Author’s response to reviews

Title: Social Relationships and Cognitive Functioning in Healthy Older Adults: A Systematic Review

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Author’s response to reviews:

1. Authors should consider strengthening their conceptualization of social engagement and provide clearer definitions of what they mean by social activity, social networks, social support, and social integration. Much of the literature has provided a conceptual framework suggesting that social activity and support are products of one's social network (downstream) and that social integration represents broader upstream levels of social resources (community, family, etc). Also social engagement has often been depicted as both social and productive activities (volunteering and work).


Thanks to the reviewer for this comment – we struggled with (and argued about!) the most appropriate category labels to use. The Berkman and Kuiper papers certainly help. We now refer to a broad label of social relationships in the title, and go on to describe how social integration (upstream levels of social resources, community, family, etc) promotes access to social networks (downstream) which in-turn impact cognitive health through social support, influence, engagement/activity, and access to resources. See abstract, introduction, and discussion.

2.1. Less clear how authors examined healthy cognitive function and impaired function.
Expanded on exclusion criteria definition with “We excluded studies if participants had been diagnosed with any cognitive impairment, cardiovascular disease, or other significant medical, psychiatric or neurological problems”. We only examined data from studies that included participants that were cognitively healthy at baseline.

2.2. What about how cognitive impairment results in a decreased ability to maintain social relationships? Should touch more on the causality concerns (e.g., "Is it the chicken or the egg?") in introduction.

The finding that cognitive impairment may result in a decreased ability to maintain social relationships has been addressed in the discussion (see section 4.3).

3. Should further justify why studies with combined data for participants with normal cognition and those with impairment were excluded. Many studies have both and seems important to take these studies into account and how those studies might impact your findings.

This review is one of a series of reviews published by the review team (protocol – PROSPERO 2012: CRD42012003248; Kelly et al. 2014a, Aging Research Reviews; Kelly et al. 2014b, Aging Research Reviews; Loughrey et al. 2017, Advances in Nutrition). We have maintained the same exclusion criteria (where possible) across reviews to ensure consistency and to aid comparability of review results. The rationale for excluding studies that combine data from participants with normal and impaired cognition is based on our primary objective of examining the impact of different lifestyle activities on the cognitive functioning of older adults without known cognitive impairment.

4. Also should describe in the introduction why/justification for global cognition, and episodic memory and executive function domains were the primary outcomes and other domains of cognition were not investigated. Moreover, were studies that focused on other cognitive domains excluded?

The primary outcome of interest was cognitive function – including episodic memory, semantic memory, overall memory ability, working memory, verbal fluency, reasoning, attention, processing speed, visuospatial abilities or overall executive functioning and global cognition. No cognitive domains were excluded so we’re unsure what the reviewer is referring to here. Cognitive outcomes were selected to maintain consistency with prior published reviews by the review team and in consultation with experts in the field.

5. Should clarify whether quality assessment/checklist was used critically appraise quality of studies.

We used the STROBE instrument to critically assess the quality of reporting across studies -- but see response to reviewer two’s comments below. Would be happy to include a section in the results on quality assessment but we want to ensure an acceptable assessment is agreed upon.
6. Unclear why a meta-analysis was not done. Understanding of effect sizes would be extremely helpful to the field. Also should consider whether subgroup meta-analysis may be feasible for studies on social activity, social networks, social support, and social integration.

Our review team strongly considered conducting meta-analyses (we have completed meta-analyses for the other three reviews in our review series) however in consultation with experts we agreed that it was not appropriate. Based on the comments of reviewer 2, we maintain that this is the correct decision. The following text explains this in the methods: “Due to large diversity between study definitions and measurement of social engagement, cognitive outcomes measured, and analysis used, and in line with recommendations of from Section 9 of the Cochrane handbook, meta-analysis was not conducted as it was unlikely to derive meaningful conclusions.”

7. Should expand a bit more on studies looking at relationship between social engagement and cognitive decline. What about social activity, social networks, social support, and social integration and cognitive decline?

