PEER REVIEW HISTORY

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ARTICLE DETAILS

TITLE (PROVISIONAL)	Developing a core outcome set for physical activity interventions in primary schools: a modified-Delphi study
AUTHORS	Ram, Bina; Foley, Kimberley; van Sluijs, Esther; Hargreaves, Dougal; Viner, Russell; Saxena, Sonia

VERSION 1 – REVIEW

REVIEWER	Kennedy, Sarah University of Newcastle, School of Education
REVIEW RETURNED	15-Feb-2022

GENERAL COMMENTS	Overall comment Thank you for the opportunity to review this manuscript. The authors present a valuable contribution to the literature on a COS for school-based physical activity interventions. Detail in this manuscript will provide useful information for future researchers to continue to improve outcome selection and assessment in schools – teamed with their suggested future work to identify these specific outcomes. I have noted points below that I believe require attention. Specific comments Introduction Page 5 Line 76: “potential to reach all children” suggest changing to “majority”, to consider the various reasons as to why some children and youth do not attend school. Lines 77-78: Suggest restructuring this section of the paragraph. It is not currently clear from the wording (until the references are checked) that you are referring to health disparities based on SES. A full stop after poverty, and then briefly introducing the relationship between SES and physical activity behaviour would be more appropriate. Second paragraph: Suggest significant rewording and combining with previous paragraph. This information could further elaborate the point made regarding the potential reach of school-based interventions, and how this helps reduce disparities in low SES children and youth. Page 6 Introduce BMI abbreviation at first instance. Page 12 Inclusion of appetite in the social and emotional health domain – did you consider other aspects of diet, such as binge eating, within this domain?

	Table 1. The definitions provided for diet and fitness imply a positively directed relationship, rather than an overarching 'definition' (i.e., diet can be unbalanced, fitness can be poor and not optimal). Musculoskeletal definition: why are only skeletal elements included in the definition and nothing to do with the muscles? Sleep: seems more like a suggestion than a definition? Appetite: as with the point made re diet and fitness, this is positively directed. Considering the placement of this aspect of diet in the social and emotional health domain, I would encourage the authors to consider the flip side of appetite. However, for this table the requirement is for a definition and that also requires an edit to present a neutral description of the word. Body awareness: this definition requires some additional clarification. Page 18 Line 271-272: "75% had English as a second language" – Out of interest, is this a representative proportion of the population for this age group? If so, would be good to comment on this. If not, perhaps comment on the reasoning and if/how this may have impacted the generalisability of the findings. Do you also have SES information for this group of students? Page 20 Second paragraph: A stronger link as to why the measurement of mental health outcomes is occurring in physical activity interventions, and why this is important, needs to be included here. Consider including the benefits of adequate physical activity and higher levels of fitness on mental health, and the increasing mental pressures on young people, for this reasoning. Page 21 First paragraph: also consider that the core business of schools is – learning. If an intervention can assist in enhancing the capacity of a student to learn (across various learning areas, not just one specific subject), whilst also improving their physical and mental health, it is going to increase the acceptability of the intervention. This would then likely lead to rise in interest from schools. Suggest including reference to McKay, et al. (2019). Implementation and scale-up of physical activity and behavioural nutrition interventions: an evaluation roadmap. International Journal of Behavioral Nutrition and Physical Activity, 16(1), 1-12. In your discussion surrounding data collection/evaluation frameworks. Page 22 Also consider how the needs of stakeholders/aim of the intervention/population group targeted/scale of intervention may influence the selection of outcomes. Page 23 Very well written and honest strengths and limitations sections – great work. Some of the points noted are slightly linked to the suggestion I have made to expand upon in the discussion (such as the mental health and choosing relevant outcomes) – which I think will tie back together nicely with a little more detail within the discussion.

