# Determinants of physical activity, exercise and sedentary behaviour; results from a systematic review of reviews.

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## Abstract (Limit: 1200 characters, actual count: 1014 characters)

This study aims to provide a systematic overview of determinants of physical activity identified by previous systematic reviews and covers over 90 determinants. Quality assessment was addressed and a systematic synthesis of the evidence was carried out. For example, among youth, positive associations with respect to physical activity were found for motor skills/motor abilities, particular forms of physical activity (e.g. walking) and summer season. Recess duration was negatively associated with physical activity. Socio-economic status was positively associated with sedentary behaviour. Results for other age groups (adults and older adults) are also presented. However, in many cases - irrespective of age group - null or inconclusive associations were found.

**Conclusion** In order to better support policymaking future systematic reviews should feed on specific questions relating to daily practice of increasing physical activity levels in the population and prevent sedentary behaviour as much as possible.

## Keywords

Determinants, sports, exercise, physical activity, sedentary behaviour, systematic review

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# Background

Physical activity has been proven to have beneficial effects on several aspects of health. In recent years, physical inactivity has been marked the fourth leading risk factor for non-communicable disease, which has been estimated to cause 9% of premature mortality.(Lee et al., 2012a) Although, many countries advocate increasing physical activity levels as a national health priority(Bull and Groups, 2010, Kemper et al., 2000, Warburton et al., 2010), worldwide nearly 31% of adults and as much as 80% of children 13-15 years old do not adhere to recommended levels of physical activity.(Hallal et al., 2012) This urges policy makers around the world to take on the challenge to stimulate physical activity on a population level.

In the Netherlands, current physical activity policy aims to facilitate active and healthy lifestyles by providing sports facilities close to home or by making physical activity easy to combine with work or school life. The policy program 'sport and physical activity close to home' incorporates three main instruments. It provides extra funding for municipal authorities in order to recruit neighbourhood sports motivators who are tasked with motivating people of all ages to take up sport or become more physically active. It also provides grants for sports clubs to collaborate with local partners in activity programs aiming at either sedentary people, overweight children and/or youth in low-income neighbourhoods and it encourages sharing expertise in how to motivate people to become more physically active. Current physical activity levels in the Netherlands still leave room for improvement. According to the national monitoring system for the year 2014, 42% of the population aged ≥12 years do not adhere to the physical activity guideline of being physically active for at least 30 minutes on a minimum of five days (moderate activity) and/or for at least 20 minutes on a minimum of 3 days (vigorous activity). Half of this population does not participate in sports on a weekly basis and the average daily sedentary time among 12-64 year olds is seven hours.

The crucial question however remains 'how to, from the national policy level, motivate and facilitate people to become more physically active'. Insight in underlying determinants of sedentary behaviour, physical activity and exercise is of the upmost importance in order for policy measures to be successful.(Horodyska et al., 2015) Many (systematic) reviews and even some meta-analyses describing determinants of physical activity have been published. Determinants have been characterized in terms of personal (e.g. age and gender), behavioural (e.g. self-efficacy) and environmental (e.g. physical and financial accessibility of sports facilities) factors.(Bauman et al., 2012) In the early years of research on determinants of physical activity, the emphasis was on personal and behavioural factors, whereas the focus shifted more towards environmental factors in

later years. At the same time, review studies started to address specific target populations such as school-aged children(Broekhuizen et al., 2014), healthy older adults(Koeneman et al., 2011), Native Americans(Coble and Rhodes, 2006), Sub-Saharan African children(Muthuri et al., 2014), but also special needs populations.(Keeton and Kennedy, 2009) Other reviews included for example studies with a focus on specific types of physical activity such as walking(Saelens et al., 2003) or cycling(Fraser and Lock, 2011) and active transportation to school.(Davison et al., 2008) In other words, the answer to the question which factors can be addressed as determinants of physical activity probably differs according to specific target populations, (cultural) context and specific types of physical activity.

We were commissioned by the Ministry of Health, Welfare and Sport to provide an overview of determinants of physical activity (including the broad spectrum starting at sedentary behaviour and reaching as far as professionally played sports) as presented in scientific literature. For this purpose, we have performed a systematic review of systematic reviews addressing determinants of physical activity, sports and sedentary behaviour. In order to be able to structure our results, we have adopted the Ecological Model for Physical Activity (EMPA).(Lee et al., 2012b, Spence and Lee, 2003) This Model (Figure 1) states physical activity levels to be influenced by 'Personal characteristics, 'Psychological factors' and, in a broad sense, the living environment through various direct and indirect interactions between factors. It categorizes contextual factors into four levels of influence: micro, meso, exo and macro. In addition, higher-level contextual factors are included as 'Physical Ecology' and 'Pressure for Macro system Change'.

Our systematic review gives an overview of available knowledge from published systematic reviews. It will provide a better understanding for researchers, health promotors and policy makers concerning the state of knowledge of physical activity determinants in a very broad sense.

# Methods

*Search strategy*

For the current study, we systematically searched three literature databases (MEDLINE (starting our search from 1950), EMBASE (starting from 1960) and PsycInfo (starting from 1960) for systematic reviews and meta-analyses, in English, Dutch or German, published up until September 2014. Search terms were composed into physical (in)activity (e.g. motor activity, leisure activities, sedentary lifestyle), words expressing an association (e.g. correlat*, motivat*, influenc*, effect*) and domains of determinants (e.g. environment, demography, health promotion, genetic heterogeneity). Articles about medical topics (e.g. chemicals and drugs, general surgery) and articles including only patient groups were excluded. Full details of the electronic search, including limitations and specific terms, can be found in Appendix 1. Reference lists from included articles were used to identify possible additional reviews of interest.

*In- and exclusion criteria*

A limited set of inclusion criteria was used to screen title, abstract and full-text:

1) the study had to be a (systematic) review or a meta-analysis,
2) the study had to address physical (in)activity, exercise/sports and/or sedentary behaviour,
3) the study had to address determinants of these behaviours and,
4) the study had to not solely address patient groups.

Studies dealing with effectiveness of interventions were only included if the impact of determinants on change in physical activity levels was described. Intervention studies solely describing effectiveness of several types of strategies, not taking into account a 'business as usual' control condition were excluded. We considered these studies not to comply with the inclusion criteria that reviews had to address determinants of physical (in)activity, exercise/sports and/or sedentary behaviour. Studies addressing sport participation were included, studies addressing athletic performance were excluded.

*Study selection*

Titles, abstracts and full text publications were screened independently by two reviewers in three separate waves. In order to prevent papers from unjust exclusion, titles and abstracts that were included by either reviewer remained in the selection. The second reviewer only screened those papers that were excluded by the first reviewer. Two reviewers both independently screened all full text documents for inclusion. In case of disagreement, a third reviewer was consulted in order to make a final decision (based on consensus).

*Quality assessment*

The methodological quality of each review that remained in the selection after full text screening was independently scored by two reviewers, using a 7-item tool (Figure 2) adapted from the Cochrane Systematic review guidelines(2011) taking into account reviews of observational studies, randomized controlled trials as well as interventions in general. Quality items were scored either '1' or '0' based on a scoring protocol (Figure 2) including one or more sub-items. The seven main quality items addressed the research question, the search, the selection procedure, quality assessment, data extraction, the main features of the included studies and an overall judgment from the reviewer regarding the results of the study being valid and reliable. Differences between reviewers were resolved by discussion and consensus. For the last quality item, a difference in opinion between reviewers was allowed and scored as '0.5'. A score of > 6 points was categorized as high quality, 4-6 points as medium, and ≤ 4 points as low quality.

*Data extraction and evidence synthesis*

Only reviews that could be considered systematic were included in our systematic evidence synthesis. In addition, these studies were included in the evidence synthesis only if the published material facilitated data extraction as described below. For our review, we defined 'systematic' as follows:

- having a research question clearly described (score '1' on this main quality item),
- reporting about the search strategy and selection procedure in such a way that results would be reproducible (score '1' on sub items '2B' and '2D' and score '1' on sub items '3A' and '3B') and
- addressing the methodological quality of the included papers (score '1' on the main quality item 'quality assessment'; see Figure 2).

For those reviews that fulfilled these criteria and that facilitated data extraction, following the protocol described below, data was extracted from the full text reviews and structured into a data sheet. Data items included: first author, year of publication, age group (categorized as either youth (children and/or adolescents), adults, older adults or as 'not specified'), study design, determinants and type of physical (in)activity. Regarding the type of physical (in)activity, the original activity reported in the review (e.g. leisure time physical activity, exercise, walking) was registered. For reasons of comprehensiveness, we decided to group these activities together into three categories: physical activity, exercise and sedentary behaviour. Regarding the determinants under study, we registered the original determinants reported in the review (e.g. social support, traffic safety, level of urbanity, size of playground). Subsequently, we grouped

together those determinants that could be argued to represent a comparable factor. For the purpose of our review, we adapted the EMPA model.[Lee et al., 2012b, Spence and Lee, 2003] We defined personal characteristics to include 'biological and genetic characteristics, 'demographic factors', 'lifestyle factors' as well as 'health and well-being'. Moreover, we assumed the model applicable to physical activity, exercise as well as sedentary behaviour (Figure 1). To further categorize contextual factors, we used the constructs that were already used within the ANGELO-framework[Swinburn et al., 1999] assuming four types of environment: physical, social, economic and political environment (Figure 3). Finally, for each combination of determinant and type of activity within the included reviews, the number of samples showing a negative, null or positive association were recorded.

The following three-step strategy was used in order to conduct a systematic synthesis of the evidence. First, within each age group, for each combination 'determinant group' – 'activity' within each separate included review, a minimum of three samples needed to be present in order to draw conclusions. In those cases where insufficient samples were present '<3' was noted. Second, per separate review, an association was concluded to be 'positive', 'negative' or 'null' if at least 2/3 of the samples pointed in that specific 'direction'. If there was no 2/3-majority present, the evidence was concluded to be 'inconclusive' ('?'). Third, if possible, an overall conclusion was drawn. The overall conclusion represents the conclusion that was present in the majority of the included reviews. This means that in those cases where only one review (including ≥ 3 samples) was present, its conclusion is presented here as overall conclusion. In case of equal shares, this equal share is noted as overall conclusion (e.g. '0/+' if over a total of four reviews two conclude a '0' association and two conclude a '+' association). These equal share conclusions will be referred to as 'inconclusive'.

