APPENDIX A. MEDLINE SEARCH STRATEGY

MEDLINE Search Strategy

1	(skiing or skier).mp. or exp SKIING/
2	(archery or archer).mp.
3	"Track and Field".mp. or exp "Track and Field"/
4	(athletics or "distance racing").mp.
5	(billiard$ or bocce or bocci).mp.
6	mountaineering.mp. or exp MOUNTAINEERING/
7	(mountain climb$ or hiking).mp.
8	(curling or curler).mp.
9	(bicycling or bicyclist).mp. or exp BICYCLING/
10	(hand-cycl$ or hand cycl$).mp.
11	exp Equine-Assisted Therapy/
12	(equine adj2 therapy).mp.
13	("horseback riding" or hippotherapy).mp.
14	(fishing or fly-fishing).mp.
15	(goalball or goal-ball).mp.
16	exp GOLF/
17	golf$.mp.
18	(kayak$ or canoe$).mp.
19	(triathlon or para-triathlon).mp.
20	(sailing or sailor).mp.
21	((trap$ adj2 shoo$) or (skeet$ adj2 shoo$) or sporting clay$).mp.
22	shooting sports.mp.
23	((sitting or seated) and volleyball).mp.
24	((sled or sledge) and hockey).mp.
25	snowboar$.mp.
26	power soccer.mp. or exp SOCCER/
27	(surfer or surfing or surfboard).mp.
28	scuba.mp. or exp SWIMMING/
29	table tennis.mp.
30	tennis.mp. or exp TENNIS/
31	(weightlifting or "weight lifting" or "power lifting").mp. or exp Weight Lifting/
32	(wheelchair and (basketball or fencing or lacrosse or rugby or soccer or tennis or sport$ or marathon$)).mp.
33	(sport$ adj5 (practice or participa$)).ti,ab.
34	1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20 or 21 or 22 or 23 or 24 or 25 or 26 or 27 or 28 or 29 or 30 or 31 or 32 or 33
35	amyotrophic lateral sclerosis.mp. or exp Amyotrophic Lateral Sclerosis/
36	(amputation or amputee).mp. or exp Amputation/ or exp Amputation, Traumatic/

37 ((limb and deficien$) or (limb and disabilit$) or (artificial and limb) or (prosthe$ and limb)).mp.
38 ((hearing adj2 loss) or deaf or hearing impair$).mp. or exp Hearing Loss/
39 multiple sclerosis.mp. or exp Multiple Sclerosis/
40 exp Stress Disorders, Post-Traumatic/
41 (post-traumatic stress disorder or posttraumatic stress disorder).mp.
42 exp Spinal Cord Injuries/
43 (spinal cord injur$ or spinal cord disorder$).mp.
44 exp STROKE/
45 ("cerebral vascular accident" or "cerebrovascular accident").mp.
46 traumatic brain injur$.mp. or exp Brain Injuries, Traumatic/
47 blindness.mp. or exp BLINDNESS/
48 (visua$ and (disab$ or impair$)).mp.
49 (sensory and (disab$ or impair$)).mp.
50 ((mobility and disabil$) or (mobility and impair$)).mp.
51 (tetraplegi$ or quadriplegi$ or paraplegi$).mp.
52 exp Quadriplegia/ or exp Paraplegia/
53 (physical$ and (disab$ or challeng$)).mp.
54 35 or 36 or 37 or 38 or 39 or 40 or 41 or 42 or 43 or 44 or 45 or 46 or 47 or 48 or 49 or 50 or 51 or 53
55 34 and 54
56 "winter sports clinic".ti,ab.
57 "summer sports clinic".ti,ab.
58 "wheelchair games".ti,ab.
59 (paralympi$ or para-olympi$ or para-sport$ or parasport$).mp.
60 exp Sports for Persons with Disabilities/
61 ((adapted or adaptive) adj5 (sport$ or recreation or activit$ or exercise)).mp.
62 "special olympi$".mp.
63 (disabl$ adj3 sport$).mp.
64 (disabl$ adj2 athlet$).mp.
65 56 or 57 or 58 or 59 or 60 or 61 or 62 or 63 or 64
66 55 or 65
67 limit 66 to (english language and yr="1995 -Current")

APPENDIX B. CRITERIA USED IN QUALITY ASSESSMENT

EXPERIMENTAL AND OBSERVATIONAL STUDIES

(Yes/No/Unclear/Not applicable)

1. Were the criteria for inclusion in the sample clearly defined?

2. Were the study subjects and the setting described in detail?

3. Were strategies to deal with confounding factors stated?

4. Were the outcomes measured in a valid and reliable way?

5. Was there evidence of ethical approval by and appropriate body?

We also noted if outcome assessment was blinded and, for randomized trials, whether randomization and allocation were adequate.

Adapted from:

Moola S, Munn Z, Tufanaro C, et al. Chapter 7: Systematic reviews of etiology and risk. In Aromataris E, Munn Z (eds) *Joanna Briggs Institute Reviewers's Manual*. The Joanna Briggs Institute. 2017. Available from https://reviewersmanual.joannabriggs.org/ Accessed 17 December 2018.

QUALITATIVE STUDIES

1. Is there congruity between the stated philosophical perspective and the research methodology?

2. Is there congruity between the research methodology and the research questions or objectives?

3. Is there a statement locating the researcher culturally or theoretically?

4. Are participants, and their voices, adequately represented?

5. Is the research ethical according to current criteria and is there evidence of ethical approval by an appropriate body?

Adapted from:

Lockwood C, Munn Z, Porritt K. Qualitative research synthesis: methodological guidance for systematic reviewers using meta-aggregation. *Int J Evid Based Healthc.* 2015;13(3):179-187.

APPENDIX C. PEER REVIEW COMMENTS/AUTHOR RESPONSES

Question Text	Comment	Author Responses
Are the objectives, scope, and methods for this review clearly described?	Yes	Thank you.
	Yes	
	Yes	
	Yes	
	Yes	
	Yes	
	Yes	
	Yes	
Is there any indication of bias in our synthesis of the evidence?	No	Thank you.
	No	
	No	
	No	
	No	
	No	
	No	
	No	
Are there any published or unpublished studies that we may have overlooked?	Yes - Possibly, but cannot say for sure. Review seems to infer there are no studies re: dosing, yet cites dosing for SCI population.	We report that there is limited evidence on dosing because only 3 of 55 studies reported effectiveness by duration or frequency of participation.
	No	
	No	
	No	
	No	
	Yes - It would be interesting to compare the results of this systematic review to results from people without disabilities.	Our topic nominators were interested in adaptive sports for people with disabilities. This comparison would be of limited applicability and was not in our approved topic scope. We did not search for studies of sports for people without disabilities.
	No	

Question Text	Comment	Author Responses
	Yes 1) Psychological strategies of Veterans and service members who participate in organized sports. SL Peterson, JZ Laferrier, AM Koontz, H Wang, M Hannan, RA Cooper. Journal of Military, Veteran and Family Health 3 (2), 42-52, 2017. 2) Research on Physical Activity and Health among People with Disabilities: A Consensus Statement. Journal of Rehabilitation Research & Development . Apr99, Vol. 36 Issue 2, p142. 12p. Cooper, Rory A.; Quatrano, Louis A. 3) Wheelchair racing sports science: a review. RA Cooper J Rehabil Res Dev 1990;27 (3), 295-312. 4) Evaluation of a manual wheelchair interface to computer games. TJ O'Connor, RA Cooper, SG Fitzgerald, MJ Dvorznak, ML Boninger, Neurorehabilitation and Neural Repair 14 (1), 21-31. 5) The relationship between wheelchair mobility patterns and community participation among individuals with spinal cord injury. RA Cooper, E Ferretti, M Oyster, A Kelleher, R Cooper. Assistive Technology 23 (3), 177-183. 6) Sports–medicine for the disabled. The time for specialization in prosthetics and orthotics is now. RS Gailey, RA Cooper. Prosthetics and orthotics international 33 (3), 187-191. 7) Quantification of activity during wheelchair basketball and rugby at the National Veterans Wheelchair Games: A pilot study. ML Sporner, GG Grindle, A Kelleher, EE Teodorski, R Cooper, RA Cooper. Prosthetics and orthotics international 33 (3), 210-217, 2009. 8) Sports and Recreation for People with Spinal Cord Injuries. I Rice, RA Cooper, R Cooper, A Kelleher, A Boyles. Spinal Cord Injuries: Management and Rehabilitation, 455-47, 2009. 9) The Gamecycle Exercise System: Comparison With Standard Ergometry. SG Fitzgerald, RA Cooper, T Thorman, R Cooper, SF Guo, ML Boninger. The journal of spinal cord medicine 27 (5), 453-459, 2004. 10) An investigation of the exercise capacity of the wheelchair sports USA team. RA Cooper, TJ O'Connor, RN Robertson, WE Langbein, FD Baldini. Assistive Technology 11 (1), 34-42, 1999.	Thank you for the suggested references. We have reviewed each of them for eligibility for inclusion. Only reference #12: Boninger was eligible for inclusion (KQ2). We also added reference #6 into the discussion under Limitations or Research Gaps 1) The focus of this study is on psychological skills/strategies used during competition. Longer participation in sports was associated with improved psychological skills but those skills were not an outcome of interest for our review. 2) The focus of this consensus statement is on physical activity rather than adaptive sport. 3) This paper is a narrative review published outside of our search dates of 1995 to the present. 4) This study reports physiological outcomes during exercise training which are not outcomes of interest for this review. 5) This study does not quantify adaptive sports participation. 6) This paper is now incorporated in the discussion. 7) This study reports on distance traveled and other measures of activity during wheelchair basketball and wheelchair rugby. These were not outcomes of interest for this review. 8) This book chapter/narrative is focused on training techniques rather than outcomes. 9) This study focused on physiological outcomes (oxygen consumption) and perceived exertion which were not outcomes of interest for this review. 10) This study focused on physiological outcomes (metabolic responses) which were not outcomes of interest for this review. 11) Please see #2 above.

