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Physical activity and safety from crime

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ABSTRACT

Background: The aim of this study was to review the evidence to date on the association between physical activity and safety from crime. **Methods:** Articles with adult populations of 500+ participants investigating the association between physical activity and safety from crime were included. A methodological quality assessment was conducted using an adapted version of the Downs and Black checklist. **Results:** The literature search identified 15,864 articles. After assessment of titles, abstracts and full-texts, 89 articles were included. Most articles (84.3%) were derived from high-income countries and only three prospective articles were identified. Articles presented high methodological quality. In 38 articles (42.7%), at least one statistically significant association in the expected direction was reported, i.e. safety from crime was positively associated with physical activity. Nine articles (10.1%) found an association in the unexpected direction and 42 (47.2%) did not find statistically significant associations. The results did not change when we analyzed articles separately by sex, age, type of measurement or domains of physical activity evaluated. **Conclusion:** The current evidence, mostly based on cross-sectional studies, suggests a lack of association between physical activity and safety from crime. Prospective studies and natural experiments are needed, particularly in areas with wide crime variability.

KEY-WORDS: insecurity; environment; physical activity correlates

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BACKGROUND

One third of the world's adult population is physically inactive,⁽¹⁾ and 5.3 million deaths per year are attributable to the pandemic of physical inactivity.^(2, 3) A good understanding of why some people are active and others are not is essential to plan effective interventions at the population level.⁽⁴⁻⁶⁾ Modifiable and non-modifiable correlates of physical activity have been studied identifying specific populations groups more or less exposed to inactivity.⁽⁷⁾ Ecological models have been used to acknowledge the multiple levels of influence on one's behavior, including individual, community and macro-society potential correlates and determinants of physical activity.⁽⁸⁾ The potential role of the environment at influencing physical activity levels has been extensively studied in recent years, particularly in high-income countries.⁽⁴⁾

One environmental feature that may be important for physical activity is safety from crime, particularly in low and middle-income countries, where there are higher levels of social inequalities, as well as more variability in terms of exposure to unsafe environments. Safety from crime can be measured through official sources (e.g. crime rates) and by self-reported perceptions. A paper by Loukaitou-Sideris and Eck⁽⁹⁾ provided a framework on how safety from crime may influence physical activity. In summary, macroeconomic and political variables might influence the occurrence of actual crime and disorder, which might then lead to fear of crime or disorder among people. The combination of these factors may influence one's willingness and motivation to practice physical activity.⁽⁹⁾

Findings from a systematic review published in 2008 suggested that safety tends to influence physical activity levels mainly among women and older adults.⁽¹⁰⁾ The current systematic review was carried out to update the scientific knowledge about the association between physical activity and safety from crime among adults, as well as to

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present an overview of methodological aspects of the studies investigating this association.

METHODS

The current systematic review was carried out using the Medline/PubMed database. We searched for the following terms and combinations in either the title or abstract of articles: "physical activity" OR "exercise" OR "fitness" OR "motor activity" OR "sedentary" OR "walking" AND "safety" OR "violence" OR "crime" OR "environment" OR "environmental" OR "built". Only articles with “humans” and published in English were included. No restrictions according to age or date of publication were applied. The literature search was conducted up to October 31st, 2014.

In order to be eligible, articles should have reported the specific association between physical activity and safety from crime. We included variables on safety from crime reported by the participants or obtained through official statistics. Examples include: crime rates in the neighborhood, street lightning, fear of crimes or violence, and perception of safety for walking during the day or at night in the neighborhood. Combined measures of safety from crime and safety from traffic or others environmental variables were not included.

To maximize the possibility of including all relevant articles, more general environmental terms were included in the literature search because the majority of articles combined various features of the environment in association with physical activity. In order to improve accuracy in the process, full texts of articles examining environmental factors associated with physical activity were scrutinized in search of data on the association between physical activity and safety from crime.

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The methods used in the present review were based on the PRISMA statement for the reporting of systematic reviews.⁽¹¹⁾ After reading the abstracts, we excluded all articles focused on children and adolescents and those with specific groups with health problems and impairments. We also excluded articles with fewer than 500 participants due to the lack of power to find possible associations between physical activity and safety from crime. This minimum sample size was based on a calculation using the following estimates and parameters: prevalence of physical inactivity of 31% ⁽¹⁾; proportion of the population exposed to unsafe environments of 20%; minimum relative risk to be detected of 1.5; statistical power of 80%. Kelsey sample size estimates were obtained in Epi InfoTM. ⁽¹²⁾ In some cases, findings from the same survey have been published in a single-site article and in a multi-country publication. In these situations, we only counted the findings from each country once.

Initially, all titles identified in the PubMed search were read by the first author, and in case of doubts, the senior author was consulted. In the second phase, two authors reviewed the abstracts and determined whether full-text reading would be needed. The senior author was responsible to check for inconsistencies. For the articles included, we extracted the following information: full reference, location, study design, sample size, age of participants, measures of safety from crime, measures of physical activity, characteristics of the statistical analysis and main findings.

Finally, two authors reviewed and assessed the quality of selected full texts. An adapted version of the Downs and Black ⁽¹³⁾ checklist was used for methodological quality assessment. Fourteen items were scored as zero, if the characteristic was absent or unable to determine, or one, if it was present. (Table 1). The first item refers to the

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objective of the study; when the aim of the study was stated, we coded this item as present (1). The second and fourth items relate to the description of the outcome and exposure variables; when the measurement tools were described and the operational definitions of the variables were mentioned, we coded these items as present. The third item relates to the characteristics of the participants. In order to code this item as present, information on sex, age and at least one indicator of socioeconomic status was required. The fifth item refers to the presentation of results on the main association under study; if the papers presented the results of the analysis between safety from crime and physical activity in the results section (text, table or figure) using statistical tests, we coded this item as present. The sixth item relates to the statistical analysis; if random variability was reported (through confidence intervals, standard deviations or standard errors), this item was coded as present. Item 7 relates to the description of participants lost to follow-up; only studies describing the proportion of non-response and presenting at least one characteristic of non-respondents as compared to respondents were coded as present in this item. Item 8 was considered present if actual P-values were reported. Item 9 refers to the representativeness of the sample; only studies using random sampling methods had this item coded as present. Item 10 relates to the appropriateness of the statistical methods used. Item 11 relates to the risk of misclassification in the exposure variable (safety from crime). We coded this item as present if information on the reliability or validity of the instrument used to assess safety from crime was presented. Item 12 is exactly the same, but in terms of the measurement of the outcome variable (physical activity). Item 13 relates to adjustment for confounding; we only coded this item as present if adjustment for (a) at least one socioeconomic variable and (b) at least one environmental feature was reported. We opted to require adjustment for socioeconomic status given its well-known associations

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with both safety from crime and physical activity. Item 14 was present for all studies given the fact that having a sample size of at least 500 participants was an inclusion criterion.

***Table 1. Adapted version of Downs and Black checklist for the assessment of the methodological quality of the included studies (N = 89).**

In the data analysis, we first evaluated whether any of the main findings of the article were in the expected direction (i.e. the safer the neighborhood, the more active people are). We also checked whether the findings were in the unexpected direction (i.e. the safer the neighborhood, the less active people are) or null (no association between safety from crime and physical activity). In order to provide readers with a more complete picture of the literature reviewed, we also used quantitative analyses to identify the number of statistical tests performed in all original articles using the same three possibilities of results. The second approach was performed because, for example, in a study on the associations between: (a) safety from crime during the day and physical activity; (b) safety from crime at night and physical activity; and (c) overall safety in the neighborhood and physical activity; three “statistical tests” on the association between safety from crime and physical activity could have been performed. Finally, the same approach was carried out again stratified by physical activity domain (leisure-time and transportation) and specific groups identified in a previous review (women and older adults).⁽¹⁰⁾

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RESULTS

In total, 15,864 articles were identified in the Medline/PubMed search. After title evaluation, 551 appeared to be related to the topic of interest. Abstracts were then read and excluded if the articles were among children and adolescent population, fewer than 500 participants, qualitative methodology and only included groups with specific health conditions. Of the 551, 76 articles were kept, including two studies among adults including people 16+ years of age. Finally, 13 more articles with adult populations were added after manually checking the reference lists of the selected studies, yielding a total of 89 articles for this review (Figure 1).

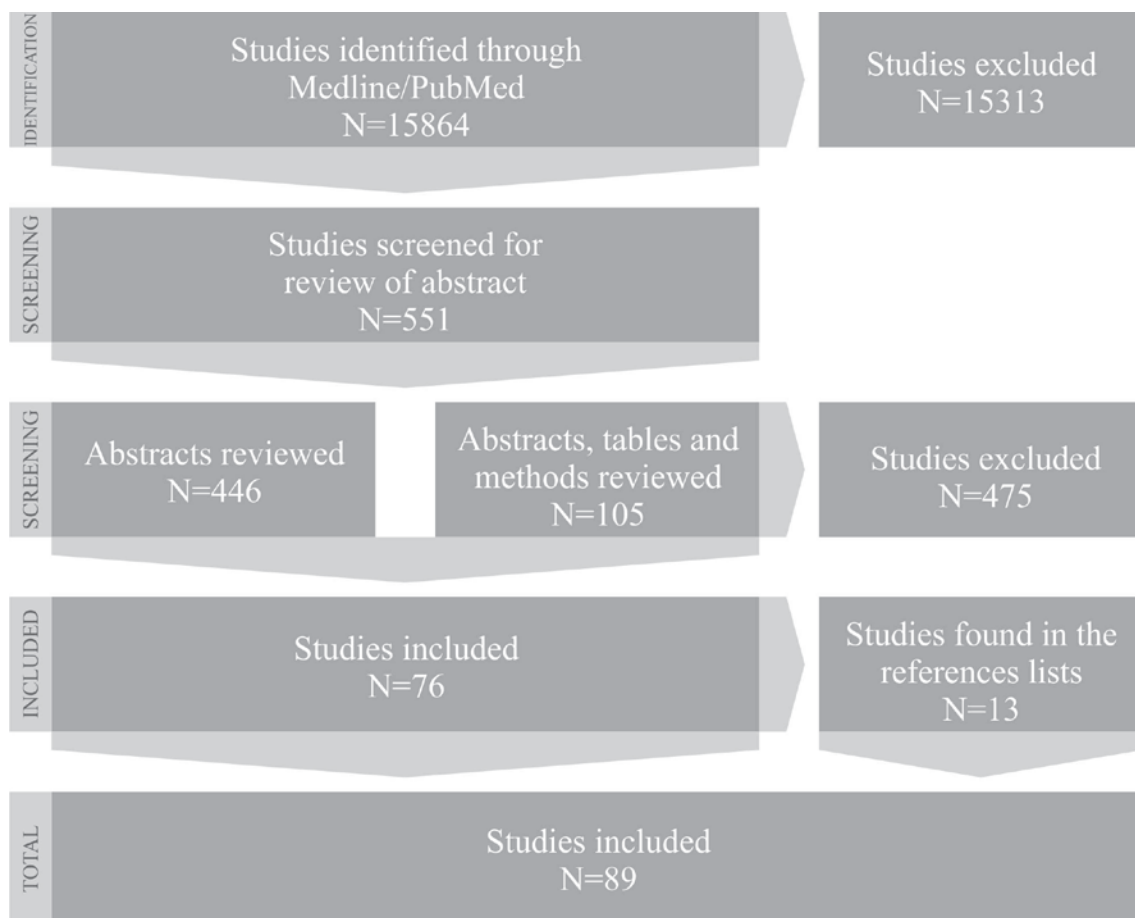


Figure 1. Flowchart describing the literature search strategy and results.

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A description of all articles included in the present review is presented in Table 2. Of the 89 articles included, 65 examined adults more broadly, and 24 evaluated specific groups (mainly older adults or women only). Only 18 articles addressed the specific association between physical activity and safety from crime as its main aim.⁽¹⁴⁻³¹⁾ In all others, safety from crime was one out of several examined correlates of physical activity. Most articles (84.3%) were carried out in high-income countries, mainly the United States and Australia. Among the studies conducted in low and middle-income countries, 10 were from Brazil, two from China, one from Mexico and one from Nigeria (countries income groups were based on World Bank definitions: available on www.worldbank.org; accessed in May 2015).^(23, 25, 26, 32-42) Only three prospective articles were identified: (1) one evaluating whether high crime perception predicts physical activity after six months,⁽⁴³⁾ (2) one assessing whether changes in fear of crime (improvements in three years interval) predicts physical activity⁽⁴⁴⁾; and (3) one evaluating changes in safety from crime perceptions and changes in leisure and transport neighborhood walking among participants surveyed before and after they moved into their new home (~12 months later).⁽⁴⁵⁾

From 14 items evaluated in the methodological quality assessment, articles presented adequately, on average 10.7 (SD 1.4) of them. Most articles clearly described their physical activity outcomes (97.8%) and safety from crime exposures (83.1%). Physical activity measures were considered accurate (valid and/or reliable) in 75 (84.3%) studies and, all articles used appropriate statistical analyses. Finally, only eight (9.0%) articles described characteristics of eligible participants who were lost, and only 28 (31.5%) used samples that were representative of the population from which participants were recruited. The 14 articles from low-income countries had an average quality evaluation

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score of 11.4 (DP 0.9), compared to 10.5 (DP 1.4) in the 75 articles from high-income countries. A summary of the quality evaluation assessment is presented in Table 1.

Measures of safety from crime obtained through official sources were presented in 13 (14.6%) articles. Physical activity was measured by accelerometers and pedometers only in five (5.6%) articles.^(14-18, 27, 30, 31, 41, 46-53) In terms of safety from crime measurement and physical activity, respectively, the Neighborhood Environment Walkability Scale (NEWS) and the International Physical Activity Questionnaire (IPAQ) were the instruments more often used. Several articles used instruments, which were created specifically for that study, but their approaches were similar to the questionnaires aforementioned. Questions addressing overall safety from crime or safety during the day and at night to practice physical activity were frequently used, as well as physical activity questionnaires which provided information that could be categorized according to current physical activity guidelines.⁽⁵⁴⁾

Another important feature presented in Table 1 is the information about the variables included in the adjusted models. Almost all papers included some socio-demographic covariate in the final models, but only 31 articles (34.8%) also included additional environmental variables in the adjusted models. Twelve articles (13.5%) reported at least one positive association between safety from crime and physical activity even after including other environmental variables as covariates in the analytical models.^(27, 31, 52, 53, 55-63) However, 19 articles did not report any significant association between safety from crime and physical activity after adjusting for other environmental variables.^(18, 29, 30, 34, 35, 40, 46-48, 64-74) Ball et al (2007)⁽⁶⁹⁾ and Wen et al (2007),⁽⁷⁰⁾ for example, reported positive associations between safety from crime and physical activity, but when additional environmental variables were included in the analyses, this effect disappeared.

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Figure 2 presents quantitative analyses on the associations between physical activity and safety from crime addressing the number of articles and number of statistical tests in the expected direction (safety from crime was positively associated with physical activity), unexpected direction, and no association. In 38 articles (42.7%), at least one statistically significant association in the expected direction was reported. Nine articles (10.1%) only found associations in the unexpected direction (higher safety from crime associated with lower physical activity) and 42 articles (47.2%) did not find statistically significant associations. Of the 14 articles from low and middle-income countries, seven reported at least one statistically significant association in the expected direction (Figure 2).