# Results

The searches in the three databases resulted into 7075 articles (Figure 4); 3752 articles in Medline, 3053 in Embase and 270 in PsycInfo. After removing duplicates, 6544 titles and 1394 abstracts were screened. Subsequently, 121 full text articles were screened. Another nine articles were excluded during full text screening, resulting in a remaining 112 papers for our quality assessment. Appendix 2 provides a full overview of the quality scores, Table 1 (a, b, c and d) gives a summary. Overall, 26 papers were deemed 'systematic'. Five of these papers did not facilitate data extraction, resulting in 21 systematic reviews included in the evidence synthesis.
The average quality score was 4.2 (range: 1.0-7.0) for all papers together and 6.2 (range: 4.5-7.0) for those included in the evidence synthesis. Overall, 71.4% of the papers included in the evidence synthesis were labelled 'high quality' (Appendix 2).

Our evidence synthesis covers over 90 different determinant groups from 21 systematic reviews. The studies included covered both individual and contextual level determinants. Contextual level determinants generally did not exceed the micro level environment. We will discuss the results divided by age category (youth, adults and older adults) and within age category by type of activity (physical activity, exercise and sedentary behaviour).

## Youth

The majority (n=13) of the systematic reviews addressed youth.(Broekhuizen et al., 2014, Craggs et al., 2011, Holfelder and Schott, 2014, Lachowycz and Jones, 2011, Larouche et al., 2014, Lubans et al., 2008, Maitland et al., 2013, Muthuri et al., 2014, Pont et al., 2009, Rich et al., 2012, Schoeppe et al., 2013, Stanley et al., 2012, Uijtdewilligen et al., 2011) All of them included physical activity. Two systematic reviews specifically addressed exercise (Broekhuizen et al., 2014, Rich et al., 2012) and five included sedentary behaviour.(Broekhuizen et al., 2014, Maitland et al., 2013, Muthuri et al., 2014, Rich et al., 2012, Uijtdewilligen et al., 2011) In general, applying our scoring protocol to the systematic reviews revealed most associations under study to lack study samples (score '<3') or to be inconclusive (score '?' for individual reviews and '+/?', '0/?', '-/?' for the overall conclusion; (Table 2a)).

*Physical activity*

Some determinant groups showed a conclusive association with physical activity. However, most of these were null associations, which were found for ethnicity, smoking, affective judgement/attitude/beliefs about physical activity, perceived benefits/ outcome expectancy, proxy efficacy, value of health/appearance/achievement. But also for environmental aesthetics either at the neighbourhood or school level, media or physical activity equipment presence in the home, seating equipment at the school level, access

to recreational and sports facilities, urban planning, household composition, personal and crime related safety and region (Table 2a).
Among youth, physical activity was positively associated with motor skills/motor ability, and with summer season. In addition, particular forms of physical activity (e.g. walking) were positively associated with physical activity in general (Table 2a).
A negative association was found for recess duration; meaning longer recess periods being associated with less physical activity (Table 2a).

*Exercise*
Whereas the systematic reviews addressing physical activity among youth covered a wide variety of factors, those systematic reviews addressing exercise concentrated mainly on factors in the physical environment (microsystem dimensions). Null associations were found for summer season, playground infrastructure design and social support / social norm (teacher; Table 2a). No positive or negative associations were found.

*Sedentary behaviour*
Among youth, a positive association was found between socio-economic status and sedentary behaviour. Null associations were found for gender, body composition, impulsivity/temperament, social support/social norm (teacher), presence of physical activity equipment at playgrounds and playground infrastructure design (Table 2a). No negative associations were found.

## Adults

One third of the systematic reviews included in this study addressed a (mainly) adult population.(Amireault et al., 2013, Arango et al., 2013, Kirk and Rhodes, 2011, Lachowycz and Jones, 2011, Mabry et al., 2010, Rhodes et al., 2009, Starnes et al., 2011) All of these studies included physical activity, none of them exercise or sedentary behaviour. Again, associations under study tended to lack study samples (score '<3') or to be inconclusive (score '?' for individual reviews and '+/?', '0/?', '-/?' for the overall conclusion; (Table 2b)).

*Physical activity*
Among adults, positive associations were found for general health, goal setting/intention/commitment to planning, self-efficacy/perceived behavioural control, degree of urbanization and urban planning at the neighbourhood level (Table 2b).
Null associations were found for body composition, marital status, employment status, smoking, knowledge, perceived negative consequences/outcome expectancy, aesthetics and air quality at the neighbourhood level. Also for presence of physical activity

equipment in the home, quality of neighbourhood level infrastructure, safety in general as well as traffic-related and personal and crime-related safety specifically, events and activities and facilitators at the community level (Table 2b).

### Older adults

Only three systematic reviews addressed determinants of physical activity and exercise among older adults.[Barnett et al., 2012, Koeneman et al., 2011, Lachowycz and Jones, 2011] All addressed physical activity, two addressed determinants of exercise.[Barnett et al., 2012, Koeneman et al., 2011] In addition, in this case many of the associations under study lacked study samples. Although some of the associations under study showed inconclusive results, the number of conclusive associations (either '+', '0' or '-') was relatively high among this age group (Table 2c).

*Physical activity*

Among older adults, positive associations were found for employment status, particular forms vs general physical activity, affective judgement/attitude/beliefs about physical activity and access to recreational and sports facilities in the neighbourhood.
A null association was found for age and a negative association was found for symptoms/illnesses/ (chronic) conditions (Table 2c).

*Exercise*

A positive association was found for motor skills/motor abilities and for cognitive skills / cognitive abilities. Null associations were found for gender, body composition, age, socio-economic status, general health, affective judgement/attitude/beliefs about physical activity and social support/social norm. Negative associations were found for retirement, symptoms/illnesses/ (chronic) conditions and life events (Table 2c).

## Discussion

In this extensive systematic review of systematic reviews and meta-analyses, we identified 21 reviews examining around 90 determinants of physical (in)activity, exercise and/or sedentary behaviour published in English, Dutch or German language between 1960 and September 2014. In many cases sufficient samples were lacking or inconclusive were found. The EMPA-model was used to categorize results. At the individual level, associations were found for both personal characteristics and psychological factors. Results at the contextual level concentrated on microsystem dimensions. At the individual level, our study shows some interesting patterns. For youth it underlines the importance of developing motor skills and being confident about ones abilities. These findings strengthen the thought that (elements of) physical education classes should be firmly embedded in the school curriculum. Based on our results, recess time should not be too long to help children to be physically active. Among adults, the associations found were predominantly for behavioural determinants, affirming the potential importance of behavioural programs aiming to increase physical activity. The association between both motor and cognitive abilities and exercise as well as the positive association between employment status and physical activity among older adults stresses the importance of exercise for participating in society. Even more, because of the negative association between having symptoms, illnesses, (chronic) conditions and physical activity.

Because our study includes the results of existing reviews as a basis and does not refer to their individual underlying studies, there will undoubtedly be overlap of the included individual studies in the reviews. This may have influenced the conclusions drawn in our evidence synthesis, since we concluded an association to be present based on the association found in the majority of the underlying reviews.
The quality score of the included systematic reviews was relatively high (6.2 compared to a maximum score of 7.0). Undoubtedly, this was caused by our inclusion criteria regarding the high quality systematic nature of the reviews. Based on our quality assessment we excluded 86 papers, most of them (n=63) because they did not include a quality assessment. Making a high quality selection as we did provides the opportunity to robustly study the association of several determinants in relation to behaviour. However, a drawback may be that the selected papers do not fully represent the field of research. This might have been the case in our study since the papers included in our evidence synthesis largely focused on youth and physical activity. Studies addressing determinants of physical activity behaviour among adults included only physical activity and not specifically exercise or sedentary behaviour. The number of studies addressing determinants of physical activity among older adults was as low as three. These studies

did not address sedentary behaviour and determinants studied mainly addressed the individual level. The extent to which our selection has influenced the conclusions of our review is hard to say without undoing the selection. It might be expected however that due to the diversity in physical activity assessment measures, assessment measures used to define sedentary behaviour and the measures used to define the determinants under study a large part of the information that would be included in this alternative scenario would still point towards inconclusive results.

Our systematic review included determinants at both the individual and the contextual level. Within the contextual level, it was very clear that the vast majority of determinants addressed micro level dimensions. This is probably because contextual level determinants addressing macro level dimensions will have to come from large-scaled studies, probably explicitly including data from different cultures. To our knowledge, there is currently no systematic review available on this topic. For the micro-level determinants included in our study, no clear and specific positive or negative associations were found. As mentioned before, underlying diversity probably dilutes results. Probably, in order to be able to be more specific in conclusions there is a need for a more specific research question both on the level of the determinant and the level of physical activity. For example, having access to sports facilities may be expected to be associated with exercise but not necessarily with walking. The latter activity may in turn be expected to correlate with having walking infrastructure in place.

Despite the notions that can be taken from our study, it still leaves some distinct questions particularly for policymaking. As mentioned before, reviewing the literature with a more specific research question can be considered the next step. However, before doing so it will be important to ensure that these research questions are in line with policy needs.