REVIEWER	Matłosz, Piotr University of Rzeszów, Faculty of Physical Education

REVIEW RETURNED	02-May-2022

GENERAL COMMENTS	Thank you for the opportunity to review this interesting, important and well-written manuscript. The authors developed a Core Outcome Set (COS) for physical activity interventions in primary schools. Considering significant heterogeneity of outcomes in recent literature in the above-mentioned topic, this work seems to be very important. The manuscript is clear and well organized, and the conclusions are adequately supported by references; however, I would like to share some of my suggestions which the authors could consider to improve the manuscript. Major Table 1 The definitions of outcomes classified in the first domain (physical activity and health) could be questioned. The authors state that the 'definitions were generated for each outcome based on those provided by authors of the relevant studies and discussions with our Steering Committee', but I have some major concerns regarding this procedure: - Bioimpedance – among the items detailed as the definition of this term in the reviewer's opinion, only 'body fat' could fit. Furthermore, the "bioimpedance" should rather be considered as one of the methods, among others, used to assess body fat. Since the authors state that the identification of best assessment tools (methods ?) to measure outcomes defined in COS should be the next step, this approach seems to be confusing. Therefore, the definition provided by the authors did not fit the outcome. If the definition provided for this item was the merged outcomes of the umbrella review then the proper merged outcome should be, for example, "anthropometry" or "body composition". - The terms 'weight' and 'body mass' seem to be synonyms; could the authors provide some rationale or differentiation for this? - Energy levels / expenditure - The provided definition fits mostly to Resting Energy Expenditure, but the outcome itself seems to be much more broad – including also the Total Energy Expenditure (related with the physical activity level) - Intensity of physical activity – the authors could consider adding the MET cut-offs next to a description of each intensity level. - Motor skills: 'swimming', are doubled. - Musculoskeletal – In the opinion of the reviewer, the definition does not match the outcome. The Bone strength and the bone mineral density usually measured with DXA are much more closely related to body composition outcomes, as the term "musculoskeletal" are rather used in context of the body system or muscle tissue type, moreover it is really hard to acknowledge this term as the outcome – what methods/tools could be used to assess the 'Musculoskeletal' as an outcome? - Since the authors did not publish the results of the umbrella review itself, I would suggest adding next to each outcome the numbers of studies (from the Supplemental File 3) from which each of the outcomes was taken. Taking into account the whole domain 1: physical activity and health could be questioned (which, in the opinion of the reviewer, seems to be the most important, since the study aims corresponds to physical activity interventions in the first place), which could explain why it

	was so underrepresent after the Delphi surveys. If participants received that set of outcomes (some of which were hard to consider as outcome) with confusing definitions, they may focus more on other domains that seemed to be more reliable. Since this stage was crucial for all subsequent stages, in the opinion of reviewer it could undermine all further results and interpretations. Table 2 – I strongly suggest adding the % of participants who rated each outcome 'not important' next to 'critical', since both were included in the inclusion threshold (>70% and <15%) Page 18, line 277 – The fact that only 13 participants attended the stakeholder meeting (approximately 10% of the initial group – n=104) should be considered an important limitation of the present study, potentially even more important than widely described geographical underrepresentation. Minor Figure 1 - In round 2 of stage 3 (prioritisation), the researchers' group seems to be doubled Table 3 – The domain of physical activity and health includes an outcome 'energy' in the table that is not mentioned anywhere in the text. The discussion Page 20, line 304 – when the authors state 'under these concepts', it could be confusing to the reader whether this sentence refers to the results 'physical activity intensity' and 'fitness' or the domain of physical activity. Page 21, line 333 - please expand the abbreviation 'RE-AIM'

VERSION 1 – AUTHOR RESPONSE

REVIEWER 1		
Introduction 1. Page 5 (a) Line 76: "potential to reach all children" suggest changing to "majority", to consider the various reasons as to why some children and youth do not attend school. (b) Lines 77-78: Suggest restructuring this section of the paragraph. It is not currently	(a) We have changed the wording from 'all' to 'majority' (b) We have restructured this section of the paragraph. (c) We have re-worded the section and combined this with the first paragraph as requested.	**Introduction, Page 4, lines 71-81** "School settings are ideal as they have the potential to reach the majority of children across society[5, 6] including those living in poverty. Socio-economic inequalities have been associated with moderate, and vigorous physical activity and may contribute to widening health inequalities.[7] Targeting schools therefore could help towards reducing the gap in physical activity among children.[7, 8] As a result of governments and the WHO recommendations