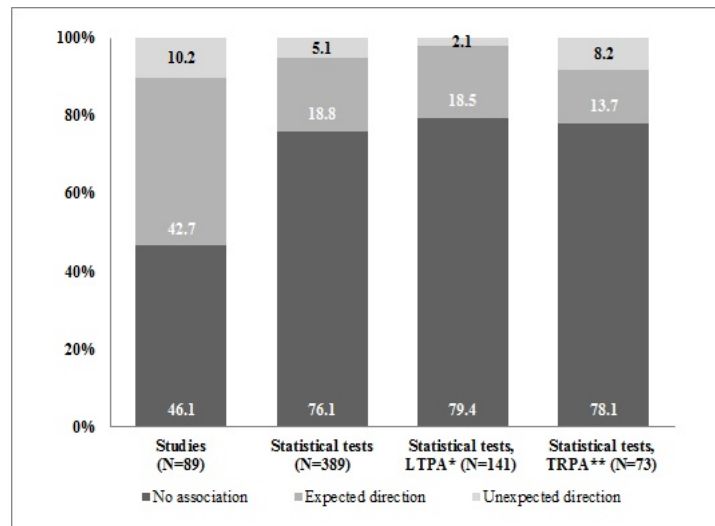


Figure 2. Descriptive quantitative analysis of the association between physical activity and safety from crime.

The additional approach, evaluating all “statistical tests” reported by each article, resulted in a total of 389 tests performed, of which 296 (76.1%) did not find statistically significant associations, 73 (18.8%) found statistically significant associations in the expected direction and 20 (5.1%) found associations in the non-expected direction. Of all statistical tests conducted in articles from low and middle-income countries, 85.9%

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found no association between physical activity and safety from crime; this proportion was 73.9% in high-income country articles. These results were similar in articles with women or older adults only. Finally, we performed the same quantitative analyses for leisure-time and transport-related physical activity. Most articles (and statistical tests) addressed leisure-time physical activity (141 tests vs. 73 addressing transport-related physical activity). Again, most tests produced null findings between safety from crime and physical activity, without differences by domains (Figure 2), except that the percentage of associations in the unexpected direction in articles on transport-related physical activity (8.2%) was higher than in studies on leisure-time activity (2.1%).

DISCUSSION

The current systematic review concludes that to date there is no evidence that safety from crime is a significant correlate of physical activity. In fact, most articles addressing this topic found no association between physical activity and safety from crime. However, it is important to highlight that most of the evidence on this issue was derived from cross-sectional studies. This observation corroborates a previous review on this topic published in 2008,⁽¹⁰⁾ except that the authors of the previous review suggested that perceived safety tended to affect specific groups, such as women and older adults, a finding that was not confirmed in our review. Possible reasons for this difference include (a) a high number of articles published recently, suggesting no association between physical activity and safety from crime among older adults and women; (b) the use of different eligibility criteria in our review as compared to the previous one – for example, no sample size restriction was used in the 2008 review.⁽¹⁰⁾

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We were unable to conduct formal meta-analyses due to large heterogeneity in exposure and outcome variables. However, we checked all associations presented in each paper and reported how many of them were significant in the expected direction, non-significant or significant in the unexpected direction. Because some degree of publication bias is possible, the percentage of null findings can be even higher than the one reported here.

The conclusion that no association exists between safety from crime and physical activity requires discussion. Many sources of bias and misclassification may have influenced the results. One of the main methodological problems detected in the studies reviewed is the safety measurement. The quality assessment rated safety from crime measures mostly as adequate, particularly because indicators of reliability of the questionnaires used were often reported. However, there is an absence of comprehensive measures of safety. Most of the measurements are non-specific to safety from crime. In approaches addressing “safety during the day”, “safety at night”, for example, the respondents may pool together safety from traffic in the same environmental self-evaluation. Questions assessing “streetlights” also may implicitly address other environmental features rather than safety from crime, like fear of injury or feeling it unpleasant to exercise outdoors. The use of official statistics could be a solution, but may not exactly capture the perception of safety from crime. In our study, four of 13 studies which evaluated safety from crime through official sources, ^(14, 17, 27, 31) found a positive association with physical activity, suggesting that the results might be considered similar for both methods.

The main limitations found in the methodological quality assessment were that few manuscripts reported the characteristics of non-respondents and few studies included samples that were representative from the target population. Therefore, some degree of

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selection bias is possible, particularly because losses tend to be associated with poor health and low socioeconomic indicators.⁽⁷⁵⁾ In this context, non-respondents might be more exposed to unsafe conditions as compared to respondents.

The cross-sectional nature of the data presented in the studies included in this review precludes inference about causality. From three prospective studies, two found safety from crime or changes in that perception as predictors of physical activity.^(43, 44) Quasi-experimental and observational prospective studies are urgently needed. Safety investments in a given community might well lead to increased physical activity levels of those living in that area. However such natural experiments have rarely been conducted to confirm this hypothesis. Another main source of uncertainty is that most studies were conducted in high-income countries, in which crime rates are markedly lower compared with many urban areas in low and middle-income countries. Moreover, even when studies in high-income countries are carried out in poorer settings, the variability of safety levels is likely lower than that of low and middle-income countries, which might contribute to the observed lack of associations. Indeed, more evidence is needed from low and middle-income countries; out of 14 studies from low and middle-income countries, half of them reported some associations in the expected direction (i.e. safety from crime was positively associated with physical activity).^(23, 32, 33, 36-38, 42)

Quantitative analyses were also carried out stratifying physical activity into the leisure time and transport domains. Although the results were similar in terms of no association, there are specificities that should be considered, like where people perform physical activity during leisure time. Safety measures used to evaluate the environment near an individual's residence do not account for physical activity practiced in different places, such as near the workplace and school, as well as in other neighborhoods with safer conditions. Therefore, the decision to perform physical activity far away from the

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individual's residence may be influenced by higher levels of safety from crime in that area. Six studies trying to address this possibility limited their outcomes as physical activity practiced in the neighborhood, ^(26, 27, 45, 73, 76, 77) but only one found an association in the expected direction.⁽²⁷⁾

Differently from leisure-time activity, physical activity for transportation is not only a consequence of an individual choice. For many individuals, walking and cycling might be the only means of transportation and, sometimes, the only alternative, due to costs and time constraints.⁽⁷⁸⁾ Thus, even with high levels of crime, people may still engage in physical activity in that domain. This may explain the higher percentage of associations in the unexpected direction observed when specifically evaluating transport-related physical activity. Additionally, for both leisure and transport physical activity, to better understand the lack of association with safety from crime, it is also important to consider the possibility that individuals who mainly take part in outdoor leisure time physical activity may be more exposed to unsafe conditions, whereas people who spend more time indoors may report higher levels of safety.⁽²⁵⁾

The ecological model is based on the multi-determination of health behaviors, as well as the inter-relationship between multiple levels of influence (individual, social, environmental and political levels).⁽⁸⁾ In this perspective, it is expected that a potential effect of an exposure will differ across groups. The possible lack of association between safety from crime and physical activity does not necessarily mean that safety from crime is unimportant for active lifestyles. It probably means that there are many other determinants beyond safety from crime influencing individuals' physical activity behavior.

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Different conceptual models employed and the availability of other personal and environmental variables were identified as important sources of variation across studies. The majority of studies that adjusted the association between physical activity and safety from crime for other environmental variables did not find significant associations. Moreover, further interactions than expected differences across sex and age groups ⁽¹⁰⁾ were found. Rech et. al (2012),⁽²⁵⁾ for example, reported no positive association between different measures of safety from crime and physical activity in leisure-time and walking for transportation. However, further analyses found interactions with (1) sex, which modified the association between safety to walk during the day and walking during leisure time; (2) socioeconomic level; (3) equipment for physical activity at home, which modified the association between moderate and vigorous physical activity and a safety from crime score; and (4) private transportation use, which modified the association between lack of safety to walk during the night and walking for transportation.

Beenackers et al (2011)⁽¹⁹⁾ reported that individuals with perceived low safety showed a protection effect of 43% (OR=0.57; 95%CI 0.42 - 0.77) for sports participation. Further interaction analyses with psychological variables (attitude and self-efficacy) evidenced that only among individuals who perceive their neighborhood as safe and who had a positive attitude, the likelihood of sports participation was two times higher than among those who did not have a positive attitude towards physical activity (OR=2.00; 95%CI 1.48 - 2.71). Regarding self-efficacy, the interactions found were in the other direction: those who reported more self-efficacy showed a significantly higher likelihood of sports participation than people who perceived their neighborhood as unsafe (OR=1.85; 95%CI 1.31 - 2.60) compared to those who perceived their neighborhood as safe

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(OR=1.19; 95%CI 1.05 - 1.36). These interactions reinforced the ecological model assumptions of multiple levels of influence on health behavior determination.

In a complementary and important approach, qualitative studies might be helpful to better understand the effect of different safety levels on individual's decisions about whether to perform physical activity or not. Eyler et al (1998 and 2002),^(79, 80) Evenson (2002)⁽⁸¹⁾ and Lees et al (2007)⁽⁸²⁾ studied minority women through focus groups and showed that, among many attributes, personal safety was an important environmental correlate of physical activity. Further qualitative studies about safety from crime and physical activity are needed, targeting mainly other specific groups.

Some limitations and strengths of this study must be taken into account. Only studies with 500+ participants were included. On one hand, this threshold is arbitrary, and some relevant studies might have been excluded. On the other hand, the inclusion of smaller studies would largely increase the number of articles, some of them with very limited statistical power. Another limitation is the use of Medline/Pubmed as the only source of information; our understanding is that differently from other research topics, virtually all articles on the association between physical activity and safety from crime are published in health-oriented journals, most of which are indexed in Medline/Pubmed. This is confirmed that our examination of reference lists of the articles did not provide many reports published in journals not indexed in Medline/Pubmed. Finally, the evaluation of all statistical tests reported might be influenced by publication bias. The possibility of a higher number of null associations or associations in the unexpected direction must be considered.

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CONCLUSION

A pattern of lack of association between physical activity and safety from crime was observed in the current systematic review, but it is important to highlight that most articles included in the review were cross-sectional. These null findings were also observed if we restrict the analyses to studies including only women or older adults. Also, the null findings were observed regardless the safety measurements or domains of activity investigated. Studies designed specifically to address the association between physical activity and safety from crime, as well as prospective and natural experiments, are still needed, particularly in low and middle-income countries.

COMPETING INTERESTS

All authors declare that they have no competing interests.

AUTHORS' CONTRIBUTIONS

IS was responsible for carrying out the first review, with collaboration from VC, AH, ARV and PH. All authors were involved in writing the manuscript, revising early drafts and approving the final version submitted for publication.

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REFERENCES

1. Hallal PC, Andersen LB, Bull FC, Guthold R, Haskell W, Ekelund U. Global physical activity levels: surveillance progress, pitfalls, and prospects. *Lancet*. 2012 Jul 21;380(9838):247-57.
2. Lee IM, Shiroma EJ, Lobelo F, Puska P, Blair SN, Katzmarzyk PT. Effect of physical inactivity on major non-communicable diseases worldwide: an analysis of burden of disease and life expectancy. *Lancet*. 2012 Jul 21;380(9838):219-29.
3. Kohl HW, 3rd, Craig CL, Lambert EV, Inoue S, Alkandari JR, Leetongin G, Kahlmeier S. The pandemic of physical inactivity: global action for public health. *Lancet*. 2012 Jul 21;380(9838):294-305.
4. Bauman AE, Reis RS, Sallis JF, Wells JC, Loos RJ, Martin BW. Correlates of physical activity: why are some people physically active and others not? *Lancet*. 2012 Jul 21;380(9838):258-71.
5. Heath GW, Parra DC, Sarmiento OL, Andersen LB, Owen N, Goenka S, Montes F, Brownson RC. Evidence-based intervention in physical activity: lessons from around the world. *Lancet*. 2012 Jul 21;380(9838):272-81.
6. Pratt M, Sarmiento OL, Montes F, Ogilvie D, Marcus BH, Perez LG, Brownson RC. The implications of megatrends in information and communication technology and transportation for changes in global physical activity. *Lancet*. 2012 Jul 21;380(9838):282-93.
7. Bauman A. The physical environment and physical activity: moving from ecological associations to intervention evidence. *J Epidemiol Community Health*. 2005 Jul;59(7):535-6.

Physical activity and safety from crime

8. Sallis JF, Owen N, Fisher E. Ecological models of health behavior. In: Glanz, K., Rimer, B.K., Viswanath, K., (Eds.), *Health Behavior and Health Education: Theory, Research, and Practice* (4th Edition). Jossey-Bass, San Francisco. 2008.
9. Loukaitou-Sideris A, Eck JE. Crime prevention and active living. *Am J Health Prom.* 2007 Mar-Apr;21(4 Suppl):380-9, iii.
10. Foster S, Giles-Corti B. The built environment, neighborhood crime and constrained physical activity: an exploration of inconsistent findings. *Prev Med.* 2008 Sep;47(3):241-51.
11. Moher D, Liberati A, Tetzlaff J, Altman DG. Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. *PLoS Medicine.* 2009 Jul 21;6(7):e1000097.
12. Kelsey JL, Whittemore AS, Evans AS, Thompson WD (1996) *Methods in Observational Epidemiology*, second edition.
13. Downs SH, Black N. The feasibility of creating a checklist for the assessment of the methodological quality both of randomised and non-randomised studies of health care interventions. *J Epidemiol Community Health.* 1998;52:377-84.
14. Piro FN, Noss O, Claussen B. Physical activity among elderly people in a city population: the influence of neighbourhood level violence and self perceived safety. *J Epidemiol Community Health.* 2006 Jul;60(7):626-32.
15. Bennett GG, McNeill LH, Wolin KY, Duncan DT, Puleo E, Emmons KM. Safe to walk? Neighborhood safety and physical activity among public housing residents. *PLoS Medicine.* 2007 Oct;4(10):1599-606; discussion 607.
16. Wilson DK, Kirtland KA, Ainsworth BE, Addy CL. Socioeconomic status and perceptions of access and safety for physical activity. *Ann Beh Med.* 2004;28:20-8.

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17. McGinn AP, Evenson KR, Herring AH, Huston SL, Rodriguez DA. The association of perceived and objectively measured crime with physical activity: a cross-sectional analysis. *J Phys Act Health*. 2008 Jan;5(1):117-31.
18. Doyle S, Schwartz AC, Schlossberg M, Stockard J. Active Community Environments and Health: The Relationship of Walkable and Safe Communities to Individual Health. *J Am Plan Assoc*. 2007;72:19-31.
19. Beenackers MA, Kamphuis CB, Burdorf A, Mackenbach JP, van Lenthe FJ. Sports participation, perceived neighborhood safety, and individual cognitions: how do they interact? *Int J Behav Nutr Phys Act*. 2011;8:76.
20. Harrison RA, Gemmell I, Heller RF. The population effect of crime and neighbourhood on physical activity: an analysis of 15,461 adults. *J Epidemiol Community Health*. 2007 Jan;61(1):34-9.
21. Shenassa ED, Liebhaber A, Ezeamama A. Perceived safety of area of residence and exercise: a pan-European study. *Am J Epidemiol*. 2006 Jun 1;163(11):1012-7.
22. Weinstein A, Feigley P, Pullen P, Mann L, Redman L. Neighbourhood safety and the prevalence of physical inactivity — selected states, 1996. *MMWR Morb Mortal Wkly Rep*. 1999;48(143-146).
23. Corseuil MW, Hallal PC, Xavier Corseuil H, Jayce Ceola Schneider I, d'Orsi E. Safety from crime and physical activity among older adults: a population-based study in Brazil. *J Environ Public Health*. 2012;2012:641010.
24. Tucker-Seeley RD, Subramanian SV, Li Y, Sorensen G. Neighborhood safety, socioeconomic status, and physical activity in older adults. *Am J Prev Med*. 2009 Sep;37(3):207-13.