Question Text	Comment	Author Responses
	11) Research on physical activity and health among people with disabilities: a consensus statement. RA Cooper, LA Quatrano. Journal of Rehabilitation Research & Development 36 (2), 1999. 12) UPPER LIMB NERVE ENTRAPMENTS IN ELITE WHEELCHAIR RACERS, ML Boninger, RN Robertson, M Wolff, RA Cooper. American journal of physical medicine & rehabilitation 75 (3), 170-176, 1996. 13) CARPAL TUNNEL SYNDROME IN PARALYMPIC WEIGHT LIFTERS. ML Boninger, M Wolff, RA Cooper, RN Robertson. American Journal of Physical Medicine & Rehabilitation 74 (2), 173, 1995. 14) Maximal exercise response of paraplegic wheelchair road racers. RA Cooper, SM Horvath, JF Bedi, DM Drechsler-Parks, RE Williams. Spinal Cord 30 (8), 573, 1992. 15) Training practices of athletes who participated in the national wheelchair athletic association training camps. KT Watanabe, RA Cooper, AJ Vosse, FD Baldini, RN Robertson. Adapted Physical Activity Quarterly 9 (3), 249-260, 1992.	12) We added this study to the results for Key Question #2. 13) This citation is for an abstract and therefore would not be eligible for inclusion in the review. 14) This study focused on physiological outcomes (heart rate, ventilation, oxygen consumption) which were not outcomes of interest for this review. The 1990 study is also outside of our search range. 15) This is a survey of training practices including exercise, diet, and mental preparation. It does not report outcomes of interst for review. The 1992 study is also outside of our search range.
Additional suggestions or comments can be provided below. If applicable, please indicate the page and line numbers from the draft report.	Text of review appears to have been written by different writers. Some sections are very detailed (e.g., citing study methodology, analysis, etc), while other sections of the report (citing studies) are not as thorough. *Specific Comments* Page 1, Lines 53-58: acronyms provided for included diagnoses in lines 29-33 on same page, therefore recommend only using only the acronyms moving forward Page 2, Lines 13-16 and 20-24: same comment regarding acronym use Page 3, Lines 58-59: the definitions for “program” used in this report are not consistent with the typical use of that terminology.Strongly recommend changing the terminology for the groupings. Page 4, Lines 43-48: Again strongly recommend changing the grouping terminology from “program” and “non-program” because the current definitions are not consistent with definitions in the field Page 5, Lines 5-7: The first sentence is awkward, and recommend a revision to ensure the intended message is clear	We reviewed and edited for better consistencyconsistency. Page 1 and Page 2: We replaced the diagnoses with acronyms throughout the document except where the diagnoses are part of a Key Question. Pages 3 and 4: This was discussed on several conference calls with our partners and TEP. There was no disagreement with our use of these terms. Suggested terms such as “cross-sectional” or “longitudinal” are generally reserved as methodologic study descriptors not an intervention characteristic. Furthermore, this does not accurately classify the differentiation. We now provide our definition of “program” and changed “non-program to “sports activity participation”. These studies do not provide a formal description of any “program” involved with the sports participation (a key component of our description).

Question Text	Comment	Author Responses
	Page 5, Line 7: spell out “mental health” (versus MH) for consistency with remainder of document ** continue recommendation for all instances of “MH” in the document ** Page 5, Line 12: replace “stroke” with “CVA” for consistency with Key Questions terminology ** continue recommendation for all instances of “stroke” in the document ** Page 5, Line 15: “…not associated with different aspects…” seems to be missing something.Potentially add “improvements in” after with, if appropriate for the intended message Page 5: Having the Outcomes by Sports adjacent to the Outcomes by Population, differences/contradictions in the summaries are much more apparent.Recommend breaking up the sections (e.g. fully address KQ1 “by sport” and then fully address KQ2 “by population”) Page 5, Line 48: Suggest change “mixed for the balance outcome” to “mixed regarding influence on balance”, if appropriate for the intended message Page 5, Lines 55-56: Unsure if final sentence adds anything.More appropriate to highlight if a study does have a significant number of Veterans included in the population Page 6, Lines 12-13: Suggest change “little information about” to “little support for”, if appropriate for the intended message Page 7, Lines 23-26: I assume that adverse events from all studies considered for KQ1 were also considered for review in KQ2, so I would think that should be reflected here. I believe any adverse events and reasons for participant withdrawals from these studies should be considered when assessing harm, not only those studies specifically aimed at assessing harm. Page 7, Line 38: number of studies (assuming 1) is missing before “was a narrative analysis” Page 8, Lines 15-60: the Discussion seems to be more a repetition of the Results. Understand if this type of work is not comparing to other works, but maybe more of a take home, or re-frame the results to not include commentary (save that for the discussion). Page 8, Lines 33-36: Example of a statement that is really a result, and not a discussion point	Page 5 Lines 5-7: sentence edited Page 5 Line 7: replaced MH with mental health throughout Page 5 Line 12: see above re acronyms Page 5 Line 15: added “changes in” Page 5 Our partners were interested in outcomes by sport and by population. Doing so does mean there is overlap of studies. Page 5 Line 48: Thank you for the suggestion. Page 5 Lines 55-56: Thank you – sentence deleted. Page 7 Lines 12-13: We believe the statement is correct as is. Page 7 Lines 23-26: Adverse events from all studies in KQ1 were included in KQ2. Page 7 Line 38: corrected – 1 narrative analysis Page 8 Lines 15-60 We revised the discussion to provide more take home messages including suggestions for using these findings to design, develop, make available, and evaluate future adaptive sports programs and participation for Veterans in and outside of VHA. Page 8 Lines 40-42: We added more detail about harms to the Results section the Executive Summary. As noted above, adverse events resulting in withdrawal from a study identified for KQ1 were included under KQ2.

Question Text	Comment	Author Responses
	Page 8, Lines 40-42: There is evidence referenced on 41- 44 that describe potential harms that can occur when participating in adaptive sports. These results should be included in the summary. Of course, identifying harms does not imply that people should not participate in sports, as it is understood that anyone participating in a sport is more likely to incur an injury, most often musculoskeletal, than someone who is not participating in a sport. However, it is important to identify the most common injuries so that providers involved with these events can help mitigate the risk through things like proper training and equipment. Suggest also discussing adverse events and reasons for participant withdrawals listed in other studies as well.	
	Page 9, Lines 30-31: Sentence "no studies provided outcomes data for…" is confusing, and may not add much value beyond what is already written, so suggest removing	Page 9 Lines 30-31: We believe this sentence is a lead-in to our statement about generalizability.
	Page 9, Lines 31-34: if listing populations where research exists, suggest adding "SCI" to the list of conditions (PTSD, multiple sclerosis, stroke…) for completeness since 20 studies reviewed in this population for KQ1.	Page 9 Lines 31-34: This sentence refers specifically to the populations studied in the sports listed.
	Page 9, Line 33: replace "multiple sclerosis" with "MS" for consistency with Key Questions terminology ** continue recommendation for all instances of "multiple sclerosis" in the document. Same comment for instance of "stroke" on this line, but comment to correct throughout listed above **	Page 9 Line 33: see above comment re acronyms Page 9 Lines 44-45: We revised this sentence – our statement was about the participants in the included studies.
	Page 9, Lines 44-45: recommend removing statements regarding "elite athletes" since this literature was not reviewed and so any comments in this section are unsupported commentary	Page 9 Lines 45-56: We revised this sentence; we did not exclude studies of individuals with severe illness or disability – this statement is referring to the exclusion criteria of the primary studies we reviewed.
	Page 9, Lines 45-56: unsure of why "individuals with severe illness or disability and comorbid conditions" were excluded from the analysis. This "exclusion" was not listed in the exclusion criteria, and the information for these patients may be very relevant because they may be participating in adaptive sports events hosted by the VA NVSP&SE. Also, a definition should be provided for the criteria used when screening "severe illness or disability" because some individuals may classify SCI into this category.	Pages 10-11: The Gaps/Future Research section was revised to focus on research gaps.

Question Text	Comment	Author Responses
	Pages 10-11, Lines 34-27: The Gaps/Future Research section includes many additional comments about the Limitations of the studies included, and did not focus primarily on identifying the Gaps. For example, the initial paragraph for KQ3 is listing limitations of the studies that could instead be included/added to the summary in the Limitations section on Page 9. Recommend reshaping this section to provide clear gaps so that others can help focus future efforts in these areas, improving the overall quality of the body of evidence available. Page 11, Lines 32-33: include SCI in diagnoses list with evidence Page 11, Lines 36-37: revise conclusion on harms to more accurately reflect the literature reviewed Page 14, Lines 23-28: only utilize acronyms for conditions listed in KQ1, because already defined on Page 13, Lines 42-46 Page 14, Lines 39-42: only utilize acronyms for conditions listed in KQ2, because already defined on Page 13, Lines 42-46 Page 14, Lines 47-51: only utilize acronyms for conditions listed in KQ3, because already defined on Page 13, Lines 42-46 Page 14, Line 53: include acronym "(VHA)" after "Veterans Health Administration" because it is used later in the paragraph (Line 58) Page 14, Line 55: can use acronym "NVSP&SE" in place of "National Veterans Sports Programs and Special Events" because previously defined on Page 13, Line 20 Page 14, Line 58: change "VHA's national programs for rehabilitation" to "VHA's rehabilitation programs that incorporate adaptive sports within their treatment plan" Page 14, Line 58-59: change "the Disabled Veterans Adaptive Sports Programs" to "the national programs hosted by the NVSP&SE" Page 18, Line 13: articles for KQ2 should include all of those reviewed in KQ1 because participant who withdrew or experienced an adverse event should be considered to determine if due or related to a potential harm. Page 18, Lines 13-16: remove final statement listed studies on "elite athletes" and list "studies conducted on elite athletes" to the exclusion criteria.If it is not appropriate to include as an exclusion	Page 11 Lines 32-33: see above re sports and populations in those sports Page 11 Lines 36-67: We believe this sentence accurately reflects the literature reviewed. Page 14 Lines 23-28, 39-42, 47-51: We chose to leave the acronyms when they are part of a Key Question. Page 14 Line 53: VHA added Page 14 Line 55: replaced with NVSP&SE Page 14 Line 58: change made Page 14 Line 58-59: change made Page 18 Line 13: KQ1 studies reporting adverse events are included in KQ2. Page 18 Lines 13-16: This sentence has been revised - studies of elite athletes were not excluded but were not included in our analyses; we provide reference citations for readers interested in those studies. Page 19: see above Page 20: Lines 34-36: see above response re: program and non-program

