and height were measured by trained raters. We used the International Obesity Task Force (IOTF) standard to ascertain if children were overweight or obese[2].

All other information has been collected by questionnaires among primary caregivers. These questionnaires included questions on the *child's age, sex, and migrant background*. Apart from that, we asked both *socio-economic status*, based on educational level of the parent that achieved the highest level, and the *weight and height of the biological parents*.

To assess the *children's physical activity level*, the questionnaire included an instrument of the National Institute for Public Health and the Environment and of the local Public Health Services in the Netherlands[3]. Further, to ascertain the *children's dietary intake*, Food Frequency Questionnaires were used[4-5]. To end with, *sleep duration* was measured by two questions based on a study by de Jong and colleagues[6]. In order to explain differences in these behaviors, we analysed the home environments of the children.

To explain ethnic differences in physical activity, *availability and accessibility of toys and equipment* were assessed by means of a checklist[7]. Apart from available toys and equipment, the parents were asked to include the *number of sport clubs* their children was member of. Physical activity of the primary caregiver was used as an indicator of *parental role modeling* and was measured by the Short QUestionnaire to ASsess Health-enhancing physical activity (SQUASH) by Wendel-Vos and colleagues[8]. *Parental policies* to support the child's physical activity were assessed by means of an instrument by Gattshall and colleagues[7].

To explain ethnic differences in dietary intake, *food availability and accessibility* were measured by means of a checklist[7], referring to the physical presence and ease of access of fruit, vegetables, sweetened beverages, and snacks at home. Dietary intake of the primary caregiver was used as indicator of *parental role modeling*

and was measured by the same Food Frequency Questionnaires used to assess child's dietary intake[4-5]. *Parental policies*, aimed to support the dietary intake of the children, were again assessed by the instrument of Gattshall and colleagues[7].

Finally, to explain ethnic differences in sleep duration, we assessed more general *parenting styles* of the primary caregiver, in order to ascertain the impact of behavioral control of the parents on sleep duration of the children[9].

STUDY RESULTS

Overweight and obesity in primary school: native children versus migrant children (Chapter 3)

In the third chapter of this thesis, a description of the differences in the prevalence of overweight and in mean BMI's between native Dutch and migrant children is presented. Most European studies do not take into account to what degree such differences can be explained by differences in BMI of the parents and their socio-economic position. However, parental overweight and obesity are regarded as an important risk factor for predicting overweight and obesity in their children[10]. Furthermore, migrants often have a lower socio-economic status than native populations, and usually there is an inverse relationship between socio-economic status and health[11].

Results showed that, the mean BMIs, as well as the prevalences of overweight and obesity, were significantly higher in all groups of migrant children (Turkish, Moroccan, other non-western, and other western children), also when taking into account differences in age and sex. Especially Turkish children were most at risk. These results are in line with our systematic review, as described before.

Parental BMI was an important predictor of both the child's BMI, and the prevalence of overweight. Parental education was not significantly associated with mean BMI, nor with the prevalence of overweight and obesity. Further, it did not explain the differences in BMI and in the prevalence of overweight and obesity between migrant and native children.

Physical activity differences between children from migrant and native origin (Chapter 4)

Physical activity is a key factor in the risk of overweight and obesity. Previous research already has indicated lower levels of physical activity among adult migrant and ethnic groups, as compared to the native population[12]. Therefore,

we investigated in the fourth chapter to what degree children from migrant and native Dutch origin differ with regard to levels of physical activity and whether and to what degree physical and social characteristics of the home environment contribute to these differences.

Our findings showed that physical activity levels were significantly lower in most migrant children, as compared to children in the native population. Availability and accessibility of *active toys and equipment* was lower among migrant children, as compared to their native counterparts. This was also the case for *membership of sport clubs*. Regarding access to *passive toys* there was no difference. With regard to *parental role modeling*, most parents of migrant children showed higher levels of physical activity, except parents from Turkish origin. Parents of Turkish, Moroccan, and non-western children were less likely to display *supportive parenting styles* than parents of native Dutch children. Although home environment characteristics were associated with the child's physical activity, they could not explain the physical activity differences between migrants and non-migrants.

Dietary intake differences between children from migrant and native origin (Chapter 5)

Dietary intake is a risk factor for overweight and obesity, since too much energy intake is a direct cause of overweight. Previous Dutch studies only described ethnic differences in dietary intake, without differentiating between migrants[13-14] or only studying among adolescents[15]. Therefore, in the fifth chapter, we compared the dietary intake of migrant with native Dutch children and assessed to what degree differences were associated with differences in their home environments.

Native Dutch children showed the lowest intake of fruit and vegetables. All migrant children consumed more fruit and vegetables. Moroccan children had the highest intake of fruit and vegetables. Consumption of sugar-sweetened beverages and snacks was lower in migrant children than in native children.

Availability and accessibility of fruit and vegetables at home did not differ between the different groups of migrant and native Dutch children, but sweetened beverages and snacks were less available and accessible in migrant families. Regarding role modeling, all migrant parents showed a higher intake of fruit, as compared to native Dutch parents, and also showed a higher intake of vegetables, except the parents of Turkish children, who consumed the least vegetables. Furthermore, all migrant parents consumed more sweet beverages, but less snacks. Finally, parents from non-western descent were less supportive than native Dutch

parents. In particular, parental role modeling, as children follow their parents, could explain dietary intake differences. However, aspects of the physical and social environment did hardly explain ethnic differences in dietary intake.

Sleep duration differences between children from migrant and native origin (Chapter 6)

Besides the more traditional risk factors of overweight and obesity, short sleep duration is regarded as an independent risk factor for overweight and obesity[16], also in childhood[17]. Sleep restriction may lead to increase in food intake and result in greater fatigue, which may decrease energy expenditure[18]. Therefore, aim of this sixth study was to assess differences in sleep duration between migrant and native Dutch children. We further investigated whether parenting styles, characterized by more behavioral control, influence the sleep duration of the children in a positive way.

Dutch children had the highest sleep duration, more than 11 hours per night. Migrant children, except those from western origin, had a lower sleep duration than native Dutch children, especially Turkish and Moroccan children.

Overall, migrants showed other parenting styles than non-migrants. Parenting styles focusing on high behavioral control (authoritative style and authoritarian style) were more prevalent among native parents than among most non-native parents. In our study, these styles were not related to sleep duration, nor did they explain ethnic differences in sleep duration.

Differences in overweight and obesity among children from migrant and native origin: the role of physical activity, dietary intake, and sleep duration (Chapter 7)

The final objective in the seventh chapter of this thesis was to assess to what degree the differences in overweight and obesity between native Dutch and migrant primary school children could be explained by differences the behavior of these children associated with overweight and obesity: physical activity, dietary intake, and sleep duration.

Low sleep duration, low fruit intake, and high snack intake were associated with higher BMIs and higher prevalence of overweight and obesity. Both sleep duration, and energy-dense snack intake were related to the child's BMI. However, ethnic differences in sleep duration and dietary intake did not have a large impact on ethnic differences in overweight and obesity among children from migrant and native origin.

CONCLUSIONS

As stated before, main research aims of this thesis were:

1. Are there differences in the prevalence of overweight and obesity between primary school children from migrant and native Dutch origin?
2. Can differences in overweight and obesity between migrant and native Dutch children be explained by differences in the levels of physical activity, dietary intake, and sleep duration of the children?
3. Does the home environment contribute to differences in these behaviors?

Concerning the first research aim, this thesis did show there were differences in the prevalence of overweight and obesity between primary school children from migrant and native Dutch origin. Mean BMI and the prevalence of overweight and obesity were significantly higher in all groups of migrant children (Turkish, Moroccan, other non-western, and other western children), also when taking into account differences in age, sex, parental educational level, and parental BMI. Especially among Turkish children, the BMI score and the prevalence of overweight and obesity were highest. Both native Dutch children, and the other western children had the lowest BMI score. Also, the lowest prevalence of overweight and obesity was found among Dutch and other western children. The other groups had an intermediate position.