Related to point 8 – these refs have been added and described in the introduction/discussion.

8. Should consider other recent systematic reviews:


These references have been included – thank you!

9. Should be more explicit in discussion about the potential heterogeneity among the studies included in this review.

Addressed under limitations – added text to highlight section on heterogeneity.

Reviewer #2:

Abstract:

The domains of cognitive function that are listed in the Results are not mentioned in the Methods

This has been reviewed and corrected.
It is unclear in the Results whether references to 'cognitive function' are meant to be 'global cognition' as specified in the Methods? This is confusing, as is, cognitive function itself is not a domain of cognitive function, but it is presented that way.

Yes, that was meant to refer to global cognition – corrected throughout.

Introduction

General: Please provide a rationale for why different aspects of social engagement (which need to be defined by the authors) might have differential effects on different domains of cognitive functioning (which also need to be defined by the authors) among older adults.

We’ve added a clearer rationale and further supportive references for this in the introduction. There is also precedence for this approach as prior research (e.g. Gow et al., 2013) has examined the differential effects of aspects of social relationships on different cognitive domains. See revised introduction and discussion sections (in particular, lines 62-85, 105-116, 117-131).

Lines 84-85: "There is problematic variation in how social factors are defined within the epidemiological literature [33]." Please provide actual definitions of the social factors of interest, and explain why variation in these definitions is problematic with respect to the research question that the review attempts to address, as it is not clear to the reader from this statement.

Introduction fully revised, definitions added.

Also added the following clarification to the introduction “One difficulty when trying to determine the effect of social relationships on cognitive function is the use of discrepant and unclear definitions of different types of social behaviours [14]. If researchers are to make accurate recommendations regarding activities that can promote cognitive health, they need to use precise terminology and be clear on what exactly these terms mean.”

Line 89: Reference to the social factors in the previous sentence as "outcomes" is confusing because they are being treated as the exposure variables in this review. Please clarify.

Corrected.

Lines 91-93: "Social factors are infrequently measured together within the same analyses [40], precluding any meaningful comment on their distinct contributions towards cognitive ageing." What "social factors" are the authors referring to, and why do they need to be measured together in order to understand their unique contributions to cognitive aging? E.g. are studies where only one is measured confounded by the other aspects of social factors? It is not clear.

Revised and corrected to improve clarity and specificity.

Lines 93-96: "One recent attempt to focus on the differential impacts of specific social factors led to the conclusion that subtle effects of social factors on cognitive functioning exist, and even
discrepancies between these factors can be shown to have clinically meaningful effects on cognitive function [41].” What do the authors mean by 'subtle effects'? Which social factors? What do they mean by 'discrepancies between these factors'? And, which cognitive outcomes were included?

This paragraph has been revised and additional detail and supportive references added.

Methods:

Line 114: Why were studies before January 2000 excluded?

A cut-off date of January 2000 was used to provide a summary of the research evidence within the last 17 years. A note on the implications of including research only from the year 2000 onwards has been added to the ‘limitations’ section of the manuscript.

Lines 113-117: Why were MeSH subject headings not used? These are standard and should be used in all PubMed/Medline searches.

We added a sentence into the ‘limitations’ section of the manuscript to highlight this limitation of the search string.

“In addition, the reviewers’ omission of Medical Subject Headings (MeSH) within searches of databases may have resulted in some studies being omitted. This has been somewhat controlled for through supplemental searches of reference lists of included studies.”

Additional File 1 Search Strategy: The column with dates under the 'Articles Found' heading is confusing - were the searches limited to these dates, or were these just the dates that were returned? Are the rows separated by different database searches, or were these really multiple separate searches of all databases? If the latter, why were so many searches done?

The search strategy table is separated by search string used (there were many combinations of terms used within the search strategy) and overall records returned, with records from Medline/Pubmed and PsycINFO amalgamated.