Question Text	Comment	Author Responses
	criterion, then it leads to the question of why this data was not included in the summaries. Page 19: Move excluded studies for “elite athletes” to a box of excluded studies Page 20, Lines 34-36: Again strongly recommend changing the grouping terminology from “program” and “non-program” because the current definitions are not consistent with definitions in the field ** continue recommendation for new terminology for remainder of the KQ1 section ** Page 20, Line 56-57: Suggest changing “Medical conditions and adaptive sports included” to “Medical conditions by adaptive sports included” Page 21, Table 2: Suggest including all diagnoses of interest in the analysis at the top of the table to clearly illustrate diagnoses where data is lacking. Also suggest using acronyms for all conditions for consistency with KQ Page 21, Table 2: Suggest breaking out the “Multiple” medical condition. For example, if the single study included MS and SCI, then both MS and SCI would have it indicated in the column.Suggestion would result in the total tally for the table to exceed the number of studies identified, however for a reader looking for studies in MS, using this hypothetical example, he/she would know there are 5 studies on EAAT, 3 on hiking and climbing, and 1 that included multiple sports. Page 21, Table 3: Suggest indicating any categories of age covered for all studies. For example, assuming age is reported in all studies, so the 25th study not currently represented within any of the categories for the Age characteristic was not included because the authors included an age range that crossed over multiple categories listed in the table. If this assumption is correct, then recommend a “1” be included for all age ranges. This addition may result, in this hypothetical example, to have >50 years and 25-49 years both having 13 studies indicated, and maybe <25 now having 1, exceeding the overall number of studies, but it would be clear for a reader to know how many studies are available that assessed individuals in the age range of his/her interest.Same comment for all 3 characteristics, when the data is present in the study.	Page 20 Line 56-57: change made Page 21 Table 2: Thank you for the suggestion; a column showing all the diagnoses with no data was added to Table 2 and Table 6. Page 21 Table 2: The studies with either multiple medical conditions or multiple sports did not report results by condition or sport. Page 21 Table 3: We clarified on the table that for Age and Time from Injury or Diagnosis, the counts for each range are the number of studies with a mean or median value for Age or Time that falls in the categories listed; the studies may or may not have reported a range; one study did not report a mean or median age; 11 studies did not report on time from injury or diagnosis Page 21 Lines 43-52: In the final report, all references have been replaced with superscript numbers. Page 22 Lines 43-45: This statement has been reworded.

Question Text	Comment	Author Responses
	Page 21, Lines 43-52: a suggestion for citation style would be to either list the references in alphabetical or chronological order ** continue recommendation for all instances of referenced literature **	
	Page 22, Lines 43-45: confused by the statement “no study reported…” so suggest rewording to “No impact on pain or overall health was reported for individuals with…” if this wording appropriately captures what was reported in the literature referenced	Page 22 Lines 48-49: We chose to leave statements about possible worsening of the KQ1 outcomes in the KQ1 results (as noted on the arrow tables, no worsening was reported).
	Page 22, Lines 48-49: final sentence “There were no reports of worsening…” more appropriate for KQ2 than KQ1.	Page 22 Line 55: Since many of the studies are observational studies, we believe that “associated with (or not)” is the appropriate terminology.
	Page 22, Line 55: terminology “program participation was not associated with” is unclear, unless all referenced studies completed correlation analyses. Potentially phrase could be reworded as “program participation did not influence” if this appropriately reflects what was reported in the literature	Page 23 Line 7: open parenthesis replaced with citation number Page 23 Line 7: statement revised
	Page 23, Line 7: add space between “balance” and the open parenthesis Page 23, Line 7: add the measure after “found no significant difference”. If appropriate for the referenced literature, could revise to “found no significant difference in balance”.Also see note below (Page 23, Lines 38-58) Page 23, Line 39: add a closed parenthesis after “Malinowski 2017”	Page 23 Line 39: parenthesis removed after replacement of citations with superscript numbers Page 23 Lines 38-58: We now refer the reader to the Appendices for more detail about the individual studies and outcomes data.
	Page 23, Lines 38-58: this section is an excellent summary of the literature reviewed. It includes details of the studies, to include the measures assessed in the studies and the change that occurred (to include mean scores and p-values). Potentially this detail is greater than what was intended for this type of review, but when a section such as this section is adjacent to other sections, such as Lines 5-12 referencing 3 studies on Golf, at least one of which had significant results, these other sections seem to be lacking. As a reader, preference would be to have all sections more like the referenced PTSD section because it includes very useful information.	Page 31 Table 6: see comments for Table 2 above
	Page 31, Table 6: ** Same suggestions as for Table 2 on Page 21** Suggest including all diagnoses of interest in the analysis at the top of the table to clearly illustrate diagnoses where data is	Page 31 Table 6: see comments for Table 2 above

Question Text	Comment	Author Responses
	lacking. Also suggest using acronyms for all conditions for consistency with KQ Page 31, Table 6: ** Same suggestions as for Table 2 on Page 21** Suggest breaking out the "Multiple" medical condition. Page 32, Table 7: ** Same suggestions as for Table 3 on Page 21** Suggest indicating any categories/ranges covered within the 30 studies, for all 3 characteristics. Page 32, Line 50-51: based on Table 8, there were 10 studies that addressed these sports. Other sections have provided a valuable summary of the articles, even when it is limited to a single study or two. It would be appreciated by the reader if these 10 studies could be summarized similarly, especially because Table 8 also indicates there were significant results in multiple of these studies. Pages 32, 35-36: Similar comment to Page 23, Lines 38-58 regarding depth and consistency of information provided is recommended for the sections included across these pages Page 39, Lines 6-30: Another example where the first paragraph references 3 studies and the second references 1, however the paragraph on the single study includes many additional details. The difference is made more evident because they are adjacent to each other, but as a reader the additional detail included in the second paragraph is appreciated. Page 39, Lines 39-40: This sentence highlights the difference in terminology used in the field, where the three events listed in this sentence would be considered adaptive sports programs, yet the study is referenced as a "non-program" study, likely because the approach was cross-sectional. A change in terminology would clarify any confusion. Page 39, Line 43: remove acronym "(SER)" if not used again Page 40, Line 14: add a comma after "SCI" Page 41, Line 15: suggest all articles included in KQ1 be considered for KQ2, regardless if the primary aim/objective of the study was to assess harm. Any/all withdrawals or adverse events should be identified and considered to potentially contribute to a better understanding of potential risks/harms associated with participation in adaptive sporting events. Page 41, Lines 21-23: Do not agree that the events that occurred by the participants with MS should have been excluded from this	Page 32 Table 7: see comments for Table 3 above Page 32 Lines 50-51, 35-36, Lines 6-30: As noted above, we now refer the reader to the Appendices for more details about the individual studies and outcomes data. Page 39 Lines 39-40 Please see comments above regarding program and non-program terminology. Page 39 Line 43: acronym removed Page 40 Line 14: added Page 41 Line 15: All articles in KQ1 were included in KQ2 if they reported adverse events. Page 41 Lines 21-23: We disagree with the reviewer's request to add this information as the findings would not address KQ2: What are the harms of participation in individuals with MS? We stated that the findings were excluded because participants in the treatment and comparator groups (if present) had exacerbations and neurological worsening during study

Question Text	Comment	Author Responses
	analysis. These events may provide very valuable information to assist providers involved with these types of activities to identify how to best approach and/or modify the activity to ensure these individuals are able to safely and effectively participate in these types of activities.Strongly agree that this information needs to be added to this section of the report. Page 41, Lines 37-41: Suggest removing the following sentence: "The large number of injuries…" Conservative approach would be to not question an investigator's determination of adverse events because they may be warranted, and/or the determination may be based on direction the investigator received from the review board overseeing the research. Page 42, Line 47-49: Suggest moving (You 2016) citation up to after first sentence. Page 42, Line 50: Remove "et al." from citation for consistency with other citations Page 44, Lines 12-15: the previous few pages had a great summary of the available literature that illustrates some potential harms/risks of participation in adaptive sports.This summary does not accurately reflect this review and should be updated. Page 46, Line 23: change "twenty-five" to "25" to be consistent with remainder of the document. Style has been to list numerically whenever the number is not the beginning of the sentence. Page 46, Line 45: change "twenty-six" to "26" (for reasons previously indicated). Page 46, Line 46: "focused mainly on amputees, SCI, or multiple diagnoses reported that" should be "reported mainly on individuals with limb amputations, SCI, or multiple diagnoses found that" Page 46, Line 54: "amputees" should be replaced with "individuals with limb amputations" Page 48, Line 7: "so they could participate" should likely be change to "so they chose not to participate" but please confirm wording consistent with referenced findings. Page 48, Line 18: change "twenty-five" to "25" (for reasons previously indicated).	participation; these events were excluded from our analysis as they could not be attributed solely to adaptive sports participation. Page 41 Lines 37-41: sentence modified Page 42 Line 47-49: superscript citation number follows first sentence Page 42 Line 50: citation in parentheses removed Page 44 Lines 12-15: While we agree with our original summary wording we changed to say "infrequent and generally not serious" based on the authors specific statements or the nature of the injury ("minor" "fatigue but not "excessive fatigue").Page 46 Lines 23 and 45: words replaced with numerals throughout for consistency of style Page 46 Lines 46 and 54: changed as suggested Page 48 Line 7: sentence was modified Page 48 Line 18: replaced (see comment above) Page 48 Lines 18-19: sentence was modified Page 48 Line 23: replaced (see comment above) Page 48 Line 52: replaced throughout the document