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# Figure title and legend

**Figure 1**. The Ecological Model for Physical Activity (*adapted from Spence and Lee*[(Spence and Lee, 2003)]).

**Figure 2.** Quality (sub)items used to score the methodology quality of the included systematic reviews.

**Figure 3**. EMPA, determinants grouped

**Figure 4.** Flowchart of study selection.

**Table 1a**. Summary of the included reviews addressing youth.

| Author, Year | Type of activity[†] | EMPA elements | Quality score | Systematic | Data ok[‡] |
|---|---|---|---|---|---|
| Horst van der, 2007(Van Der Horst et al., 2007) | PA, SED | Personal characteristics<br>Psychological factors<br>Microsystem dimensions | 5.5 | No | -- |
| Maitland, 2013(Maitland et al., 2013) | PA, SED | Psychological factors<br>Microsystem dimensions | 6.5 | Yes | Yes |
| Sallis, 2000(Sallis et al., 2000) | PA | Personal characteristics<br>Psychological factors<br>Microsystem dimensions | 5.5 | No | -- |
| Lubans, 2008(Lubans et al., 2008) | PA | Psychological factors | 6.0 | Yes | Yes |
| Larouche, 2014(Larouche et al., 2014) | PA | Personal characteristics | 6.5 | Yes | Yes |
| Schoeppe, 2012(Schoeppe et al., 2013) | PA | Personal characteristics | 6.5 | Yes | Yes |
| Davison, 2008(Davison et al., 2008) | PA | Personal characteristics<br>Psychological factors<br>Microsystem dimensions | 2.5 | No | -- |
| Stanley, 2012(Stanley et al., 2012) | PA | Personal characteristics<br>Psychological factors<br>Microsystem dimensions | 6.0 | Yes | Yes |
| Craemer, 2012(De Craemer et al., 2012) | PA | Personal characteristics<br>Psychological factors<br>Microsystem dimensions | 5.5 | No | -- |
| Craggs, 2011(Craggs et al., 2011) | PA | Personal characteristics<br>Psychological factors<br>Microsystem dimensions<br>Macrosystem dimensions | 6.5 | Yes | Yes |
| Sallis, 1992(Sallis et al., 1992) | PA, EX | Personal characteristics<br>Psychological factors<br>Microsystem dimensions | 1.0 | No | -- |
| Uijtdewilligen, 2011(Uijtdewilligen et al., 2011) | PA, SED | Personal characteristics<br>Psychological factors<br>Microsystem dimensions | 6.5 | Yes | Yes |
| Davison, 2006(Davison and Lawson, 2006) | PA | Microsystem dimensions | 5.5 | No | -- |
| Fitzgerald, 2012(Fitzgerald et al., 2012) | PA | Psychological factors | 4.5 | No | -- |
| Trost, 2010(Trost et al., 2010) | PA | Microsystem dimensions<br>Exosystem dimensions | 2.0 | No | -- |
| Stalsberg, 2010(Stalsberg and Pedersen, 2010) | PA | Personal characteristics | 4.5 | No | -- |
| Giles-Corti, 2009(Giles-Corti et al., 2009) | PA | Microsystem dimensions | 1.0 | No | -- |
| Limstrand, 2008(Limstrand, 2008) | PA | Personal characteristics<br>Psychological factors<br>Microsystem dimensions | 3.5 | No | -- |
| Pont, 2009(Pont et al., 2009) | PA | Personal characteristics<br>Psychological factors<br>Microsystem dimensions<br>Mesosystem dimensions | 6.5 | Yes | Yes |
| Ferreira, 2007(Ferreira et al., 2007) | PA | Microsystem dimensions | 6.0 | No | -- |

| Author, Year | Type of activity[†] | EMPA elements | Quality score | Systematic | Data ok[‡] |
|---|---|---|---|---|---|
| Verloigne, 2012[(Verloigne et al., 2012)] | PA, SED | Personal characteristics<br>Psychological factors<br>Microsystem dimensions | 4.5 | No | -- |
| Sawka, 2013[(Sawka et al., 2013)] | PA, SED | Psychological factors | 5.5 | No | -- |
| Sleddens, 2011[(Sleddens et al., 2011)] | PA, SED | Psychological factors | 6.0 | No | -- |
| Lachowycz, 2011[(Lachowycz and Jones, 2011)] | PA | Microsystem dimensions | 6.5 | Yes | Yes |
| Maturo, 2013[(Maturo and Cunningham, 2013)] | PA | Psychological factors | 4.5 | No | -- |
| Engberg, 2012[(Engberg et al., 2012)] | PA | Personal characteristics | 3.5 | No | -- |
| Allender, 2008[(Allender et al., 2008)] | PA | Personal characteristics | 4.5 | No | -- |
| Kremers, 2007[(Kremers et al., 2007)] | PA | Personal characteristics<br>Microsystem dimensions | 3.5 | No | -- |
| Ding, 2011[(Ding et al., 2011)] | PA | Microsystem dimensions | 6.0 | No | -- |
| Beets, 2010[(Beets et al., 2010)] | PA | Psychological factors | 2.5 | No | -- |
| Pugliese, 2007[(Pugliese and Tinsley, 2007)] | PA | Psychological factors | 4.5 | No | -- |
| Ridgers, 2012[(Ridgers et al., 2012)] | PA | Personal characteristics<br>Psychological factors<br>Microsystem dimensions | 5.5 | No | -- |
| Mitchell, 2012[(Mitchell et al., 2012)] | PA | Psychological factors<br>Microsystem dimensions | 4.5 | No | -- |
| Sandercock, 2010[(Sandercock et al., 2010)] | PA | Macrosystem dimensions | 3.5 | No | -- |
| Carver, 2008[(Carver et al., 2008)] | PA | Microsystem dimensions | 1.0 | No | -- |
| Hinkley, 2008[(Hinkley et al., 2008)] | PA | Personal characteristics<br>Psychological factors<br>Microsystem dimensions | 3.5 | No | -- |
| Holfelder, 2014[(Holfelder and Schott, 2014)] | PA | Personal characteristics | 6.0 | Yes | Yes |
| Rich, 2012[(Rich et al., 2012)] | PA | Macrosystem dimensions | 6.0 | Yes | Yes |
| Shephard, 2009[(Shephard and Aoyagi, 2009)] | PA | Macrosystem dimensions | 1.0 | No | -- |
| Plotnikoff, 2013[(Plotnikoff et al., 2013)] | PA | Personal characteristics<br>Psychological factors<br>Microsystem dimensions | 6.5 | Yes | No |
| Lee, 2008[(Lee et al., 2008)] | PA | Personal characteristics | 3.5 | No | -- |
| Muthuri, 2014[(Muthuri et al., 2014)] | PA, SED | Personal characteristics | 4.5 | Yes | Yes |
| Broekhuizen, 2014[(Broekhuizen et al., 2014)] | PA, EX, SED | Psychological factors<br>Microsystem dimensions | 6.5 | Yes | Yes |
| Allender, 2006[(Allender et al., 2006)] | PA, EX | Personal characteristics<br>Psychological factors<br>Microsystem dimensions | 3.0 | No | -- |
| Keeton, 2009[(Keeton and Kennedy, 2009)] | PA | Personal characteristics<br>Psychological factors<br>Microsystem dimensions | 1.0 | No | -- |
| Rees, 2006[(Rees et al., 2006)] | PA | Psychological factors | 5.5 | Yes | No |

| Author, Year | Type of activity† | EMPA elements | Quality score | Systematic | Data ok‡ |
|---|---|---|---|---|---|
| | | Microsystem dimensions | | | |

†PA: Physical activity, EX: Exercise, SED: Sedentary behaviour. ‡Yes, if reviews facilitated data extraction.
Grey scale: included in evidence synthesis

**Table 1b**. Summary of the included reviews addressing adults.

| Author, Year | Type of activity† | EMPA elements | Quality score | Systematic | Data ok |
|---|---|---|---|---|---|
| Bellows-Riecken, 2008(Bellows-Riecken and Rhodes, 2008) | PA | Personal characteristics<br>Psychological factors | 4.5 | No | -- |
| Rhodes, 2009(Rhodes et al., 2009) | PA | Psychological factors | 6.5 | Yes | Yes |
| Tammelin, 2005(Tammelin, 2005) | PA | Personal characteristics<br>Psychological factors | 2.0 | No | -- |
| Vrazel, 2008(Vrazel et al., 2008) | PA | Psychological factors<br>Microsystem dimensions | 4.5 | No | -- |
| McCormack, 2004(McCormack et al., 2004) | PA | Microsystem dimensions | 3.5 | No | -- |
| Arango, 2013(Arango et al., 2013) | PA | Microsystem dimensions | 6.5 | Yes | Yes |
| Panter, 2010(Panter and Jones, 2010) | PA | Psychological factors<br>Microsystem dimensions | 4.5 | No | -- |
| Trost, 2002(Trost et al., 2002) | PA | Personal characteristics<br>Psychological factors<br>Microsystem dimensions<br>Macrosystem dimensions | 3.5 | No | -- |
| Sugiyama, 2012(Sugiyama et al., 2012) | PA | Microsystem dimensions | 5.5 | No | -- |
| Kaewthummanukul, 2006(Kaewthummanukul and Brown, 2006) | PA, EX | Personal characteristics<br>Psychological factors | 3.5 | No | -- |
| Amireault, 2013(Amireault et al., 2013) | PA | Personal characteristics<br>Psychological factors<br>Microsystem dimensions | 6.5 | Yes | Yes |
| Richards, 2013(Richards, 2013) | PA | Microsystem dimensions | 4.5 | No | -- |
| Cutt, 2007(Cutt et al., 2007) | PA | Microsystem dimensions | 2.5 | No | -- |
| Frost, 2010(Frost et al., 2010) | PA | Microsystem dimensions | 4.5 | No | -- |
| Humpel, 2002(Humpel et al., 2002) | PA | Microsystem dimensions | 5.5 | No | -- |
| Mabry, 2010(Mabry et al., 2010) | PA | Personal characteristics | 4.5 | Yes | Yes |
| Piazza-Gardner, 2012(Piazza-Gardner and Barry, 2012) | PA | Personal characteristics | 4.5 | No | -- |
| Gaston, 2011(Gaston and Cramp, 2011) | PA, EX | Personal characteristics<br>Psychological factors | 4.5 | No | -- |
| Teixeira, 2012(Teixeira et al., 2012) | EX | Psychological factors | 5.0 | No | -- |
| Seefeldt, 2002(Seefeldt et al., 2002) | PA | Personal characteristics<br>Psychological factors | 1.0 | No | -- |
| White, 2005(White et al., 2005) | PA | Personal characteristics<br>Psychological factors | 3.5 | No | -- |
| Keller, 2006(Keller and Fleury, 2006) | PA | Personal characteristics<br>Psychological factors | 2.5 | No | -- |
| Lachowycz, 2011(Lachowycz and Jones, 2011) | PA | Microsystem dimensions | 6.5 | Yes | Yes |
| McCormack, 2011(McCormack and Shiell, 2011) | PA | Microsystem dimensions | 6.0 | No | -- |
| Engberg, 2012(Engberg et al., 2012) | PA | Personal characteristics | 3.5 | No | -- |
| Allender, 2008(Allender et al., 2008) | PA | Personal characteristics | 4.5 | No | -- |
| Kirk, 2011(Kirk and Rhodes, 2011) | PA | Personal characteristics | 6.5 | Yes | Yes |
| Rhodes, 2006(Rhodes and Smith, 2006) | PA | Personal characteristics | 4.5 | No | -- |

| Author, Year | Type of activity† | EMPA elements | Quality score | Systematic | Data ok |
|---|---|---|---|---|---|
| Daniel, 2011(Daniel and Wilbur, 2011) | PA | Personal characteristics<br>Psychological factors | 4.5 | No | -- |
| Coble, 2006(Coble and Rhodes, 2006) | PA | Personal characteristics<br>Psychological factors<br>Microsystem dimensions | 3.5 | No | -- |
| Caperchione, 2009(Caperchione et al., 2009) | PA | Personal characteristics<br>Psychological factors<br>Microsystem dimensions | 2.5 | No | -- |
| Wendel-Vos, 2007(Wendel-Vos et al., 2007) | PA, EX, SED | Microsystem dimensions | 4.5 | No | -- |
| Holle van, 2012(Van Holle et al., 2012) | PA | Microsystem dimensions | 4.5 | No | -- |
| Shephard, 2009(Shephard and Aoyagi, 2009) | PA | Macrosystem dimensions | 1.0 | No | -- |
| Beenackers, 2012(Beenackers et al., 2012) | PA | Personal characteristics<br>Microsystem dimensions | 5.0 | No | -- |
| Foster, 2008(Foster and Giles-Corti, 2008) | PA | Personal characteristics<br>Microsystem dimensions | 3.5 | No | -- |
| Owen, 2004(Owen et al., 2004) | PA | Microsystem dimensions | 2.5 | No | -- |
| Allender, 2006(Allender et al., 2006) | PA, EX | Personal characteristics<br>Psychological factors<br>Microsystem dimensions | 3.0 | No | -- |

