Physical activity in a multi-ethnic population: measurement and associations with cardiovascular health and contextual factors

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Citation for published version (APA):
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Cardiovascular disease (CVD) is currently a major public health burden in the general population. However, CVD risk is not similar across population groups. Compared to the European-Dutch, the African-Surinamese and South Asian-Surinamese ethnic minority groups in the Netherlands are characterized by higher levels of CVD, CVD-related hospital admission, and CVD-related mortality. This pattern of higher levels of CVD and CVD risk factors is also observed in other industrialized countries in ethnic minority groups of African and South Asian ancestry compared to the majority populations. While the relationship of physical activity with CVD and CVD risk factors has been well researched in European-origin groups in general, there are no comprehensive population studies that present the relationship of specific measures of physical activity with CVD and CVD risk factors in the Dutch ethnic minority groups of South Asian-Surinamese and African-Surinamese descent.

This thesis will assess ethnic differences in physical activity, as well as the association of physical activity with CVD and CVD risk factors in South Asian-Surinamese, African-Surinamese, and European-Dutch ethnic groups. We will also assess the association between physical activity and contextual factors, in particular socioeconomic position and country of residence.

Chapter 1 describes the background information regarding physical activity and CVD as well as the thesis structure, a conceptual model, and the research questions answered in this thesis. The thesis is structured in three parts. The first part identifies ethnic differences in the measurement and operationalization of physical activity (Chapter 2). The second part focuses on the relationship of physical activity with CVD and CVD risk factors across ethnic groups and compared to the European-Dutch population (Chapters 3-5). The third part focuses on the socioeconomic and environmental factors that influence the individual level of physical activity (Chapters 6-7).

In Chapter 2 we assess the prevalence of level of physical activity (including recommended level of physical activity) in various domains of activity in South Asian-Surinamese, African-Surinamese, and European-Dutch study populations. Marked ethnic differences were observed for the domains of activity as well as the frequency, intensity, and duration for each type of activity within the domains. Active commuting was found to be more prevalent in the European-Dutch than in the Surinamese ethnic minority groups, and therefore contributed more to recommended level of physical activity in the European-Dutch; however, longer duration of vigorous-intensity occupational activity mitigated ethnic differences in recommended level of physical activity. South Asian-Surinamese women had lower levels of recommended physical activity in all domains compared to European-Dutch women. Lower levels of recommended physical activity were also
observed among the South Asian-Surinamese men and the African-Surinamese groups compared to the European-Dutch, although these were not statistically significant. Specific activities such as yoga and dancing mitigated ethnic differences in recommended level of physical activity, although only slightly. These results suggest that to correctly estimate ethnic differences in physical activity, a broad range of domains and activities should be included in the measurement tool.

In Chapter 3 we assess differences in the association of low physical activity with CVD-related hospital discharge in people of European-Dutch, South-Asian-Surinamese, and African-Surinamese descent. Low levels of physical activity were associated with an increased hazard of a CVD-related hospital discharge after a median of 5.5 years of follow-up since the baseline interview. There was no evidence of a statistically significant differential relationship of physical activity and CVD-related hospital discharge between the ethnic groups. The results suggest that physical activity is similarly beneficial to all ethnic groups in terms of CVD-related hospital discharge.

In Chapter 4 we assess differences in the association of low physical activity with type 2 diabetes among South Asian-Surinamese, African-Surinamese, and European-Dutch study populations. Low physical activity was associated with type 2 diabetes in the multiethnic study population. There was no evidence of a statistically significant differential relationship between physical activity and type 2 diabetes between the ethnic groups. The results suggest that physical activity is similarly beneficial to all ethnic groups in terms of type 2 diabetes.

In Chapter 5 we assess the relationship of a total physical activity score as well as dimensions of physical activity (intensity, duration) with HDL cholesterol and triglycerides in South Asian-Surinamese, African-Surinamese, and European-Dutch study populations. The total physical activity score was associated with HDL cholesterol and triglyceride levels in the African-Surinamese group, while the physical activity intensity score was associated with HDL cholesterol in the European-Dutch and African-Surinamese, and triglyceride level in all ethnic groups. These findings indicate that the intensity score was more consistently associated with blood lipids across ethnic groups. Additionally, these results suggest that the varying association in total physical activity score and blood lipids across ethnic groups might stem from differences in composition of activity.

In Chapter 6 we assess the association of leisure-time physical activity and active commuting with measures of socioeconomic position in South Asian-Surinamese, African-Surinamese, and European-Dutch study populations. We found a differential association between active commuting and socioeconomic position across ethnic groups. The positive association between active commuting and education was strongest in European-Dutch men, less strong in the South Asian-Surinamese men, and there was a lack of association
in African-Surinamese men; this was not the case for occupation (non-manual compared to manual). Among women, a similar pattern of ethnic differences was observed across the ethnic groups, but for occupation only. For leisure-time physical activity, we were unable to observe a clear pattern of differences in the association with socioeconomic position between the ethnic groups in either men or women. These findings suggest that public health interventions that target physical activity should focus more on the general population rather than on groups with a low socioeconomic position, particularly among South Asian-Surinamese and African-Surinamese groups.

In **Chapter 7** we test the convergence hypothesis by assessing the prevalence of leisure-time physical activity between Dutch and English populations that include ethnic minority groups of similar ancestry. We observed that both the European-Dutch and the Dutch ethnic minority groups reported cycling and sports activity more frequently than their English counterparts. The European-English and the English ethnic minority groups reported gardening more frequently than the Dutch groups. Additionally, within each country compared to the European-origin groups we observed that the prevalence for certain types of leisure-time physical activity was lower for gardening and cycling in the Dutch and English ethnic minority groups and lower for 30-minute walking in English South Asians, but higher for dancing in those of African descent. These findings provide indications which suggest that differences between countries in some of the major types of leisure-time physical activity reflect similarly in the ethnic minority groups and therefore provides evidence for convergence. Although differences by duration of residence were observed, these were small and not as consistent.

**Chapter 8** gives a summary of the main findings presented in this thesis and a reflection on these findings as well as implications for prevention and recommendations for future research; the chapter ends with the conclusions of this thesis. Three main conclusions can be drawn from the main findings presented in this thesis. First, physical activity patterns and types of activity differ between ethnic groups, which results in ethnic differences in the contribution of certain domains of activity to the recommended level of physical activity. The results also suggest that to better understand ethnic differences in physical activity and cardiovascular health, both summary measures and volume measures of physical activity should be taken into account.

Second, in terms of the observed patterns of physical activity, the South Asian-Surinamese and African-Surinamese ethnic groups are less active compared to the European-Dutch ethnic group. The cross-national comparison gave further insight into the influence of environmental differences on physical activity behavior and possible convergence in the ethnic minority groups. Such a cross-national approach has proven to be helpful in studying the effect of environmental differences on behavior, in this case physical activity.
Third, in terms of the relationship with health and recommendations for public health, ethnic minority populations might also benefit from becoming more physically active. Our results suggest that the social patterning of physical activity in ethnic minority groups differs from that of the majority population. It is therefore important to stimulate physical activity while, because of expected changes over time, also monitoring which subgroups within the ethnic minority groups are at high risk of a certain type of physical activity behavior.