Question Text	Comment	Author Responses
	Page 48, Lines 18-19: “Eleven studies also reported” should be “Of these, 11 studies reported” if these 11 are include in the initially referenced 23 studies. Page 48, Line 23: change “twelve” to “12” (for reasons previously indicated). Page 48, Line 52: “amputees” should be replaced with “individuals with limb amputations” Page 49, Line 14: “l” missing at the end of “general” Page 49, Lines 14-16: Move citation to the end of the sentence (and cite as “Chard 2017”) to be consistent with formatting utilized throughout other sections. Page 49, Line 35: “TBI” previously defined on only need to list “TBI” in this instance Page 49, Line 36: confirm studies including individuals with “tetraplegia”, “quadriplegia”, and “paralysis” were not the result of a SCI, or else these studies should be referenced above in the same paragraph (lines 27-28) Page 49, Lines 22-39: Did these studies indicate that the health conditions were facilitators or motivators of participation in adaptive sports. The paragraph completely lays out the studies that included these diagnoses, but does not as clearly indicate if these conditions were found to be facilitators or motivators. Page 51, Lines 8-10: Change in-sentence reference to “Kars et al.” and move citation to the end of the sentence to be consistent with formatting utilized throughout other sections. Page 51, Line 9: “lower limb amputees” should be replaced with “individuals with lower limb amputations” Page 51, Lines 9: Change in-sentence reference to “Bragaru et al.” Page 51, Line 10: “prosthetics” should be changed to “prostheses” or “prosthetic devices” Page 51, Line 11: “prosthetics” should be changed to “prostheses” or “prosthetic devices” Page 52, Line 8: add “limb” in front of “amputation” Page 52, Line 12: “amputees” should be replaced with “individuals with limb amputations” Page 52, Line 43: add “limb” in front of “amputation” Page 52, Line 53: add “limb” in front of “amputation” Page 52, Line 58: add “limb” in front of “amputation”	Page 49 Line 14: corrected Page 49 Lines 14-16: sentence revised with citation at the end Page 49 Line 35: replaced with abbreviation Page 49 Line 36: We used the language provided in the original studies which did not specify if the tetraplegia, quadriplegia, and paralysis resulted from a SCI. Page 49 Lines 22-39: Studies did not indicate whether health conditions influenced participation in adaptive sports; we added a sentence to clarify this point. Page 51 Lines 8-10: sentence modified Page 51 Line 9: see correction above Page 51 Line 9: sentence corrected Page 51 Lines 10 and 11: changed to “prosthetic devices” Page 52 Line 8 and others listed below: “Limb” added in front of “amputation” throughout the document. Page 53 Lines 11 and 17 (below): As noted above, we used the language provided in the original studies which did not specify if the tetraplegia, quadriplegia, and paralysis resulted from a SCI.

Question Text	Comment	Author Responses
	Page 53, Line 5: add “limb” in front of “amputation” (and change “an” to “a”) Page 53, Line 11: confirm studies including individuals with “paraplegia” and “tetraplegia” were not the result of a SCI Page 53, Line 11: add “limb” in front of “amputation” Page 53, Line 17: confirm studies including individuals with “paraplegia” were not the result of a SCI Page 53, Line 34: suggest changing “extremity” to “limb” for consistency Page 53, Line 40: add “limb” in front of “amputation” Page 53, Line 48: add “limb” in front of “amputation” Page 54, Line 10: add “limb” in front of “amputation” Page 54, Line 42: change period at the end of the citation to a closed parenthesis Page 54, Line 45: add “limb” in front of “amputation” Page 54, Line 47: add “limb” in front of “amputation” Page 54, Lines 53-54: change “among tetraplegics and amputees” to “among Veterans with tetraplegia or limb amputation” (suggest list as “Veterans with SCI” if cause of tetraplegia was SCI). Page 55, Line 18: add “limb” in front of “amputation” Page 56, Line 10: same concern regarding terminology “program” and “non-program” indicated above Page 56, Lines 21-22: final sentence “there were no reports…” related to KQ2 more than KQ1 Page 56, Line 25: same concern regarding terminology “program” and “non-program” indicated above Page 56, Line 26-29: “spinal cord injury” should be “SCI” and “amyotrophic lateral sclerosis” should be “ALS” for consistency Page 56, Line 26-30: There were many studies reviewed for participation in sports of individuals with SCI, and these findings should be better captured here Page 56, Lines 34-36: KQ2 summary should be re-written as recommended above Page 57, Lines 31-32: Sentence “No studies provided outcomes data for many adaptive sports…” doesn’t seem accurate since studies reporting on multiple sports were included in this report, so the meaning of this sentence may not be clear, and therefore it is recommended to remove it.	Page 53 Line 34: changed as suggested Page 54 Line 42: corrected with change to superscript citations Page 54 Lines 53-54: As noted, we used the language provided in the original studies. Page 56 Line 10: see above regarding terminology Page 56 Lines 21-22: see previous comment re “worsening” Page 56 Line 25: see above regarding terminology Page 56 Lines 26-29: abbreviations are now used throughout the document except in the Key Questions (as noted above) Page 56 Lines 26-30: section modified Page 56 Lines 34-36: More text was added to the Results summary but we believe this is an accurate overall summary for KQ2 Page 57 Lines 31-32: As noted for the Executive Summary, we believe this sentence is appropriate; studies reporting on multiple sports did not report result by sport. Page 57 Line 38: “*ie*” has been added Page 57 Lines 45-47: This text has been modified as in the Executive Summary.

Question Text	Comment	Author Responses
	Page 57, Line 38: add “based on” inside of the parentheses – “(based on age, gender..) Page 57, Lines 45-47: remove these lines as indicated above (commented change for Page 9, Lines 44-45 and Page 9, Lines 45-56) Page 57, Lines 52-53: “Most of the evidence…” is not a statement of a limitation. The limitation would be that potential harms to other diagnoses of interest were not covered as thoroughly as potential harms for the SCI and MS populations Page 57, Line 53: Change “spinal cord injuries” to “SCI” for consistency Page 57, Line 57-60: update terminology for “program” and “non-program” and update number of studies that can be considered for addressing KQ2 (as suggested in comment for Page 41, Line 15) Page 58, Line 5: change “1” to “one” for consistency with remainder of document Page 58, Lines 43-50: Address “program” and “non-program” terminology Page 59: Lines 5-16: again this section is great information, but it may be better to include it in the Limitations section versus the Gaps/Future Research section Page 59, Lines 41-42: revise conclusion on harms to more accurately reflect the literature reviewed	Page 57 Lines 52-52: sentence modified Page 57 Line 53: see above re acronyms Page 57 Lines 57-60: see above regarding terminology Page 58 Line 5: the current ESP style is to use the numeral “1” in most cases and the report has been corrected for consistency Page 58 Lines 43-50: see above regarding terminology Page 59 Lines 5-16: Thank you for the suggestion; we have elected to leave it as is. Page 59 Lines 41-42: As noted above, we believe this sentence accurately reflects the literature reviewed.
	none	Thank you.
	The manuscript is very easy to read. However, going back and forth for on the Key Questions posed a problem of trying to keep the subtopics in check for this reviewer. Only comment I have is that if after the review of the articles, can we compare Veterans only articles vs general population articles and make any inference or conclusions. I do not have anything else to add as a reviewer.	Thank you. We reviewed the organization of the report. There is not sufficient evidence to make inference or conclusions about adaptive sports for Veterans vs. the general population.
	1. Overall the report reads well - flows nicely and is easy to follow. 2. I have made some comments directly on the document - a few items that stand out; first of all, in the studies, do Veterans	1) Thank you. 2) Veterans typically reported other diagnoses; if one diagnosis (*eg,* PTSD) was predominant, we identified the study as a study of that diagnosis.

Question Text	Comment	Author Responses
	identify only as a person with PTSD, or are other diagnosis's listed? 3. Exclusion criteria is not clear in regards to physical activity. 4. Double check formatting and use of acronyms, placement of periods and spaces. 5. Although it is great to see author's names and identify key research, I am wondering if AMA format would read better - it is "clunky" to read in some areas. *Specific comments from document* Page 5 the title should be changed from Associate Chair to Graduate Coordinator Page 9 1) This sentence reads awkward - do we want to say "harms" or concerns. 2) Can we combine spinal cord disorder and spinal cord injury? I am assuming "no", but thought I would ask. Page 10 should this be separated into two questions - facilitators one question, barriers the second question. Page 11 1) Different font on headings. 2) Were "physical activity" only studies excluded as well? Page 12 1) do we know the range of years? from xxxx to 2019? 2) GREAT clarification 3) wondering if question 1 should be restated here? Page 14 1) Interesting finding - this shows we all have plenty of work ahead of us! :-) 2) Interesting... Page 17 It seems that this limitation of generalizability is common across sport studies. Page 24 I am assuming how this reads that exercise/physical activity studies were included? Page 28 1) Is there a reason this is all in large caps? The format seems as if you are "yelling" at the reader. 2) Was the only identified diagnosis PTSD? Page 44 were identified Page 48 This reads well - minimal comments or suggestions. Page 53 A one sentence brief definition of the ICF will be helpful here, in addition, these are "domains" of the ICF, not categories. Page 54 Just curious why only the first author is listed? Page 55, Figure 2 This is GREAT!	3) We added that studies involving physical activity must include a “sport” component. 4) We edited and attempted to identify and correct any formatting/grammatical inconsistencies throughout the document. 5) Author’s names appeared in the peer review version; for the final version, the citations appear as superscripted numbers. Page 5: corrected Page 9 1) Our interest was in harms – injuries, etc. during participation. 2) These were considered separate conditions. Page 10. In the reporting of findings for Key Quesiton3, we address barriers and facilitators separately. Page 11 1) All fonts checked for consistency with ESP style. 2) We required that there be a “sport” component (one of the sports of interest). Page 12: 1) Added the range of years (also reported in the Methods); 2) Thank you; 3) Given the length of the Key Questions, we chose not to add the question here. Page 14: 1), 2) Agree! Page 17: We agree but the issue is probably even greater here when the variability of condition/severity and necessary adaptations may make big differences. Page 24: Yes – as noted above there had to be a sport component. Page 28: 1) Thank you for the feedback; 2) See comment above re diagnoses Page 44: We believe “reported” is correct. Page 48: Thank you Page 53: Thank you for the suggestion. We added a brief sentence on the ICF model and replaced the word ‘categories’ with the word ‘domains’. Page 54: The author names are removed and citations are in superscript format in the final report. Page 55: Thank you