†PA: Physical activity, EX: Exercise, SED: Sedentary behaviour. ‡Yes, if reviews facilitated data extraction.
Grey scale: included in evidence synthesis

**Table 1c**. Summary of the included reviews addressing older adults.

| Author, Year | Type of activity† | EMPA elements | Quality score | Systematic | Data ok |
|---|---|---|---|---|---|
| Boehm, 2013(Boehm et al., 2013) | EX | Personal characteristics<br>Psychological factors<br>Microsystem dimensions | 3.5 | No | -- |
| Cunningham, 2004(Cunningham and Michael, 2004) | PA | Microsystem dimensions | 4.5 | No | -- |
| Koeneman, 2011(Koeneman et al., 2011) | PA, EX | Personal characteristics<br>Psychological factors<br>Microsystem dimensions | 7.0 | Yes | Yes |
| Rhodes, 1999(Rhodes et al., 1999) | EX | Personal characteristics<br>Psychological factors | 2.5 | No | -- |
| Lachowycz, 2011(Lachowycz and Jones, 2011) | PA | Microsystem dimensions | 6.5 | Yes | Yes |
| Engberg, 2012(Engberg et al., 2012) | PA | Personal characteristics | 3.5 | No | -- |
| Baert, 2011(Baert et al., 2011) | PA | Psychological factors<br>Microsystem dimensions | 6.0 | Yes | No |
| Barnett, 2012(Barnett et al., 2012) | PA, EX | Personal characteristics | 6.5 | Yes | Yes |
| Cauwenberg van, 2011(Van Cauwenberg et al., 2011) | PA | Microsystem dimensions | 5.5 | No | -- |
| Allender, 2006(Allender et al., 2006) | PA, EX | Personal characteristics<br>Psychological factors<br>Microsystem dimensions | 3.0 | No | -- |
| Moran, 2014(Moran et al., 2014) | PA | Microsystem dimensions | 2.5 | No | -- |
| Horne, 2012(Horne and Tierney, 2012) | PA | Psychological factors<br>Microsystem dimensions | 5.0 | Yes | No |

†PA: Physical activity, EX: Exercise, SED: Sedentary behaviour. ‡Yes, if reviews facilitated data extraction.
Grey scale: included in evidence synthesis

**Table 1d**. Summary of the included reviews addressing populations in general (without specifying the age category).

| Author, Year | Type of activity† | EMPA elements | Quality score | Systematic | Data ok |
|---|---|---|---|---|---|
| Ntoumanis, 1999(Ntoumanis and Biddle, 1999) | PA | Psychological factors | 1.5 | No | -- |
| Renalds, 2010(Renalds et al., 2010) | PA | Microsystem dimensions | 3.0 | No | -- |
| Durand, 2011(Durand et al., 2011) | PA | Microsystem dimensions<br>Exosystem dimensions | 5.5 | No | -- |
| Saelens, 2008(Saelens and Handy, 2008) | PA | Microsystem dimensions | 4.5 | No | -- |
| Fraser, 2010(Fraser and Lock, 2011) | PA | Microsystem dimensions | 6.0 | Yes | No |
| Shemilt, 2013(Shemilt et al., 2013) | PA | Microsystem dimensions<br>Exosystem dimensions | 3.5 | No | -- |
| Saelens, 2003(Saelens et al., 2003) | PA | Microsystem dimensions | 2.5 | No | -- |
| Aaltonen, 2014(Aaltonen et al., 2014) | PA | Personal characteristics<br>Psychological factors | 1.0 | No | -- |
| Herring, 2014(Herring et al., 2014) | PA | Personal characteristics<br>Psychological factors | 1.0 | No | -- |
| Vilhena e Santos, 2012(de Vilhena e Santos et al., 2012) | PA | Personal characteristics | 3.5 | No | -- |
| Geus de, 2014(de Geus et al., 2014) | EX, SED | Personal characteristics | 1.0 | No | -- |
| Kaczynski, 2008(Kaczynski and Henderson, 2008) | PA | Microsystem dimensions | 4.5 | No | -- |
| Duncan, 2005(Duncan et al., 2005) | PA | Microsystem dimensions | 3.5 | No | -- |
| Larsen, 2013(Larsen et al., 2013) | PA | Psychological factors<br>Microsystem dimensions | 1.0 | No | -- |
| Kaczynski, 2008(Kaczynski et al., 2008) | PA | Personal characteristics | 3.5 | No | -- |
| Mavoa, 2008(Mavoa and McCabe, 2008) | PA | Personal characteristics<br>Psychological factors<br>Microsystem dimensions | 1.0 | No | -- |
| Dishman, 1985(Dishman et al., 1985) | PA | Personal characteristics<br>Psychological factors<br>Microsystem dimensions | 1.0 | No | -- |
| Tucker, 2007(Tucker and Gilliland, 2007) | PA | Psychological factors<br>Macrosystem dimensions | 2.5 | No | -- |
| Lee, 2011(Lee and Maheswaran, 2011) | PA | Personal characteristics<br>Psychological factors<br>Microsystem dimensions | 3.5 | No | -- |
| Ferdinand, 2012(Ferdinand et al., 2012) | PA | Microsystem dimensions | 3.5 | No | -- |
| Fleury, 2006(Fleury and Lee, 2006) | PA | Personal characteristics<br>Psychological factors<br>Microsystem dimensions | 3.5 | No | -- |
| Starnes, 2011(Starnes et al., 2011) | PA | Personal characteristics<br>Psychological factors<br>Microsystem dimensions | 6.5 | Yes | Yes |

| Author, Year | Type of activity† | EMPA elements | Quality score | Systematic | Data ok |
|---|---|---|---|---|---|
| Toohey, 2011(Toohey and Rock, 2011) | PA | Psychological factors<br>Microsystem dimensions | 4.5 | No | -- |
| Jacobsen, 2009(Jacobsen et al., 2009) | PA | Microsystem dimensions | 1.0 | No | -- |
| †PA: Physical activity, EX: Exercise, SED: Sedentary behaviour<br>Grey scale: included in evidence synthesis | | | | | |

**Table 2a.** Number of systematic reviews addressing determinant groups associated with physical activity, exercise and/or sedentary behaviour among youth.