Physical activity and safety from crime

25. Rech CR, Reis RS, Hino AA, Rodriguez-Anez CR, Fermino RC, Goncalves PB, Hallal PC. Neighborhood safety and physical inactivity in adults from Curitiba, Brazil. *Int J Behav Nutr Phys Act.* 2012;9:72.
26. Mendes Mde A, Silva IC, Hallal PC, Tomasi E. Physical activity and perceived insecurity from crime in adults: a population-based study. *PloS One.* 2014;9(9):e108136.
27. Mason P, Kearns A, Livingston M. "Safe Going": the influence of crime rates and perceived crime and safety on walking in deprived neighbourhoods. *Soc Sci Med(1982).* 2013 Aug;91:15-24.
28. Kramer D, Maas J, Wingen M, Kunst AE. Neighbourhood safety and leisure-time physical activity among Dutch adults: a multilevel perspective. *Int J Behav Nutr Phys Act.* 2013;10:11.
29. Beenackers MA, Kamphuis CB, Mackenbach JP, Burdorf A, van Lenthe FJ. Why some walk and others don't: exploring interactions of perceived safety and social neighborhood factors with psychosocial cognitions. *Health Educ Res.* 2013 Apr;28(2):220-33.
30. Foster S, Knuiman M, Villanueva K, Wood L, Christian H, Giles-Corti B. Does walkable neighbourhood design influence the association between objective crime and walking? *Int J Behav Nutr Phys Act.* 2014 Jul 26;11(1):100.
31. Evenson KR, Block R, Diez Roux AV, McGinn AP, Wen F, Rodriguez DA. Associations of adult physical activity with perceived safety and police-recorded crime: the Multi-ethnic Study of Atherosclerosis. *Int J Behav Nutr Phys Act.* 2012;9:146.
32. Florindo AA, Salvador EP, Reis RS. Physical activity and its relationship with perceived environment among adults living in a region of low socioeconomic level. *J Phys Act Health.* 2013 May;10(4):563-71.

Physical activity and safety from crime

33. Florindo AA, Salvador EP, Reis RS, Guimaraes VV. Perception of the environment and practice of physical activity by adults in a low socioeconomic area. *Rev Saude Publica*. 2011 Apr;45(2):302-10.
34. Hallal PC, Reis RS, Parra DC, Hoehner C, Brownson RC, Simoes EJ. Association between perceived environmental attributes and physical activity among adults in Recife, Brazil. *J Phys Act Health*. 2010;7 Suppl 2:S213-22.
35. Gomes GA, Reis RS, Parra DC, Ribeiro I, Hino AA, Hallal PC, Malta DC, Brownson RC. Walking for leisure among adults from three Brazilian cities and its association with perceived environment attributes and personal factors. *Int J Behav Nutr Phys Act*. 2011;8:111.
36. Parra DC, Hoehner CM, Hallal PC, Ribeiro IC, Reis R, Brownson RC, Pratt M, Simoes EJ. Perceived environmental correlates of physical activity for leisure and transportation in Curitiba, Brazil. *Prev Med*. 2011 Mar-Apr;52(3-4):234-8.
37. Rech CR, Reis RS, Hino AA, Hallal PC. Personal, social and environmental correlates of physical activity in adults from Curitiba, Brazil. *Prev Med*. 2014 Jan;58:53-7.
38. Oyeyemi AL, Adegoke BO, Oyeyemi AY, Sallis JF. Perceived environmental correlates of physical activity and walking in African young adults. *Am J Health Prom* . 2011 May-Jun;25(5):e10-9.
39. Jia Y, Usagawa T, Fu H. The Association between walking and perceived environment in Chinese community residents: a cross-sectional study. *PloS One*. 2014;9(2):e90078.
40. Su M, Tan YY, Liu QM, Ren YJ, Kawachi I, Li LM, Lv J. Association between perceived urban built environment attributes and leisure-time physical activity among adults in Hangzhou, China. *Prev Med*. 2014 Sep;66:60-4.

Physical activity and safety from crime

41. Salvo D, Reis RS, Stein AD, Rivera J, Martorell R, Pratt M. Characteristics of the built environment in relation to objectively measured physical activity among Mexican adults, 2011. *Prev Chronic Dis.* 2014;11:E147.
42. Amorim TC, Azevedo MR, Hallal PC. Physical activity levels according to physical and social environmental factors in a sample of adults living in South Brazil. *J Phys Act Health.* 2010;7 Suppl 2:S204-12
43. Sallis JF, King AC, Sirard JR, Albright CL. Perceived environmental predictors of physical activity over 6 months in adults: activity counseling trial. *Health psychology.* 2007 Nov;26(6):701-9.
44. Jongeneel-Grimen B, Droomers M, van Oers HA, Stronks K, Kunst AE. The relationship between physical activity and the living environment: a multi-level analyses focusing on changes over time in environmental factors. *Health & place.* 2014 Mar;26:149-60.
45. Giles-Corti B, Bull F, Knuiman M, McCormack G, Van Niel K, Timperio A, Christian H, Foster S, Divitini M, Middleton N, Boruff B. The influence of urban design on neighbourhood walking following residential relocation: longitudinal results from the RESIDE study. *Soc Sci Med(1982).* 2013 Jan;77:20-30.
46. Saelens BE, Sallis JF, Frank LD, Cain KL, Conway TL, Chapman JE, Slymen DJ, Kerr J. Neighborhood environment and psychosocial correlates of adults' physical activity. *Med Sci Sports Exerc.* 2012 Apr;44(4):637-46.
47. van Lenthe FJ, Brug J, Mackenbach JP. Neighbourhood inequalities in physical inactivity: the role of neighbourhood attractiveness, proximity to local facilities and safety in the Netherlands. *Soc Sci Med(1982).* 2005 Feb;60(4):763-75.
48. Prince SA, Kristjansson EA, Russell K, Billette JM, Sawada M, Ali A, Tremblay MS, Prud'homme D. A multilevel analysis of neighbourhood built and social

Physical activity and safety from crime

environments and adult self-reported physical activity and body mass index in Ottawa, Canada. *Int J Environ Res Pub Health*. 2011 Oct;8(10):3953-78.

49. Hoehner CM, Brennan Ramirez LK, Elliott MB, Handy SL, Brownson RC. Perceived and objective environmental measures and physical activity among urban adults. *Am J Prev Med*. 2005 Feb;28(2 Suppl 2):105-16.

50. Duncan M, Mummery K. Psychosocial and environmental factors associated with physical activity among city dwellers in regional Queensland. *Prev Med*. 2005 Apr;40(4):363-72.

51. Bentley R, Jolley D, Kavanagh AM. Local environments as determinants of walking in Melbourne, Australia. *Soc Sci Med(1982)*. 2010;70 (11):1806-15.

52. Van Dyck D, Cardon G, Deforche B, Giles-Corti B, Sallis JF, Owen N, De Bourdeaudhuij I. Environmental and psychosocial correlates of accelerometer-assessed and self-reported physical activity in Belgian adults. *Int J Behav Med*. 2011 Sep;18(3):235-45.

53. Cerin E, Cain KL, Conway TL, D VAND, Hinckson E, Schipperijn J, I DEB, Owen N, Davey RC, Hino AA, Mitas J, Orzanco-Garralda R, Salvo D, Sarmiento OL, Christiansen LB, Macfarlane DJ, Schofield G, Sallis JF. Neighborhood environments and objectively measured physical activity in 11 countries. *Med Sci Sports Exerc*. 2014 Dec;46(12):2253-64.

54. WHO. Global recommendations on physical activity for health. Geneva: World Health Organization. 2010.

55. Kamphuis CB, Van Lenthe FJ, Giskes K, Huisman M, Brug J, Mackenbach JP. Socioeconomic status, environmental and individual factors, and sports participation. *Med Sci Sports Exerc*. 2008 Jan;40(1):71-81.

Physical activity and safety from crime

56. McCormack GR, Spence JC, Berry T, Doyle-Baker PK. Does perceived behavioral control mediate the association between perceptions of neighborhood walkability and moderate- and vigorous-intensity leisure-time physical activity? *J Phys Act Health*. 2009 Sep;6(5):657-66.
57. Poortinga W. Perceptions of the environment, physical activity, and obesity. *Soc Sci Med(1982)*. 2006 Dec;63(11):2835-46.
58. Van Dyck D, Veitch J, De Bourdeaudhuij I, Thornton L, Ball K. Environmental perceptions as mediators of the relationship between the objective built environment and walking among socio-economically disadvantaged women. *Int J Behav Nutr Phys Act*. 2013;10:108.
59. Van Dyck D, Cerin E, Conway TL, De Bourdeaudhuij I, Owen N, Kerr J, Cardon G, Frank LD, Saelens BE, Sallis JF. Perceived neighborhood environmental attributes associated with adults' leisure-time physical activity: findings from Belgium, Australia and the USA. *Health & place*. 2013 Jan;19:59-68.
60. Sugiyama T, Cerin E, Owen N, Oyeyemi AL, Conway TL, Van Dyck D, Schipperijn J, Macfarlane DJ, Salvo D, Reis RS, Mitas J, Sarmiento OL, Davey R, Schofield G, Orzanco-Garralda R, Sallis JF. Perceived neighbourhood environmental attributes associated with adults recreational walking: IPEN Adult study in 12 countries. *Health & place*. 2014 Jul;28:22-30.
61. Sugiyama T, Paquet C, Howard NJ, Coffee NT, Taylor AW, Adams RJ, Daniel M. Public open spaces and walking for recreation: moderation by attributes of pedestrian environments. *Prev Med*. 2014 May;62:25-9.
62. Heesch KC, Giles-Corti B, Turrell G. Cycling for transport and recreation: associations with socio-economic position, environmental perceptions, and psychological disposition. *Prev Med*. 2014 Jun;63:29-35.

Physical activity and safety from crime

63. Bergman P, Grijbovski AM, Hagströmer M, Sallis JF, Sjöström M. The association between health enhancing physical activity and neighbourhood environment among Swedish adults – a population-based cross-sectional study. *Int J Behav Nutr.* 2009;6(8).
64. Sugiyama T, Leslie E, Giles-Corti B, Owen N. Physical activity for recreation or exercise on neighbourhood streets: associations with perceived environmental attributes. *Health & place.* 2009 Dec;15(4):1058-63.
65. Cleland V, Ball K, Hume C, Timperio A, King AC, Crawford D. Individual, social and environmental correlates of physical activity among women living in socioeconomically disadvantaged neighbourhoods. *Soc Sci Med* 2010;70(12):2011-8.
66. King AC, Castro C, Wilcox S, Eyster AA, Sallis JF, Brownson RC. Personal and environmental factors associated with physical inactivity among different racial-ethnic groups of U.S. middle-aged and older-aged women. *Health psychology.* 2000 Jul;19(4):354-64.
67. Troped PJ, Tamura K, Whitcomb HA, Laden F. Perceived built environment and physical activity in U.S. women by sprawl and region. *Am J Prev Med.* 2011 Nov;41(5):473-9.
68. Wilcox S, Castro C, King AC, Housemann R, Brownson RC. Determinants of leisure time physical activity in rural compared with urban older and ethnically diverse women in the United States. *J Epidemiol Community Health.* 2000 Sep;54(9):667-72.
69. Ball K, Timperio A, Salmon J, Giles-Corti B, Roberts R, Crawford D. Personal, social and environmental determinants of educational inequalities in walking: a multilevel study. *J Epidemiol Community Health.* 2007 Feb;61(2):108-14.

Physical activity and safety from crime

70. Wen M, Kandula NR, Lauderdale DS. Walking for transportation or leisure: what difference does the neighborhood make? *J Gen Intern Med.* 2007 Dec;22(12):1674-80.
71. Solomon E, Rees T, Ukoumunne OC, Metcalf B, Hillsdon M. Personal, social, and environmental correlates of physical activity in adults living in rural south-west England: a cross-sectional analysis. *Int J Behav Nutr Phys Act.* 2013;10:129.
72. Saito Y, Oguma Y, Inoue S, Tanaka A, Kobori Y. Environmental and individual correlates of various types of physical activity among community-dwelling middle-aged and elderly Japanese. *Int J Environ Res Pub Health.* 2013 May;10(5):2028-42.
73. Jack E, McCormack GR. The associations between objectively-determined and self-reported urban form characteristics and neighborhood-based walking in adults. *Int J Behav Nutr Phys Act.* 2014;11:71.
74. Saris C, Kremers S, Assema PV, Hoefnagels C, Droomers M, N. DV. What Moves Them? Active Transport among Inhabitants of Dutch Deprived Districts. *J Obes.* 2013;153973.
75. Delgado-Rodriguez M, Llorca J. Bias. *J Epidemiol Community Health.* 2004 Aug;58(8):635-41.
76. Inoue S, Ohya Y, Odagiri Y, Takamiya T, Ishii K, Kitabayashi M, Suijo K, Sallis JF, Shimomitsu T. Association between perceived neighborhood environment and walking among adults in 4 cities in Japan. *J Epid / Japan Epidemiological Association.* 2010;20(4):277-86.
77. Inoue S, Ohya Y, Odagiri Y, Takamiya T, Kamada M, Okada S, Oka K, Kitabatake Y, Nakaya T, Sallis JF, Shimomitsu T. Perceived neighborhood environment and walking for specific purposes among elderly Japanese. *J Epid / Japan Epidemiological Association.* 2011;21(6):481-90.

Physical activity and safety from crime

78. Jones CH, Ogilvie D. Motivations for active commuting: a qualitative investigation of the period of home or work relocation. *Int J Behav Nutr Phys Act.* 2012;9:109.
79. Eyler AA, Baker E, Cromer L, King AC, Brownson RC, Donatelle RJ. Physical activity and minority women: a qualitative study. *Health Educ Behav.* 1998 Oct;25(5):640-52.
80. Eyler AA, Vest JR. Environmental and policy factors related to physical activity in rural white women. *Women Health.* 2002;36(2):111-21.
81. Evenson KR, Sarmiento OL, Macon ML, Tawney KW, Ammerman AS. Environmental, policy, and cultural factors related to physical activity among Latina immigrants. *Women Health.* 2002;36(2):43-57.
82. Lees E, Taylor WC, Hepworth JT, Feliz K, Cassells A, Tobin JN. Environmental changes to increase physical activity: perceptions of older urban ethnic-minority women. *J Aging Phys Act.* 2007 Oct;15(4):425-38.
83. Ainsworth BE, Wilcox S, Thompson WW, Richter DL, Henderson KA. Personal, social, and physical environmental correlates of physical activity in African-American women in South Carolina. *Am J Prev Med.* 2003 Oct;25(3 Suppl 1):23-9.
84. Brownson RC, Baker EA, Housemann RA, Brennan LK, Bacak SJ. Environmental and policy determinants of physical activity in the United States. *Am J public health.* 2001 Dec;91(12):1995-2003.
85. De Bourdeaudhuij I, Sallis JF, Saelens BE. Environmental correlates of physical activity in a sample of Belgian adults. *Am J Health Prom .* 2003 Sep-Oct;18(1):83-92.
86. Doescher MP, Lee C, Berke EM, Adachi-Mejia AM, Lee CK, Stewart O, Patterson DG, Hurvitz PM, Carlos HA, Duncan GE, Moudon AV. The built

Physical activity and safety from crime

environment and utilitarian walking in small U.S. towns. *Prev Med.* 2014 Sep 6;69C:80-6.