clear from the wording (until the references are checked) that you are referring to health disparities based on SES. A full stop after poverty, and then briefly introducing the relationship between SES and physical activity behaviour would be more appropriate. (c) Second paragraph: Suggest significant rewording and combining with previous paragraph. This information could further elaborate the point made regarding the potential reach of school-based interventions, and how this helps reduce disparities in low SES children and youth.		of physical activity promotion and engagement in schools, there are many physical activity interventions that are implemented. However, the interventions vary in design. Some interventions integrate additional physical education classes alongside compulsory physical education lessons,[9] whilst some may incorporate 10 minutes of physical activity into every school day.[10] There are also others which implement classroom movement breaks[11] or active mile interventions.[12, 13]"
2. Page 6 Introduce BMI abbreviation at first instance.	Thank you for spotting this - we had missed adding the abbreviation in the first mention of body mass index. This has now been added to the Introduction (Page 5, line 102).	
3. Page 12 Inclusion of appetite in the social and emotional health domain – did you consider other aspects of diet, such as binge eating, within this domain?	'Binge eating' was not identified as an outcome in the published literature nor mentioned in the Steering Group Focus Group and therefore not included. Binge eating may be less relevant to primary school aged children.	
4. Table 1. The definitions provided for diet and	We agree with the reviewer that the 'definitions' of are in fact descriptions of the outcomes; some may include a definition	**Table 1, Pages 10-12** Title: "List of 50 outcomes and their descriptions by

fitness imply a positively directed relationship, rather than an overarching 'definition' (i.e., diet can be unbalanced, fitness can be poor and not optimal). Musculoskeletal definition: why are only skeletal elements included in the definition and nothing to do with the muscles? Sleep: seems more like a suggestion than a definition? Appetite: as with the point made re diet and fitness, this is positively directed. Considering the placement of this aspect of diet in the social and emotional health domain, I would encourage the authors to consider the flip side of appetite. However, for this table the requirement is for a definition and that also requires an edit to present a neutral description of the word. Body awareness: this definition requires some additional clarification.	whilst others include a positively directed relationship or suggestion. The 'definitions' were extracted from the published literature and identified from our focus group with our Steering Group members. Across the studies, there were variations of how the outcomes were defined or described, if at all. We have considered the reviewer suggestions but methodologically we think it is important to include how the information was presented to the participants to interpret the results. For clarity we have: (a) amended the title of Table 1 by replacing 'definition' with 'description' (and changed this throughout the manuscript) and added a footnote to explain how the descriptions were created; (b) added 'muscle' to the description of 'musculoskeletal' and provided a footnote to state that participants were not presented with this term in the description; (c) added a sentence to the Methods and Results to clarify how the descriptions were created; and (d) addressed the wide variations across the studies when describing the outcomes as a limitation in the Discussion.	domain, and the number of studies from which the outcomes were extracted." Footnote: "Descriptions were guided by the published literature and our Steering Group members." Description of 'musculoskeletal': "Bone strength, bone mineral density, muscle" Footnote: "'Muscle' was not included in the original description presented to the participants. This was added based on reviewer suggestions." **Methods, Page 6, Lines 153-154** "Descriptions of each outcome were guided by the published literature and discissions with our Steering Group." **Results, Page 8, Lines 222-225** "However, we identified variations across studies of how the outcomes were defined or described if at all." "We created the description for each outcome guided by the literature and from discussions with our Steering Group." **Discussion, Page 18, lines 384-387** "The descriptions of each outcome were guided by the published literature. We had found variations in how the outcomes were described across studies. This resulted in our descriptions for each outcome either being a definition, suggestion, implying a positively directed relationship, or a combination of these. Further research is needed to identify neutral