| | | **Physical activity** | | | | | | | **Exercise** | | | | | | | **Sedentary behaviour** | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Determinant group by EMPA element**[†] | | **+** | **0** | **-** | **?** | **<3** | **concl** | | **+** | **0** | **-** | **?** | **<3** | **concl** | | **+** | **0** | **-** | **?** | **<3** | **concl** |
| | | | | | | | | | | | | | | | | | | | | | |
| Individual level: Personal characteristics | | | | | | | | | | | | | | | | | | | | | |
| *Biological and Genetic* | | | | | | | | | | | | | | | | | | | | | |
| Gender (male) | | (Stanley et al., 2012, Muthuri et al., 2014) | | | (Craggs et al., 2011, Uijtdewilligen et al., 2011) | | **+/?** | | | | | | | | | | (Muthuri et al., 2014) | | | (Uijtdewilligen et al., 2011) | **0** |
| Body composition | | | (Craggs et al., 2011, Uijtdewilligen et al., 2011) | (Stanley et al., 2012) | (Larouche et al., 2014, Schoeppe et al., 2013) | | **0/?** | | | | | | | | | | (Uijtdewillligen et al., 2011) | | | | **0** |
| Motor skills / Motor abilities | | (Holfelder and Schott, 2014, Uijtdewilligen et al., 2011) | | | | (Stanley et al., 2012) | **+** | | | | | | | | | | | | | | |
| Cognitive skills / Cognitive abilities | | | | | | | | | | | | | | | | | | | | (Uijtdewilligen et al., 2011) | |
| | | | | | | | | | | | | | | | | | | | | | |
| *Demographic factors* | | | | | | | | | | | | | | | | | | | | | |
| Age | | (Uijtdewilligen et al., 2011) | | (Stanley et | (Craggs et al., 2011) | (Broekhuizen et al., | **+/-/?** | | | | | | | | | | | | | (Muthuri et al., | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | al., 2012) | | 2014) | | | | | | | | | | | | | 2014) | |
| Developmental stage | | | | | (Craggs et al., 2011) | | **?** | | | | | | | | | | | | (Uijtdewillegen et al., 2011) | | **?** |
| Ethnicity | | | (Craggs et al., 2011, Stanley et al., 2012) | (Uijtdewillegen et al., 2011) | (Pont et al., 2009) | | **0** | | | | | | | | | | | | | |
| SES | | (Muthuri et al., 2014) | | | (Craggs et al., 2011) | (Stanley et al., 2012) | **+/?** | | | | | | | | (Muthuri et al., 2014) | | | | | + |
| Employment status | | | | | | (Pont et al., 2009) | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| *Lifestyle factors* | | | | | | | | | | | | | | | | | | | | |
| Alcohol consumption | | | | | | (Craggs et al., 2011) | | | | | | | | | | | | | | |
| Dietary habits | | | | | | (Craggs et al., 2011) | | | | | | | | | | | | | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Physical activity | | (Craggs et al., 2011, Larouche et al., 2014, Schoeppe et al., 2013, Uijtdewilligen et al., 2011) | | | | | + | | | | | | | | | | | | | | |
| Sedentary behaviour | | | (Craggs et al., 2011, Schoeppe et al., 2013) | (Stanley et al., 2012) | (Uijtdewilligen et al., 2011) | | ? | | | | | | | | | | | | | | |
| Sleep | | | | | | | | | | | | | | | | | | | | (Uijtdewilligen et al., 2011) | |
| Smoking | | | (Craggs et al., 2011) | | | | 0 | | | | | | | | | | | | | | |
| Licence | | | | | (Pont et al., 2009) | (Stanley et al., 2012) | ? | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | |
| | | **Physical activity** | | | | | | | **Exercise** | | | | | | | **Sedentary behavior** | | | | | |
| **Determinant group by EMPA element** | | **+** | **0** | **-** | **?** | **<3** | **concl** | | **+** | **0** | **-** | **?** | **<3** | **concl** | | **+** | **0** | **-** | **?** | **<3** | **concl** |
| | | | | | | | | | | | | | | | | | | | | | |
| *Health and well being* | | | | | | | | | | | | | | | | | | | | | |
| General health | | | | | | (Stanley et al., 2012) | | | | | | | | | | | | | | | |
| Symptoms, illnesses, | | | | | | (Craggs | | | | | | | | | | | | | | (Uijtde | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (chronic) conditions | | | | | | et al., 2011) | | | | | | | | | | | | | | willigen et al., 2011) | |
| Cardiovascular fitness | | | | | (Larouche et al., 2014) | | **?** | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | |
| Individual level: Psychological factors | | | | | | | | | | | | | | | | | | | | | |
| *Behavioural factors* | | | | | | | | | | | | | | | | | | | | | |
| Goal setting /intention/ commitment to planning | | | (Lubans et al., 2008) | | (Craggs et al., 2011, Uijtdewilligen et al., 2011) | | **?** | | | | | | | | | | | | | | |
| Impulsivity/temperament | | | | | | | | | | | | | | | | (Uijtdewillegen et al., 2011) | | | | **0** | |
| Stimulus control / counter conditioning | | | | | | (Lubans et al., 2008) | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | |
| *Cognitive factors* | | | | | | | | | | | | | | | | | | | | | |
| Affective judgement /attitude/beliefs PA | | | (Craggs et al., 2011, Uijtdewilligen et al., 2011) | | | (Lubans et al., 2008, Stanley et al., 2012) | **0** | | | | | | | | | | | | | | |
| Barriers | | | (Craggs et al., 2011, Lubans et al., 2008, | (Pont et al., 2009 | (Uijtdewilligen et al., 2011) | | **?** | | | | | | | | | | | | | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Stanley et al., 2012) | ) | | | | | | | | | | | | | | | | | |
| Enjoyment/satisfaction | | | (Craggs et al., 2011) | | (Lubans et al., 2008) | (Stanley et al., 2012) | **0/?** | | | | | | | | | | | | | | |
| Facilitators | | | | | | (Pont et al., 2009, Stanley et al., 2012) | | | | | | | | | | | | | | | |
| Knowledge | | | | | | (Craggs et al., 2011) | | | | | | | | | | | | | | | |
| Perceived benefits / outcome expectancy | | | (Lubans et al., 2008) | | | | **0** | | | | | | | | | | | | | | |
| Proxy attitude | | | | | (Pont et al., 2009) | | **?** | | | | | | | | | | | | | | |
| Proxy efficacy | | | (Lubans et al., 2008) | | | | **0** | | | | | | | | | | | | | | |
| Self-efficacy/perceived behavioural control | | | | | (Craggs et al., 2011, Lubans et al., 2008, Stanley et al., 2012, Uijtdewilligen et al., 2011) | | **?** | | | | | | | | | | | | | | |
| Value of health, appearance, achievement | | | (Craggs et al., 2011) | | | | **0** | | | | | | | | | | | | | | |
| | | **Physical activity** | | | | | | | **Exercise** | | | | | | | **Sedentary behavior** | | | | | |
| **Determinant group by EMPA element** | | **+** | **0** | **-** | **?** | **<3** | **concl** | | **+** | **0** | **-** | **?** | **<3** | **concl** | | **+** | **0** | **-** | **?** | **<3** | **concl** |
| | | | | | | | | | | | | | | | | | | | | | |
| *Interpersonal factors* | | | | | | | | | | | | | | | | | | | | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Social cohesion | | | | | (Pont et al., 2009) | | **?** | | | | | | | | | | | | (Uijtdewillegen et al., 2011) | |
| Social network | | | | | (Pont et al., 2009) | (Craggs et al., 2011, Stanley et al., 2012) | **?** | | | | | | | | | | | | | |
| Social support / social norm (parent/peers) | | | (Craggs et al., 2011, Lubans et al., 2008) | | (Maitland et al., 2013, Pont et al., 2009, Stanley et al., 2012, Uijtdewilligen et al., 2011) | | **?** | | | | | | | | | | | (Maitland et al., 2013) | (Uijtdewillegen et al., 2011) | **?** |
| Social support / social norm (teacher) | | | (Stanley et al., 2012) | | (Broekhuizen et al., 2014) | | **0/?** | | | (Broekhuizen et al., 2014) | | | | **0** | | | (Broekhuizen et al., 2014) | | | **0** |
| | | | | | | | | | | | | | | | | | | | | |
| Contextual level: Microsystem dimensions | | | | | | | | | | | | | | | | | | | | |
| *Physical environment* | | | | | | | | | | | | | | | | | | | | |
| Aesthetics[c] | | | (Pont et al., 2009) | | | (Craggs et al., 2011, Stanley et al., 2012) | **0** | | | | | | | | | | | | | |
| Aesthetics[b] | | | (Broekhuize | | | (Stanley | **0** | | | | | | (Broek | | | | | | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | n et al., 2014) | | | et al., 2012) | | | | | | huizen et al., 2014) | | | | | | | | |
| Air quality[c] | | | | | | (Pont et al., 2009) | | | | | | | | | | | | | | |
| Degree of urbanization[c] | | | | | (Pont et al., 2009) | | **?** | | | | | | | | | | | | | |
| Equipment; media[a] | | | (Maitland et al., 2013) | | | (Pont et al., 2009) | **0** | | | | | | | | | | | | (Maitland et al., 2013) | | **?** |
| Equipment; physical activity[a] | | | (Maitland et al., 2013) | | | (Pont et al., 2009) | **0** | | | | | | | | | | | | (Maitland et al., 2013) | | **?** |
| Equipment; physical activity[b] | | | | | (Broekhuizen et al., 2014, Stanley et al., 2012) | | **?** | | | | | (Broekhuizen et al., 2014) | | **?** | | | (Broekhuizen et al., 2014) | | | | **0** |
| Equipment; seating[a] | | | | | (Pont et al., 2009) | | **?** | | | | | | | | | | | | | (Broekhuizen et al., 2014) | |
| Equipment; seating[b] | | | (Broekhuizen et al., 2014) | | | (Stanley et al., 2012) | **0** | | | | | (Broekhuizen et al., | | | | | | | | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | 2014) | | | | | | | |
| Infrastructure; design[c] | | | (Craggs et al., 2011) | | (Pont et al., 2009) | (Stanley et al., 2012) | **0/?** | | | | | | | | | | | | | |
| Infrastructure; design[b] | | | (Broekhuizen et al., 2014) | | (Stanley et al., 2012) | | **0/?** | | | (Broekhuizen et al., 2014) | | | | **0** | | | (Broekhuizen et al., 2014) | | | **0** |
| Infrastructure; quality[c] | | | | | | (Pont et al., 2009) | | | | | | | | | | | | | | |
| Infrastructure; quality[b] | | | | | (Broekhuizen et al., 2014) | | **?** | | | | | (Broekhuizen et al., 2014) | | **?** | | | | | (Broekhuizen et al., 2014) | |
| Recreational and sports facilities; access[c] | | (Broekhuizen et al., 2014) | (Craggs et al., 2011) | | (Lachowycz and Jones, 2011, Pont et al., 2009, Stanley et al., 2012) | | **?** | | | | | | | | | | | | | |
| | | **Physical activity** | | | | | | | **Exercise** | | | | | | | **Sedentary behavior** | | | | | |
| **Determinant group by EMPA element** | | **+** | **0** | **-** | **?** | **<3** | **concl** | | **+** | **0** | **-** | **?** | **<3** | **concl** | | **+** | **0** | **-** | **?** | **<3** | **concl** |
| | | | | | | | | | | | | | | | | | | | | | |
| *Physical environment (Continued)* | | | | | | | | | | | | | | | | | | | | | |
| Recreational and sports facilities; access[b] | | | (Broekhuizen et al., 2014, | | | | **0** | | | | | | (Broekhuizen et al., | | | | | | (Broekhuizen | | **?** |

| | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Stanley et al., 2012) | | | | | | | | | 2014) | | | | | | et al., 2014) | | |
| Recreational and sports facilities; quality[c] | | | | | | (Stanley et al., 2012) | | | | | | | | | | | | | | | |
| Recreational and sports facilities; quality[b] | | | | | | (Stanley et al., 2012) | | | | | | | | | | | | | | | |
| Recreational and sports facilities; use[c] | | | | | | (Stanley et al., 2012) | | | | | | | | | | | | | | | |
| Safety[c] | | | (Stanley et al., 2012) | | | (Craggs et al., 2011) | **?** | | | | | | | | | | | | | | |
| Safety; traffic-related[c] | | | (Craggs et al., 2011) | | (Pont et al., 2009) | | **0/?** | | | | | | | | | | | | | | |
| Safety; traffic-related[c] parent | | | | | (Pont et al., 2009) | | **?** | | | | | | | | | | | | | | |
| Safety; playground[b] | | | | | | (Broekhuizen et al., 2014) | | | | | | (Broekhuizen et al., 2014) | | | | | | | | | |
| Season (spring)[d] | | | | | (Rich et al., 2012) | | **?** | | | | | | | | | | | | | (Rich et al., 2012) | |
| Season (summer)[d] | | (Rich et al., 2012) | | | | (Pont et al., 2009) | **+** | | (Rich et al., 2012) | | | | **0** | | | | (Rich et al., 2012) | | | **?** |
| School size[b] | | | | | | (Broekhuizen et | | | | | | (Broekhuizen | | | | | | | | | |