Records returned were broken down by year in our previous version to signify division of search tasks by the review team. However, we agree that this display of data is confusing and does not add meaning so we have simplified the table. There is now one figure indicating records returned for each search string used and the table is divided in two according to initial 2015 – 2017 search and the updated 2014 – 2015 search. The overlap in years 2014 and 2015 was to ensure that no records ‘slipped through the cracks’ between the initial and subsequent searches.

Line 120: Please provide the inclusion criteria for the literature search.

Section 2.2 has been updated to provide more clarity on the inclusion criteria used.
“The following inclusion criteria were used: 1) peer-reviewed and academically published observational, RCT or twin studies that 2) investigated the impact of social relationships on cognitive function and 3) included a sample of community dwelling older adults (>50 years) with no known cognitive impairments.”

Lines 131-137: Why were these specific domains of cognitive function included? This is something that must be established in the Introduction, as there must be rationale for a relationship between different aspects of social engagement and each of these different domains of cognitive function.

Cognitive outcomes were selected to maintain consistency with prior published reviews by the review team (protocol – PROSPERO 2012: CRD42012003248; Kelly et al. 2014a, Aging Research Reviews; Kelly et al. 2014b, Aging Research Reviews; Loughrey et al. 2017, Advances in Nutrition) and in consultation with experts in the field. The relationship between social engagement and cognitive functioning has been well established – it seems reasonable to wish to examine this relationship in more detail by seeking to determine if different cognitive domains are differentially impacted by different types of engagement.

Lines 138-148: Same issue as previous comment - why these specific domains of social engagement? Again, the definitions and rationale for each of these domains should be given in the literature review.

Rationale added to introduction.

Line 160: How were different aspects of study design allocated to be either 'high', 'moderate', or 'low' risk? These seem like very subjective allocations.

Consulted Cochrane guidelines. See additional file 4.

Line 161: The STROBE statement is not a measure of risk of bias. STROBE simply assesses whether key aspects of study design, methods, and results are reported, it does not assess whether that they are likely to be biased. Please remove and use an appropriate measure of risk of bias in observational studies.

We have selected this approach as the STROBE instrument is widely used to assess study quality in meta-analyses of observational studies. We have amended the manuscript to reflect this by changing the term to study quality instead of risk of bias. If the reviewers still feel that a Risk of Bias assessment is required we would be happy to oblige but would be interested in a specific recommendation as there is a lack of consensus on the best RoB tool to use for observational studies.

Results:

Lines 203-210: What aspects of social networks were associated with cognitive function? This section is quite vague. Presumably most people have a social network, unless they are
completely isolated, so did these studies look at simply at the presence of a social network, or was it social network size, or density of connections, or quality of connections, etc.? Please clarify these findings.

Additional detail provided to improve clarity.

Discussion:

Lines 252-258: The reference to cognitive function and then individual domains of cognitive function is confusing, as it's unclear whether the authors mean 'global cognition' by 'cognitive function'. Please clarify.

Clarified throughout

Lines 275-276: This doesn't seem to be an accurate representation of this review. Although it was comprehensive by including 39 studies, they could not be pooled together as they were so heterogeneous so it is not an improvement upon Brown's previous collation of four studies. Please revise.

Revised and removed comment suggesting that our review was an improvement.

Lines 279-280: The statement "Additional research is required to examine the differential effects of social activity on executive functioning" doesn't make sense with respect to how the authors have categorized 'social activity': they define 'social activity' it as one single domain of social engagement, and executive functioning is also one single domain of cognitive function as well.

Not fully clear on what was meant by this comment – added detail to clarify that social activity was related to specific domains of executive functioning.

Lines 292-295: Negative social interactions (references 67, 68, 70) may actually be symptomatic of sub-clinical cognitive impairment or dementia having adverse effects on social engagement. The causality of this interpretation may be incorrect.

General: I have found several typos and grammatical errors throughout (eg. unclosed brackets), please proofread once more.

Proof – read and edited