		descriptions of outcomes."
5. Page 18 Line 271-272: "75% had English as a second language" – Out of interest, is this a representative proportion of the population for this age group? If so, would be good to comment on this. If not, perhaps comment on the reasoning and if/how this may have impacted the generalisability of the findings. Do you also have SES information for this group of students?	According to the *'Percentage of Pupils by First Language, Borough'* from the Department for Education in 2018, 48% of all primary school aged children in London do not have English as a first language (see: https://data.london.gov.uk/dataset/percentage-pupils-first-language-borough) We have added a sentence to the Discussion to describe the comparison of children in our study to that of the average for London primary school children. We did not collect SES information of the children.	**Discussion, Page 19, Lines 407-409** "In addition, our representation of children with English as a second language was much higher (75%) than the average number of children with English as a second language in London primary schools (48%).[47]"
6. Page 20 Second paragraph: A stronger link as to why the measurement of mental health outcomes is occurring in physical activity interventions, and why this is important, needs to be included here. Consider including the benefits of adequate physical activity and higher levels of fitness on mental health, and the increasing mental pressures on young people, for this reasoning.	We have added detail to provide a stronger link of why mental health should be measured as part of physical activity interventions.	**Discussion, Page 16, Lines 315-322** "In the published literature, we found only 10 studies which measured outcomes that related to mental health, yet all our stakeholders placed critical importance on many of the outcomes under the domain of social and emotional health. These findings may be explained by the growing awareness of poor mental health in children and the growing evidence base of associations between increased physical and b etter mental health."
7. Page 21 (a) First paragraph: also consider that the core business of schools is – learning. If an intervention can	(a) We agree with the reviewer and have added text this to the paragraph.	**Discussion, Page 17, Lines 342-346** "Schools provide children with learning a range of subjects. However, if increased physical activity in schools enhance children's

assist in enhancing the capacity of a student to learn (across various learning areas, not just one specific subject), whilst also improving their physical and mental health, it is going to increase the acceptability of the intervention. This would then likely lead to rise in interest from schools. (b) Suggest including reference to McKay, et al. (2019). Implementation and scale-up of physical activity and behavioural nutrition interventions: an evaluation roadmap. International Journal of Behavioral Nutrition and Physical Activity, 16(1), 1-12. In your discussion surrounding data collection/evaluation frameworks.	(b) We have added this reference to the data collection / evaluation frameworks as suggested (Page 16).	learning by improving their physical and mental health, this will likely increase the acceptability of physical activity interventions in schools. This may therefore generate a greater interest from schools to implement these interventions." **Discussion, Page 17, Lines 360-362** "A study by McKay and colleagues (2019), prioritised a list of frameworks to improve the quality and consistency of implementing interventions to ensure that interventions are effectively delivered to achieve population level benefits." [40]
8. Page 22 Also consider how the needs of stakeholders/aim of the intervention/population group targeted/scale of intervention may influence the selection of outcomes.	We have added additional text to explain what should be considered when developing COS's.	**Discussion, Page 18, Lines 371-374** "Developing COS's require the need to consider the aims and scale of the intervention, the population groups being targeted, and the needs of the stakeholders. Our COS, focussed on physical activity interventions in primary schools, developed in consultation

		with those who would benefit the most to better understand intervention effects, should be considered as part of a set of tools for wider improvement of health in primary schools”

REVIEWER 2		
1. Table 1 (a) The definitions of outcomes classified in the first domain (physical activity and health) could be questioned. The authors state that the ‘definitions were generated for each outcome based on those provided by authors of the relevant studies and discussions with our Steering Committee', but I have some major concerns regarding this procedure: - Bioimpedance – among the items detailed as the definition of this term in the reviewer's opinion, only 'body fat' could fit. Furthermore, the "bioimpedance" should rather be considered as one of the methods, among others, used to assess body fat. Since the authors state that the identification of best assessment tools (methods	(a) Please see response to Reviewer 1 #4. We agree that the outcomes include descriptions of the outcomes rather than definitions. These were guided by the published literature (where we identified wide variations of how outcomes were described across studies), and from discussions with our Steering Group. We have replaced the word ‘definitions’ with ‘descriptions’ throughout the manuscript. We have considered all of the reviewer’s suggestions but by making considerable changes to the descriptions would not be a true reflection of what the participants were presented with when they rated each outcome, and may have resulted in different ratings. However, as per the response to Reviewer 1 #4, we have: (a) changed the title of Table 1 to reflect a ‘description’ of outcomes. (b) changed ‘bio-impedance’ to ‘anthropometry’ and added ‘muscle’ to the description of ‘musculoskeletal.’ We have included a footnote to explain that these terms were not included in the original description presented to the participants (c) removed the duplication of ‘swimming’ under Motor Skills. (d) added text to our Discussion to include the ‘descriptions’ of the outcomes as a methodological limitation.	