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| | | | | | | al., 2014) | | | | | | et al., 2014) | | | | | | | | | |
| Services /shops, access[c] | | | (Craggs et al., 2011) | | (Pont et al., 2009) | | **0/?** | | | | | | | | | | | | | | |
| Urban planning[a] | | | (Maitland et al., 2013) | | | | **0** | | | | | | | | | | | | | | |
| Urban planning[c] | | | | | (Pont et al., 2009) | (Stanley et al., 2012) | **?** | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | |
| *Social environment* | | | | | | | | | | | | | | | | | | | | | |
| Employment status parent[a] | | | | | (Pont et al., 2009) | | **?** | | | | | | | | | | | | | | |
| Events and activities[b] | | | | | (Broekhuizen et al., 2014) | (Stanley et al., 2012) | **?** | | | | | (Broek huizen et al., 2014) | | | | | | | (Broek huizen et al., 2014) | | |
| Recess duration[b] | | | | (Brokhuizen et al., 2014) | | (Stanley et al., 2012) | **-** | | | | | (Broek huizen et al., 2014) | | | | | | | (Broek huizen et al., 2014) | | |
| Gender of the responsible parent[a] | | | | | | (Pont et al., 2009) | | | | | | | | | | | | | | | |
| | | **Physical activity** | | | | | | | **Exercise** | | | | | | | **Sedentary behavior** | | | | | |
| **Determinant group by EMPA element** | | **+** | **0** | **-** | **?** | **<3** | **concl** | | **+** | **0** | **-** | **?** | **<3** | **concl** | | **+** | **0** | **-** | **?** | **<3** | **concl** |
| | | | | | | | | | | | | | | | | | | | | | |
| *Social environment (Continued)* | | | | | | | | | | | | | | | | | | | | | |
| Household composition[a] | | | (Pont et al., 2009) | | | (Craggs et al., | **0** | | | | | | | | | | | | | (Uijtde willige | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | 2011) | | | | | | | | | | | | | n et al., 2011) | |
| Level of job strain / mental work load parent[a] | | | | | | (Pont et al., 2009) | | | | | | | | | | | | | | |
| Marital status parent[a] | | | (Craggs et al., 2011) | | (Pont et al., 2009) | | **0/?** | | | | | | | | | | | | | |
| Safety; personal and crime-related[c] | | | (Pont et al., 2009) | | | (Stanley et al., 2012) | **0** | | | | | | | | | | | | (Uijtdewillegen et al., 2011) | |
| Safety; personal and crime-related parent[c] | | | | | (Pont et al., 2009) | | **?** | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| *Economic environment* | | | | | | | | | | | | | | | | | | | | |
| SES[a] | | | (Uijtdewillegen et al., 2011) | | (Pont et al., 2009) | | **0/?** | | | | | | | | | | | | | |
| SES[b] | | | | | (Pont et al., 2009) | | **?** | | | | | | | | | | | | | |
| SES[c] | | | | | (Pont et al., 2009) | (Craggs et al., 2011) | **?** | | | | | | | | | | | (Uijtdewillegen et al., 2011) | | **?** |
| | | | | | | | | | | | | | | | | | | | | |
| *Political environment* | | | | | | | | | | | | | | | | | | | | |
| Physical activity policy[b] | | | | | | (Pont et al., 2009, Stanley et al., | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | 2012) | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | |
| Contextual level: Mesosystem dimensions | | | | | | | | | | | | | | | | | | | | | |
| *Cognitive factors* | | | | | | | | | | | | | | | | | | | | | |
| Proxy efficacy parent | | | | | | (Pont et al., 2009) | | | | | | | | | | | | | | | |
| Barriers parent | | | | | | (Pont et al., 2009) | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | |
| Contextual level: Macrosystem dimensions | | | | | | | | | | | | | | | | | | | | | |
| *Physical environment* | | | | | | | | | | | | | | | | | | | | | |
| Region | | | (Craggs et al., 2011) | | | | **0** | | | | | | | | | | | | | | |
| Urban/Rural | | | | | | (Craggs et al., 2011) | | | | | | | | | | | | | | | |
| Setting: a = Home, b= School, c=Neighbourhood, d=Place of Residence , † For explanation see Figure 1, concl = conclusion | | | | | | | | | | | | | | | | | | | | | |

**Table 2b.** Number of systematic reviews addressing determinant groups associated with physical activity, exercise and/or sedentary behaviour among adults.

| | | Physical activity | | | | | |
|---|---|---|---|---|---|---|---|
| **Determinant group by EMPA element**† | | **+** | **0** | **-** | **?** | **<3** | **concl** |
| | | | | | | | |
| Individual level: Personal characteristics | | | | | | | |
| *Biological and Genetic* | | | | | | | |
| Gender (male) | | | (Amireault et al., 2013, Starnes et al., 2011) | | (Kirk and Rhodes, 2011, Mabry et al., 2010) | | **0/?** |
| Body composition | | | (Amireault et al., 2013) | | | (Starnes et al., 2011) | **0** |
| | | | | | | | |
| *Demographic factors* | | | | | | | |
| Age | | | (Amireault et al., 2013) | | (Starnes et al., 2011) | | **0/?** |
| Ethnicity | | | | | (Starnes et al., 2011) | (Amireault et al., 2013) | **?** |
| Marital status | | | (Amireault et al., 2013) | | | (Starnes et al., 2011) | **0** |
| SES | | (Starnes et al., 2011) | | | (Amireault et al., 2013) | | **+/?** |
| Employment status | | | (Starnes et al., 2011) | | | | **0** |
| Level of job strain / mental work load | | | | | (Kirk and Rhodes, 2011) | | **?** |
| | | | | | | | |
| *Lifestyle factors* | | | | | | | |
| Occupational physical activity | | | | | (Kirk and Rhodes, 2011) | | **?** |
| Physical activity | | | | | | (Amireault et al., 2013, Starnes et al., 2011) | |
| Smoking | | | (Amireault et al., 2013) | | | | **0** |
| Trail use | | | | | (Starnes et al., 2011) | | **?** |
| | | | | | | | |
| *Health and well being* | | | | | | | |
| General health | | (Amireault et al., 2013) | | | | | **+** |
| Symptoms, ilnesses, (chronic) conditions | | | | | (Amireault et | | **?** |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | | | al., 2013) | | |
| | | | | | | | |
| Individual level: Psychological factors | | | | | | | |
| *Behavioural factors* | | | | | | | |
| Goal setting /intention/ commitment to planning | | (Amireault et al., 2013) | | | | | + |
| | | | | | | | |
| *Cognitive factors* | | | | | | | |
| Affective judgement /attitude/beliefs PA | | (Starnes et al., 2011) | | | (Amireault et al., 2013) | (Rhodes et al., 2009) | +/? |
| Barriers | | | | | (Amireault et al., 2013, Starnes et al., 2011) | | ? |
| Facilitators | | | | | | (Starnes et al., 2011) | |
| Knowledge | | | (Amireault et al., 2013) | | | | 0 |
| Perceived benefits / outcome expectancy | | | | | (Amireault et al., 2013) | | ? |
| Perceived negative consequences / outcome expectancy | | | (Amireault et al., 2013) | | | | 0 |
| Self-efficacy/perceived behavioral control | | (Amireault et al., 2013) | | | | | + |
| Value of health, appearance, achievement | | | | | | (Amireault et al., 2013) | |
| | | | | | | | |
| *Interpersonal factors* | | | | | | | |
| Social network | | | | | | (Starnes et al., 2011) | |
| Social support / social norm (parent/peers) | | | | | (Amireault et al., 2013) | | ? |
| | | | | | | | |
| Contextual level: Microsystem dimensions | | | | | | | |
| *Physical environment* | | | | | | | |
| Aesthetics[c] | | | (Arango et al., 2013) | | | (Starnes et al., 2011) | 0 |
| Air quality[c] | | | (Arango et al., 2013) | | | | 0 |
| Degree of urbanization[c] | | (Starnes et al., 2011) | | | | | + |
| | | **Physical activity** | | | | | |
| **Determinant group by EMPA element[†]** | | **+** | **0** | **-** | **?** | **<3** | **concl** |
| | | | | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| *Physical environment (Continued)* | | | | | | | |
| Equipment; physical activity[a] | | | (Amireault et al., 2013) | | | | **0** |
| Infrastructure; design[c] | | | (Arango et al., 2013) | | (Starnes et al., 2011) | | **0/?** |
| Infrastructure; quality[c] | | | (Arango et al., 2013) | | | (Starnes et al., 2011) | **0** |
| Recreational and sports facilities; access[c] | | | | | (Arango et al., 2013, Lachowycz and Jones, 2011, Starnes et al., 2011) | | **?** |
| Recreational and sports facilities; use[c] | | | | | | (Amireault et al., 2013) | |
| Safety[c] | | | (Arango et al., 2013) | | | | **0** |
| Safety; traffic-related[c] | | | (Arango et al., 2013) | | | | **0** |
| Services /shops, access[c] | | | | | (Arango et al., 2013) | (Starnes et al., 2011) | **?** |
| Urban planning[c] | | (Starnes et al., 2011) | | | | | **+** |
| | | | | | | | |
| *Social environment* | | | | | | | |
| Events and activities[c] | | | (Arango et al., 2013) | | | | **0** |
| Household composition[a] | | | | | | (Starnes et al., 2011) | |
| Safety; personal and crime-related[c] | | | (Arango et al., 2013) | | | | **0** |
| | | | | | | | |
| <u>Contextual level: Mesosystem dimensions</u> | | | | | | | |
| *Cognitive factors* | | | | | | | |
| Facilitators community level | | | (Starnes et al., 2011) | | | | **0** |
| Setting: a = Home, c=Neighbourhood, † For explanation see Figure 1, concl = conclusion | | | | | | | |