Regarding the second aim, we could conclude that we were hardly able to explain the above mentioned ethnic differences in overweight and obesity between children from migrant and native origin. We did find that low sleep duration, low fruit intake, and high snack intake were associated with higher BMIs and higher prevalence of overweight and obesity. Both sleep duration, and snack intake explained ethnic differences in BMI to some extent. Physical activity, dietary intake of fruit, dietary intake of vegetables, and dietary intake of sweet beverages did not. However, ethnic differences in sleep duration and dietary intake only slightly contributed to explaining the observed ethnic differences in overweight and obesity between native Dutch and migrant children.

To end with the third research aim, the physical home environment (availability, accessibility) did contribute to the explanation of physical activity and dietary intake. Also, the social home environment did contribute to this explanation: role modeling to a higher extent than supportive policies. We were unable to explain differences in sleep duration by parenting styles. The home

environment did contribute to differences in these behaviors to some extent. However, these home characteristics were only slightly able to explain the ethnic differences in these behaviors.

Conclusions in perspective

The results with regard to the prevalence of overweight and obesity between primary school children from migrant and native Dutch origin were in line with our systematic review of the European literature (Chapter 2), pointing out that especially non-European migrant children were at higher risk for overweight and obesity than their native counterparts.

To put the other study results into perspective, we should point back to the introduction of this thesis, in which the etiology of overweight and obesity was described. As already described, and as, once again, displayed in the discussion of this thesis in Figure 1 below, the etiology of childhood overweight and obesity is presented as an ecological model with different layers influencing child's weight status[19]. The model consists of three layers: (1) child characteristics and child risk factors, (2) parenting styles and family characteristics, and (3) community, demographic, and societal characteristics. Each layer has its own determinants.

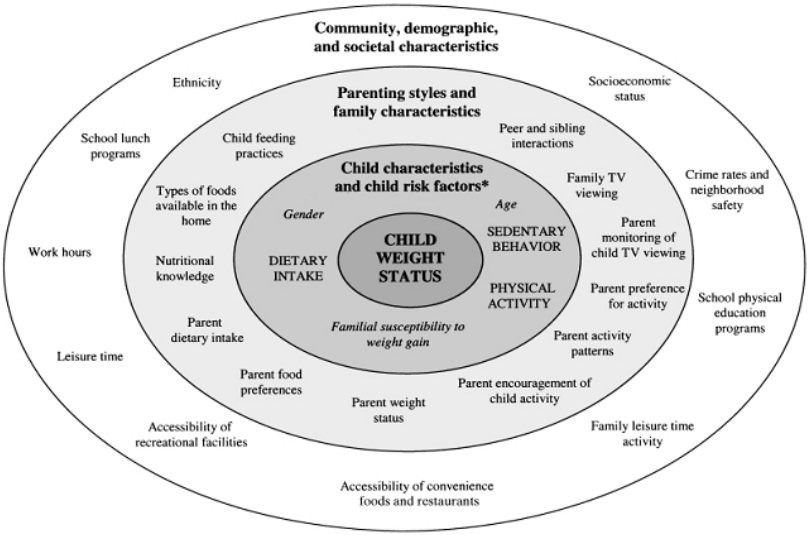

Figure 1. Ecological model: predictors of childhood overweight and obesity

In line with this model, we were slightly able to explain ethnic differences in overweight and obesity by child risk behaviors (layer 1): physical activity, dietary intake, and sleep duration. Additionally, parental weight status (layer 2) was an important predictor of child's overweight and obesity and child's BMI. Socio-economic status of the parents (layer 3) was not an important predictor, according to our study.

We were partly able to explain ethnic differences in the child's risk behaviors by determinants in the children's home environments (layer 2 and layer 3), in which socio-economic position was included, apart from many other variables, as socio-economic status is a known predictor for risk behaviors. We did not include parental BMI, because BMI of the parents was not considered a predictor for child's risk behavior. However, possibly, parental BMI might have influenced these risk behaviors, such as physical activity and dietary intake. Although it is, thus, impossible to pass judgments on this specific relationship, we did include the parent's behavior regarding physical activity and dietary intake in our analyses. According to the ecological model, this parental role modeling (layer 2) can be considered as a more direct predictor of childhood overweight and obesity than socio-economic status (layer 3). Our study results confirm this assumption: in particular, parental role modeling can explain differences in behaviors between migrant and native children.

Although our included determinants are responsible for a part of the explained ethnic differences, the total explanation of overweight and obesity differences between children from migrant and migrant origin remains limited in this study. Once again, in this multidimensional model lies an important explanation for this limited explanation of ethnic differences in overweight and obesity.

First, this thesis focused on explaining ethnic differences in overweight and obesity through differences in the weight-related behaviors of the child, thus, focusing on behaviors within the most inner layer: child characteristics and child risk factors. We chose to investigate the most immediate behaviors influencing overweight and obesity[20-21]. At the same time, we could not include all associated types of behaviors. For example, sedentary behavior is an important determinant of BMI[22]. However, we did not assess sedentary habits, such as watching television and playing computer games. Although questions with regard to game computers were included in the survey, in these questions also more active game computers, such as the Wii, were included, making it difficult to distinguish between the more active and the more passive computer systems[23]. Further, we

could not measure all relevant aspects related to one specific type of behavior. For example, dietary habits are likely to become less healthy as individuals increase consumption of processed foods that contain high levels of fat, sugar, and salt. Such products often are added to the healthy dietary components of the native diet[24]. Our assessment of dietary intake did not take into consideration preparation methods, such as the use of oil to prepare vegetables, which is more often the case for Mediterranean migrants, neither did it include an assessment of energy density and energy content.

Secondly, we aimed to explain differences in these child's weight-related behaviors by focusing on specific determinants within the middle layer: parenting styles and family characteristics. Again, we could not include all determinants in that specific layer. For example, we did not use specific issues that may be relevant for sleep duration, because these data were not available in this study. Perhaps features in the child's home environment offer a better explanation, such as temperature, light, or noise[16], but also specific aspects in the social home environment, such as sleep duration of the parents (modeling) and specific rules regarding bedtime (parental policies). These specific aspects may be different between children from migrant and native descent.

Thirdly, although the home environment is a critical context for primary school children, other environmental factors outside this environment may also be important for weight development. These factors are presented in the top layer: community, demographic, and societal characteristics. Besides ethnicity and socio-economic position, we did not include such characteristics. We admit it is impossible to study all related factors, but at the same time it would have been interesting to also include other characteristics of the environment that could affect overweight and obesity, such as the often underestimated influence of characteristics in the school environment and the neighborhood environment[25-26], in order to further explain differences in the child's behaviors.

Strengths and limitations of our study

In the separate chapters, we have already discussed some specific methodological issues that may have contributed to our results. In this part, we will elaborate on some more general strengths and weaknesses of our study.

Cross-sectional design

The present study has a cross-sectional design. This design limits the possibility to assess causal relations. Especially the association between physical activity

and overweight, obesity, and BMI may be interpreted in both directions. For example, higher BMIs may be the result of lack of exercise, but the opposite may also be the case.

As the main focus of this thesis was to investigate the association between overweight and obesity and ethnicity, a cross-sectional design is regarded as appropriate.

Study population

In this study, we focused on Turkish and Moroccan children, who are most at risk for overweight and obesity. These children belong to two of the largest groups of migrants in the Netherlands. The classification of other non-native children into two heterogeneous groups was necessary, because the number of children in separate groups was too small. As a consequence, these two groups have a more heterogeneous composition. It was not possible to separately analyse children from other large Dutch migrant groups, such as Surinamese and Antillean. They have been added to the group of non-western children.

Further, we assessed migrant origin by the country of birth of the parents, because it has the advantage to be objective and stable[27]. However, the classification into western and non-western migrants is subject to critique, also in the Netherlands.

In addition, of the 276 invited schools, 101 schools (36.6%) participated in this study and of the 3162 invited parent-child dyads, 1943 dyads (61.5%) took part in this study. We did not perform a non-response analysis among invited schools and dyads that did participate in the study, because no data were obtained from those who refused to participate in the study. Therefore, we have no information about possible selection bias.