87. Evenson KR, Sarmiento OL, Tawney KW, Macon ML, Ammerman AS. Personal, social, and environmental correlates of physical activity in North Carolina Latina immigrants. *Am J Prev Med.* 2003 Oct;25(3 Suppl 1):77-85.

88. Eyler AA. Personal, social, and environmental correlates of physical activity in rural Midwestern white women. *Am J Prev Med.* 2003 Oct;25(3 Suppl 1):86-92.

89. Foster C, Hillsdon M, Thorogood M. Environmental perceptions and walking in English adults. *J Epidemiol Community Health.* 2004 Nov;58(11):924-8.

90. Foster C, Hillsdon M, Jones A, Grundy C, Wilkinson P, White M, Sheehan B, Wareham N, Thorogood M. Objective measures of the environment and physical activity--results of the environment and physical activity study in English adults. *J Phys Act Health.* 2009;6 Suppl 1:S70-80.

91. Garrett N, Schluter PJ, Schofield G. Physical activity profiles and perceived environmental determinants in New Zealand: a national cross-sectional study. *J Phys Act Health.* 2012 Mar;9(3):367-77.

92. Granner ML, Sharpe PA, Hutto B, Wilcox S, Addy CL. Perceived individual, social, and environmental factors for physical activity and walking. *J Phys Act Health.* 2007 Jul;4(3):278-93.

93. Hooker SP, Wilson DK, Griffin SF, Ainsworth BE. Perceptions of environmental supports for physical activity in African American and white adults in a rural county in South Carolina. *Prev Chronic Dis.* 2005 Oct;2(4):A11.

94. Huston SL, Evenson KR, Bors P, Gizlice Z. Neighborhood environment, access to places for activity, and leisure-time physical activity in a diverse North Carolina population. *Am J Health Prom.* 2003 Sep-Oct;18(1):58-69.

Physical activity and safety from crime

95. Leslie E, Cerin E, Kremer P. Perceived Neighborhood Environment and Park Use as Mediators of the Effect of Area Socio-Economic Status on Walking Behaviors. *J Phys Act Health*. 2010;7:802-10.
96. Li Y, Kao D, Dinh TQ. Correlates of Neighborhood Environment With Walking Among Older Asian Americans. *J Aging Health*. 2014 Jun 17.
97. Lim K, Taylor L. Factors associated with physical activity among older people-- a population-based study. *Prev Med*. 2005 Jan;40(1):33-40.
98. Osuji T, Lovegreen SL, Elliott M, Brownson RC. Barriers to physical activity among women in the rural midwest. *Women Health*. 2006;44(1):41-55.
99. Pichon LC, Arredondo EM, Roesch S, Sallis JF, Ayala GX, Elder JP. The relation of acculturation to Latinas' perceived neighborhood safety and physical activity: a structural equation analysis. *Ann Behav Med*. 2007 Nov-Dec;34(3):295-303.
100. Reed J, Ainsworth B. Perceptions of environmental supports on the physical activity behaviors of university men and women: a preliminary investigation. *J Am Coll Health*. 2007 Sep-Oct;56(2):199-204.
101. Ross CE. Walking, exercising, and smoking: does neighborhood matter? *Soc Sci Med(1982)*. 2000 Jul;51(2):265-74.
102. Sallis JF, Bowles HR, Bauman A, Ainsworth BE, Bull FC, Craig CL, Sjostrom M, De Bourdeaudhuij I, Lefevre J, Matsudo V, Matsudo S, Macfarlane DJ, Gomez LF, Inoue S, Murase N, Volbekiene V, McLean G, Carr H, Heggebo LK, Tomten H, Bergman P. Neighborhood environments and physical activity among adults in 11 countries. *Am J Prev Med*. 2009 Jun;36(6):484-90.
103. Salmon J, Owen N, Crawford D, Bauman A, Sallis JF. Physical activity and sedentary behavior: a population-based study of barriers, enjoyment, and preference. *Health psychology*. 2003 Mar;22(2):178-88.

Physical activity and safety from crime

104. Sanderson BK, Foushee HR, Bittner V, Cornell CE, Stalker V, Shelton S, Pulley L. Personal, social, and physical environmental correlates of physical activity in rural African-American women in Alabama. *Am J Prev Med*. 2003 Oct;25(3 Suppl 1):30-7.
105. Sharpe PA, Granner ML, Hutto B, Ainsworth BE. Association of environmental factors to meeting physical activity recommendations in two South Carolina counties. *Am J Health Prom* . 2004 Jan-Feb;18(3):251-7.
106. Shigematsu R, Sallis JF, Conway TL, Saelens BE, Frank LD, Cain KL, Chapman JE, King AC. Age differences in the relation of perceived neighborhood environment to walking. *Med Sci Sports Exerc*. 2009 Feb;41(2):314-21.
107. Van Cauwenberg J, Clarys P, De Bourdeaudhuij I, Van Holle V, Verte D, De Witte N, De Donder L, Buffel T, Dury S, Deforche B. Physical environmental factors related to walking and cycling in older adults: the Belgian aging studies. *BMC public health*. 2012;12:142.
108. Velasquez KS, Holahan CK, You X. Relationship of perceived environmental characteristics to leisure-time physical activity and meeting recommendations for physical activity in Texas. *Prev Chronic Dis*. 2009 Jan;6(1):A24.
109. Vest J, Valadez A. Perceptions of neighbourhood characteristics and leisure-time physical inactivity--Austin/Travis County, Texas, 2004. *MMWR Morb Mortal Wkly Rep*. 2005;54:926-8.

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Table 1. Adapted version of Downs and Black checklist for the assessment of the methodological quality of the included studies (N = 89).

Items	Presence (%)
Is the hypothesis/aim/objective of the study clearly described?	89 (100.0)
Are the main outcomes clearly described?	87 (97.8)
Are the characteristics of the participants included in the study clearly described?	82 (92.1)
Are the exposures of interest clearly described?	74 (83.1)
Are the main findings related to safety from crime and physical activity clearly described?	78 (87.6)
Does the study provide estimates of the random variability in the data for the main outcomes or safety from crime?	58 (65.2)
Have the characteristics of individuals lost to follow-up been described?	8 (9.0)
Have actual probability values or confidence intervals been reported?	80 (89.9)
Was the sample representative of the entire population from which it was recruited?	28 (31.5)
Were the statistical tests used to assess the main outcomes appropriate?	89 (100.0)
Were the exposures realistic (reliable), i.e, without misclassification?	77 (86.5)
Were the main outcomes used accurate (valid and reliable)?	75 (84.3)
Was there adequate adjustment for confounding in the analyses?	30 (33.7)
Did the study have sufficient power to detect a clinically important effect?*	89 (100.0)

*Having a sample size of 500+ participants was one of the inclusion criteria.

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Table 2. Description of the studies included in the review (N=89).

First author (year)	Location	Sample size and age	Instruments	Safety measures	Physical activity measures	Statistical adjustment	Main findings
Ainsworth (2003) ⁽⁸³⁾	Sumter and Orangeburg County, South Carolina, USA	917 (20-50 years - Only among African American women)	BRFSS	Perception of safety from crime dichotomized into extremely/ somewhat safe or slightly/not at all safe.	Self-reported MVPA defined with two variables: (1) Inactive and insufficiently active vs. meets guidelines. (2) Inactive vs. Insufficiently active and meets guidelines.	County of residence and educational attainment.	Safety from crime was not significantly associated with physical activity.
Amorim (2010) ⁽⁴²⁾	Pelotas, Brazil	972 (20+ years)	NEWS and long IPAQ	Perception of the participant on: (1) Safety to walk during day; (2) Safety to walk at night; (3) Existence of crime in the neighborhood.	Active (150+ min/wk.) vs. inactive (<150 min/wk.) in leisure-time and transport self-reported.	Sex, age, socioeconomic level, and skin color.	Existence of crime in the neighborhood was related to a 10% increase in the prevalence of inactivity in leisure-time. All other associations tested were non-significant in the adjusted models.
Ball (2007) ⁽⁶⁹⁾	Melbourne, Australia	1282 (18+ years - women only)	long IPAQ	Perceived safety with three items about neighborhood safe for walking during the day or at night, and streets well lit at night.	Self-reported walking for leisure and walking for transport: both were dichotomized into any walking vs. no walking.	Education and environmental, social and personal mediators	No associations in fully adjusted models.

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First author (year)	Location	Sample size and age	Instruments	Safety measures	Physical activity measures	Statistical adjustment	Main findings
Beenackers (2011) ⁽¹⁹⁾	Eindhoven, Netherlands	2474 (25-75 years)	GLOBE postal survey of 2004	Perceived safety (low, medium and high) assessed through four items: (1) Fear of being home alone; (2) Fear of going out in the streets during the day; (3) Fear of going out in the streets at night; (4) Overall neighborhood safety.	Sport participation was defined as having participated in sports of moderate or high intensity at least once a week for at least 30 minutes.	Age, sex, educational level, country of origin. individual cognition (attitude, self-efficacy, social influence and intention)	Perception of low safety (as compared to high safety) in the neighborhood was related to a 43% reduced odds of sports participation.
Beenackers (2013) ⁽²⁹⁾	Eindhoven and its surrounding municipalities, Netherlands	4395 (adults, 25 - 75 years)	SQUASH	Perceived safety of the neighborhood based on people's fear of being home alone or of going out on the streets during the daytime or at night, and whether respondents perceived their neighborhood as unsafe. High, medium and low perceived safety categories were	Frequency and duration of leisure-time walking were collected. Outcome variables were (1) walking practice or not, and (2) among 'walkers' total minutes/week walking.	All models adjusted for age, gender, educational class and country of origin. Model 1 contained all neighborhood perceptions. Model 2 contained all psychosocial	Perceived neighborhood safety was neither significantly associated with leisure-time walking practice, nor with minutes spent walking among those 'walkers'.

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First author (year)	Location	Sample size and age	Instruments	Safety measures	Physical activity measures	Statistical adjustment	Main findings
				generated based in the final score.		cognitions. Model 3 combined neighborhood perceptions with psychosocial cognitions.	
Bennett (2007) ⁽¹⁵⁾	Boston, USA	1735 (465 men, 1270 women) (18+ years)	Designed for this specific study	How safe is to walking in the neighborhood during day (safe or unsafe) and at night (safe, a little unsafe or unsafe)?	Number of steps per day during 5 days objectively assessed by pedometers.	Age, BMI, race/ethnicity, employment status, and stratified for gender	Women who reported their neighborhoods to be safe at night took significantly more steps per day than women who reported their neighborhoods as unsafe. No associations were found between day time safety and steps/day in men or women and safety at night and steps/day in men.

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First author (year)	Location	Sample size and age	Instruments	Safety measures	Physical activity measures	Statistical adjustment	Main findings
Bentley (2010) ⁽⁵¹⁾	Melbourne, Australia	2334 (18+ years)	SPACES - Systematic Pedestrian and Cycling Environmental Scan and Active Australia Questionnaire	Personal safety objectively measured according the proportion of segments with streetlights, and average surveillance score per area (1=can be observed from <50% of buildings, 2=50-75% of buildings, 3≥75% of buildings).	Self-reported walking in the previous week into four categories: (1) Low: people who reported not walking continuously for 10 min/wk.; (2) Medium-walked 10-60 min/wk. walking; (3) Medium-high 61-180 min/wk. walking and; (4) High 180 min/wk. walking.	Adjusted for age, sex, household type, country of birth, education, occupation, household income, and area disadvantage	No associations in fully adjusted models.
Bergman (2009) ⁽⁶³⁾	Sweden	1470 (adults, 18 - 74 years)	short IPAQ	Fear of crime was categorized in tertiles based on agreement to two sentences: "The crime rate in my neighborhood makes it unsafe to go on walks during the day" and "The crime rate in my neighborhood makes it unsafe to go on walks	Total self-report physical activity was classified as 'high' (≥3 days of VPA or 7 days of any combination of walking or MVPA, moderate (≥3 days of VPA for ≥ 20 min/day, or ≥5 days of MPA or walking for ≥30 min/day, ≥5 days of	Adjusted for age, gender, self-perceived health, BMI, education, employment, marital status, smoking and other environmental variables	Fear of crime was linearly and inversely associated with middle tertile of walking (80–300 minutes per week) and was not associated with the upper tertile of walking. There were no associations between fear of crime and total physical activity in both moderate and high

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First author (year)	Location	Sample size and age	Instruments	Safety measures	Physical activity measures	Statistical adjustment	Main findings
				at night"	any combination of PA, and low (no activity or some activity reported but not enough to meet categories 2). Walking during the last seven days was divided into tertiles: low, (< 80min), moderate (80–300 min) and high (>300 min)		categories.
Brownson (2001) ⁽⁸⁴⁾	USA (Low-income subjects were oversampled)	1818 (18+ years)	NHIS, BRFSS, and others	Perception of high crime (yes/no).	Self-reported data on meeting recommendations (≥ 5 days \times ≥ 30 min/day of moderate-intensity physical activity or ≥ 3 days \times 20 min/day of vigorous-intensity physical activity) or not.	Age, sex, race, income, and education	No associations in fully adjusted models.

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First author (year)	Location	Sample size and age	Instruments	Safety measures	Physical activity measures	Statistical adjustment	Main findings
Cerin (2014) ⁽⁵³⁾	11 Countries (17 study sites - Belgium, Brazil, Colombia, Czech Republic, Denmark, Hong Kong, Mexico, New Zealand, Spain, United Kingdom and USA)	6968 (Adults, 18 - 66y, living in areas with low and high walkability and SES)	Accelerometers, long IPAQ and NEWS	Perceived safety from crime	Average daily minutes of MVPA objectively measured and using the average daily minute measures multiplied by 7 d, a variable was created to indicate whether participants met the PA guidelines for cancer and weight gain prevention (≥ 420 min/week of MPA or ≥ 210 min/week VPA).	Adjusted for age, sex, marital status, educational attainment, employment status, administrative-unit SES, accelerometer wear time, and other environmental variables.	Pooled associations among the 11 countries: Safety from crime was not associated with average minutes/day spent in MVPA, but there was a positive association with meeting guidelines for cancer and weight gain prevention.
Cleland (2010) ⁽⁶⁵⁾	Victoria Australia (urban and rural neighborhoods of low socioeconomic status in	4108 (18-45 years -women only)	long IPAQ	Personal safety according a sum of three items measured on a 5-point Likert scale: (1) I feel safe walking in my neighborhood, day or night, (2) Violence is	Self-reported LTPA categorized as inactive (0 min/wk.), insufficiently active (1-149 min/wk.) and, sufficiently active (≥ 150 min/wk.). TRPA was also measured and	Model 1: Age, education, employment status, marital status, number of children, country of birth, weight status, pregnancy	No associations in fully adjusted models.