| **Table 2c.** Number of systematic reviews addressing determinant groups associated with physical activity, exercise and/or sedentary behavior among older adults. | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | **Physical activity** | | | | | | | **Exercise** | | | | | |
| **Determinant group by EMPA element**[†] | | **+** | **0** | **-** | **?** | **<3** | **concl** | | **+** | **0** | **-** | **?** | **<3** | **concl** |
| | | | | | | | | | | | | | | |
| Individual level: Personal characteristics | | | | | | | | | | | | | | |
| *Biological and Genetic* | | | | | | | | | | | | | | |
| Gender (male) | | | | | (Koeneman et al., 2011) | | **?** | | | (Koeneman et al., 2011) | | | | **0** |
| Body composition | | | | | (Koeneman et al., 2011) | | **?** | | | (Koeneman et al., 2011) | | | | **0** |
| Motor skills / Motor abilities | | | | | (Koeneman et al., 2011) | | **?** | | (Koeneman et al., 2011) | | | | | **+** |
| Cognitive skills / Cognitive abilities | | | | | | (Koeneman et al., 2011) | | | (Koeneman et al., 2011) | | | | | **+** |
| | | | | | | | | | | | | | | |
| *Demographic factors* | | | | | | | | | | | | | | |
| Age | | | (Koe | | | | **0** | | | (Koe | | | | **0** |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | nemaan et al., 2011) | | | | | | | nemaan et al., 2011) | | | | |
| Retirement | | | | | (Barnett et al., 2012) | (Koenemaan et al., 2011) | **?** | | | | (Barnett et al., 2012) | | | **-** |
| Ethnicity | | | | | | (Koenemaan et al., 2011) | | | | | | | (Koenemaan et al., 2011) | |
| Marital status | | | | | | (Koenemaan et al., 2011) | | | | | | | (Koenemaan et al., 2011) | |
| SES | | | | | (Koeneman et al., 2011) | | **?** | | | (Koenemaan et al., 2011) | | | | **0** |
| Employment status | | (Koenemaan et al., 2011) | | | | | + | | | | | | (Koenemaan et al., 2011 | |

| | | | | | | | | | | | | | ) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Level of job strain / mental work load | | | | | | (Koeneman et al., 2011) | | | | | | | | |
| | | | | | | | | | | | | | | |
| *Lifestyle factors* | | | | | | | | | | | | | | |
| Drug use | | | | | | | | | | | | | (Koeneman et al., 2011) | |
| Physical activity | | (Koeneman et al., 2011) | | | | | + | | | | | (Koeneman et al., 2011) | | **?** |
| Smoking | | | | | | (Koeneman et al., 2011) | | | | | | | (Koeneman et al., 2011) | |
| | | | | | | | | | | | | | | |
| *Health and well being* | | | | | | | | | | | | | | |
| General health | | | | | | (Koeneman et al., 2011 | | | | (Koeneman et al., 2011 | | | | **0** |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | ) | | | | ) | | | | |
| Mental health | | | | | | (Koenemann et al., 2011) | | | | | | | (Koenemann et al., 2011) | |
| Symptoms, illnesses, (chronic) conditions | | | | (Koenemann et al., 2011) | | | - | | | | (Koeneman et al., 2011) | | | - |
| Medication use | | | | | | (Koenemann et al., 2011) | | | | | | | | |
| Cardiovascular fitness | | | | | | (Koenemann et al., 2011) | | | | | | | | |
| Life events | | | | | | | | | | | (Koeneman et al., 2011) | | | - |
| | | **Physical activity** | | | | | | | **Exercise** | | | | | |
| **Determinant group by EMPA element** | | **+** | **0** | **-** | **?** | **<3** | **concl** | | **+** | **0** | **-** | **?** | **<3** | **concl** |
| | | | | | | | | | | | | | | |
| Individual level: Psychological factors | | | | | | | | | | | | | | |
| *Behavioural factors* | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Coping | | | | | | (Koenemann et al., 2011) | | | | | | | | |
| Goal setting /intention/ commitment to planning | | | | | | (Koenemann et al., 2011) | | | | | | | (Koenemann et al., 2011) | |
| Stage of change | | | | | | | | | | | | | (Koenemann et al., 2011) | |
| Stimulus control / counter conditioning | | | | | | | | | | | | | (Koenemann et al., 2011) | |
| | | | | | | | | | | | | | | |
| *Cognitive factors* | | | | | | | | | | | | | | |
| Affective judgement /attitude/beliefs physical activity | | (Koenemann et al., 2011) | | | | | + | | | (Koenemann et al., 2011) | | | | **0** |
| Barriers | | | | | | (Koenema | | | | | | | (Koenema | |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | n et al., 2011) | | | | | | | n et al., 2011) | |
| Facilitators | | | | | | (Koenemann et al., 2011) | | | | | | | (Koenemann et al., 2011) | |
| Perceived benefits/outcome expectancy | | | | | | (Koenemann et al., 2011) | | | | | | (Koenemann et al., 2011) | | **?** |
| Self-efficacy/perceived behavioural control | | | | | (Koeneman et al., 2011) | | **?** | | | | | (Koenemann et al., 2011) | | **?** |
| Value of health, appearance, achievement | | | | | | | | | | | | | (Koenemann et al., 2011) | |
| | | | | | | | | | | | | | | |
| *Interpersonal factors* | | | | | | | | | | | | | | |
| Social cohesion | | | | | | (Koenemann et al., | | | | | | | (Koenemann et al., | |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | 2011) | | | | | | | 2011) | |
| Social network | | | | | | (Koeneman et al., 2011) | | | | | | | | |
| Social support / social norm (parent/peers) | | | | | (Koeneman et al., 2011) | | **?** | | | (Koeneman et al., 2011) | | | | **0** |
| | | | | | | | | | | | | | | |
| Contextual level: Microsystem dimensions | | | | | | | | | | | | | | |
| *Physical environment* | | | | | | | | | | | | | | |
| Recreational and sports facilities; access[c] | | (Koeneman et al., 2011, Lachowycz and Jones, 2011) | | | | | **+** | | | | | | (Koeneman et al., 2011) | |
| Safety[c] | | | | | | (Koeneman et al., 2011) | | | | | | | | |
| Setting: a = Home, c=Neighbourhood, † For explanation see Figure 1, concl = conclusion | | | | | | | | | | | | | | |