?) to measure outcomes defined in COS should be the next step, this approach seems to be confusing. Therefore, the definition provided by the authors did not fit the outcome. If the definition provided for this item was the merged outcomes of the umbrella review then the proper merged outcome should be, for example, “anthropometry” or “body composition”. - The terms 'weight' and 'body mass' seem to be synonyms; could the authors provide some rationale or differentiation for this? - Energy levels / expenditure - The provided definition fits mostly to Resting Energy Expenditure, but the outcome itself seems to be much more broad – including also the Total Energy Expenditure (related with the physical activity level) - Intensity of physical activity – the authors could consider adding the MET cut-offs next to a description of	(b) In Table 1, we have now added the number of studies from which each outcome was taken or whether the outcome was identified by our focus group (please see Appendix 1 of this document). In addition, we think that a list of the 74 studies from which the outcomes were identified would be more relevant as Supplemental File 3 instead of the list of the 53 reviews. We have therefore replaced the original Supplemental File 3 with a list of the 74 studies extracted from the reviews (please see Appendix 2 of this document)	

each intensity level. - Motor skills: 'swimming', are doubled. - Musculoskeletal – In the opinion of the reviewer, the definition does not match the outcome. The Bone strength and the bone mineral density usually measured with DXA are much more closely related to body composition outcomes, as the term "musculoskeletal" are rather used in context of the body system or muscle tissue type, moreover it is really hard to acknowledge this term as the outcome – what methods/tools could be used to assess the 'Musculoskeletal' as an outcome? (b) Since the authors did not publish the results of the umbrella review itself, I would suggest adding next to each outcome the numbers of studies (from the Supplemental File 3) from which each of the outcomes was taken.		
2. Taking into account the whole domain 1: physical	We appreciate the reviewers' opinion but highlight that the purpose of the Delphi process is to gain consensus on the most important outcomes. Our work shows that there appears to be a lack of consensus of	**Discussion, Page 16, Lines 306-313** "As discussed in our consensus meeting, the underrepresentation of

activity and health could be questioned (which, in the opinion of the reviewer, seems to be the most important, since the study aims corresponds to physical activity interventions in the first place), which could explain why it was so underrepresent after the Delphi surveys. If participants received that set of outcomes (some of which were hard to consider as outcome) with confusing definitions, they may focus more on other domains that seemed to be more reliable. Since this stage was crucial for all subsequent stages, in the opinion of reviewer it could undermine all further results and interpretations.	which outcome is the most important to measure in this domain, and is also reflected in that many outcomes had high ratings, but did not reach the pre-specified level for consensus (i.e., we believe that the specificity of the outcomes under this domain may have caused their underrepresentation rather than the definitions/descriptions). We have added text to the Discussion to clarify this.	outcomes rated critically important in the physical activity domain may have been due to the specificity of outcomes listed. For example researchers agree that physical activity should be measured but do not agree on which specific outcome to measure. This would explain the wide variation of physical activity outcomes that were identified from the published literature. Physical activity can have many benefits beyond measuring its impact on particular health or clinical outcomes. Therefore our participants agreed that measuring physical activity is important and should be included."
3. Table 2 – I strongly suggest adding the % of participants	We have added the percentage of participants who rated each outcome not important to Table 2. Please see Appendix 3 with this document.	