External validity

Our study samples were drawn from schools in two urban areas. Thus, in principle, we cannot generalize to the Dutch population, especially not to children living in more rural areas. However, as most migrant children live in urban areas in the Netherlands, the latter is not a problem. Also, we cannot generalize to other countries within or outside the European Region, although the results regarding overweight and obesity, as obtained through our systematic review of the European literature (Chapter 2), resemble the results of our empirical study (Chapter 3).

Measurements: BMI and socio-economic position

Strength of this study was the *measurement of child weight* by trained raters, rather than by parental report. We could also control for parental BMI. However, parental weights and heights were assessed by self-reports, which may lead to socially desirable answers. Indeed, a previous study in the Netherlands showed that self-reports underestimate actual weight more among Turkish and Moroccan adult women than among Dutch women and not among Turkish and Moroccan men[28]. In our study, it was usually the mother that filled out the questionnaire. As a consequence, parental BMI might be underestimated.

BMI, calculated as weight in kilograms divided by the square of height in meters, was used to assess overweight and obesity. Prevalence rates of overweight and obesity were determined by means of the IOTF international reference standard to define overweight and obesity in children (2). Some evidence exists that ethnic specific cut of point may be necessary for some groups, especially in Asians[29-30], but not regarding Turkish and Moroccan children.

We assessed *socio-economic position* only by educational level, although it is a multidimensional concept. Discrepancies may exist between several indicators. Previous research showed that the relationship between ethnicity and health may be different according to the indicator of socio-economic position includes in the analysis[31]. We nevertheless decided to choose this indicator because of the following reasons. First, educational level influences the level of knowledge on healthy exercise and dietary habits. Most of the parents of the children in this study are first generation migrants and they relatively often experience little formal education[11]. As appeared in our study, this was especially the case among Turkish and Moroccan children. Another indicator, for example income level, also may affect the BMI, because high income levels make healthier choices more likely, such as participation in sports clubs, as well as healthier food, which usually is regarded as more expensive. Although information on the income level of the families was available, the amount of missing values was considerable, especially among the migrant respondents.

Measurements: physical activity, dietary intake, and sleep duration

The measurement of these three specific risk factors for overweight and obesity by questionnaires has some limitations.

Regarding physical activity, the use of parental reports may lead to bias, leading to an underestimation or an overestimation, as a recent study suggests that self-reports by the child are more accurate than parent reports[32]. Also, we only

assessed duration and frequency, but not intensity or a measure that expresses the energy costs of physical activities by metabolic equivalent intensity levels[33]. Due to concerns of expense, self-reports are most often used in observational studies. More direct methods might be more valid, such as the use of an accelerometer[34]. Further, questionnaires were filled out by the primary caregiver, whereas no information is available on the validity of proxy reports on physical activity levels in children with different migrant backgrounds.

Regarding dietary intake, food estimates of parents might not always be in agreement with the actual intake, due to unawareness or recall problems[35] and to socially desirable answers[4]. Additionally, in the literature no evidence was found on cross-cultural validity of questionnaires measuring dietary intake. These questionnaires are based on common food practices among native respondents. Also, migrants and non-migrants may differ in their answering patterns, leading to cultural bias. Further, we did not assess those aspects of food intake that may be especially important as risk factors for overweight and obesity among migrants, such as preparation of vegetables with or without addition of fat, and the combination of traditional – usually healthier food – and western – usually less healthy food – items. We did not study differences in the use of breakfast, although a recent review showed higher BMIs in European children and adolescents that skip over breakfast[36]. Also, one Dutch study showed that breakfast is skipped more often in some migrant groups[37]. Thus, we may have missed relevant aspects in the assessment of dietary intake. Specific questionnaires validated for specific migrant groups are unavailable, but might be necessary to improve cross-cultural validity.

Regarding sleep duration, caregivers often know what time the child goes to bed, but they may not know whether the child actually is asleep or is awake. Awake, as a result of not being able to sleep, or awake, as a result of not wanting to sleep, for example reflected in secretly reading a book, playing games, or listening to music. A more objective method might have been the use of physiological measurements, such as polysomnography[21].

Measurements: home environment

The assessment of characteristics of the physical and social home environment has also been discussed earlier in this thesis. Although cross-cultural validity may also be an issue here, this is less likely the case regarding the physical environment, because its assessment was based on questions regarding quite factual and concrete issues. Regarding the social environment, cross-cultural validity is more

likely to be of importance. The questions regarding physical activity and dietary intake of the parents are prone to the same risks regarding validity in general and cross-cultural validity specifically. For example, migrant parents may differ in their parenting style by using food as a reward, in order to obtain specific behavior by their children, an issue we did not assess.

Despite these methodological issues, we found a clear confirmation regarding the contribution of the physical environment to the level of physical activity and to the intake of fruit, vegetables, snacks and sweetened beverages. Regarding the contribution of the social environment, role modeling, in general, seems more important than supportive policies and is an important predictor of physical activity and dietary intake. However, characteristics in the home environment did hardly contribute to an explanation of ethnic differences in levels of physical activity and dietary intake.

Future research

Future research may close some gaps in our knowledge on overweight and obesity among children from migrant and native descent. Overall, concerning the measurements of the behaviors in this study, the cross-cultural validity of our instruments may be questioned. In the literature, no evidence on the validity of these questionnaires among migrants was found. Future research should pay attention to this issue.

Regarding specific measurements, such as physical activity, we propose a further exploration of parental attitudes regarding the importance of physical activity for children from migrant origin, since studies from the United States suggest that in some minority groups physical activity is considered as 'a waste of time' or as a 'luxury'[38-39]. This also might explain why we found that migrant parents were less supportive to enhance physical activity in their children.

Furthermore, sedentary behavior is an important determinant of BMI, independently of physical activity[40-41]. Therefore, we also recommend that future studies should investigate differences in sedentary habits. Also, the underlying mechanisms between overweight and physical activity are unclear, as results from a review point out that, apart from other potential health benefits, more exercise does not automatically result in lower BMIs[42].

With regard to sleep duration, we suggested the assessment of more specific characteristics in the physical environment, such as room temperature, the amount of light and noise, or the use of a television in the bedroom[16]. Apart from sleep duration, it would be interesting to take into account differences

in sleep quality, as both duration, and quality may affect the development of overweight and obesity in children[43].

Particularly, regarding dietary intake, our results suggest an even greater challenge. In our study, migrants show a higher intake of fruit and vegetables, and a lower intake of snacks and sweet beverages, suggesting that dietary intake is less important in reducing their higher risk on overweight and obesity. However, before drawing this conclusion, it is necessary to evaluate the cross-cultural validity of our assessment, as described earlier. It may be necessary to further investigate differences in dietary intake, especially concerning energy density, energy content, and preparation methods, and their possible role in the explanation of ethnic differences in overweight and obesity.

Policy implications

Our findings have implications for the prevention and treatment of overweight and obesity in children. Focus on parental responsibility seems to be an important parameter in weight control interventions among children[44]. In this study, the social environment, especially parental role modeling, contributed clearly to differences in physical activity and dietary intake. Therefore, role modeling may be an important focus of interventions, aimed at stimulating healthy exercise and healthy food in their children. Parents should be aware of their role in shaping the home environment and, therefore, should be targeted in health interventions. The awareness of parents can be regarded as potentially modifiable.

Although ethnic differences are hardly explained by the studied behaviors, sleep duration, fruit intake, and snack intake did show impact on BMIs and prevalence of overweight and obesity. As this thesis focuses on modifiable factors affecting overweight and obesity, we recommend the importance of promoting more sleep, more fruit intake, and less snack intake among children. Especially sleep duration, a risk factor for overweight and obesity that might be modifiable, as it may be relatively easy for parents to implement and to control in their home environments, is not often included in policy and environmental strategies[45].