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First author (year)	Location	Sample size and age	Instruments	Safety measures	Physical activity measures	Statistical adjustment	Main findings
	Victoria)			not a problem in my neighborhood, (3) My neighborhood is safe from crime.	categorized into three groups: low (0-29 min/wk.), medium (30-149 min/wk.) and high (≥ 150 min/wk.).	status, long-term illness/disability, current smoking Model 2: Above variables and other significant environmental variables	
Corseuil (2012) ⁽²³⁾	Florianopolis, Brazil	1656 (60+ years)	NEWS and long IPAQ	Safety from crime based on a score from three questions (Are the streets near your household well illuminated at night? Do you feel it is safe to walk, cycle or practice sports in your neighborhood during the day and at night?).	Self-reported leisure-time and commuting PA according guidelines (≥ 150 min/wk.: active).	Sex, age, schooling, disability score, and self-perceived health	In the leisure-time, physical activity was positively associated only with feel safe to walk during the day and with the safety score. In terms of commuting, physical activity was positively associated only with street lighting at night.
De Bourdeaudhuij (2003) ⁽⁸⁵⁾	Ghent, Belgium	521 (18-65 years)	NEWS and short IPAQ	The crime rate in my neighborhood makes it unsafe to go on walks during the day/night?	Self-reported minutes of walking, moderate- and vigorous-intensity physical activity.	Not reported	No significant associations in the unadjusted analysis.

Physical activity and safety from crime

First author (year)	Location	Sample size and age	Instruments	Safety measures	Physical activity measures	Statistical adjustment	Main findings
Doescher (2014) ⁽⁸⁶⁾	Nine small towns located in three diverse locations, Washington State, Texas, and the Northeast (New Hampshire and New York), USA	2152 (adults, 18+ years) *18.8% response rate. Telephone-based survey	NEWS and questions designed for this specific study	Street lighting and other safety conditions	Minutes per week engaged in utilitarian walking from participants' homes to specific destinations was calculated based on its reported frequency and duration per month. Two dichotomized variables "any" versus "none"; and "high" (≥ 150 min per week) versus "low" (< 150 min per week, including none).	Only unadjusted analysis for the specific association between safety from crime and walking	Street lighting and other safety from crime conditions were not associated with any walking variables in the unadjusted analysis.
Doyle (2007) ⁽¹⁸⁾	Counties in large urban areas, USA	9252 (18+ years)	Designed for this specific study	Crime rate objectively measured.	Frequency of walking, measured by whether or not respondents reported ever walking one mile or more without stopping during the last month.	Age, gender, race, income, education, social support, smoke status, residence period and walkability.	Crime rate was not associated with walking.

Physical activity and safety from crime

First author (year)	Location	Sample size and age	Instruments	Safety measures	Physical activity measures	Statistical adjustment	Main findings
Duncan (2005) ⁽⁵⁰⁾	Rockhampton, Queensland, Australia	1281 (18+ years) *46.6% response rate	Active Australia Physical Activity Questionnaire	Perceptions of safety assessed with three questions: (1)It is safe to walk in your neighborhood? (2)Crime is high in the neighborhood? (3)It is safe to cycle in your neighborhood? Safety was also objectively estimated by the total amount of roadway within 20 m of a streetlight.	Two variables with self-reported walking for leisure or recreation, for transport purposes, and any moderate or vigorous activities. (1) Sufficient active or not (≥ 150 min/wk.) and (2) recreational walking (yes/no).	Adjusted for age, income, gender, BMI, social support for physical activity, and self-efficacy	Safety from crime variables were associated with physical activity in the adjusted models.
Evenson (2003) ⁽⁸⁷⁾	Counties of Chatham, Durham, Orange, Sampson, and Wake, North Carolina, USA	671 (20-50 years - only women Latina immigrants)	BRFSS	Perception of safety from crime (extremely/somewhat safe and slightly/no at all safe) and Street lighting at night (very good/good, fair, poor/very poor).	Self-reported MVPA divided into three levels based physical activity guidelines (meet guidelines, insufficiently active and, inactive). Analyses were carried out combining: (1) meets	The final models were adjusted for acculturation only (age, perceived health status, number of children, marital status, and education did not	Street lighting and safety were not predictors of physical activity.

Physical activity and safety from crime

First author (year)	Location	Sample size and age	Instruments	Safety measures	Physical activity measures	Statistical adjustment	Main findings
					guidelines or do not meet guidelines, and (2) any activity or inactive.	meaningfully change the results)	
Evenson (2012) ⁽³¹⁾	Chicago, Illinois site residing in Cook County, USA	818 (45 - 84 years)	Designed for this specific study	Perceived safety was based on how safe from crime participants considered their neighborhood and if violence was considered as a problem in their neighborhood. Police-recorded crime (counts/1000) in the same census block of participants (incivilities, criminal offenses and homicides).	Transport-related physical activity was based only on walking. Leisure-time physical activity was based on walking and non-walking activities.	Adjusted for age, gender, race/ethnicity, education, income, working status, sidewalk presence in neighborhood, length of residence in neighborhood and distance to nearest public transportation.	Self-reported neighborhood safety was positively associated with transport walking, while lower reported neighborhood violence was inversely associated with leisure walking. Lower rates of police-recorded incivilities was positively associated with transport physical activity. Higher leisure walking was lower among adults with lower outdoor criminal offenses. No association was found regarding to non-walking leisure activities

Physical activity and safety from crime

First author (year)	Location	Sample size and age	Instruments	Safety measures	Physical activity measures	Statistical adjustment	Main findings
Eyler (2003) ⁽⁸⁸⁾	Rural areas in Missouri and Illinois, USA	1000 (women only, 20 - 50 years)	Designed for this specific study	Perceptions on safety from crime	Overall physical activity and participants were classified as: (1) meets recommendations (≥ 30 minutes 5 to 7 days of MPA, or ≥ 20 minutes at a time for 3 to 7 days a week, (2) insufficiently active: women who performed some physical activity, but not enough to meet recommendations, and (3) inactive: women who did not participate in any MVPA	Adjusted for age, general health, and self-efficacy	Safety from crime was not significantly associated with physical activity (in both categories, reaching recommendations or insufficiently active.

Physical activity and safety from crime

First author (year)	Location	Sample size and age	Instruments	Safety measures	Physical activity measures	Statistical adjustment	Main findings
Florindo (2011) ⁽³³⁾	District of Sao Paulo, Brazil	890 (18+ years)	Long IPAQ and NEWS	Overall public safety score was defined with a score of safety of walking, good street lighting at night of streets around the residence and bicycle riding or physical activity during the day or physical activity at night (Bad; Normal; Good and; Excellent).	Self-reported commuting walking at least 150 minutes per week (yes/no) and leisure-time moderate and vigorous physical activity at least 150 minutes per week (yes/no).	Model adjusted for sex, age, education and length of residence in household, and environmental variables	Participants with a good perception of safety were more likely to be active in commuting (walking to transport - bad perception as reference). No associations, after adjustment, were found with leisure time physical activity.
Florindo (2013) ⁽³²⁾	Ermelino Matarazzo district, São Paulo, Brazil	890 (18+ years)	Long IPAQ and NEWS	Good perception of safety during the day and at night, and a general safety score based on safety perception during the day and at night and street lighting at night.	Overall physical activity based on min/wk spent in TRPA and LTPA. Variable dichotomized as reaching or not the current guidelines (≥ 150 min/week).	Adjusted for sex, age, education, time lived in current home, and number of cars per household	There was a linear association between general safety score and physical activity. No associations was found regard overall physical activity and good perception of safety during the day and at night

Physical activity and safety from crime

First author (year)	Location	Sample size and age	Instruments	Safety measures	Physical activity measures	Statistical adjustment	Main findings
Foster (2004) ⁽⁸⁹⁾	England (National sample)	4268 (16-74 years)	Designed for this specific study	Perception of safety to walk during the day and at night (High/Low).	Self-reported walking at least 15 min/wk. in past 4 weeks and walking ≥ 150 min/wk. in past 4 weeks.	Age, socioeconomic status, education, self-reported health status, car use and stratified by sex	Low safety for walking during the day was negatively associated with walking ≥ 15 min/wk. in women. All other associations tested were non-significant in the adjusted models.
Foster (2009) ⁽⁹⁰⁾	Norwich, United Kingdom	13927 (45-4 years)	EPAQ2	Safety from crime objectively estimated according the neighborhood levels of crime (calculated rate of crimes/1000 persons in ward then divided into quartiles).	Frequency, duration of recreational walking reported during previous year (dichotomized: any vs. none).	Age, social status, educational qualifications, car use, area deprivation, self-reported health, mode of travel to work, occupational physical activity and stratified by sex.	Walking for recreation was not significantly associated with quartiles of crime.
Foster (2014) ⁽³⁰⁾	Perth, Australia	3487 (adults, 25 - 65 years)	Designed for this specific study and	Objectively measured crime according to spatial locations	Number of times they walked in the past week	Adjusted for age, sex, marital status, education	All objective crime were positively and significantly associated with walking

Physical activity and safety from crime

First author (year)	Location	Sample size and age	Instruments	Safety measures	Physical activity measures	Statistical adjustment	Main findings
			GIS	of reported crimes: (1) actual and attempted burglary; and (2) personal crime in public space. For each crime category, the count of offences within 400 m and 1600 m of participants' home addresses were calculated.		and index of relative socio-economic disadvantage (model 1). Additional adjustment for residential density and street connectivity (model 2); and for destinations variables (model 3).	frequency for both the 400 m and 1600 m neighborhood (model 1 and model 2). Only burglary (400 m buffer) remained positively associated with walking frequency in model 3.
Garrett (2012) ⁽⁹¹⁾	New Zealand (nationally representative population mail survey)	8038 (18+ years)	NZPAQ	Perception if there was a lot of crime (yes/no).	Self-reported walking and MVPA categorized as: (1) Sedentary: no PA reported; (2) Insufficient: some PA below guidelines; (3) Sufficient (≥ 150 min/wk.) combined activity (walking and	Sex, ethnicity group, age group, number of chronic health conditions, income group, education, presence of children and/or	High crime perception was associated with lower levels of "sufficient combined activity (walking and MVPA)" and with "sufficient VPA".

Physical activity and safety from crime

First author (year)	Location	Sample size and age	Instruments	Safety measures	Physical activity measures	Statistical adjustment	Main findings
					MVPA); (4) Sufficient Walking; (5) Sufficient by other moderate activity; (6) Sufficient by vigorous activity; (7) Sufficient MVPA.	infants in household, town or city category	
Giles-Corti (2013) ⁽⁴⁵⁾ * Prospective study	New housing developments across metropolitan Perth, Australia	1420 (adults, 18+ years) (People building new homes)	NPAQ - neighborhood Physical Activity Questionnaire	Perceived safety from crime (decrease, no change and increase)	Recreational and leisure neighborhood walking (Changes in total weekly minutes of neighborhood recreational and transport-related walking calculated from T1 to T2)	Specific safety from crime associations were presented only in the unadjusted analyses.	Increasing perceived safety from crime was not associated with both leisure and transport neighborhood walking.

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First author (year)	Location	Sample size and age	Instruments	Safety measures	Physical activity measures	Statistical adjustment	Main findings
Gomes (2011) ⁽³⁵⁾	Three cities in Brazil (Recife, Curitiba and Vitoria)	6166 (18+ years)	NEWS-A and long IPAQ	Perception of safety with two questions about safety to walking/bicycling during the day and at night (yes/no).	Self-reported walking/cycle in the leisure-time (active: ≥ 150 min of walking/wk.).	Demographics variables (gender, age, education level, marital status), perceived health, BMI, and others perceived environmental variables (sidewalks on nearby streets and traffic) * pooled analysis and stratified by city	No associations were found with perceived safety to cycle/walk during day or night across all three cities and in the pooled analysis.
Granner (2007) ⁽⁹²⁾	Two adjacent counties in South Carolina, USA	1806 (18+ years)	BRFSS	Perception of safety of recreational areas in the county used for PA and perception of safety of trails from crime (safe/unsafe).	Self-reported MVPA categorized as meet or not PA recommendation and self-reported walking categorized as regular walker (≥ 5 times/wk., 30 min/day) or irregular walker.	Age, sex, race, education, and employment status	Safety of trails from crime was negatively associated with meeting PA recommendations and with regular walking.

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First author (year)	Location	Sample size and age	Instruments	Safety measures	Physical activity measures	Statistical adjustment	Main findings
Hallal (2010) ⁽³⁴⁾	Recife, Brazil	2046 (16+ years)	NEWS-A and long IPAQ	Safety from crime for walking or bicycling during the day and at night, street lighting and number of assaults in the neighborhood (safe/unsafe).	Self-reported LTPA, Transport-PA and Walking for leisure. A cut-off of ≥ 150 min/wk. was used for all outcome variables.	Model 1: unadjusted, Model 2: adjusted for age, sex, education level, skin colour, marital status, participation in ACP*, and having heard about ACP; Model 3: adjusted for above confounders and other environmental variables tested *Programa Academia da Cidade (city gyms).	Personal safety was not significantly associated with LTPA, transport-related PA, and walking.

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First author (year)	Location	Sample size and age	Instruments	Safety measures	Physical activity measures	Statistical adjustment	Main findings
Harrison (2007) ⁽²⁰⁾	Two districts in northwest England, UK	15461 (adults)	From previous national surveys	Perceptions of safety with two questions about how much problem are vandalism and assaults or muggings in the neighborhood (not a problem, some problem, serious problem). Personal experience of crime in the past year (yes/no) and Whether they felt safe “out and about” in their neighborhood during the day and at night (yes/no).	Self-reported information about how many times in the past week they had engaged in light, moderate or vigorous activity for a session lasting at least 15 min. Physically active was defined as participating in at least five sessions per week of moderate or vigorous physical activity.	Age, sex, ethnicity and deprivation	People who felt unsafe out and about in their neighborhood during the day and at night were significantly less likely to be defined as physically active compared with those who felt safe during these times. All other associations tested were non-significant in the adjusted models.

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First author (year)	Location	Sample size and age	Instruments	Safety measures	Physical activity measures	Statistical adjustment	Main findings
Heesch (2014) ⁽⁶²⁾	Brisbane, Australia	11036 (adults, 40 - 65y)	NEWS-A	Perceived crime in the neighborhood	Recreational cycling in the last 12 months, and transport cycling in the last week. Participants were categorized as: (1) non-cyclists if they reported recreational cycling less than monthly and no minutes of utility cycling; (2) recreation-only cyclists if they reported recreational cycling at least monthly and no minutes of utility cycling, and (3) utility cyclists if they reported any minutes of utility cycling in addition to any reports of recreational cycling	Adjusted for age, gender, and household composition and for clustering within the 200 neighborhoods. Final model also adjusted for socio-economic, neighborhood environment perceptions and psychological disposition variables with $p < 0.10$.	There was no association between perceived crime and only recreational cycling. High crime perception decreased odds of utility cycling.