Question Text	Comment	Author Responses
	Page 56 I am wondering if AMA format would be easier to read? I am torn, because it's great to see who the authors are, and recognize key studies, yet, it is "clunky" to read. Page 58 Figure 3 This is GREAT! Page 59 I think the list of citations would be better reported in a table. Page 64 I think one of the limitations not mentioned is that we really don't know the disabling conditions...it's self-reported and typically there is more than one disability present. Page 65 Few studies with standardized assessments measuring clinical outcomes. Page 66 Possibly examine the different domains of the ICF and how this impacts engagement in sport (?) May not be necessary - just a thought. Page 67 EAAT - check when using acronyms throughout the document.	Page 56: The final report is in AMA format. Page 58: Thank you Page 59: The citations have been replaced with superscript numbers. Pages 64 and 65: Thank you – we included these suggestions in the limitations section. Page 66 Thank you for your comment. Although we used the ICF framework to conceptualize reported barriers, motivators, and facilitators the studies themselves did not necessarily report this way. No studies examined how the ICF domains impacted participation, therefore we are unable to comment. Page 67: Thank you – we now use this acronym throughout and have checked other acronyms for consistency.
	Review of “ADAPTIVE SPORTS FOR DISABLED VETERANS” The systematic review aims to answer three key questions. The authors provide adequate information about how they chose the articles that were reviewed, but not necessarily why the articles were chosen. I have a number of issues with the current version. Major Comments. 1. There is no justification presented for the choices made to include/exclude studies or activities. Justification is needed for the inclusion/exclusion criteria, for why elite athletes weren’t included, for why human performance laboratory studies were excluded, for why and how the outcomes were put into the 7 categories that you’ve identified, and for why the listed activities were chosen. Are the different activities important to the overall conclusions of this review? Why are they sometimes distinguished and sometimes combined? How and why were the specific activities chosen? 2. It is not apparent that the authors answered the questions that were presented. The questions should be answered and clearly supported with quantitative evidence collected in the review.	We developed a protocol for the review (including the key questions, sports, medical conditions, and inclusion/exclusion criteria) to address the interests of our Operational Partners. We focused on study design that might provide some level of certainty though given the paucity of data we included studies at much higher ROB than typically included in evidence reports to determine intervention effectiveness. 1) As noted above, the review criteria were developed to meet the information needs of our Partners. Studies of elite athletes would be of limited applicability to the overall Veteran population. Laboratory studies would yield outcomes that are not patient-centered or broadly applicable. The categories of outcomes provided a logical grouping of the outcomes of interest to allow us to speak more broadly about the studies (vs single studies reporting different measures of the same outcome). Our Partners developed the list of activities and medical conditions. There was interest in outcomes by activities and by medical conditions and therefore activities were sometimes reported individually and sometimes combined.

Question Text	Comment	Author Responses
	3. The current version is repetitive and reads like a sometimes-unrelated list. The authors should also consider reorganizing the information to have a better flow. The way in which the information is presented is hard to follow. Each paragraph needs a topic sentence or summary sentence so that the main point of the paragraph is understood and the paragraphs are linked. Right now, it seems like each paragraph is a reiteration of the list of results. Consider reorganizing the results to support the main points of the review. 4. What is the big overall result of this analysis, why is it important, and how will it change adaptive sports in the future? Please provide a summary of what the findings mean. Are there enough studies? Why are the experimental designs important? If the study quality is poor, are these valid results to report? Why are the results important? 5. There are no comparisons of this systematic review with other reviews. For example, how does the incidence of injury compare to people without a disability? How does quality of life compare? The review would benefit from context and references to other studies. Are the barriers to participation different for people with disabilities compared to without? How might we address similarities or differences to promote participation? Additional comments Define effectiveness	2) We disagree that we did not answer the posed key questions. Other reviewers did not raise this concern. It is true that the evidence available provides little high quality or applicable information that can allow stakeholders to have confidence that implementation in VHA will result in similar findings. We discussed these limitations at great length. We also do not believe that formal quantitative analyses is appropriate or would be useful in this situation e given the heterogeneity and paucity of data on a given activity or condition.Furthermore, the methodological quality as assess by risk of bias and clinical applicability for included studies was very low. In many instances we resorted to small, single, observational studies of unique populations, with unique interventions and settings. We did this because we attempted to provide some level of information on this important topic despite the paucity of data for the key questions. 3) We have done some reorganization. We attempted to provide results stratified by intervention, condition, and program and participation. There was little information according to sex or race or comorbidities. We also provide information when available in Veterans. As noted, there was interest in outcomes by sport and by conditions which, by design, requires some repetition. 4) We believe such a comparison would be of little value and potentially hazardous. Ideally, we would have been able to synthesize and summarize but with the available data, our options were limited. There are few studies (or no studies) for many of the sports and medical conditions. Experimental design is important for credibility, certainty of information, risk of bias and applicability of findings. Based on discussion with our Partners we erred on including a range of study designs with varying quality with the caveat that they are high risk of bias, low applicability, and very unique 5) These would be incredibly hard comparisons to make and likely flawed. We did identify and include a few small studies that included groups of individuals with and without disabilities (*eg*, sighted and non-sighted soccer players).

Question Text	Comment	Author Responses
	P4 Line 10. Are you referring to the community level and up? How are you defining the community level? P5-6. starting at line 36. What are these being compared to? Improved compared to what? P7. A take-home message or topic sentences would help convey the primary results for each question. P7 line 38. You're missing a number here in front of "was a narrative analysis" P8 Line 16. Define quantity, quality, and applicability. P8 Line 41. Quantify what you mean by "few" P9 Lines 24-25. How was "quality" assessed? What do you mean by "small in size"? Please quantify these statements throughout. P10. What should be done by future studies and why? P10 Line 69. Define "helpful" P11 Line 12. What are the important barriers that may not be identified? Why is this important? P22. Why are these results important? P22. Lines 42-45. What does this refer to? P24 Lines 3-5. What are the "other outcomes of interest"? P24 Line 10. How is "balance" measured? P35 Lines 27-29. Define "consistent" and "less consistent". Quantify "little reporting" P39-40. Are the questions answerable? It seems like this is just reiterating the results rather than providing a summary of whether the question is answered by the systematic review P42 Table 10. Can the duration of participation be added to this table? And to Table 11? P44. Lines 11-15. The summary of findings seems to contradict all of the results that were presented. What is this conclusion based on? P46. Line 48. Define "poor physical health"	We now refer to "benefits". P4 Line 10: We clarified that focus was community level or higher; we focused on participation as part of an organized activity as opposed to an individual level fitness program (see Exclusion criteria). P 5-6: Many studies did not include a comparator; in the full report and Appendixes we provide more details. P7: We attempted to make the primary results clearer. P7 Line 38: corrected P8 Line 16: The text following the sentence with 'quantity, quality, and applicability" clarifies our meanings. P8 Line 41: We appreciate the reviewer's comments (here and below) about defining and quantifying terminology, however, for readability, we chose to leave most statements as written. P 10: The Future research section has been modified. P 10 Line 69: see comment above re further definitions P 11 Lin 12. We could speculate but given the limitations of the research, it is likely that not all important barriers were identified in the included studies. P 22: We added context information in the Discussion section. P 22 Lines 42-45: this statement was modified P 24 Lines 3-5: all outcomes of interest are identified in the methods sections and summary tables P 24 Lines 10: the Appendix tables contain detailed information about the specific measures P 35 Lines 27-29: these statements are based on the arrows tables and are intended to provide an overview of the outcomes; P 39-40: our topic sentence for each section (KQ1a, KQq1b) is that there are few studies so we are not able to provide a definitive answer; we provide the evidence P 42 Table 10, Table 11: we added duration where reported P 44 Lines 11-15: as noted above in response to another reviewer, we modified this section but overall find there is little conclusive evidence about harms associated with adaptive sports due to the limited reporting

Question Text	Comment	Author Responses
	P48. Line 21. Define “cost” Is this monetary? P48. Line 52. Reword. I think you mean that the physical consequences of advanced age prevented participants from engaging in sports. P49. Line 15. Change “genera” to “general” P51. Line 46. This sentence seems incomplete. What does “participation in society” mean? P52. Line 25. Define “attributes” P55. Lines 33-49. These are great topic sentences, but seem removed from the data that was just presented. P55. Lines 48-49. Are these research approaches sufficient? Valid? A good idea? P56. Lines 10-19. Please quantify these conclusions about limitations. How often is “infrequently”? Quantify “many” on this page and throughout P56. Were the questions answered? How are these answers supported? The summary seems to reiterate the results again rather than provide a conclusion based on the results. P57. Under Limitations: How did you conclude that “The quality of evidence was limited and there were few studies for many of the adaptive sports and conditions of interest.”? Quantify “many” “small” “very” “low” “most” How did you conclude that “Results from EAAT, golf, and fly-fishing programs for individuals with PTSD, multiple sclerosis, or history of stroke may not be generalizable to other sports and other populations.”? You state: “Few program studies provided follow-up data to assess whether participation continued and/or whether benefits were maintained.” Why is it important to provide follow-up data? P58. Lines 36-41. Why is this important? And what should specifically be done in future studies that would help address some of the problems that you uncovered? P58. Line 43. Why are long-term effects important? P58. Lines 54-55. Why should studies use a randomized study design? P59. Lines 7-8. Define “helpful information”	P 46 Line 48: This term was used to summarize information from multiple studies so there is no single definition. P 48 Line 21: Costs refers to monetary costs. P 48 Line 52: We have not modified this statement – the studies report “age” or “too old” as barriers. P 49 Line 15: corrected P 51 Line 46: We believe “participation in society” captures the theme identified in the cited studies. P 52 Line 25: Attributes are characteristics (not beliefs). P 55 Lines 33-49: We reviewed and believe they provide a summary of the results. P 55: Lines 48-89: We expand on this in the Future Research section. P 56: Lines 10-19 see comment above regarding quantification P 56: Please see response under Major Comments (#2) above P 57: The summary tables in the Results section provide a good visual overview on which to base conclusions. See comment above regarding quantification It is our sense (no data to support) that a low percentage of individuals participate in equine activities, golf, or fly-fishing (either adaptive sport or non-adaptive sport) If there is an investment in a program (monetary or time), one would want to know whether benefits were maintained. P 58 Lines 36-41: We modified the future research section. P 58 Line 43: see comment above P 58 Lines 54-55: appropriately designed and executed randomized studies provide the best evidence by minimizing risk of bias and allow for statements of cause and effect