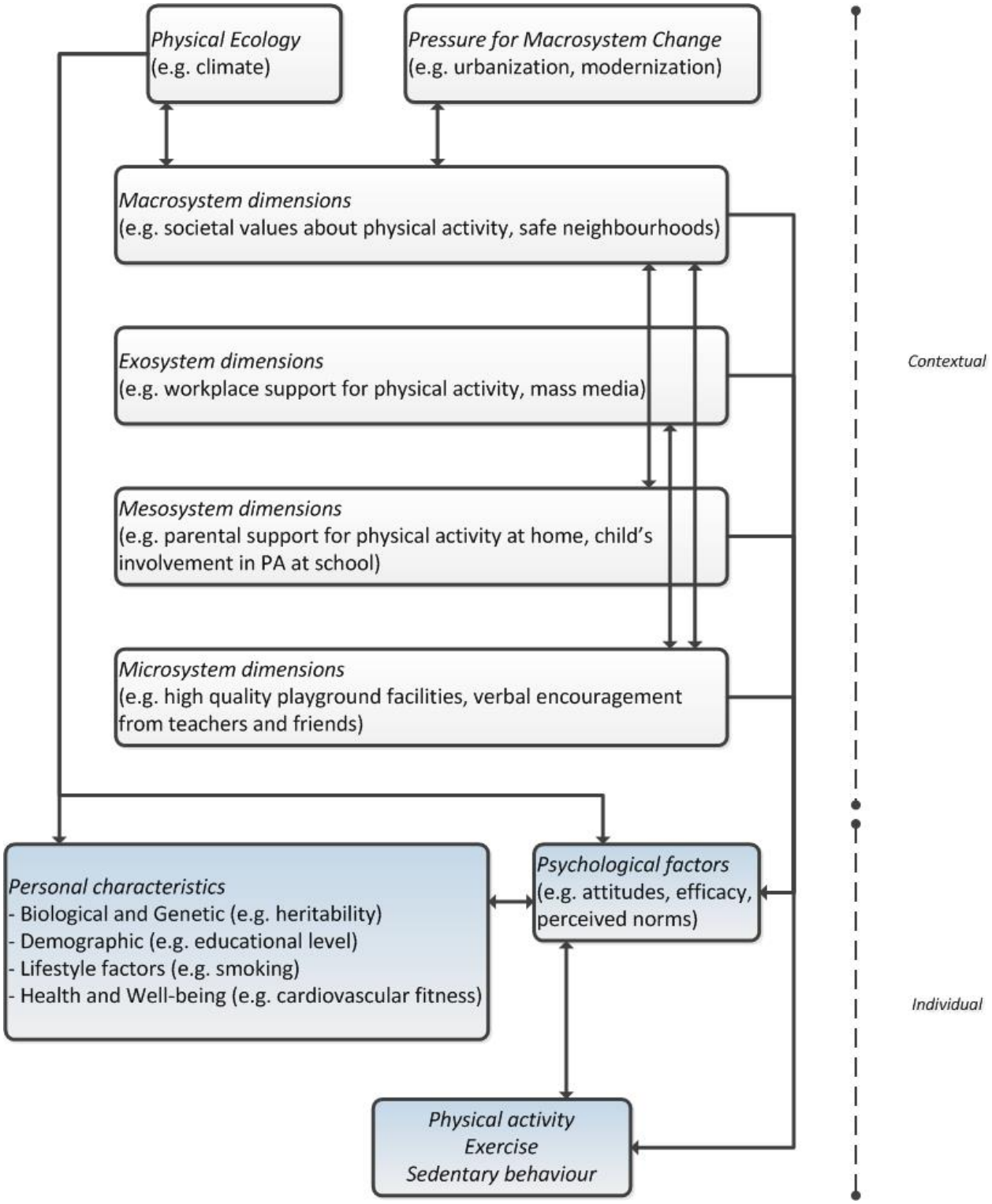


**Figure 1**. The Ecological Model for Physical Activity (*adapted from Spence and Lee*[(Spence and Lee, 2003)]).

| Main Quality items | Sub items ('yes' = 1 point) | | Scoring protocol for Main Quality items | |
|---|---|---|---|---|
| 1. Research question | *Does the research question include details about* | | | |
| | A. The population? | Yes / No | 1 point: | total sub-item |
| | B. Investigated factor? | Yes / No | | score ≥ 2 |
| | C. Intervention? | Yes / No | 0 points: | total sub-item |
| | D. Outcome? | Yes / No | | score < 2 |
| | | | | |
| 2. Search | *Does the description of the search include details about* | | | |
| | A. If search databases were used? | Yes / No | 1 point: | sub item B *and* D |
| | B. The particular search databases that were used? | Yes / No | | were scored 'yes' |
| | C. If search restrictions are used? | Yes / No | 0 points: | all other cases |
| | D. The particular search restrictions that were used? | Yes / No | | |
| | | | | |
| 3. Selection procedure | *Does the description of the selection procedure include details about* | | | |
| | A. If in- and exclusion criteria were used? | Yes / No | 1 point: | sub item A *and* B |
| | B. The particular in- and exclusion criteria that were used? | Yes / No | | were scored 'yes', as well as sub items C, D *and* E |
| | C. The selection being performed by at least two reviewers? | Yes / No | 0.5 points | Either sub item A *and* B, <u>or</u> sub |
| | D. These reviewers selecting articles independently? | Yes / No | | items C, D *and* E were scored 'yes' |
| | E. The selection procedure being performed on the whole set of reviews? | Yes / No | 0 points: | all sub items were scored 'no' |
| | | | | |
| 4. Quality assessment | *Does the paper describe* | | | |
| | A. A quality assessment being performed for included studies? | Yes / No | 1 point: | Yes |
| | | | 0 points: | No |
| | | | | |
| 5. Data extraction | *Does the paper describe* | | | |
| | A. How data extraction of the included articles has been performed? | Yes / No | 1 point: | Yes |
| | | | 0 points: | No |
| | | | | |
| 6. Main features | *Does the paper describe the main features of the included studies?* | | | |
| | <u>In case of a review of observational studies:</u> | | | |
| | A. Research population? | Yes / No | 1 point: | total sub-item |
| | B. Exposure? | Yes / No | | score ≥ 3 |
| | C. Outcomes? | Yes / No | | |
| | D. Confounders? | Yes / No | 0 points: | total sub-item |
| | E. Results? | Yes / No | | score < 3 |
| | | | | |
| | <u>In case of a review of randomized controlled trials:</u> | | | |
| | A. Research design? | Yes / No | 1 point: | total sub-item |
| | B. Population? | Yes / No | | score ≥ 3 |
| | C. Intervention and control treatments? | Yes / No | | |
| | D. Primary outcomes? | Yes / No | 0 points: | total sub-item |
| | E. Follow-up duration? | Yes / No | | score < 3 |
| | | | | |
| 7. Overall judgment | *In general, do you judge this review to be valid an reliable?* | Yes / No | 1 point: | Yes |
| | | | 0 points: | No |

**Figure 2.** Quality (sub)items used to score the methodology quality of the included systematic reviews.

| EMPA categories of determinant groups | Determinant group |
|---|---|
| **INDIVIDUAL LEVEL** | |
| Personal characteristics | |
| *Biological and Genetic* | Gender |
| | Body composition |
| | Motor skills / Motor abilities |
| | Cognitive skills / Cognitive abilities |
| *Demographic factors* | Age |
| | Developmental stage |
| | Retirement |
| | Ethnicity |
| | Marital status |
| | SES |
| | Employment status |
| | Level of job strain / mental work load |
| *Lifestyle factors* | Alcohol consumption |
| | Dietary habits |
| | Drug use |
| | Occupational physical activity |
| | Physical activity |
| | Sedentary behaviour |
| | Sleep |
| | Smoking |
| | Trail use |
| | Licence |
| *Health and well being* | General health |
| | Mental health |
| | Symptoms, illnesses, (chronic) conditions |
| | Medication use |
| | Cardiovascular fitness |
| | Life events |
| Psychological factors | |
| *Behavioural factors* | Coping |
| | Goal setting/intention/commitment to planning |
| | Impulsivity/temperament |
| | Stage of change |
| | Stimulus control / counter conditioning |
| *Cognitive factors* | Affective judgement/attitude/beliefs PA |
| | Barriers |
| | Enjoyment/satisfaction |
| | Facilitators |
| | Knowledge |
| | Perceived benefits / outcome expectancy |
| | Perceived negative consequences / outcome expectancy |
| | Proxy attitude |
| | Proxy efficacy |
| | Self-efficacy/perceived behavioural control |
| | Value of health, appearance, achievements |

| EMPA<br>categories of determinant groups | Determinant group |
|---|---|
| *Interpersonal factors* | Social cohesion |
| | Social network |
| | Social support / social norm (parent/peers) |
| | Social support / social norm (teacher) |
| **CONTEXTUAL LEVEL** | |
| Microsystem dimensions | |
| *Physical environment* | Aesthetics (Neighbourhood) |
| | Aesthetics (School) |
| | Air quality (Neighbourhood) |
| | Degree of urbanization (Neighbourhood) |
| | Equipment; media (Home) |
| | Equipment; physical activity (Home) |
| | Equipment; playground (School) |
| | Equipment; seating (Home) |
| | Equipment; seating (School) |
| | Infrastructure; design (Neighbourhood) |
| | Infrastructure; design (School) |
| | Infrastructure; quality (Neighbourhood) |
| | Infrastructure; quality (School) |
| | Recreational and sports facilities; access (Neighbourhood) |
| | Recreational and sports facilities; access (School) |
| | Recreational and sports facilities; quality (Neighbourhood) |
| | Recreational and sports facilities; quality (School) |
| | Recreational and sports facilities; use (Neighbourhood) |
| | Safety (Neighbourhood) |
| | Safety; traffic-related (Neighbourhood) |
| | Safety; traffic-related parent (neighbourhood) |
| | Safety; playground (School) |
| | Season (spring) (Place of residence) |
| | Season (summer) (Place of residence) |
| | School size (School) |
| | Services and shops (Neighbourhood) |
| | Urban planning (Home) |
| | Urban planning (Neighbourhood) |
| *Social environment* | Employment status parent (Home) |
| | Events and activities (Neighbourhood) |
| | Events and activities (School) |
| | Recess duration (School) |
| | Gender of the responsible parent (Home) |
| | Household composition (Home) |
| | Level of job strain / mental work load parent (Home) |
| | Marital status parent (Home) |
| | Safety; personal and crime-related (Neighbourhood) |
| | Safety; personal and crime-related parent (Neighbourhood) |
| *Economic environment* | SES parent (Home) |
| | SES area (Neighbourhood) |
| | SES household (Home) |
| | SES school (School) |
| *Political environment* | Physical activity policy (School) |

| EMPA<br>categories of determinant groups | Determinant group |
|---|---|
| Mesosystem dimensions | |
| *Cognitive factors* | Proxy efficacy parent |
| | Barriers parent |
| | Facilitators community level |
| Macrosystem dimensions | |
| *Physical environment* | Region |
| | Urban/Rural |

**Figure 3**. EMPA, determinants grouped

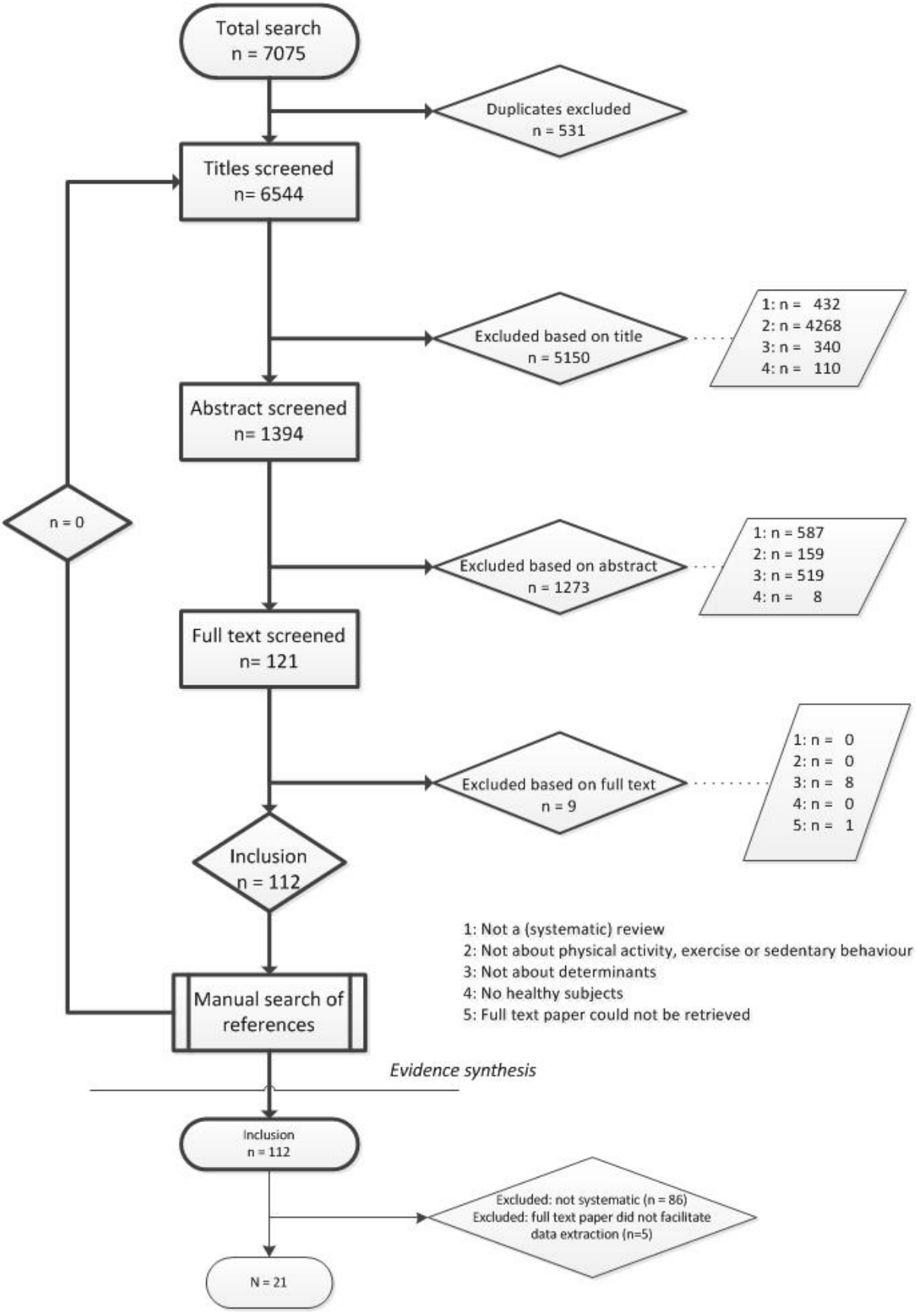


**Figure 4.** Flowchart of study selection.