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First author (year)	Location	Sample size and age	Instruments	Safety measures	Physical activity measures	Statistical adjustment	Main findings
Hoehner (2005) ⁽⁴⁹⁾	USA (Higher- and lower-income areas of St. Louis MO (representing a low-walkable city) and Savannah GA (representing a high-walkable city))	1068 (18+ years)	long IPAQ	Safety objectively measured according the count of crime watch signs. Perception of safety from crime was assessed with one question about how safe from crime do the participants feel while walking/riding their bike in neighborhood (extremely, quite, slightly, or not at all safe).	Self-reported TRPA according: (1) Engaged in any vs. no transportation activity and; (2) met or did not meet PA guidelines (≥ 150 min/wk.). Recreational PA was also measured and categorized into met or did not meet guidelines.	Age, gender, and education level	No associations between safety from crime (objective and subjective measures) and any physical activity variables.
Hooker (2005) ⁽⁹³⁾	Rural county in South Carolina, EUA	1165 (18+ years)	BRFSS	Safety-related environmental supports for PA: streetlight quality, the safety of public recreational facilities, and overall neighborhood safety.	Self-reported PA categorized as meeting the guidelines or not (≥ 150 min/wk.) and walking categorized as meeting the guidelines or not (≥ 150 min/wk.).	Education, age, sex, and stratified by race/ethnicity	Neighborhood safe from crime was positively associated with walking only among white Americans. All other associations tested were non-significant in the adjusted models.

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First author (year)	Location	Sample size and age	Instruments	Safety measures	Physical activity measures	Statistical adjustment	Main findings
Huston (2003) ⁽⁹⁴⁾	5 Counties in North Carolina (Cabarrus, Henderson, Pitt, Robeson, Surry, and Wake), USA	1796 (18+ years)	BRFSS	Perception of safety from crime in the neighborhood (extremely/quite safe and slightly/not at all safe).	Self-report LTPA in the past month categorized as (1) any activity/none; and (2) meet guidelines (moderate PA ≥ 5 x/wk., ≥ 30 min/day or vigorous PA ≥ 3 x/wk., ≥ 20 min/day).	Sidewalks, trails, heavy traffic, streetlights, unattended dogs, safety of neighborhood, access to places for PA, sex, age, race, education	Safety of neighborhood was not associated with any activity or recommended activity in unadjusted or adjusted models.
Inoue (2010) ⁽⁷⁶⁾	Japan - 4 cities (Koganei, Tsukuba, Shizuoka, Kagoshima)	1461 (20-69 years)	NEWS-A	Personal safety from crime estimated as the mean of scale items that used 4 point Likert scale.	Self-reported days/week walking and duration of walking per day categorized into four groups: (1) walking for daily errands; (2) commuting to work; (3) walking for leisure; and (4) neighborhood walking (sum of all categories).	Age, sex, location of residence, education, BMI and self-rated health	Personal safety was not significantly associated with any walking categories.
Inoue (2011) ⁽⁷⁷⁾	Three cities in Japan (Oyama,	1921 (65-74 years)	IPAQ-E	Perception of safety from crime (poor/good)	Self-reported frequency and duration of walking	Age, sex (also stratified by sex),	Perception of safety from crime was inversely

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First author (year)	Location	Sample size and age	Instruments	Safety measures	Physical activity measures	Statistical adjustment	Main findings
	Bunkyo and Fuchu)			evaluated with an statement about safety from crime (strongly disagree, somewhat disagree, somewhat agree, and strongly agree).	in three variables: (1) transportation walking for daily activity (≥ 60 min/wk. or not), (2) recreational walking (≥ 60 min/wk. or not), and (3) total neighbourhood walking (transportation or, recreational ≥ 150 min/week or not).	employment status, educational level, BMI, and self-rated health	associated with walking for transportation in men. All other associations tested were non-significant in the adjusted models.
Jack (2014) ⁽⁷³⁾	Calgary, Alberta, Canada (mail and telephone-based survey)	1875 (adults, 18+ years) (~30% response-rate)	Adapted long IPAQ and NEWS-A	Perceived safety from crime	Neighborhood-based transportation and recreational walking (≥ 10 min/week classified as "walkers")	Adjusted for age, gender, education, home ownership, dependents, years lived in neighborhood, attitude towards walking, reasons for neighborhood choice and other self-reported environmental	No associations between safety from crime and participation in walking for transportation. In model 3, safety from crime was inversely associated with minutes/week walking for transportation. Interaction was found between High walkability and safety from crime, where the inverse association with

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First author (year)	Location	Sample size and age	Instruments	Safety measures	Physical activity measures	Statistical adjustment	Main findings
						variables (model 2). Model 3 also included all statistically significant interaction terms retained in the model.	minutes/week spent in walking for transportation was stronger. No associations were found between safety from crime and participation in leisure-time walking and minutes/week in leisure-time walking.
Jia (2014) ⁽³⁹⁾	Minhang district of Shanghai, China	1528 (15 - 75 years)	long IPAQ and NEWS-A	Perceived crime safety based on three items (total crime rate, crime rate during the day, and crime rate at night (total score used as continuous variable).	Minutes/week spent in walking for transport and leisure were analyzed according reaching or not 90 min/week.	Adjusted by gender, age, location of the community, education levels, employment status, BMI, marital status, physical activity knowledge score, and hypertension.	Crime safety was not associated with neither walking for transportation, nor leisure-time walking. Stratified analyses for sex, current workers and retired participants did not found any association as well.

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First author (year)	Location	Sample size and age	Instruments	Safety measures	Physical activity measures	Statistical adjustment	Main findings
Jongeneel-Grimen (2014) ⁽⁴⁴⁾ * Prospective study	Netherlands	25309 (adults, 18 - 84 years)	Designed for this specific study	Fear of crime based on agreement with the sentence "I am afraid to be assaulted or robbed in this neighborhood". Five-point scale from 1 (totally disagree/totally unsatisfied) to 5 (totally agree/totally satisfied) (reversed). Fear of crime in 2006 and change in fear of crime was calculated by subtracting fear of crime score in 2006 from that in 2009	Measured in the single question: "How many hours a week do you spend on physical activity or sports?" Those engaging in PA at least 1 hour/week were considered active (2009).	All models were adjusted for gender, age, employment status, education, household income, and degree of urbanization of municipality	Lower fear of crime in 2006 was associated with higher odds of being active in 2009 for all gender and age groups. However, changing (improvements) in the fear of crime from 2006 to 2009 was only positively associated among those aged 18 - 34 years. Duration of residence at current address did not modify the association between fear of crime and physical activity.

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First author (year)	Location	Sample size and age	Instruments	Safety measures	Physical activity measures	Statistical adjustment	Main findings
Kamphuis (2008) ⁽⁵⁵⁾	Eindhoven, Netherlands	3839 (25-75 years)	SQUASH	Agreement or not if the neighborhood is unsafe (Agree or disagree).	Self-reported sports participation weekly with at least moderate intensity or not (moderate intensity = 4–6 METs for 18–55 year old; 3–5 METs for 55+ year old).	Model 1: Age, sex, and country of origin; Full Model: Age, sex, country of origin and, household, individual and environmental variables	Agreement that the neighborhood is unsafe was positively associated with no sports participation (Model 1). In the full model safety remained statistically significant.
King (2000) ⁽⁶⁶⁾	Rural and Urban area in USA (national sample of minority women)	2912 (40+ years - only women)	BRFSS, the National Health Interview Survey, and other surveys	Three questions assessing safety from crime: Rated the presence or absence of high levels of crime; How safe it was to walk or jog alone in their neighborhood during the day (dichotomized unsafe or safe) and; Personal barriers: Lack safe	Engagement reported in any of a number of aerobic activities in the past two weeks (frequency, duration and intensity). PA was categorized as sedentary (no reported sports or exercise) and active (achieve the guidelines) and Underactive (not meeting the criteria for	Race/ethnicity (after stratified), age, employment, marital status, education, location (rural/urban), neighborhood characteristics, days physical health was not good, limited in	Any safety from crime variables were not associated with physical inactivity

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First author (year)	Location	Sample size and age	Instruments	Safety measures	Physical activity measures	Statistical adjustment	Main findings
				place to exercise (yes/no).	sedentary or active). In the logistic regression: Inactive or Underactive/active).	activities owing to health, home-based exercise preference, and personal barriers	
Kramer (2013) ⁽²⁸⁾	Netherlands (national health survey)	20046 (adults, 18+ years)	SQUASH (Short Questionnaire to Assess Health-enhancing)	Crime-related fear based on fear to be troubled or robbed in this neighborhood (general safety was available but it was not evaluated in this systematic review).	Total minutes per week spent on leisure-time walking and cycling (categorized as inactive or active - ≥ 30 minutes/week)	Adjusted for age, gender, ethnicity, household composition, education, income, wealth and population density	Leisure walking was not associated with crime-related fear, but leisure cycling (≥ 30 minutes/week) was inversely associated with crime-related fear.
Leslie (2010) ⁽⁹⁵⁾	Areas of high and low SES in City of Greater Geelong, Australia	502 (18+ years)	NPAQ - Neighborhood Physical Activity Questionnaire	Perception of safety from crime (yes/no).	Self-reported frequency and duration of walking for recreation and transportation.	Age, children in household, gender, working status, self-reported health status, educational attainment, and dog ownership	A higher level of safety from crime in neighborhood was negatively associated with minutes walking for transport and total minutes walking (transport and recreation).

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First author (year)	Location	Sample size and age	Instruments	Safety measures	Physical activity measures	Statistical adjustment	Main findings
Li (2014) ⁽⁹⁶⁾	California, USA	1045 (older Asian adults, 55+ years) Telephone-based survey	Designed for this specific study	Perceived neighborhood safety based on agreement with the sentences “Many people in this neighborhood are afraid to go out at night”, and the question asking if participants home have ever been broken into. Respondents who strongly agreed or agreed that people were afraid or had their homes broken into were coded as living in an “unsafe” neighborhood.	Frequency and total duration of walking for transport and leisure in the past week.	Adjusted for gender, immigration status, marital status, poverty level, educational attainment, employment status, health conditions (asthma and heart diseases), instrumental activities of daily living, and body mass index groups	Perceived neighborhood safety was not associated with walking. Stratified analyses for specific Asian subgroups found a positively association between perceived safety and minutes of walking among those classified as older Filipino adults.

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First author (year)	Location	Sample size and age	Instruments	Safety measures	Physical activity measures	Statistical adjustment	Main findings
Lim (2005) ⁽⁹⁷⁾	New South Wales Australia	8881 (65+ years)	Designed for this specific study	Whether respondent feels safe in neighborhood (all or most of the time versus some or none of the time).	Self-reported PA according guidelines classified as adequate or not adequate (Walking, MPA or VPA for at least 30 min, 5 times/wk.).	Age, sex, area of residence, physical functioning, health characteristics and others	No associations in fully adjusted models.
Mason (2013) ⁽²⁷⁾	Deprived neighborhoods in Glasgow, Scotland, UK	3824 (adults)	Designed for this specific study	(1) Reported crime objectively measured (crimes that had occurred in the city during the 5-year period). The combinations of crime category (person or property), averaging period (1, 3 or 5 years) and measure (frequency or rate) yielded 12 estimates. (2) Perceptions of crime and disorder: Neighborhood	Days of neighborhood walking in the last seven days, for at least 20 min at a time (0, 1 - 4 days and 5 - 7 days)	Multilevel analysis: Included all crime/safety variables adjusting for socio-demographic characteristics (model 3) and; the same model plus variables from the home and neighborhood, psychosocial, and amenities and	Crime objectively measured: Five-year recorded person crime rate was positively associated with a higher odds of more frequent walking (unadjusted for individual variables). Property crime was not associated with walking. People being drunk or rowdy in public places, house break-ins/burglary considering as neighborhood serious

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First author (year)	Location	Sample size and age	Instruments	Safety measures	Physical activity measures	Statistical adjustment	Main findings
				problems (vandalism, graffiti, deliberate damage to property/vehicles; violence (assaults and muggings), among others. (3)Perceptions of safety from crime: based on 6 items such as ratings of the home as a place of safety and of refuge; sense of neighborhood safety (feeling safe walking after dark); quality of local policing, among others.		services groups (model 4).	problems was inversely associated with walking. People using or dealing drugs was positively associated with walking. Perceived safety from crime: Feeling safe in their home and feeling safe walking alone in the neighborhood after dark were positively associated with more frequent walking.
McCormack (2009) ⁽⁵⁶⁾	Province of Alberta, Canada	1041 (18+ years)	IPAQ Environmental Module and Godin Leisure-Time	Agreement that crime rate in the neighborhood makes it unsafe to go for walks at night (5 point Likert scale: strongly disagree	Self-reported frequency, duration and intensity of leisure-time MVPA.	Age, education, and other self-reported environmental variables and stratified by sex	Agreement that crime rate in the neighborhood makes it unsafe to go for walks at night was statistically associated with vigorous PA in men only; and

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First author (year)	Location	Sample size and age	Instruments	Safety measures	Physical activity measures	Statistical adjustment	Main findings
			Exercise Questionnaire	to strongly agree).			associated with moderate PA in women only.
McGinn (2008) ⁽¹⁷⁾	Forsyth County, NC, and the city of Jackson, MS, USA	1659 (18+ years)	BRFSS	<p>(1) Perception of crime with 6 questions (4-point Likert scale) and after general score divided in quartiles.</p> <p>(2) Perception if crime, or fear for personal safety, was a barrier to being physically active (yes/no).</p> <p>Objective (only 303 people): Crimes (criminal offenses, incivilities, and traffic-related offenses) were mapped with GIS according the number</p>	<p>Self-reported PA measured into four variables: (1) LTPA; (2) Outdoor LTPA; (3) Walking (Three categories for all variables - meet guidelines, insufficiently active and, inactive) and; (4) Transportation activity (bicycling or walking at least 10 min).</p>	<p>Race/ethnicity, age, gender, and study area.</p> <p>Further adjustment for marital status, work activity, number of children in the household, education, household income, availability of motor vehicle for personal use, general health, disability that</p>	<p>According to crime subjectively measured, respondents perceiving less crime in their neighborhood were more likely to be active than to be inactive for leisure physical activity. Furthermore, those who perceived crime as not being a barrier to physical activity were 40% more likely to meet PA guidelines during leisure activities. No associations between perceived crime and walking or transportation activity were found.</p>

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First author (year)	Location	Sample size and age	Instruments	Safety measures	Physical activity measures	Statistical adjustment	Main findings
				of calls for police service.		limits physical activity, or census level income	In terms of crime objectively measured, those participants whose in 1-mile buffers were categorized as having low crime were about 2.5 times more likely to meet PA guidelines in the leisure activity. Analysis with criminal offenses and LTPA showed a stronger association with LTPA and incivilities were not associated with LTPA. Objectives measures and walking and transportation activity were not associated as well.
Mendes (2014) ⁽²⁶⁾	Pelotas, Brazil	2874 (adults, 20+ years)	Adapted version of long IPAQ, NEWS and CSI (Crime	Perceived insecurity from crime based on five questions about (1) mild crimes (2) serious crimes, (3) drug dealers	Transport-related physical activity was based only on walking or bicycle riding (categorized as practice	Adjusted for sex, skin color, age, schooling, income and place of residence	No associations between perceived insecurity from crime and leisure-time or transport-related physical activity were found. The