Question Text	Comment	Author Responses
	P59. Line 16. What do you mean by “There may be some important barriers not identified.”? Provide more specific information about these potential barriers. P59. Line 18. Define what “gap” means. P59. Line 24. Why is it important to replicate results? What should future studies do to be more generalizable? P59. Lines 27-32. What is the point of these two sentences? P59. Lines 39-46. Define “insufficient” What would be sufficient? This conclusion paragraph seems to undermine the whole point of this review. You state: “Future research could focus on other adaptive sports and populations, other outcomes including harms, and long-term results.” Why? How would this improve the current study?	P 59 Lines 7-8: see comments above about quantifying/defining P 59 Line 16: see above P 59 Line 18 Modified to state a “gap in the evidence.” P 59 Line 24 Replicating results would increase confidence in the findings; P 59 Lines 27-32: These sentences identify sports and medical conditions that might benefit from future research. P 59 Lines 39-46: Insufficient is a standard term in evidence reviews. We modified the conclusion paragraph. The current state of the evidence provides low certainty of evidence to inform future programming.
	There are two important deficits from the report. First, it did not adequately cover sports for powered wheelchair users such as boccia, power wheelchair soccer, and power wheelchair field hockey. Second, there are a number of papers that show the physiological and health (e.g., work capacity benefits) of adaptive sports that are important to be discussed. The VA programs frequently provide an introduction to or improved skills training in adaptive sports and recreation that helps individuals to improve or maintain their physiological capacity and strength/flexibility. These data do not come out in the report.	1) Studies involving the suggested sports for powered wheelchair users would have been included. No studies of those sports were identified. 2) In scoping discussion with our operational partners, it was determined that including studies with only physiologic outcomes (including strength and flexibility) would not be useful for informing clinical practice and policy related to this topic. We agree and believe it is generally accepted that sports participation improves physiologic and health outcomes. We have not included these studies nor provided comment in our report.

APPENDIX D. EVIDENCE TABLES

Appendix D Table 1. Study Characteristics – Included Studies

Author, year Study Design (Method of Data Collection[a]) US Veteran Population (Yes/No)	Study Inclusion/ Exclusion Criteria	Medical Condition(s) (%)	Sport(s) (%) or Definition/ Characteristics	Number of Participants	Age (years) (mean unless noted)	Gender (% male)	Time from Injury or Diagnosis (years)
Adnan 2001[3] Cross-sectional (matched pairs questionnaire) US Veteran Population: No	Inclusion: male, quadriplegia, ≥1 year experience using a wheelchair Exclusion: none reported	Quadriplegia	Wheelchair rugby	30 (15 wheelchair rugby players, 15 quadriplegic non-players); matched on lesion level	33 (rugby players 30 yrs, non-players 36 yrs)	100%	11.6
Akbar 2015[4] Cross-sectional (questionnaire and Imaging) US Veteran Population: No	Inclusion: paraplegia, wheelchair dependent 24/7 and >5 yrs, mentally healthy, no brain injury, complete information on over-head-sports activity Exclusion: contra-indications for magnetic resonance imaging; cervical disc herniation; advanced degenerative disease of spine; cervical and thoracic syringo-myelia; history of soft tissue injury or surgery of upper	Spinal Cord Injury (100%)	Sport: "overhead-sports activity on a regular basis (at least 1-2 times/wk)"	317 (296 after drop out)	Sports group: 49.1 ± 9.0 No-Sports group: 48 ± 9.7	Sports group: 19.8% male No-Sports group: 30.0% male	Sports group: 26.2 No-Sports group: 25.2

Author, year Study Design (Method of Data Collection[a]) US Veteran Population (Yes/No)	Study Inclusion/ Exclusion Criteria	Medical Condition(s) (%)	Sport(s) (%) or Definition/ Characteristics	Number of Participants	Age (years) (mean unless noted)	Gender (% male)	Time from Injury or Diagnosis (years)
	extremity; active infection of shoulder						
Aydoğ 2006[7] Cross-sectional with comparator US Veteran Population: No	Inclusion: free of lower extremity and back problems for previous 6 months, habitually physically active, and no neurological or systematic disorders Exclusion: none reported	Visual impairment: 100% (67% of sample)	Goalball, trained for 1-3	40 (20 active blind, 20 sedentary blind, 20 sighted)	25	60%	NR
Aytar 2012[8] Case series US Veteran Population: No	Inclusion: age ≥18 yrs, male, use of prosthetics ≥4 hours/day, played amputee soccer for ≥2 months prior to start of study Exclusion: any chronic or systemic disease (diabetes mellitus, hypertension, heart disease); bilateral limb amputation	Limb amputation: 100%	Amputee soccer: 100% Others include Volleyball: 9% Soccer: 9% Gymnastic: 9% Running: 18% Basketball: 9%	11	25	100%	10 months
Barbin 2008[9] Pre-post (questionnaire)	Inclusion: SCI, use wheelchair for daily ambulation Exclusion: none reported	Spinal Cord Injury (100%)	Sport: "1-week skiing program"	10	32.1	70% male	5.1 (3.3)

Author, year Study Design (Method of Data Collection[a]) US Veteran Population (Yes/No)	Study Inclusion/ Exclusion Criteria	Medical Condition(s) (%)	Sport(s) (%) or Definition/ Characteristics	Number of Participants	Age (years) (mean unless noted)	Gender (% male)	Time from Injury or Diagnosis (years)
US Veteran Population: No							
Bauerfeind 2015[10] Longitudinal case series (9-months with questionnaire) US Veteran Population: No	Inclusion: members of Polish National WR team who participated in training camps and tournaments for ≥18 days Exclusion: none reported	SCI: 86% Other: 14%	Wheelchair rugby	14	30	100%	NR
Beinotti 2013[11] RCT US Veteran Population: No Brazil	Inclusion: clinical diagnosis of first or recurrent unilateral CVA, in chronic phase (≥365 days after CVA); age 50-85 yrs; no serious cognitive deficits (assessed by clinical neurologist) no other neurologic, neuromuscular, or orthopedic disease; no participation in any experimental rehabilitation or drug studies Exclusion: CVA relapse or seizure during intervention	CVA, Ischemic 85% Hemorrhagic 15%	Horseback riding therapy (HBRT)	24, 20 completed HBRT + physiotherapy n=10 Physiotherapy only n=10	56	70%	5.9

Author, year Study Design (Method of Data Collection[a]) US Veteran Population (Yes/No)	Study Inclusion/ Exclusion Criteria	Medical Condition(s) (%)	Sport(s) (%) or Definition/ Characteristics	Number of Participants	Age (years) (mean unless noted)	Gender (% male)	Time from Injury or Diagnosis (years)
Beinotti 2010[12] CCT US Veteran Population: No Brazil	Inclusion: diagnosis of single CVA, unilateral, of both genres; in chronic phase of disease (>365 days), age 30-85 yrs, sequelae of hemiparesis and significant impaired gait; score of ≥ 2 in Functional Ambulation Category Scale, understand simple instructions, no apraxia or hemineglect, ability to stand with or without assistance and walk, ≥1 step with or without assistance Exclusion: neurological pathologies associated with CVA; any other clinical entity resulting in comorbidity such as heart disease, uncontrolled diabetes, cognitive deficits or psychiatric problems; bilateral CVA or other	CVA (hemiparetic), Ischemic 85% Hemorrhagic 15%	Hippotherapy	20 Hippotherapy/ usual care n=10 Usual care only n=10	56	70%	5.8

Author, year Study Design (Method of Data Collection[a]) US Veteran Population (Yes/No)	Study Inclusion/ Exclusion Criteria	Medical Condition(s) (%)	Sport(s) (%) or Definition/ Characteristics	Number of Participants	Age (years) (mean unless noted)	Gender (% male)	Time from Injury or Diagnosis (years)
	degenerative distal disease that might interfere with gait training						
Bennett 2017[14] Pre-post US Veteran Population: Yes	Inclusion: Veterans with combat-related disabilities/symptoms of PTS, depression, perceived stress, functional impairment, self-determination, and leisure satisfaction Exclusion: none reported	Combat-related disabilities (some overlap) PTSD: 80% (33/40) TBI: 30% (12/40) Hearing impairments: 40% (16/40)	Horseback riding therapy (HBRT)	57, 40 completing follow-up	35 (range 24-64)	80%	Median 5-6
Bennett 2014[13] CCT US Veteran Population: Yes	Inclusion: Veterans with posttraumatic stress symptoms; an official diagnosis of PTSD, TBI (TBI), polytrauma, blindness, or mental illness required to participate in program Exclusion: none reported	Symptoms of PTSD: 100% <u>Group A (n=10)</u> PTSD n=4; TBI n=4, Limb amputation, Hemiplegic, Epilepsy n=1 each; Visual impairment n=6 <u>Group B (n=12)</u> PTSD n=7; TBI n=7, Limb amputation, Depression n=1 each <u>Controls (n=12)</u>	"Couples" adaptive snow sports (skiing and snowboarding)	Experiment Group A (5 couples, n=10) Experiment Group B (6 couples, n=12) Control (did not participate in Higher Ground, 6 couples, n=12)	Group A 37 Group B 35 Control 41	NR	Group A (n=5) 1-3 yrs n=3; ≥5 yrs n=2 Group B (n=6) 3-4 yrs n=3; ≥5 yrs n=3 Control (n=6) 3-4 yrs n=3; 4-5 yrs n=1; ≥5 yrs n=2