Further, strategies should focus more on the influence of cross-cultural food preparations methods, apart from only promoting the consumption of fruit and vegetables. For example, with regard to dietary intake, particular preparation methods among specific migrant groups, focusing on fat, sugar, and salt, deserve more attention in interventions.

Insufficient attention to the community might explain the relatively low effectiveness or the rather low duration of effectiveness of interventions[46]. It

is striking that none of the common interventions seems to discern migrant from non-migrant children. Especially within migrant families, that often tend to share much time together, behavioral changes can be more easily reached if interventions engage families. Indeed, according to a Dutch study, it is advised that interventions should pay attention to specific cultural aspects of the targeted population, as the attitudes and social norms towards specific behavior are the main contributing factors to the parental intention to monitor the child's behavior[47]. These attitudes and norms may be shaped within their families.

Also, the low effectiveness of interventions may be explained by the lack of evidence regarding the effectiveness of policy strategies, which makes it difficult to make single recommendations upon the use of these policies. Often, these policies are aimed to influence only a single type of behavior, related to weight status within one domain, such as the home or the school[45]. As said before, the etiology of childhood overweight and obesity is regarded as multidimensional, in which multiple factors play a key role. When implemented alone, policies related to a specific type of behavior appear insufficient to prevent or treat overweight or obesity in children. However, they do appear to be effective when developed and implemented as part of a more extensive intervention programme[48]. Therefore, we advocate an integrative approach, combining child risk factors both with parenting styles and family characteristics, and with community, demographic, and societal characteristics.

To end with, according to this thesis, overweight and obesity are significantly more prevalent among all migrant children. Additionally, differences with regard to physical activity, dietary intake, and sleep duration did exist between children from migrant and native descent in the Netherlands. Our results emphasize the need for more attention in research and policy to cultural and community aspects of the target group, not only to prevent overweight and obesity among children from migrant origin, but in order to decrease overweight and obesity among all children.

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Summary

BACKGROUND AND AIM

Worldwide, overweight and obesity have increased enormously. Rising prevalence rates form a threat for public health, as overweight is one of the most leading causes of morbidity, disability, or mortality. Apart from the negative effects on health and quality of life, overweight and obesity are responsible for a health-economic burden.

The vast overweight and obesity increase is not only restricted to adults. Aside from adverse health outcomes, childhood overweight negatively affects self-confidence, social development, and cognitive abilities. Overweight in childhood may develop into adolescent obesity. The future children of these adolescents might develop overweight and obesity of their own.

Prevalence rates are still growing, also in the Netherlands. Differences in overweight and obesity can be seen between native and non-native children. The question arises which factors influence the elevated rates, especially among Turkish and Moroccan children. Relevant risk factors seem to have spread uneven among ethnic groups.

Overweight is the result of an excess of energy intake on energy expenditure, during a longer period of time. In the obesogenic environment, lifestyle behaviors are influenced. In case of overweight and obesity, the explanation of differences between native Dutch and migrant children is often sought in these behaviors: physical activity, dietary intake, and sleep duration.

Caregivers play a key role in the home environment. In the physical home environment, availability and accessibility of risk factors (e.g., active toys, specific food) play a role; in the social home environment, parental modeling, parental policies, and parenting styles play a role.

Migrants tend to adopt western lifestyle. However, these adoptions do not explain why prevalences of overweight and obesity are even higher among migrant groups.

Main aim of this thesis is to gain knowledge on modifiable factors, which explain differences in overweight and obesity between primary school children from migrant and native origin in the Netherlands.

METHODS

Data of the IVO Nutrition and Physical Activity Child CohorT (INPACT) study, a longitudinal project, which addresses factors in the obesogenic environment within the developmental trajectory of weight, were studied. Subjects were Dutch primary school children from the age of 8-9 years old ($n = 1943$) and their primary caregiver, living in the areas of Eindhoven or Rotterdam. We discern native Dutch ($n = 1546$), Turkish ($n = 93$), Moroccan ($n = 66$), non-western ($n = 105$), and western children ($n = 133$) with different socio-economic positions.

STUDY RESULTS

Chapter 2. What is the prevalence of overweight and obesity among children from migrant and native origin in Europe?

A systematic review (1999-2009) was performed, using Embase, PubMed, and citation snowballing. Literature research resulted in 19 manuscripts, reporting studies in 6 countries, mostly situated in Western and Central Europe.

From this review, it appears that especially non-European migrant children are at higher risk for overweight and obesity than their native counterparts. The prevalence of overweight in migrant children ranged from 8.9% to 37.5%, and from 8.8% to 27.3% in native children. The prevalence of obesity in migrant children ranged from 1.2% to 15.4%, and from 0.6% to 11.6% in native children. Overall, Turkish children seem to be most at risk.

Chapter 3. Are there differences in the prevalence of overweight and obesity and in the BMIs of primary school children from migrant and native origin in the Netherlands? And is socio-economic position, based on educational level of the parents, associated with these differences?

A cross-sectional survey was performed to compare the mean BMIs and the prevalences of overweight and obesity between native Dutch and migrant primary school children and to assess to what degree these differences could be explained by socio-economic position and BMI of the mother and the father.

Outcome measures: BMI and the prevalence of overweight, including obesity. Main independent variables: migrant background, socio-economic status, and parental BMI. Other independent variables: age and sex of the child.

Our findings show that overweight and obesity are significantly more prevalent among migrant children from non-western descent. Parental BMI is an important predictor of child's BMI; socio-economic position is not.

Chapter 4. Are there differences regarding the levels of physical activity between children from migrant and native Dutch origin? And, if there are differences, which home environment aspects (physical environment: availability, accessibility; social environment: parental role modeling, parental policies) contribute to these differences?

A cross-sectional survey was carried out to assess to what degree children from migrant and native Dutch origin differ with regard to levels of physical activity and to determine which home environment aspects contribute to these differences.

Level of physical activity was outcome measure. Main independent variables were migrant background and variables in the physical and social home environment: the availability and the accessibility of toys and equipment, as well as sport club membership (physical environment), and both parental role modeling, and supportive parental policies (social environment). We controlled for age and sex of the child, and for socio-economic status of the parents.

Our results show that physical activity levels are significantly lower in migrant children, as compared to children in the native population. Less physical activity is most often seen in Turkish, Moroccan, and other non-western children. Traditional home characteristics provide only modest explanation of the differences in physical activity between migrant and non-migrant children.

Chapter 5. Are there differences with regard to dietary intake between children from migrant and native Dutch origin? And, if there are differences, which home environment aspects (physical environment: availability, accessibility; social environment: parental role modeling, parental policies) contribute to these differences?

A cross-sectional survey was carried out to assess to what degree children from migrant and native Dutch origin differ with regard to dietary intake (fruit, vegetables, sweet beverages, snacks) and to determine which aspects in their physical and social home environment(s) contribute to these differences.

Four types of dietary intake were outcome measures: consumption of fruit, vegetables, sugar-sweetened beverages, and snacks. Main independent variables were migrant background, the availability and accessibility regarding food (physi-

cal home environment), and both parental role modeling of food consumption, and parental policies around food (social home environment). We controlled for socio-economic status of the parents and for age and sex of the child.

Our results show that consumption of fruit and vegetables is significantly lowest in native children, as compared to children in migrant populations, especially compared to Turkish and Moroccan children. Also, consumption of sugar-sweetened beverages and snacks is higher in native children, as compared to migrant children. In particular, parental role modeling can explain differences between groups of children.

Chapter 6. Are there differences regarding the sleep duration between children from migrant and native Dutch origin? And, if there are differences, in which degree do parenting styles (rejecting style, neglecting style, permissive style, authoritarian style, authoritative style) contribute to these differences?

A cross-sectional survey was performed to explore whether primary school children from migrant and native Dutch origin differ regarding their sleep duration per night and to determine in which degree differences in parenting styles contribute to these differences.

Outcome measure: sleep duration of the child. Main independent variable was migrant background. Possible mediating variable is parenting style (rejecting, neglecting, permissive, authoritarian, authoritative). Age and sex of the child, and parental socio-economic status were added as confounders.