who rated each outcome 'not important' next to 'critical', since both were included in the inclusion threshold (>70% and <15%)		
4. Page 18, line 277 – The fact that only 13 participants attended the stakeholder meeting (approximately 10% of the initial group – n=104) should be considered an important limitation of the present study, potentially even more important than widely described geographical underrepresentation.	We have acknowledged this as a limitation.	**Discussion, Page 18, Lines 387-392** "The low attendance of participants in our consensus meeting which did not include a representation for the educators stakeholder group, may have possibly limited further discussions of the outcomes that should be included in the COS. However, the final list of outcomes was circulated to all the participants who completed both rounds of the Delphi survey and an opportunity to comment further was provided before the final outcome set was agreed."
5. (a) Figure 1 - In round 2 of stage 3 (prioritisation), the researchers' group seems to be doubled (b) Table 3 – The domain of physical activity and health includes an outcome 'energy' in the table that is	(a) Thank you for spotting this. The duplication has been removed in Figure 1. (b) 'Energy' was identified by the children as being important and is mentioned on Page 14, line 272. In our Methods section under the heading 'Stakeholder Meeting' we state that the results of the Delphi surveys along with children's views were considered for discussion.	

not mentioned anywhere in the text.		
6. Discussion (a) Page 20, line 304 – when the authors state 'under these concepts', it could be confusing to the reader whether this sentence refers to the results 'physical activity intensity' and 'fitness' or the domain of physical activity. (b) Page 21, line 333 - please expand the abbreviation 'RE-AIM'	(a) We have replaced 'concepts' with 'domain' for clarification. (b) We have expanded the abbreviation of RE-AIM.	**Discussion, Page 16, Lines 302-303** "…that may fit under this domain include…" **Discussion Page 17, Lines 351-352** "…RE-AIM (Reach, Effectiveness, Adoption, Implementation, Maintenance)."

References

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6. Waters E, de Silva-Sanigorski A, Hall BJ, et al. Interventions for preventing obesity in children. Cochrane Database Syst Rev. 2011(12):CD001871.

7. Love R, Adams J, Atkin A, et al. Socioeconomic and ethnic differences in children's vigorous intensity physical activity: a cross-sectional analysis of the UK Millennium Cohort Study. Bmj Open. 2019;9(5).

8. Marmot M, Allen J, Boyce T, et al. Health equity in England: The Marmot Review 10 years on. London: Institute of Health Equity; 2020.

9. Kriemler S, Zahner L, Schindler C, et al. Effect of school based physical activity programme (KISS) on fitness and adiposity in primary schoolchildren: cluster randomised controlled trial. BMJ. 2010;340:c785.

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11. Daly-Smith AJ, Zwolinsky S, McKenna J, et al. Systematic review of acute physically active learning and classroom movement breaks on children's physical activity, cognition, academic performance and classroom behaviour: understanding critical design features. Bmj Open Sport Exerc. 2018;4(1).

12. The Daily Mile Foundation. The Daily Mile [Available from: https://thedailymile.co.uk/.

13. Marathon Kids UK. 2010 [Available from: https://www.marathonkids.co.uk/.

40. McKay H, Naylor PJ, Lau E, et al. Implementation and scale-up of physical activity and behavioural nutrition interventions: an evaluation roadmap. Int J Behav Nutr Phy. 2019;16(1).

47. Department for Education. Percentage of Pupils by First Language, Borough. UK; 2018. [Available from: https://data.london.gov.uk/dataset/percentage-pupils-first-language-borough (Accessed June 2022)].

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APPENDIX 1. Table 1. List of 50 outcomes and their descriptions by domain, and the number of studies from which the outcomes were extracted