Author, year Study Design (Method of Data Collection[a]) US Veteran Population (Yes/No)	Study Inclusion/ Exclusion Criteria	Medical Condition(s) (%)	Sport(s) (%) or Definition/ Characteristics	Number of Participants	Age (years) (mean unless noted)	Gender (% male)	Time from Injury or Diagnosis (years)
		PTSD n=4; TBI n=3, Limb amputation, n=1; Visual impairment n=2; Hearing impairment n=4					
Bennett 2014[15] Qualitative (focus groups) US Veteran Population: Yes	Inclusion: Veterans with combat-related disabilities Exclusion: none reported	PTSD n=28 (100%); TBI n=10, Limb amputation, n=1; Visual impairment n=1; Hearing impairment n=7; 11 Veterans had ≥2 disabilities	Therapeutic fly-fishing (TFF)	28	NR	71%	NR
Blauwet 2017[18] Retrospective cohort US Veteran Population: No	Inclusion: age 18-60 yrs, mobility impairments, registered for community-based adaptive sports program from April 1, 2013 to May 31, 2014 Exclusion: age <18 yrs or >60 yrs, cognitive impairment that prevented being able to follow instructions independently, limited fluency in English	Musculoskeletal, neurologic, other Use of assistive device 78%	Multiple, including water, individual endurance, winter sports, court sports, yoga, horseback riding	Sustainers attended ≥2 sessions n=78 Non-sustainers attended 0-1 sessions n=56	Overall 41	54	NR, (disability present at birth: 22%)

Author, year Study Design (Method of Data Collection[a]) US Veteran Population (Yes/No)	Study Inclusion/ Exclusion Criteria	Medical Condition(s) (%)	Sport(s) (%) or Definition/ Characteristics	Number of Participants	Age (years) (mean unless noted)	Gender (% male)	Time from Injury or Diagnosis (years)
Blauwet 2013[16] Cross-sectional US Veteran Population: Yes (47% of enrollees were US Veterans)	Inclusion: age ≥22 yrs, ≥1 year after injury, not ventilator dependent, no tracheostomy, no other neuromuscular disease Exclusion: none reported	SCI	Organized sports (multiple, including basketball (21%, 7/33), tennis 18% (6/33), skiing (15%, 5/33), sailing, rowing, and bowling (4 each 36%, handcycling through hunting)	149 33 Participators in organized sports 166 non-participators 70 (47%) overall were Veterans	50	83%	Mean 19
Boninger 1996[19] Cross-sectional US Veteran Population: No	Inclusion: wheelchair racer invited to participate in Wheelchair Sports USA training camp Exclusion: none reported	SCI: 75% (9/12) Lower limb amputation: 17% (2/12) Cerebral palsy: 8% (1/12)	Wheelchair racing	12	33 (24-45)	92% (11/12)	16 (5-26)
Bragança 2018[20] Cross-sectional (focus group and questionnaire) US Veteran Population: No	Inclusion: non-professional athletes Exclusion: none reported	Limb amputation, brain injury, cerebral palsy, MS, muscle dystrophy, spina bifida, and SCI	Wheelchair rugby	61	NR	89%	18-30=38% 31-40=20% 41-50=28% 51-60=12% 60+=3%
Bragaru 2015[21] Cross-sectional	Inclusion: age ≥18 yrs, ≥12 months since diagnosis of upper	Upper limb deficiency: 100%	Sport: “physical exercise 2 times per week for a	175	Athletes: 48.3	61%	All ≥12 months

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(digital/paper questionnaire) US Veteran Population: No	limb deficiency, recruited through prosthetic manufacturers and rehab facilities Exclusion: none reported		minimum ½ hour/time and minimal duration of 60 min/week of moderately intensive physical activity, with or without game or competition elements, where skills, and physical endurance are either required or to be improved."		Non-athletes: 48.7	(60% athlete, 64% non-athlete)	
Bragaru 2013[22] Cross-sectional (postal survey) US Veteran Population: No	Inclusion: age ≥18 yrs, able to speak and understand Dutch Exclusion: none reported	Lower limb amputation: 100%	Sport: "participation more than 5 hours per month"	780	59.6	62%	20.4 (245.1 months)
Bragaru 2013[23] Cross-sectional (in-person semi-structured interview) US Veteran Population: No	Inclusion: age ≥18 yrs, ≥12 months since limb amputation, amputation more proximal than ankle, able to speak and understand Dutch Exclusion: none reported	Lower limb amputation: 100%	Sport: "an activity involving physical exertion with or without game or competitive elements, with a minimal duration of ½ hour/time and minimal duration of 60 min/week, and	26	Athletes: 50 Non-athletes: 65	73% (69% athlete, 77% non-athlete)	All ≥12 months

Author, year Study Design (Method of Data Collection[a]) US Veteran Population (Yes/No)	Study Inclusion/ Exclusion Criteria	Medical Condition(s) (%)	Sport(s) (%) or Definition/ Characteristics	Number of Participants	Age (years) (mean unless noted)	Gender (% male)	Time from Injury or Diagnosis (years)
			where skills and physical endurance are either required or to be improved"				
Calsius 2015[25] D'hooghe 2014[37] Pre-post (hiking trip) US Veteran Population: No	Inclusion: mild/moderate neurological disability (EDDS ≤4) Exclusion: declined to participate (n=1)	Multiple Sclerosis: (100%)	5 day climbing expedition	9	42 (median)	33%	9 (median)
Campayo-Piernas 2017[26] Cross-sectional with comparator (EMG measurements during balance test) US Veteran Population: No	Inclusion: soccer players with visual impairment at B1 level Exclusion: none reported	Visual Impairment at B1 level: (18%)	Soccer players (57%)	38	28.5 (n=15 sighted soccer players: 25.1; n=6 sighted sedentary: 28.0; n=7 blind soccer players: 28.4; n=10 sighted healthy 32.7)	NR	NR
Carin-Levy 2007[29] Cross-sectional (scripted semi-structured	Inclusion: disabled divers, responded to advertisement Exclusion: congenital impairment or trained	Spinal cord injury: (66%) BK amputation: (33%)	Scuba divers (100%)	3	44	100%	12

Author, year Study Design (Method of Data Collection[a]) US Veteran Population (Yes/No)	Study Inclusion/ Exclusion Criteria	Medical Condition(s) (%)	Sport(s) (%) or Definition/ Characteristics	Number of Participants	Age (years) (mean unless noted)	Gender (% male)	Time from Injury or Diagnosis (years)
telephone interviews) US Veteran Population: No	as divers before disability						
Carless 2013[31] Carless2014[30] Cross-sectional (narrative life story interviews) US Veteran Population: No (UK Army members)	Inclusion: attendee at Battle Black Centre, UK intervention for injured military personnel, 11/24 men were interviewed in 2013 paper based on "emerging rapport and positive relationship between first author" Exclusion: none reported	2014: 1 leg amputation 1 gunshot wound to head w/ paralysis 2 SCI patients 4 PTSD patients	Basketball, Badminton, Volleyball, archery, bowling Adventure training: indoor rock climbing, caving, clay pigeon shooting, kayaking	2013: 11 2014: 6 (subset of 11)	2013: 20-43 2014: 19-28	100%	NR
Chard 2017[32] Cross-sectional (scripted semi-structured telephone interview) US Veteran Population: No	Inclusion: age ≥18 yrs, MS diagnosis, engaged in water-based exercise in past 6 months Exclusion: none reported	Multiple Sclerosis (100%)	Aquatic sports: General (low impact): (40%) MS-specific: (28.9%) Laps: (13.3%) Lap + General: (11.1%) General + MS-specific: (6.7%)	45	≥18	22%	16.3
Côté-Leclerc 2017[33]	Inclusion: age 18-64 yrs; use manual wheelchair daily;	Quantitative Study Paraplegia (52.9%) Tetraplegia (20.5%)	Quantitative Study Athletics (23.6%) Tennis (23.6%)	34 (Quantitative)	37.7 (Quantitative)	73.5 (Quantitative)	NR

Author, year Study Design (Method of Data Collection[a]) US Veteran Population (Yes/No)	Study Inclusion/ Exclusion Criteria	Medical Condition(s) (%)	Sport(s) (%) or Definition/ Characteristics	Number of Participants	Age (years) (mean unless noted)	Gender (% male)	Time from Injury or Diagnosis (years)
Mixed-methods with comparator (standardized outcome measure; semi-structured interview) US Veteran Population: No	played an adaptive sport at least once per week for 4 months; not presenting with cognitive problems Exclusion: none reported	Limb amputation (5.9%) Cancer (5.9%) Other (14.8%)	Rugby (17.6%) Paracycling (14.7%) Basketball (8.8%) Other (11.8%)	10 (Qualitative)	39.2 (Qualitative)	50 (Qualitative)	
Curtis 1999[34] Cross-sectional (self-report survey) US Veteran Population: No	Inclusion: female wheelchair basketball player at National Women's Tournament in 1997 Exclusion: none reported	SCI (39.1%) Lower extremity musculoskeletal and neuromuscular disability (28.3%) Polio (13%) Spina Bifida (10.9%) Limb amputation (8.7%)	Basketball (100%)	46	33.2	0%	12.5 (years of wheelchair use)
da Silva 2018[35] Cross-sectional with comparator (researcher administered questionnaires) US Veteran Population: No	Inclusion: visually impaired football or goalball players (3 months to 29 yrs experience) or physical active sighted individuals; free of bone and/or musculoskeletal and neurological disorders or any chronic joint pain in past 6 months	Visual Impairment at B1 level: 100%	Goalball (58%) Football (41.6%)	12 VI athletes 12 sighted active controls	VI: 31.5 Sighted: 26.0	66.7%	11.3 (excluding athletes with congenital visual impairment)