Migrant background is associated with sleep duration. Our data indicate that migrant children show significantly lower sleep durations, as compared to their indigenous counterparts. Migrant children from non-western origin show the lowest sleep duration per night. Parenting styles do not contribute to these differences.

Chapter 7. Can differences in overweight and obesity among children from migrant and native origin be explained by differences in the levels of physical activity, dietary intake, and sleep duration?

A cross-sectional survey was performed to examine to what degree differences in overweight and obesity between native Dutch and migrant primary school children could be explained by differences in physical activity, dietary intake, and sleep duration among these children.

Outcome measures: BMI and prevalence of overweight, including obesity. Main independent variables: migrant background, physical activity, dietary intake (fruit, vegetables, sweet beverages, snacks), and sleep duration. We controlled for age, sex, socio-economic status, and parental BMI.

Although sleep duration, dietary intake of fruit, and dietary intake of snacks are associated with BMI, ethnic differences in sleep duration and dietary intake do not have a large impact on ethnic differences in overweight and obesity among children from migrant and native origin.

In chapter 8, an overview of all study results is provided, on basis of the conclusions in the former chapters and in relevance to the research aims of this thesis. Finally, limitations and implications of these findings are discussed.

Samenvatting

ACHTERGROND EN DOELSTELLING

De wereldwijde toename van overgewicht en obesitas is enorm. De aldoor stijgende prevalentiecijfers vormen een bedreiging voor de volksgezondheid, aangezien overgewicht kan leiden tot ziekte, allerlei beperkingen of de dood. Afgezien van de negatieve gevolgen voor gezondheid en kwaliteit van leven, leiden overgewicht en obesitas tot hoge kosten in de gezondheidzorg.

De sterke stijging van overgewicht en obesitas blijft niet alleen beperkt tot volwassenen. Naast negatieve gezondheidsuitkomsten, is overgewicht in de kindertijd nadelig voor het zelfvertrouwen, de sociale ontwikkeling en de cognitieve vaardigheden. Kinderen met overgewicht kunnen zich ontwikkelen tot adolescenten met obesitas. De toekomstige kinderen van deze adolescenten kunnen vervolgens weer zelf te maken krijgen met overgewicht en obesitas.

Prevalentiecijfers nemen, ook binnen Nederland, alsmaar toe. Er worden verschillen geconstateerd tussen overgewicht en obesitas bij migrantenkinderen en autochtone kinderen. Het is de vraag welke factoren een rol spelen bij de verhoogde prevalentie onder met name Turkse en Marokkaanse kinderen. Relevante risicofactoren onder migranten lijken ongelijk verdeeld te zijn.

Overgewicht is het resultaat van het gedurende langere tijd innemen van een hogere hoeveelheid energie ten opzichte van het energieverbruik. In de obesogene omgeving wordt de leefstijl beïnvloed. De verklaring van verschillen in overgewicht en obesitas tussen kinderen van migranten en kinderen van autochtone Nederlanders wordt doorgaans gezocht in de volgende gedragingen: beweeg-, voedings- en slaapgedrag.

Opvoeders spelen een sleutelrol binnen de thuisomgeving. In de fysieke thuisomgeving spelen de beschikbaarheid en de toegankelijkheid van risicofactoren, zoals actief speelgoed en bepaalde voeding, een rol; in de sociale thuisomgeving spelen het voorbeeldgedrag van ouders, de regels binnen het gezin en ouderschapsstijlen een rol.

Migranten hebben de neiging om de westerse leefstijl over te nemen. Het overnemen van gedragingen vormt daarentegen niet een verklaring voor de juist hogere prevalentie van overgewicht en obesitas onder groepen migranten.

De hoofddoelstelling van dit proefschrift is om kennis te verkrijgen omtrent modificeerbare factoren ter verklaring van de verschillen in overgewicht en obesitas tussen migrantenkinderen en autochtone kinderen op de basisschool in Nederland.

METHODEN

Er zijn data geanalyseerd van het 'IVO Nutrition and Physical Activity Child CohorT (INPACT)' onderzoek, een longitudinaal project dat factoren in de obesogene omgeving in relatie tot de gewichtsontwikkeling bestudeert. De respondenten bestonden uit basisschoolkinderen in de leeftijd van 8 tot 9 negen jaar oud ($n = 1943$) en hun vaste opvoeder, woonachtig in de regio Eindhoven of Rotterdam. We maken een onderscheid tussen kinderen van Nederlandse ($n = 1546$), Turkse ($n = 93$), Marokkaanse ($n = 66$), niet-westerse ($n = 105$) en westerse ($n = 133$) komaf met verschillende sociaal-economische posities.

ONDERZOEKSRESULTATEN

Hoofdstuk 2. Wat is de prevalentie van overgewicht en obesitas onder kinderen van migranten en autochtone kinderen in Europa?

Een systematisch literatuuronderzoek (1999-2009) is uitgevoerd, waarbij gebruik werd gemaakt van Embase, PubMed en de sneeuwbalmethode. De zoektocht naar literatuur mondde uit in 19 artikelen, waarin studies van 6 landen, veelal gelegen in West- en Centraal-Europa, beschreven werden.

Uit dit onderzoek blijkt dat vooral kinderen van niet-Europese migranten een grotere kans hebben op overgewicht en obesitas dan autochtone kinderen. De prevalentie van overgewicht varieerde van 8,9% tot 37,5% onder migrantenkinderen en van 8,8% tot 27,3% onder kinderen van autochtonen. De prevalentie van obesitas varieerde van 1,2% tot 15,4% onder migrantenkinderen en van 0,6% tot 11,6% onder kinderen van autochtonen. Turkse kinderen lopen het grootste risico op het verkrijgen van overgewicht en obesitas.

Hoofdstuk 3. Bestaan er verschillen in de prevalentie van overgewicht en obesitas en in de BMI's bij kinderen op de basisschool tussen migrantenkinderen en autochtone kinderen in Nederland? En bestaat

er samenhang tussen deze verschillen en de sociaal-economische status, gebaseerd op het opleidingsniveau van de ouders?

Teneinde de gemiddelde BMI's en de prevalenties van overgewicht en obesitas te kunnen vergelijken tussen basisschoolkinderen van autochtone en allochtone afkomst in Nederland en teneinde te onderzoeken in welke mate deze verschillen verklaard kunnen worden door sociaal-economische positie en BMI van de moeder en de vader, is er cross-sectioneel onderzoek uitgevoerd.

Uitkomstmaat: zowel BMI, als de prevalentie van overgewicht, inclusief obesitas. Voornaamste onafhankelijke variabelen: de specifieke migrantengroep, sociaal-economische status en BMI van de ouders. Overige onafhankelijke variabelen: leeftijd en geslacht van het kind.

Onze resultaten tonen aan dat overgewicht en obesitas significant meer voorkomen bij kinderen van niet-westerse afkomst. BMI van de ouders is een belangrijke voorspeller van BMI van het kind; dat geldt niet voor sociaal-economische positie.

Hoofdstuk 4. Bestaan er verschillen in het beweeggedrag bij kinderen op de basisschool tussen migrantenkinderen en autochtone kinderen in Nederland? En, als er verschillen bestaan, welke factoren in de thuisomgeving (fysieke omgeving: beschikbaarheid, toegankelijkheid; sociale omgeving: voorbeeldgedrag van de ouders, regels binnen het gezin) dragen dan bij aan deze verschillen?

Er is een cross-sectionele studie verricht zowel om te onderzoeken of er verschillen bestaan in het beweeggedrag bij kinderen op de basisschool in Nederland tussen migrantenkinderen en autochtone kinderen, als om te onderzoeken welke factoren in de thuisomgeving bijdragen aan deze verschillen.