Domain	Outcomes measured	Description[1]	Studies[2]
1: Physical activity and health	Active travel	To get to and from school, for example, walking, public transport i.e., train/tube/bus (do not include car, van, motorcycle), cycling, scooter	FG*
	Anthropometry[a]	Weight, height, body mass index (BMI) body fat, body mass, waist circumference	34
	Blood lipids	Fatty substances found in the blood (i.e., cholesterol, triglycerides) which increase the risk of heart attack	2
	Blood pressure	The force at which your heart pumps blood around your body and the resistance to the blood flow in the blood vessels	2
	Diet	Varied and balanced diet including fruit and vegetables	FG*
	Energy levels / expenditure	The amount of energy needed to carry out physical functions such as breathing, exercising or digesting food	5
	Fitness	Being fit and healthy for optimal health and overall wellbeing	16
	Heart rate	Number of beats per minutes (BPM) to establish normal resting heart rate, high or low heart rate	5
	Intensity of physical activity	Includes light activity (i.e., taking a stroll); moderate activity (i.e., cycling / swimming at regular pace, sweeping, washing windows); and vigorous activity (i.e., aerobics, running, fast cycling or swimming, climbing stairs)	42
	Leisure time activity	Time spent in activity for leisure during the day (i.e., walking in the park, playing sports with friends/family)	FG*
	Motor skills	Skills that require using large muscles of the arms/legs/torso, i.e., standing, walking, going up and down stairs, running, swimming, jumping, skipping, leaping, kicking	8
	Musculoskeletal	Bone strength, bone mineral density, muscle[b]	8
	Peak oxygen intake	The maximal rate at which oxygen can be used by the body during maximal work	1
	Sedentary time	Time spent sitting at desk, reading, sitting or lying down to watch television	7
	Sleep	Between approximately 10 to 12 hours per night	FG*
	Step counts	Number of steps taken in a day	13
2: Social and emotional	Anxiety	Persistent feeling of worry, fear or nervousness	FG*
	Appetite	Eating well and regularly	FG*
	Body	The ability to recognize one's body moves helping to	1

health	awareness	understand how to relate to objects and people at home, at school and outdoors		
	Body image	The perception one has of their physical self		1
	Depression	Feeling persistently sad for more than a few days		FG*
	Empowerment	Feeling a sense of becoming stronger and more confident		FG*
	Enjoyment	Taking pleasure in doing something		3
	Happiness	Feeling a sense of joy and contentment		FG*
		Mood	A state of mind or a feeling such as happy, sad, cheerful or angry	FG*
		Peer support	Using one's own experiences to help others	1
		Resilience	The ability to recover quickly from difficulties	FG*
		Satisfaction	A sense of fulfilling a need, desire or appetite	FG*
		Self-confidence	A feeling of trust in one's abilities, qualities, and judgment	FG*
		Self-efficacy	A person's belief of their capacity to perform behaviours necessary to produce specific performance attainments	2
		Self-esteem	A factor that influences people's choices and decisions which results in them either taking or not taking care of themselves and explore their full potential	1
		Self-expression	The communication of one's personality, feelings, or opinions	FG*
		Self-perception	Attitudes towards own preferences and behaviour	1
		Sickness	Feeling unwell, nauseous, dizzy	FG*
		Sleep patterns	Sleep patterns /achieving less than recommended (10-12 hours) / broken sleep	FG*
		Social interaction	An exchange between two or more people	FG*
		Stress	Feeling under pressure or threatened	FG*
		Wellbeing	Feeling well, happy, healthy and ability to manage stress	FG*
3: Educational performance		Academic performance	Measurement of a child's achievement over a range of academic subjects	20
		Attention	Taking notice of someone or something	6
		Classroom behaviour	How children are acting in the classroom in response to what is going on or present around them	15
		Cognitive development / function	How children think, explore and figure things out	6
		Concentration	Ability to focus on task	16
		Engagement	The degree of attention, curiosity, interest, optimism, and passion that children show when they are learning or being taught	5
		Executive functioning	A set of mental skills including working memory, flexible thinking, and self-control to apply to everyday learning, work, and daily life	4
		Focus	Ability to concentrate and not easily distracted	16
		Maths	The study of numbers, shapes and patterns	16
		Reading	A cognitive process that involves decoding symbols to arrive at meaning, the primary	8

purpose of which is to understand the text

APPENDIX 1 continued

Working memory / inhibition	A cognitive system with a limited capacity that can hold information temporarily and is important for reasoning, decision-making and behaviour	6
Writing	A form of communication to express language using symbols; being able to understand grammar, punctuation, spelling, and vocabulary	5

[1]Descriptions were guided by the published literature and our Steering Group.

[2]From the 74 studies identified from the 53 relevant reviews

*FG = outcome identified by our Focus Group (Steering Group)

[a]Anthropometry was presented as 'Bio-impedance' to participants. Changed to 'Anthropometry' based on reviewer suggestions.

[b]'Muscle' was not included in the original description presented to participants . This was added based on reviewer suggestions.