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First author (year)	Location	Sample size and age	Instruments	Safety measures	Physical activity measures	Statistical adjustment	Main findings
			Stress Inventory	near home, and safety to physical activity practice in the neighborhood (4) during the day and (5) at night.	yes/no). Leisure-time physical activity was based on frequency and duration of walking, running and bicycle riding (categorized as meeting or not ≥ 150 min/week).		same result was found when the analysis was restricted to individuals that reported leisure-time activity practice near their residences.
Osuji (2006) ⁽⁹⁸⁾	Missouri, Tennessee, Arkansas USA (Rural Areas that had walking trails available to community members)	1877 (18+ years - Rural women only)	BRFSS	Perception the community unsafe from crime and no safe place to exercise (Variables coded sometimes/often vs. rarely/never).	Number of days and number of minutes per day self-reported in a usual week that they engaged in physical activities (meet PA recommendation - ≥ 150 minutes per week).	Adjusted for age and income	Women who reported community not safe from crime were 1.3 times less likely to meet PA guidelines for moderate-intensity activity. No association was found between lack of safe place to exercise and not meeting PA guidelines.
Oyeyemi (2011) ⁽³⁸⁾	Students in the University Ibadan, in the capital city of Oyo State,	1006 (18-65 years - undergraduates students)	PANES questionnaire and IPAQ (Short version)	Safety from crime derived from two statements assessing if "the crime rate in their neighborhood makes it	Self-reported PA categorized as (1) meeting guidelines with MVPA and walking or not and; (2) meeting	Adjusted for age, body mass index, gender, and residence hall, after stratified by	Meeting the guidelines with walking was associated with higher safety from crime at night. All other associations tested were

Physical activity and safety from crime

First author (year)	Location	Sample size and age	Instruments	Safety measures	Physical activity measures	Statistical adjustment	Main findings
	Nigeria			unsafe to walk at night and during the day. Answers dichotomized in “agree” and “disagree”.	guidelines only with walking or not.	sex	non-significant in the adjusted models.
Parra (2011) ⁽³⁶⁾	Curitiba, Brazil	2097 (adults)	News and long IPAQ	Perception of personal safety according nearby crime incidents and safety from crime when walking or bicycling at night and during the day (low, middle and high personal safety).	Self-reported walking and bicycling for transportation (any vs. none) and; walking and MVPA during the leisure-time (any vs. none).	Age, gender, education level, and car ownership	Those who reported perceptions of moderate and high personal safety were more likely to be classified as having any walking for transportation (low=reference). All other associations tested were non-significant in the adjusted models.
Pichon (2007) ⁽⁹⁹⁾	Southwest region of San Diego County, USA	526 (21-74 years - Women only)	short IPAQ	Perceived safety defined as "too much crime" (yes/no).	Self-reported PA categorized as meeting vs. not meeting guidelines (30 min MPA, 5 days/week or 20 min VPA 3 days/week) and other variable comparing	Education and Marital status	Perceived neighborhood safety was not significantly related to physical activity variables.

Physical activity and safety from crime

First author (year)	Location	Sample size and age	Instruments	Safety measures	Physical activity measures	Statistical adjustment	Main findings
					regular walkers (≥ 150 min/week) vs. non-regular walkers.		
Piro (2006) ⁽¹⁴⁾	Oslo, Norway	3499 (75-76 years) *53.2% response rate	Designed for this specific study	Perceived safety was assessed by the question: "Would you feel safe walking alone in your neighborhood in the evening?" (feeling safe or feeling lightly/or very unsafe). Safety was also measured objectively according the cases of violence per 1000 inhabitants (dichotomized by the median value).	Physical activity was assessed by the single question: "What kind of PA have you undertaken in the course of the past year?" (dichotomized into physical activity less than one hour a week and more than one hour a week)	Sex (later stratified by sex), medical conditions, marital status, income, education, fortune, average income, residence period	With the entire sample, only self-perceived safety was positively associated with physical activity. Among men, neighborhood violence level objectively measured was negatively associated with physical activity and self-perceived safety was not. Among women, neighborhood violence level objectively measured was not associated and self-perceived safety was positively associated with physical activity

Physical activity and safety from crime

First author (year)	Location	Sample size and age	Instruments	Safety measures	Physical activity measures	Statistical adjustment	Main findings
Poortinga (2006) ⁽⁵⁷⁾	England (National Survey for England)	14836 (16+ years)	Designed for this specific study	Social nuisances assessed in two items: (1) Teenagers hanging around. (2) Vandalism, graffiti, damage to property (not a problem vs. fairly/very big problem).	Number of days during the last 4 weeks that people reported have been moderately or vigorously active for at least 30 min (all domains) in three variables: (1) Number of walks/wk. (<1 vs. ≥1). (2) Number of sport days/wk. (<2 vs. ≥2). (3) Number of active days/wk. (<5 vs. ≥5).	Socio-demographic, social support/capital, and perceptions of the environment variables	Perceived social nuisances in terms of "Vandalism, graffiti, damage to property" was associated with a greater likelihood of being active on at least 5 days of the week. Others social nuisances variables were not associated with walking, sports, or active days.
Prince (2011) ⁽⁴⁸⁾	Ottawa, Canada	5025 (18+ years)	Short IPAQ	Neighborhood safety was objectively evaluated using City of Ottawa Police 2006 crime incidence rates for each neighborhood aggregated to crimes against property and crimes against person.	Self-reported PA in two categories according meet or not the guidelines: insufficiently active and active.	Age, education, household income, smoking status, season of collection and others built and social environmental variables	The present investigation identified no significant associations between crime and PA.

Physical activity and safety from crime

First author (year)	Location	Sample size and age	Instruments	Safety measures	Physical activity measures	Statistical adjustment	Main findings
Rech (2012) ⁽²⁵⁾	Curitiba, Brazil (neighborhoods with different economic and environmental conditions)	1261 (18+ years)	NEWS and long IPAQ	Three questions dichotomized and one score (range 0 to 3) with this three questions: (a) Are there many crimes in your neighborhood? (b) Is it safe to walk during the day in your neighborhood? And; (c) Is it safe to walk during the night in your neighborhood?	Self-reported physical inactivity was defined as performing “zero” min/wk. for (1) walking; (2) MVPA in the leisure-time and; (3) walking for transportation.	(1)Sex, age, SES, private transport use and home facilities to PA; (2)Sex, age, nutritional status, SES, marital status, children, private transport use and home facilities to PA; (3)Sex, age, SES, marital status, private transport use. *Interactions with sex, SES, private transport and private home equipment	Only individuals who perceived unsafely to walk at night were 27% less likely to be inactive in walking for transportation. All other associations tested were non-significant in the adjusted models. Interactions were found between (a) safe for walking during the day and walking for leisure and gender; (b) Score of safety and SES; (c) MVPA and home equipment for PA and; (d) Walking for transportation and private transport.

Physical activity and safety from crime

First author (year)	Location	Sample size and age	Instruments	Safety measures	Physical activity measures	Statistical adjustment	Main findings
Rech (2014) ⁽³⁷⁾	Curitiba, Brazil (neighborhoods with different economic and environmental conditions)	1461 (adults, 18+ years)	Long IPAQ and NEWS-A	Perceived neighborhood safety from crime	Self reported leisure-time physical activity separately: leisure-time walking and MVPA (≥ 150 min/week)	Adjusted for gender, age, marital status, socioeconomic status and weight status	LTPA was associated with safety from crimes. However, this association was moderated by age. The association between perceived neighborhood safety from crime and LTPA was significant for the age group ≥ 40 years, and not significant in young people.
Reed (2007) ⁽¹⁰⁰⁾	Liberal arts college on a rural campus in the south-eastern United States	560 (18-23 years - undergraduate students) *20% response rate	SCESPAQ - South Carolina Environmental Supports for PA Questionnaire and NCHR.S - National College	Perception of safety from crime	Self-reported moderate and vigorous intensity PA. Moderate was defined through how many of the past 7 days did the participants walk or bike for at least 30 min at a time. Vigorous was defined through how many of the past 7 days did the	Not reported	No significant associations between physical activity and safety for crime in either gender.

Physical activity and safety from crime

First author (year)	Location	Sample size and age	Instruments	Safety measures	Physical activity measures	Statistical adjustment	Main findings
			Health Risk Behaviour Survey		participants exercise for at least 20 min that made you sweat and breathe hard.		
Ross (2000) ⁽¹⁰¹⁾	Illinois, USA	2482 (18+ years)	Designed for this specific study	Fear was measured as a mean-score index of the number of days in the last week that someone: (1) feared being robbed, attacked, or physically injured; (2) worried that their home would be broken into; and (3) felt afraid to leave the house.	Walking was measured as the reported number of days walked per week, and exercise was measured as the number of days of strenuous exercise per week.	Neighborhood poverty, education, and racial and ethnic composition, individual and geographic characteristics and significant moderators or mediators	People who feel afraid in their neighborhood are significantly less likely to walk. No association was found with strenuous exercise.
Saelens (2012) ⁽⁴⁶⁾	King County–Seattle, WA, and Baltimore, MD–Washington, DC, USA	2199 (20+ years)	NEWS, IPAQ (walking) and accelerometers	Safety from crime according four items from the NEWS.	Objectively PA measured by accelerometer's (accelerometers counts converted for MVPA minutes) and self-reported leisure-time and transport-related	Demographic, psychological and environment variables; and repeated measures over time, site (Seattle, Baltimore),	No associations in fully adjusted models.

Physical activity and safety from crime

First author (year)	Location	Sample size and age	Instruments	Safety measures	Physical activity measures	Statistical adjustment	Main findings
					walking.	season, subjects nested within census blocks, and census blocks nested within neighborhoods	
Saito (2014) ⁽⁷²⁾	Fujisawa, Japan (mail-based survey)	2449 (adults, 40 - 69 years)	Long IPAQ and IPAQ-E	Perceived safety from crime	Moderate-to-vigorous LTPA, recreational walking and transportation walking (dichotomized according to the median)	Gender, age, and education and other independent individual and environmental variables with $p \leq 0.10$ in the crude analyses	Crime safety was not associated with any physical activity variable and it was not included in the final model
Sallis (2007) ⁽⁴³⁾ *Prospective	Three regions in the USA (Tennessee, California and Texas)	861 (35-75 years)	Designed for this specific study	Perception of safety from crime (safe or unsafe) assessed with two items: (1) Perception of high crime? (yes/no); (2) How safe do you feel walking in your neighborhood during	Self-reported MVPA measured with 7 day recall interviews at baseline and follow-up.	Adjusted for experimental conditions and other potential moderators	High crime predicted women participating in about 1 hour less/week of MVPA. High crime did not predict MVPA in men.

Physical activity and safety from crime

First author (year)	Location	Sample size and age	Instruments	Safety measures	Physical activity measures	Statistical adjustment	Main findings
				the day? (1=very unsafe-4=very safe).			
Sallis (2009) ⁽¹⁰²⁾	11 countries: Belgium, Brazil, Canada, Colombia, China (Hong Kong), Japan, Lithuania, New Zealand, Norway, Sweden, USA	11541 (18+ years)	PANES or IPS Environmental Module and short IPAQ	Perception crime as a barrier to walking at night (agree or disagree).	Self-report PA categorized according meeting guidelines or not (≥ 3 days of VPA for at least 20 min/day or ≥ 5 days of MPA or walking at least 30 min/day or ≥ 5 days of any combo of walking or MVPA with min of 600 MET min/wk.).	Gender, age, and country	Safety from crime and meeting physical activity guidelines was not statistically significant associated.
Salmon (2003) ⁽¹⁰³⁾	Australia	1332 (18+ years)	Designed for this specific study	Safety assessed on a 5 point likert scale and dichotomized (≤ 2 =low barrier).	Four variables of self-reported LTPA: (1) Walking: < 2.5 hr./wk. vs. ≥ 2.5 hr./wk.; (2) Other moderate: < 2.5 hr./wk. vs. ≥ 2.5 hr./wk.; (3) Vigorous: < 1.0 hr./wk. vs. ≥ 1.0 hr./wk. and; (4) Total LTPA: < 2.5 vs. ≥ 2.5 hr./wk..	Sex, age, education, and all predictor variables	Safety was not predictor for PA variables.

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First author (year)	Location	Sample size and age	Instruments	Safety measures	Physical activity measures	Statistical adjustment	Main findings
Salvo (2014) ⁽⁴¹⁾	Cuernavaca, Mexico	662 (adults, 20 - 65 years, living in areas with low and high walkability and SES)	NEWS and Accelerometers	Perception of neighborhood safety (safe/unsafe)	Minutes spent in MVPA objectively measured by accelerometer.	Adjusted models control for total accelerometer wear time, sex, age, individual socioeconomic status, education, marital status, motor vehicle ownership, and body mass index.	Perceived neighborhood safety was not significantly associated with total minutes of MVPA or MVPA within bouts.
Sanderson (2003) ⁽¹⁰⁴⁾	Three rural Alabama counties, USA	567 (20-50 years - Only rural African American women)	Designed for this specific study	Perception of safety from crime dichotomized into extremely/ somewhat safe or slightly/not at all safe.	Self-reported MVPA according two different variables: (1) Inactive and insufficiently active OR meets recommendations and, (2) inactive OR insufficiently active and meets recommendations.	Age, education, annual household income, employment, marital status, number of children, and general health	Safety from crime was not significantly associated with physical activity.

Physical activity and safety from crime

First author (year)	Location	Sample size and age	Instruments	Safety measures	Physical activity measures	Statistical adjustment	Main findings
Saris (2013) ⁽⁷⁴⁾	Deprived neighborhoods, Netherlands	622 (adults)	SQUASH and NEWS	Safety from crime based on 5 items ("e.g., because of criminality it is unsafe to walk in my neighborhood during the day")	Active transport was defined as the minutes/week spent on (a) walking or (b) cycling with that purpose.	Adjusted for age, sex, ethnicity, BMI, and environmental characteristics	Safety from crime was neither significantly associated with walking for transportation, nor cycling for transportation
Sharpe (2004) ⁽¹⁰⁵⁾	Two South Carolina Counties, USA	1936 (18+ years)	BRFSS (2001), items adapted from other surveys, and items developed for this project	Safety perception of areas in county to participate in PA (safe/unsafe).	Self-reported MVPA according meet or not the guidelines (Guidelines set in 2000: Moderate PA \geq 5x/week, \geq 30min/day or Vigorous PA \geq 3x/week or \geq 20 min/day).	Sex, race, age, and education	No statistically significant association was found in the adjusted analysis.