De mate van beweging was de centrale uitkomstmaat. De belangrijkste onafhankelijke variabelen waren etnische achtergrond en variabelen in de fysieke en sociale thuisomgeving: enerzijds de beschikbaarheid en de toegankelijkheid van speelgoed en materiaal, evenals lidmaatschap van een sportvereniging (fysieke omgeving), anderzijds het voorbeeldgedrag van de ouders en de regels binnen het gezin aangaande beweeggedrag (sociale omgeving). We controleerden voor leeftijd en geslacht van het kind en voor sociaal-economische status van de ouders.

Onze resultaten laten zien dat er minder bewogen wordt onder kinderen van migranten, in vergelijking met de autochtone kinderen. De minste beweging vindt plaats bij Turkse, Marokkaanse en niet-westerse kinderen. De onderlinge

verschillen in beweeggedrag kunnen slechts deels worden verklaard door traditionele karakteristieken in de thuisomgeving.

Hoofdstuk 5. Bestaan er verschillen in het voedingsgedrag bij kinderen op de basisschool tussen migrantenkinderen en autochtone kinderen in Nederland? En, als er verschillen bestaan, welke factoren in de thuisomgeving (fysieke omgeving: beschikbaarheid, toegankelijkheid; sociale omgeving: voorbeeldgedrag van de ouders, regels binnen het gezin) dragen dan bij aan deze verschillen?

Er is een cross-sectionele studie verricht zowel om te onderzoeken of er verschillen bestaan in het voedingsgedrag (fruit, groenten, zoete frisdranken, snacks) bij kinderen op de basisschool in Nederland tussen migrantenkinderen en autochtone kinderen, als om te onderzoeken welke aspecten in de fysieke en de sociale thuisomgeving(en) bijdragen aan deze verschillen.

Er gelden vier typen voeding als centrale uitkomstmaat: consumptie van fruit, groenten, suikerhoudende frisdranken en snacks. De belangrijkste onafhankelijke variabelen waren etnische achtergrond, de beschikbaarheid en de toegankelijkheid van voeding (fysieke thuisomgeving) en het voorbeeldgedrag van de ouders en de regels binnen het gezin aangaande voedingsgedrag (sociale thuisomgeving). We controleerden voor sociaal-economische status van de ouders en voor leeftijd en geslacht van het kind.

Onze resultaten tonen aan er significant minder fruit en groenten worden gegeten bij de autochtone kinderen, in vergelijking met de groepen migranten, vooral vergeleken met kinderen van Turkse en Marokkaanse komaf. Tegelijkertijd worden er meer suikerhoudende frisdranken en snacks geconsumeerd door kinderen van autochtonen, in vergelijking met migrantenkinderen. Het is vooral het voorbeeldgedrag van de ouders dat de verschillen tussen deze kinderen verklaart.

Hoofdstuk 6. Bestaan er verschillen in slaapduur bij kinderen op de basisschool tussen migrantenkinderen en autochtone kinderen in Nederland? En, als er verschillen bestaan, in welke mate dragen ouderschapsstijlen ('rejecting style', 'neglecting style', 'permissive style', 'authoritarian style', 'authoritative style') dan bij aan deze verschillen?

Om te verkennen of basisschoolkinderen van allochtone en autochtone afkomst in Nederland verschillen in hun slaapduur per nacht en om vast te stellen in welke mate ouderschapsstijlen bijdragen aan deze verschillen, is een cross-sectioneel onderzoek uitgevoerd.

Uitkomstmaat: slaapduur van het kind. Voornaamste onafhankelijke variabele was de specifieke migrantengroep. Mogelijk mediërende variabele was ouderschapsstijl ('rejecting', 'neglecting', 'permissive', 'authoritarian', 'authoritative'). Zowel leeftijd en geslacht van het kind, als sociaal-economische status van de ouders werden toegevoegd als mogelijkerwijs beïnvloedende variabelen.

De migrantengroep waartoe een kind behoort hangt samen met slaapduur. Onze data tonen aan dat kinderen van migranten een kortere slaapduur hebben dan kinderen van autochtonen. Migrantenkinderen van niet-westerse origine slapen per nacht het kortst. Ouderschapsstijlen dragen niet bij aan deze verschillen.

Hoofdstuk 7. Kunnen verschillen in overgewicht en obesitas tussen migrantenkinderen en autochtone kinderen worden verklaard door verschillen in beweeg-, voedings- en slaapgedrag?

Met het doel om verschillen in overgewicht en obesitas tussen migrantenkinderen en autochtone kinderen te verklaren middels verschillen bij deze kinderen in beweeg-, voedings- en slaapgedrag, is er een cross-sectionele studie gedaan.

Uitkomstmaten: BMI en de prevalentie van overgewicht, inclusief obesitas. Andere voorname onafhankelijke variabelen: de specifieke migrantengroep, beweging, voeding (fruit, groenten, zoete frisdranken, snacks) en slaapduur. We corrigeerden voor leeftijd, geslacht, sociaal-economische status en ouderlijk BMI.

Alhoewel slaapduur, het eten van fruit en het eten van snacks geassocieerd zijn met BMI, blijken de etnische verschillen in slaapgedrag en voedingsgedrag nauwelijks in staat te zijn om de verschillen in overgewicht en obesitas tussen migrantenkinderen en autochtone kinderen te verklaren.

In hoofdstuk 8 wordt een overzicht van alle onderzoeksresultaten gepresenteerd aan de hand van de conclusies in de voorafgaande hoofdstukken in relatie tot de doelstellingen van dit proefschrift. Aansluitend worden de beperkingen en de implicaties van deze resultaten bediscussieerd.

Slotwoord

Tegen het eind van deze zomerdag pakken donkere wolken zich samen boven het weidse Friese landschap. De wind neemt toe. In de verte kun je de bliksem horen en zien. Een schouwspel van de natuur. Overweldigend!

Binnen, vanuit mijn veilige woonkamer, is het daadwerkelijk een fascinerend uitzicht. De haard brandt, de koffie loopt. Vanuit een andere hoek van de kamer klinken er virtuoze Vivaldi klanken uit de luidspreker.

Op de eettafel staat de iMac klaar voor gebruik. Ik neem plaats achter deze tafel. Kennelijk is dit het decor waarin ik het slotwoord, behorend bij mijn eigen proefschrift, zal schrijven. Een slotwoord in de vorm van een algehele terugblik en een woord van dank. De laatste woorden van dit boek.

Een algehele terugblik? Velen weten dat er met het voltooien van dit proefschrift een eind komt aan een lange periode. Weg uit de randstad, weg van de Rotterdamse Erasmus Universiteit. Afscheid van een tijdperk met een dissertatie als slotaccoord: 'hora est'!

Vanzelfsprekend ontkom ik er niet aan even stil te staan bij mijn jaren aan deze universiteit. Ik kijk naar binnen; de blik op oneindig. Er gaan meerdere gedachten door mijn hoofd. Mijn bewogen overstap van Leiden naar Rotterdam, mijn briljante studietijd in deze havenstad, mijn eerste aanstelling als studentassistent alhier. Tal van herinneringen. Wie had destijds kunnen vermoeden dat ik na mijn afstuderen nog vijftien jaren verbonden zou blijven aan deze 'Alma Mater'?