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APPENDIX 2. Supplemental File 3. List of 74 studies extracted from the relevant reviews

	Author(s)	Year	Title	Journal
1	Ahamed Y., MacDonald H., Reed K., Naylor PJ,. Liu-Ambrose T., and McKay H.	2007	School-based physical activity does not compromise children's academic performance	Psychology and Behavioural Strategies (39(2):371-6)
2	Bryant ES., Duncan MJ., Birch SL., and James RS.	2016	Can fundamental movement skill mastery be increased via a six-week physical activity intervention to have positive effects on physical activity and physical self-perception?	Sports (16(4))
3	Cradock AL., Barrett JL., Carter J., McHugh A., Sproul J., Russon ET., et al.	2014	Impact of the Boston active school day policy to promote physical activity among children	American Journal of Health Promotion (28(3))
4	Crova C., Struzzolino I., Marchetti R., Masci I., Vannozzi G., Forte R., et al.	2014	Cognitive challenging physical activity benefits executive function in overweight children	Journal of Sports Science (32(3), 201-211)
5	Dalziell A., Boyle J., and Mutrie N.	2015	Better movers and thinkers (BMT): an exploratory study of innovative approach to physical education	Europe's Journal of Psychology (11(4), 722–741)

6	de Greef JW., Hartman E., Mullender-Wijnsma MJ., Bosker RJ., Doolard S., and Visscher C.	2016	Long-term effects of physically active academic lessons on physical fitness and executive functions in primary school children	Health Education Research (31:2), 185-194)
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APPENDIX 3. Table 2. Outcomes rated 'not important' and 'critical' to measure after Delphi survey Round 2 (n=60)

Domain	Outcome	% of participants rating outcomes 'not important'	% of participants rating outcomes 'critical'
1. Physical activity and health	Active travel	3%	51%
	Anthropometry[1]	15%	26%
	Blood lipids	32%	14%
	Blood pressure	28%	14%
	Diet (varied and balanced)*	3%*	71%*
	Energy	8%	26%
	Fitness	0%	60%
	Heart rate	20%	17%
	Intensity of physical activity	3%	63%
	Leisure time activity	3%	62%
	Motor skills	8%	46%
	Musculoskeletal	12%	20%
	Oxygen peak intake	29%	9%
	Sedentary time	3%	63%
	Sleep (number of hours)*	3%*	85%*
	Step counts	12%	23%
2. Social and emotional health	Anxiety*	0%*	78%*
	Appetite	8%	42%
	Body awareness	2%	46%
	Body image	2%	66%
	Depression	3%	74%

	Empowerment	2%	42%
	Enjoyment*	0%*	74%*
	Happiness*	0%*	85%*
	Mood	0%	51%
	Peer support	0%	46%
	Resilience	3%	55%
	Satisfaction	2%	46%
	Self-confidence*	0%*	74%*
	Self-efficacy	2%	68%
	Self-esteem*	0%*	75%*
	Self-expression	8%	34%
	Self-perception	2%	51%
	Sickness	12%	40%
	Sleep patterns	3%	69%
	Social interaction	0%	65%
	Stress*	0%*	72%*
	Wellbeing*	0%*	85%*

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3. Educational performance	Academic performance	2%	57%
	Attention*	0%*	74%*
	Classroom behaviour	2%	68%
	Cognition	2%	54%
	Concentration*	0%*	75%*
	Engagement	0%	69%
	Executive functioning	2%	46%
	Focus*	3%*	72%*
	Maths	8%	55%
	Memory	2%	48%
	Reading	8%	51%
	Writing	8%	48%

*Ratings that met the threshold (≤15% participant agreement of 'not important' to measure and ≥70% participant agreement of 'critical' to measure).
[1]Anthropometry was presented as 'Bio-impedance' to the participants. This was changed based on reviewer comments.

VERSION 2 – REVIEW

REVIEWER	Kennedy, Sarah University of Newcastle, School of Education
REVIEW RETURNED	19-Aug-2022

GENERAL COMMENTS	Well done on the revised manuscript.

REVIEWER	Matłosz, Piotr University of Rzeszów, Faculty of Physical Education
REVIEW RETURNED	13-Aug-2022

GENERAL COMMENTS	The authors have satisfactorily addressed most of my suggestions.