Physical activity and safety from crime

First author (year)	Location	Sample size and age	Instruments	Safety measures	Physical activity measures	Statistical adjustment	Main findings
Shenassa (2006) ⁽²¹⁾	Eight European cities in France, Germany, Slovakia, Hungary, Portugal, Italy, Switzerland, and Lithuania	5338 (18+ years)	Designed for this specific study	Do you feel safe returning to your home when it is dark? (yes, to some extent, no, no at all - Dichotomized: feeling safe vs. unsafe).	Single item assessing PA: "Which statement do you think best describes your amount of sport or physical exercise?" (1) I never do sport/physical exercise (No current exercise); (2) I occasionally do sport/physical exercise (Occasional exercise) and; (3) I frequently do sport/exercise on a moderate level or intense level (Frequent exercise).	Age, gender, marital status, education and stratified by sex	Perceived safety was positively associated with occasional exercise but was not associated with frequent exercise in the entire sample. The same was found among men, but among women, perceived safety was positively associated with occasional exercise and frequent exercise.
Shigematsu (2009) ⁽¹⁰⁶⁾	King County (Seattle area), USA	1623 (20-97 years)	NEWS, IPAQ and CHAMPS (walking)	Safety from crime based on 3 items from NEWS (safe/unsafe).	Self-reported walking for transportation and leisure-time (hr./wk.).	Sex, BMI, education level, income, and driver's license	Safety from crime was inversely correlated with walking for transport among adults age 20-39 and age 50-65. Safety from crime inversely correlated

Physical activity and safety from crime

First author (year)	Location	Sample size and age	Instruments	Safety measures	Physical activity measures	Statistical adjustment	Main findings
							with walking for leisure among adults age 20-39.
Solomon (2013) ⁽⁷¹⁾	Rural areas across Devon, England (mail-based survey)	2415 (adults, 18+ years) *37.7% response rate	Short IPAQ	Perception of safety of walking after dark, categorized into “Unfavourable”, “Neutral”, and “Favourable”	Self-reported PA categorized as meeting vs. not meeting guidelines (≥ 150 min/week of MPA or ≥ 75 min/week VPA), and total MET/week.	Personal, social, environmental, and village-level factors associated in the crude analysis.	Safety to walk after dark was not associated with meeting physical activity guidelines nor total MET/week.
Su (2014) ⁽⁴⁰⁾	Hangzhou, China	1434 (25 - 59 years)	Long IPAQ and NEWS-A	Safety from crime based on street lighting, and perception of safety during the day and at night.	Frequency and duration of walking, moderate, and vigorous intensity PA for leisure purposes were converted to METs of leisure-time overall PA and leisure-time walking. Participants were classified as reaching or not the guidelines.	Adjusted for perceived built environment in individual and neighborhood-level.	Safety from crime was neither significantly associated with overall leisure-time physical activity, nor leisure-time walking (for both males and females).

Physical activity and safety from crime

First author (year)	Location	Sample size and age	Instruments	Safety measures	Physical activity measures	Statistical adjustment	Main findings
Sugiyama (2009) ⁽⁶⁴⁾	Adelaide, Australia	2194 (18+ years)	NEWS	Perception of safety from crime with four items combined: few petty crimes, few major crimes, safe to walk around during day, safe to walk around at night.	Self-reported MVPA performed in streets (number of days); dichotomized using median split (≤ 4 days vs. > 4 days).	All models were adjusted for age, gender, educational attainment, work status, and annual household income level Model 1 included the neighborhood attributes and access score within 10- (Model 2 20-min walk)	Safety was not significantly associated with neighborhood street use for physical activity.

Physical activity and safety from crime

First author (year)	Location	Sample size and age	Instruments	Safety measures	Physical activity measures	Statistical adjustment	Main findings
Sugiyama (2014a) ⁽⁶⁰⁾	12 Countries (17 study sites - Australia, Belgium, Brazil, Colombia, Czech Republic, Denmark, Hong Kong, Mexico, New Zealand, Spain, United Kingdom and USA)	13745 (Adults, 18 - 66y, living in areas with low and high walkability and SES)	Long IPAQ and NEWS	Perceived safety from crime based on: (1) High crime rate perception; (2) Unsafe to walk during the day; (3) Unsafe to walk at night.	Frequency (days/week) and duration (min/week) of walking for recreation. Three outcome variables: (1) Any walking for recreation. (2 and 3) Non-zero frequency (days/week and minutes/week) of walking for recreation.	Adjusted for other perceived environmental characteristics, age, gender, marital status, educational attainment, work status, and socio-economic status	The logits of walking for recreation were linearly positively related to perceived safety from crime. This association was not found evaluating non-zero frequency (days/week and minutes/week) of walking for recreation.

Physical activity and safety from crime

First author (year)	Location	Sample size and age	Instruments	Safety measures	Physical activity measures	Statistical adjustment	Main findings
Sugiyama (2014b) ⁽⁶¹⁾	Northern and western regions of metropolitan Adelaide, Australia	1712 (adults, 18 - 85 years)	NEWS and other designed for this specific study	Crime concern (a lot of petty crime, a lot of major crime, unsafe to walk during the day, unsafe to walk at night, not feeling safe walking home from bus/train stops at night, not free from litter/rubbish/graffiti). Variable was dichotomized into “poorer” and “better” using a median split.	Number of times participants walked for sport, recreation, or fitness in the last two weeks. Outcome classified as 'no walking' (0 times/week), 'occasional walking' (1–4 times/week), and 'frequent walking' (5+ times/week)	Adjusted for age, gender, education, work status, household income, SF-36 physical functioning score, sense of community, and IRSD (area-level socio-economic status)	Crime concern was not associated with leisure-time walking.

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First author (year)	Location	Sample size and age	Instruments	Safety measures	Physical activity measures	Statistical adjustment	Main findings
Troped (2011) ⁽⁶⁷⁾	EUA (national sample of nurses)	68968 (40-59 years - only women)	PANES	How much crime rate in the neighborhood makes it unsafe to go on walks at night (yes/no).	Self-reported PA in the last year (walking, jogging, running, bicycling) according two different variables: (1) Walking ≥ 500 MET-minutes/wk. (active) and; (2) Walking, jogging, running, bicycling ≥ 500 MET-minutes/wk..	Model 1: Age, race, ethnicity, BMI categories, and husband's education; Model 2: Age, race, ethnicity, BMI categories, husband's education and, the others perceived environmental variables * Analysis stratified by Sprawl and Region	Perceived crime was inversely associated with meeting PA guidelines (≥ 500 MET-minutes/wk.) only with walking and with walking, jogging, running, bicycling. The authors also mentioned that for both physical activity outcomes, a greater number of inverse associations were found for women who lived in low- and medium-sprawl counties.
Tucker-Seeley (2009) ⁽²⁴⁾	USA (National Survey, with oversamples of blacks, Hispanics, and	18370 (50+ years)	Designed for this specific study	Perceptions of safety in the neighborhood (Safe (excellent and very good and good) and unsafe (fair or poor)).	Self-reported LTPA according an index created by combining responses for MVPA (range 0-18). VPA was	Model 1 (unadjusted); Model 2 (adjusted for gender, age, marital status,	Those who reported living in a safe neighborhood had a higher mean of LTPA than those who perceived their neighborhood as

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First author (year)	Location	Sample size and age	Instruments	Safety measures	Physical activity measures	Statistical adjustment	Main findings
	residents from the state of Florida)				categorized as 0=hardly ever or never, 2=1-3 times/month, 6=1 time/week, 12=>1/week. MVP was categorized with the half of VPA values.	race, ethnicity); Model 3 (adjusted for above demographic characteristics and SES defined as years of schooling, annual income, and household wealth); Model 4 (adjusted for demographic characteristics, SES, and functional limitations).	unsafe.
Weinstein (1999) ⁽²²⁾	Maryland, Montana, Ohio, Pennsylvania, and Virginia, USA	12767 (18+ years)	Designed for this specific study	Neighborhood safety assessed with one question: "How safe from crime do you consider your neighborhood to be?"	Respondents were classified as physically inactive if they reported no physical activity or exercise during the preceding month.	Stratified by age and sex and controlling for race and education	There was a negative association between neighborhood safety and physical inactivity only among older adults (≥ 65 years).

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First author (year)	Location	Sample size and age	Instruments	Safety measures	Physical activity measures	Statistical adjustment	Main findings
				(extremely safe, quite safe, slightly safe, or not at all safe).			
Wen (2007) ⁽⁷⁰⁾	California, USA	41545 (18+ years)	Designed for this specific study	Neighborhood safety scale derived from three items: many people are afraid to go out at night, the park closest to where I live is safe during the day, and the park closest to where I live is safe at night.	Self-reported walking (leisure and transport) dichotomized into meet or not the guidelines (5 or more sessions of walking/wk. at least 150 min/wk.).	Race/ethnicity, BMI, employment status, education and SES, after neighborhood features (neighborhood SES, social cohesion, access to open space)	No associations in fully adjusted models.
Wilcox (2000) ⁽⁶⁸⁾	Rural and Urban area in USA (national sample of minority women)	2912 (40+ years - only women)	Designed for this specific study	Perception of safety from crime according to how the participants rated the presence or absence of high levels of crime.	Engagement self-reported in any of a number of aerobic activities in the past two weeks (frequency, duration and intensity). Categorized as sedentary (no reported sports or exercise) and	Race/ethnicity, geographical region, age, education, psychosocial factors (social support and personal barriers), health variables	Sports or exercise practice was not associated with high levels of crime in both rural and urban women.

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First author (year)	Location	Sample size and age	Instruments	Safety measures	Physical activity measures	Statistical adjustment	Main findings
					active (achieve the recommendations) and Underactive (not meeting the criteria for sedentary or active). In the logistic regression: Sedentary or Underactive/active.	(i.e. physical limitations and BMI) and neighborhood characteristics (i.e. sidewalks, heavy traffic, etc.)	
Wilson (2004) ⁽¹⁶⁾	Rural U.S. south-eastern county, USA	1194 (18+ years)	BRFSS	Perceptions of safety according the street lighting, safe neighborhoods, and neighbors that could be trusted. Safety was also measured objectively according the number of violent crimes estimated at the neighborhood and community levels.	Self-reported MVPA as meeting the guidelines or not and; walking for recreation, exercise or transportation as meeting the guidelines or not.	Race, education, age, sex, and BMI	No associations in fully adjusted models.
Van Cauwenbergh	Belgium (national sample of	48879 (older adults, 65+ years)	Elderly Feelings of Unsafety	Personal safety based on 8 items regarding degree of feelings of	Walking for transportation were dichotomized into daily	Adjusted for educational level and number of	Personal safety from crime was inversely associated with walking for

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First author (year)	Location	Sample size and age	Instruments	Safety measures	Physical activity measures	Statistical adjustment	Main findings
(2012) ⁽¹⁰⁷⁾	Belgian Aging Studies)		Scale and other designed for this specific study	unsafety to crime.	walking for transportation versus less than daily walking for transportation (the same variable for cycling). Walking or cycling for recreation were dichotomized into weekly versus less than weekly walking or cycling for recreation.	functional limitations	transportation and with walking and cycling for recreation. There was no association between personal safety and cycling for transportation.
van Dyck (2011) ⁽⁵²⁾	Ghent, Belgian (neighborhoods with different economic and environmental conditions)	1200 (20-65 years)	NEWS, long IPAQ and Accelerometers	Perception of safety from crime based on crime prevalence in the neighborhood, perceived safety for walking and cycling during the day and at night?	MVPA objectively measure by accelerometer and Self-reported minutes of (a) walking for transport and (b) recreation, (c) cycling for transport, and (d) moderate and (e) vigorous leisure-time PA.	Gender, age, and educational attainment; environmental and psychosocial variables.	Perceiving to be safe from crime was positively related to cycling for transportation. No associations were found with accelerometer-assessed MVPA, walking for transport, recreation and moderate and vigorous PA. No interactions were found with gender, age and SES.

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First author (year)	Location	Sample size and age	Instruments	Safety measures	Physical activity measures	Statistical adjustment	Main findings
Van Dick (2013a) ⁽⁵⁸⁾	Victoria Australia (urban and rural neighborhoods of low socioeconomic status)	4139 (Women only, 18 - 45y)	Long IPAQ	Personal safety based on three items: (1) Feel safe walking in my neighborhood, day or night; (2) Violence not being a problem in the neighborhood; (3) Perceived neighborhood safety from crime	Minutes/week spent in transport walking and leisure-time walking	Adjusted for age, educational level, employment status, smoking status, marital status and destinations/ connectivity z-score.	After taking into account the destinations/ connectivity z-score, personal safety were positively associated with walking for transportation and leisure-time walking
van Dick (2013b) ⁽⁵⁹⁾	Three countries (four study sites), USA (Seattle-King and Baltimore), Australia (Adelaide), and Belgium (Ghent)	6014 (adults, 20 -65 years)	long IPAQ and NEWS	Perception of personal safety based on three items (not described)	Weekly minutes of recreational walking and weekly non-walking leisure-time moderate-to-vigorous physical activity	Adjusted for gender, age, living arrangements, education, area household income, body mass index, study site, and weekly minutes of other types of physical activity (household, work	Safety from crime was positively associated with minutes spent in recreational walking only among females. Safety from crime was predictive of less recreational walking in Ghent and Seattle, and more in Adelaide. Regarding moderate-to-vigorous leisure-time physical activity, safety from crime was positively

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First author (year)	Location	Sample size and age	Instruments	Safety measures	Physical activity measures	Statistical adjustment	Main findings
						and transportation). Further adjustments for other environmental variables were also carried out.	associated only in Baltimore.
van Lenthe (2005) ⁽⁴⁷⁾	Eindhoven, Netherlands	8767 (20-69 years)	Designed for this specific study	Safety from crime estimated by the amount of police attention required in the area, according a core group of representatives of municipal services responsible for functional, physical and social conditions of the city developed a plan to monitor these conditions for policy	Three variables of self-reported PA categorized as almost never, <1hr./wk., 1-2hr./wk., >2hr./wk.: (1) Walking, cycling to shops or work; (2) Walking, cycling, or gardening in leisure time and; (3) Sport participation.	Adjusted for age, sex, educational level and neighborhood socioeconomic environment.	No associations in fully adjusted models.

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First author (year)	Location	Sample size and age	Instruments	Safety measures	Physical activity measures	Statistical adjustment	Main findings
				<p>purposes (1=neighborhood requires attention regularly, 5=very quiet area with hardly any conflicts).</p>			
Velasquez (2009) ⁽¹⁰⁸⁾	Texas, USA	6317 (18+ years)	BRFSS	<p>How safety from crime is their neighborhood (extremely safe, somewhat safe, slightly safe, not at all safe).</p>	<p>Self-reported LTPA assessed by a single question: “During the past month, other than your regular job, did you participate in any PA or exercise?” Additionally, questions determined days per week and minutes per day spent doing MVPA were categorized as (a) meet guidelines (30 min MPA, 5 days/wk. or 20 min VPA 3 days/wk.); some activity and inactivity.</p>	<p>Education, income, race/ethnicity, and age stratified by sex</p>	<p>Among men, safety from crime was positively associated only with practice of some activity. Among women, safety from crime in neighborhood was positively associated with LTPA meets guidelines and some activity.</p>

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First author (year)	Location	Sample size and age	Instruments	Safety measures	Physical activity measures	Statistical adjustment	Main findings
Vest (2005) ⁽¹⁰⁹⁾	Austin/Travis County, Texas, USA	1635 (18+ years)	BRFSS	Perception of neighborhood safety assessed with one question: "How safe from crime do you consider your neighborhood to be?" (extremely safe, quite safe, slightly safe, not at all safe).	Self-reported participation in LTPA in the past month (yes/no).	Sex, race/ethnicity, age and education	People who perceived neighborhood as quite safe were twice more likely to be inactive than those who reported extremely safe. Stronger effects were found in the categories of slightly safe and not at all safe.

PA – Physical activity; LTPA – Leisure-time physical activity; TRPA – Transport-related physical activity; MVPA – Moderate and vigorous; physical activity; MPA – Moderate physical activity; VPA – Vigorous physical activity; MET – Metabolic equivalent; SES – Socioeconomic status; BMI – Body mass index; wk – week.; min – minutes; IPAQ – International Physical Activity Questionnaire; NEWS – Neighborhood Environmental Walkability Scale; BRFSS – Behavior Risk Factors Surveillance System; GLOBE – Global Leadership and Organizational Behavior Effectiveness; EPAQ2 – European Physical Activity Questionnaire (2); GIS – Geographic Information System; NZPAQ – New Zealand Physical Activity Questionnaire; PANES – Physical Activity Neighborhood Environmental Survey