Ik denk terug aan de oorsprong van dit proefschrift. Wat ben ik dankbaar voor de wijze waarop ik deze proeve van bekwaamheid heb mogen afleggen. Kernwoord: onafhankelijkheid. Ongetwijfeld houdt deze omschrijving verband met mijn eigen persoonlijkheid. Immers, autonoom handelen, zelfstandig zijn en vrij denken zijn altijd belangrijk voor mij geweest. Dat zal dan ook herkenbaar zijn in mijn werk. Afgezien daarvan, denk ik dat dit onafhankelijke gevoel te maken heeft met het moment waarop mijn promotietraject aanving. Doordat ik pas relatief laat besloten heb om te promoveren, heb ik de eerste jaren ontzettend veel kunnen kijken naar het werk van mijn collega's. Telkens leerde ik van hun ervaringen. De participatie in veelal kleinere onderzoeksprojecten vormde voor mij een leerschool in het doen van onderzoek. Het coördineren van grote

databestanden, het stellen van de juiste onderzoeksvragen, het omgaan met lastige referenten. Doorzettingsvermogen. Het verruimde mijn blik. Tegelijkertijd wakkerde het mijn onderzoeksinteresse aan. Bovendien maakte het mij zeker van mijn zaak, hetgeen het gevoel van onafhankelijkheid versterkte. Dezelfde onafhankelijkheid was bovendien terug te zien in de manier waarop ik mijn promotietraject oppakte. Zo besefte ik al snel dat ik beslist niet op ieder onderwerp wilde promoveren. Het onderwerp van mijn promotie zou moeten aansluiten bij mijn beide achtergronden – Gezondheidswetenschappen en Psychologie – en bovenal bij mijn eigen belangstelling. Intrinsieke motivatie diende voorop te staan. Het woord plezier durfde ik daarbij in de mond te nemen. Niet alleen tijdens de promotie zelf, maar ook tijdens de weg ernaartoe. Dat heb ik, achteraf bezien, ook zo ervaren. Dit inzicht daagde mij uit om onderzoeksvoorstellen te schrijven. Je eigen keuzes durven maken, je eigen keuzes durven verdedigen. Veelal kon ik zelf, in goed overleg met mijn promotoren, de richting en het tempo van mijn onderzoek bepalen. Onafhankelijkheid. Tot slot: doordat het promoveren slechts een bescheiden onderdeel vormde van mijn totale aanstelling, een vaste aanstelling die ook nog eens onafhankelijk was van het hele promotietraject, heb ik mij eveneens op tal van andere interessante zaken de afgelopen jaren kunnen storten. Wederom onafhankelijkheid. Onderwijs in al zijn facetten – onderwijsontwikkeling, onderwijsuitvoering, onderwijsevaluatie, onderwijsorganisatie – vormde immers het sleutelwoord in mijn tijd aan de Erasmus Universiteit Rotterdam. Dat had ik niet willen missen. Louter onderzoek en publicatiepunten? Neen! Er is nog zoveel meer…

Kent u de volgende uitspraak? Het mogen werken aan een proefschrift is een waar voorrecht. Meermaals ben ik de uitspraak tegengekomen bij het lezen van verschillende proefschriften. Vooropgesteld: in staat gesteld worden om jezelf gedurende enkele jaren dusdanig te verdiepen in een interessant onderwerp naar keuze is inderdaad een mooie kans die slechts een enkeling ten deel valt. Ik ben blij dat deze kans mij eens gegund is. Daarnaast heb ik de vrijheid waarmee ik dit onderzoek altijd heb kunnen verrichten beslist als een waardevolle toevoeging gezien. Meerdere artikelen heb ik mogen schrijven op het mij geliefde Waddeneiland Vlieland. Schrijven, wandelen in de duinen, herschrijven. Uiteraard heb ik mij ook altijd prettig gevoeld in mijn kantoor aan de Burgemeester Oudlaan. Juist binnen de academie voelde ik mij 'als een vis in het water'. Bovendien is het bijzonder te beseffen dat met de door jou verkregen kennis een bijdrage geleverd kan worden aan de verdere ontwikkeling van onderzoek en onderwijs: de kerntaken van een universiteit. Het maakt de cirkel rond.

Het mogen werken aan een proefschrift is een waar voorrecht. Aan de andere kant… Toegegeven: zo heeft het niet altijd gevoeld. Het is een tamelijk lang pad. Telkens heb ik gemerkt dat schrijven zich niet laat afdwingen. De academie van nu is, jammer genoeg, niet meer de academie van toen. En zeker het laatste jaar ben ik – in meerdere opzichten – op de proef gesteld. Deze woorden behoeven voor velen geen nadere toelichting. Toch denk ik met een brede glimlach op mijn gezicht terug aan mijn Rotterdamse tijd. Een glimlach die ik regelmatig nog zal delen met voormalige collega's.

Een woord van dank? Mijn dank gaat uit naar alle personen die op de een of andere manier een bijdrage hebben geleverd. Hierbij denk ik volstrekt niet alleen aan de universitaire gemeenschap. Waren het ook niet juist personen van ver daarbuiten en personen lang geleden die een essentiële rol hebben gespeeld? De buurt waarin ik opgroeide, de scholen die ik bezocht, de mensen die ik tussentijds heb ontmoet. Velen hebben mij eens enthousiast gemaakt voor de wereld om mij heen. Velen hebben mij begeleid tijdens de jaren van onderwijs. Velen hebben mij voorzien van afleiding op de route naar de graad van 'doctor'.

Helaas! Het is onbegonnen werk een lijst van namen bij te sluiten van iedereen die op welke wijze dan ook een bijdrage heeft geleverd. Ik vrees dat ik nimmer zal slagen in het samenstellen van een dergelijke namenlijst. De door mij genoemde namen blijven dan ook beperkt tot de personen die min of meer rechtstreeks verband houden met de totstandkoming van dit proefschrift.

In de eerste plaats een woord van dank aan mijn beide promotoren: de professoren Frans Rutten en Dike van de Mheen. Onze relativerende afspraken vonden regelmatig plaats. Tijdens deze afspraken was er altijd aandacht voor de persoon achter de wetenschapper. Dat stel ik bijzonder op prijs. De snelheid waarmee jullie op berichten hebben gereageerd kan voor menigeen als voorbeeld dienen. Tijdens het gehele traject wisten jullie telkens zowel op het vlak van vorm, als op het vlak van inhoud optimale begeleiding te bieden. Mijn dank is groot!

Aansluitend noem ik mijn copromotor die mij eens als wetenschappelijk onderzoeker introduceerde binnen het iBMG: Marleen Foets, universitair hoofddocent Sociaal Medische Wetenschappen. Je bent voor mij een onmisbare schakel in dit traject geweest. Al snel plaatste jouw ziekte dit proefschrift in een ander perspectief. Ik ben dankbaar dat jij aan de promotietafel mag zitten. Jouw Belgische aanwezigheid – vergeef mij: het is positief bedoeld – is niet te missen. De combinatie tussen jouw aangename betrokkenheid, jouw tomeloze inzet en jouw energieke chaos hebben voor mij talrijke onvergetelijke momenten

opgeleverd. Ons contact zal dan ook niet ophouden te bestaan. Ik verwelkom jou binnenkort graag in mijn Friese buitenhuis. Tot spoedig!

De leden van mijn kleine commissie en de leden van mijn grote commissie – een mooie diversiteit in personen en disciplines – wil ik vervolgens bedanken voor hun aanwezigheid op de dag van mijn promotie en de geleverde inzet in aanloop naar deze dag. Hartelijk dank voor jullie inspanningen!

Het in dit proefschrift beschreven onderzoek had geenszins kunnen plaatsvinden zonder de medewerking van velen. In de eerste plaats noem ik de in de loop der jaren talrijke onderzoeksassistenten bij dit project. Met huurauto's werden jaarlijks alle betrokken basisscholen bezocht, teneinde metingen bij de leerlingen te verkrijgen. Jullie hebben ontzettend goed werk verricht. In de tweede plaats noem ik de desbetreffende kinderen en hun ouders als gevolg van hun doorgaans jarenlange medewerking aan dit onderzoek. Jullie vormen de bron van mijn proefschrift. Een buitengewone blijk van dankbaarheid!

Ik zet voort met een bijzonder woord van dank aan onze decaan: Werner Brouwer. In een voor mij moeilijke tijd was jij telkens een goede gesprekspartner. Daarnaast bleek jij verantwoordelijkheden te nemen, daar waar anderen het, spijtig genoeg, af lieten weten. Op elegante wijze heb je voor mij de weg vrijgemaakt. Veel dank!

Voorts sta ik stil bij de personen van de voormalige onderzoeksgroep Sociaal Medische Wetenschappen, toen nog onderdeel van de sectie GE-iMTA: Gerrit Koopmans, Anushka Choté, Freek Lötters, Renske Hoefman en Erwin Birnie. Ik associeer jullie namen voortaan met respectievelijk Amsterdamse ongehoorzaamheid, onvergetelijke djembé genoegens, Rorschach interpretaties tijdens door mij verzorgde hoorcolleges, taxiritjes door donkere Poolse steden en kritische bespiegelingen op de universiteit van hedentendage. Een hechtere onderzoeksgroep met bovenal effectief leiderschap is sindsdien niet meer voorgekomen. Begrijpelijkerwijs bewaar ik warme herinneringen aan deze tijd. Dankjulliewel!

De diverse collega's buiten de hiervoor genoemde onderzoeksgroep wil ik in deze paragraaf bedanken. Wat ooit begonnen is als enkele contacten in en rondom mijn dierbare kamer van destijds, te weten L4-125, is uitgegroeid tot contacten binnen vrijwel iedere laag van het gehele instituut. Juristen met een luisterend oor, economen met muzikale aspiraties, secretaresses met talent voor poëzie. En wat dies meer zij. Ik noem jullie niet bij naam: het zijn er veel. Onze contacten – bij de wandelingen, tijdens etentjes, op congressen – hebben enorm bijgedragen aan het prettige werkklimaat. De vele persoonlijke reacties op mijn vertrek hebben mij diep ontroerd. Alle goeds gewenst!

AnneLoes van Staa, mijn scriptiebegeleider van destijds, was de persoon die ik tijdens mijn collegereeks maar wat graag introduceerde als de 'nestor' van het vak Sociaal Medische Wetenschappen. Dat was niet onterecht. Jij blijft in jouw bevlogenheid, liefde voor het vakgebied en jouw oprechtheid niet te evenaren. Wim is weg? Dankjewel!

Vervolgens gaan mijn gedachten uit naar Honorine Machielsen. Sinds onze ontmoeting hebben we veel gedeeld. Het was fijn een dergelijke vertrouweling – FYEO! – binnen dit instituut te kennen. Met beide benen zijn we stevig op de grond blijven staan. Onze goede verstandhouding, gecombineerd met ons beider passie voor het mooie Noorden, zal ons de komende jaren ongetwijfeld nog regelmatig met elkaar in contact brengen. Tot binnenkort!

Annette Wever wil ik bedanken voor de wandeling(en) die zij samen met mij is aangegaan. Wat mij duidelijk is geworden? Een reis hoeft niet altijd een duidelijke richting of een zekere bestemming te hebben. Door goed stil te staan bij jezelf en de omgeving ontstaat er langzamerhand vanzelf een koers. Onze tochten zullen mij altijd bijblijven. Het waren intense belevenissen vol verwondering. Herzlichen dank!

De mensen van de theaterwereld en de muziekwereld – zo ver weg van de wereld van onderzoek en onderwijs – bezorgden mij voortdurend de nodige afleiding. Op de planken, achter de schrijftafel, aan de piano. De hierdoor verkregen inspiratie wist ik in mijn werk te gebruiken. Tijdens voordrachten, in artikelen, bij het bedenken van tentamens. Proost!

Aansluitend zou ik graag mijn lieve vrienden noemen. Ik prijs me gelukkig met jullie. Ieder zo anders, ieder zo bijzonder, ieder zo passend. Vriendschappen maken de wereld mooier. Jullie vormen de door mij zelf gekozen familieleden. Koffiemomenten, eetafspraken, museumbezoekjes. Fietsvakanties, 'live escape rooms', nachtelijke borrels. Jullie weten dat jullie belangrijk voor mij zijn en dat jullie belangrijk voor mij blijven. Wij zoeken elkaar op, ook al woont een zeker persoon tegenwoordig in een ander deel van Nederland. Tot gauw!

Paranimfen Lisa Kolet en Simone van der Heiden hebben vanaf het eerste uur van mijn promotie een rol gespeeld. Ineens was daar, onder het genot van een cocktail, de vraag om naast mij te staan op deze belangrijke dag. Alhoewel de taken van een paranimf jullie aanvankelijk onbekend waren, hebben jullie deze rol de afgelopen jaren uitmuntend gespeeld. Wat te dragen? Zelfs de kledij kreeg dikwijls alle aandacht. De verkregen steun? Doortastend, meelevend, inspirerend. Dank aan allebei!

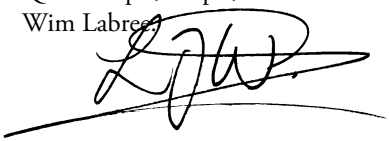
Weggerukt worden uit een leven is voor eenieder een onbeschrijflijk verdrietige gebeurtenis. Daarentegen had ik de manier waarop jij, Saskia de Leeuw, zo plotseling uit mijn leven verdween nooit voor mogelijk gehouden. Nog veel-te-veel te bespreken, nog veel-te-veel te doen, nog veel-te-veel liefde te geven. Dit lot hadden jij en ik allebei niet verdiend. Menikmati kehidupan!

Er was eens… Een vogel, een vlinder, een gele bloem. Gedurende bijna een tiental jaren heeft Rinske Tamminga een belangrijke rol in mijn leven gespeeld. In die jaren hebben we samen veel beleefd; in die jaren hebben we samen veel doorstaan. Wij weken daarbij nimmer van elkaars zijde. Alle fasen van het proefschrift hebben we dan ook gedeeld. Er bestaat geen twijfel dat onze levens voor altijd met elkaar verbonden zullen blijven. Nev gefl milo gasu!

Ik sluit af met een diepe blijk van waardering jegens mijn ouders die altijd op onvoorwaardelijke wijze achter mij zijn blijven staan. De academische wereld blijkt soms maar lastig te begrijpen. Een proefschrift? Jullie zoon heeft een boek geschreven. Als geen ander weet ik dat jullie trots zijn op dit resultaat. Ik gun jullie nog een gezond leven met z'n tweeën. Heb het leven lief!

Van op de drempel van een nieuwe tijd, naar over de drempel van een nieuwe tijd!

Quod scripsi, scripsi,
Wim Labree



Curriculum vitae

Wim Labree was born on December 10th, 1979, in Rotterdam: city of water. From a young age, he showed a strong curiosity to discover and experience the world around him, perhaps explaining his fascination for science later in life.

Labree is a health scientist and a clinical psychologist with experience both within private practice, as well as within the academic field. He has been a researcher and a lecturer at Erasmus University's institute of Health Policy and Management since 2000. His research areas of interest are broad, varying from quality of life and health behavior, to forensic psychopathology and child welfare. During the years, he was involved in numerous study projects and many educational innovations. As a supervisor of various theses and with an enrollment in several courses throughout the Bachelor and Master program, Labree was nominated for the 'Teacher of the Year' Award in 2012.

Wim Labree is also owner of an agency for creative coaching. He lives in a small village in the province of Friesland, near forests and the Frisian sea. Apart from enjoying pure nature, good wine, and delicious food, his passion lies in art, music, and theatre. If possible, he likes to combine these privileges of life, surrounded by his loved ones.

List of publications

Labree LJW, Nijman H, Marle HJ, Rassin EGC. Backgrounds and characteristics of arsonists. *Int J Law Psychiatry* 2010; 33/3: 149-153.

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Labree LJW, van de Mheen H, Rutten FFH, Rodenburg G, Koopmans GT, Foets M. Differences in overweight and obesity among children from migrant and native origin: the role of physical activity, dietary intake, and sleep duration. *PLoS One* 2015; 10/6: E0123672.

Globally, the increase of overweight and obesity has reached epidemic proportions in both adults, and children. Overweight and obesity have become a major public health concern as a consequence of the serious impact on morbidity, quality of life, and mortality. Prevalence rates are still growing, also in the Netherlands. Differences in overweight and obesity can be seen between native and non-native children. Migrant children are more at risk of overweight and obesity, as compared to their indigenous counterparts. The question arises which factors influence these elevated rates. Risk factors seem to have spread uneven among ethnic groups.
This book gains knowledge on modifiable factors, aiming to explain differences in overweight and obesity between primary school children from migrant and native Dutch origin.

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