Author, year Study Design (Method of Data Collection[a]) US Veteran Population (Yes/No)	Study Inclusion/ Exclusion Criteria	Medical Condition(s) (%)	Sport(s) (%) or Definition/ Characteristics	Number of Participants	Age (years) (mean unless noted)	Gender (% male)	Time from Injury or Diagnosis (years)
	Exclusion: none reported						
Earles 2015[38] CCT US Veteran Population: No	Inclusion: ≥1 Criterion A traumatic event on the Life Events Checklist; current PTSD Checklist-Specific (PCL-S) Exclusion: PCL scores <31	PTSD: 100%	Hippotherapy	16	51	25%	19 (1-39)
Fiorilli 2013[42] Cross-sectional (questionnaire) US Veteran Population: No	Inclusion: men from Italian wheelchair basketball teams competing at National level (athletes) or from different Italian associations for disabled people (non-athletes), lower limb impairment produced by spinal cord injuries in lumbar section (paraplegic subjects), and amputation over the knee Exclusion: concomitant upper body disabilities or presence of metabolic or chronic degenerative	SCI or limb amputation	Wheelchair basketball	46 (24 athletes, 22 non-athletes)	36	100%	26

Author, year Study Design (Method of Data Collection[a]) US Veteran Population (Yes/No)	Study Inclusion/ Exclusion Criteria	Medical Condition(s) (%)	Sport(s) (%) or Definition/ Characteristics	Number of Participants	Age (years) (mean unless noted)	Gender (% male)	Time from Injury or Diagnosis (years)
	pathology, and/or motor disabilities resulting from neurodegenerative disease or cerebral injury						
Foreman 1997[43] Cross-sectional (questionnaire) US Veteran Population: No	Inclusion: age 16-60 yrs, diagnosis of paraplegia or quadriplegia, and injury occurred ≥12 months prior to study Exclusion: none reported	SCI: 100%	Sport: organized event at least once per fortnight for the last 3 months Basketball: 37% Rugby: 35% Tennis: 7% Road racing: 7% Athletics: 9% Swimming: 4%	121 (54 active vs 67 nonactive)	Active: 32 Nonactive: 38 P=.001	84%	Active: 21 yrs at injury Nonactive: 25 yrs at injury P=.004
Fullerton 2003[44] Cross-sectional (questionnaire) US Veteran Population: No	Inclusion: primarily manual wheelchair users Exclusion: none reported	SCI: 86% Others included lower-limb amputation, spina bifida, or unknown	Basketball: 51% Tennis: 26% Rugby: 23% Racing: 19% Skiing: 5% Handcycle: 5% *Athletes* met at least 2 of 3 criteria: 1) trained ≥3 hrs/week; 2) were involved in ≥3 competitions per year; 3) had a wheelchair	257 (172 athletes, 85 non-athletes)	38	NR	NR

Author, year Study Design (Method of Data Collection[a]) US Veteran Population (Yes/No)	Study Inclusion/ Exclusion Criteria	Medical Condition(s) (%)	Sport(s) (%) or Definition/ Characteristics	Number of Participants	Age (years) (mean unless noted)	Gender (% male)	Time from Injury or Diagnosis (years)
			modified for sports				
Garshick 2016[45] Cross-sectional with comparator (questionnaire) US Veteran Population: No (1 of 5 recruitment sites was VA facility)	Inclusion: traumatic SCI; ≥1 year post-injury; from 5 SCI referral centers Exclusion: none reported	SCI	"organized sports"	347 with complete data	45	84	9.2
Giacobbi 2008[46] Cross-sectional (questionnaire and semi-structured interview) US Veteran Population: No	Inclusion: age 18-54 yrs with ≥1 condition that impacted activities of daily living Exclusion: none reported	Paraplegia: 54% Quadriplegia: 4% Limb amputation (bilateral or single): 12% Cerebral palsy: 8% Spina bifida: 4% Chronic pain: 4% Fusion of spine: 4% NS: 12%	Wheelchair basketball	26	31	46%	NR
Hammer 2005[49] Pre-post assessment US Veteran Population: No	Inclusion: MS diagnosed by neurologist Exclusion: on-going relapse, participation in therapeutic riding in	Multiple sclerosis	Therapeutic riding	13 enrolled, 11 completed	48	15% of enrolled, 18% of completers	10

Author, year Study Design (Method of Data Collection[a]) US Veteran Population (Yes/No)	Study Inclusion/ Exclusion Criteria	Medical Condition(s) (%)	Sport(s) (%) or Definition/ Characteristics	Number of Participants	Age (years) (mean unless noted)	Gender (% male)	Time from Injury or Diagnosis (years)
	past 6 months, body weight >85 kg						
Hanson 2001[50] Cross-sectional (Questionnaire) US Veteran Population: No	Inclusion: age ≥18 yrs, medically stable, and cognitively intact Exclusion: none reported	SCI: 100%	Athlete: wheelchair user with an SCI who participated in aerobic wheelchair sports ≥4 hrs per week or exercised ≥3 times per week for ≥30 minutes each session	48 (30 athletes vs 18 nonathletes)	37	75%	14
Hawkins 2011[52] Observational (interviews) US Veteran Population: Yes, injured service members	Inclusion: age 18-55 yrs, physical disability, member of armed services Exclusion: none-reported	Limb amputation: 60% TBI: 20% SCI: 20% Other: 10%	Multiple (US Paralympic Military Sport Camp – included cycling, strength and conditioning, archery, volleyball, swimming, track and field, and rowing)	10 (of 50 in program); volunteered for interview	20-30 yrs: 90% 30-40 yrs: 10%	90%	< 1 yr: 20% ≥1 to 3 yrs: 60% >3 yrs: 20%
Haykowsky 1999[53] Cross-sectional (questionnaire) US Veteran Population: No	Inclusion: qualified and competed at the 1994 Canadian Blind Sports Association National Powerlifting Championships	Visual impairment: 100%	Powerlifting	11	37	82%	NR

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	Exclusion: none reported						
Herzog 2018[54] RCT (cross-over) US Veteran Population: No	Inclusion: age ≥18 yrs, recruited from out-patient physio-therapy department, AIS stable for ≥6 months, able to sit in wheelchair ≥4 hours, able to lean upper body forward ≥20 deg Exclusion: progressive SCI pathologies, known dysfunction of vestibular system, severe visual restriction, acute pain, restricted arm or hand function	SCI (traumatic and non-traumatic): 100%	Indoor wheelchair curling	13	52	54	NR
Jaarsma 2014[55] Cross-sectional (questionnaire – on-line or telephone) US Veteran Population: No	Inclusion: age ≥18 yrs, registered with 1 of 3 centers of expertise for people with visual impairment in Netherlands or attending an exhibition for people with visual impairments Exclusion: none reported	Visual impairment: 100% Self-reported: Mild 10% Moderate 31% Severe 46% Total 9% Other 4% (no difference between active and inactive groups)	"An activity involving physical exertion with or without a game or competition element with a minimal duration of 30 min for at least 2 times a week where skills and physical endurance are	648 (411 active, 237 inactive) (13% response rate)	49 49 active, 49 inactive)	48 (47% active, 49% inactive)	NR

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			either required or to be improved"				
Jackson 1996[57] Cross-sectional (physical examination) US Veteran Population: No	Inclusion: participant in wheelchair basketball tournament in US Exclusion: none reported	Paraplegia: 58% Limb amputation: 18% Polio: 9% Miscellaneous: 15%	Wheelchair basketball: 100%	33	36	100%	20
Johnson 2018[58] RCT (wait list control) US Veteran Population: Yes	Inclusion: age ≥18 yrs, US Veterans (no longer in active military service including reserves), weight ≤220 pounds, able to walk ≥ 25 feet without assistance of a person, willing to interact with and ride a horse, diagnosis of PTSD or PTSD and TBI, living within 50 miles of riding site Exclusion: none reported	PTSD or PTSD+TBI	Therapeutic horseback riding (100%)	38 enrolled (9 did not receive intervention, 29 randomized, 28 completed baseline data collection, 23 completed week 3 data collection, 19 completed week 6 data collection)	54.4	84.2%	NR
Jolk 2015[59] Case series, pre-post	Inclusion: age 18-65 yrs, diagnosis of MS, no previous experience with sports climbing, score of 1-6	Multiple sclerosis: 100%	Sports climbing: 100%	7	32	14	4.6

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(evaluation, self-report of injuries) US Veteran Population: No	on Expanded Disability Status Scale, willing to participate in program, no relapse or unstable medication status for at least past 30 or 90 days (respectively) Exclusion: any medically unstable conditions, contraindications (*eg*, severe cardiovascular or respiratory conditions, pulmonary disease, clinically relevant internal disease, severe orthopedic diseases						
Kars 2009[60] Cross-sectional (survey) US Veteran Population: No	Inclusion; age 18-80 yrs, level of amputation proximal to a Syme amputation (*eg*. transtibial, knee disarticulation, transfemoral) Exclusion: admitted to nursing home, not prescribed a prosthesis	Amputation (lower limb): 100%	"An activity involving physical exertion with or without a game or competition element with a minimal duration of half an hour, and where skills and physical endurance are either required or to be improved"	107 (37% response rate; 2 subsequently excluded – limb amputation site did not meet inclusion criteria)	Sports-participating: 55.5 Non-sports-participating: 60.2 (P=.03)	66	Sports-participating: 16.6 Non-sports-participating: 12.5 (P=.06)

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Kim 2017[61] Cross-sectional (survey) US Veteran Population: Yes	Inclusion: qualifying disability, registered to participate in NVWG Exclusion: none reported	SCI: 75% Amputation: 16% MS: 8% TBI: 7% Stroke: 3%	NR	302 (of 643 registered for NVWG)	54.8	91%	20.6
Laferrier 2015[63] Cross-sectional (questionnaire) US Veteran Population: Yes	Inclusion: active duty service members or Veterans with a disability participating in NVWG, WSC, or US Olympic Committee Warrior Games Exclusion: unable to complete question-naires or severe TBI	TBI (mild or moderate): 43% SCI: 34% PTSD: 20% Limb amputation: 17% Other: 6%	Sport NS, included team, combination, and individual events	220	40	86%	NR
Lanning 2013[64] Pre-post (questionnaires and interview) US Veteran Population: Yes	Inclusion: Veterans with 1 to 3 deployments to Iraq and/or Afghanistan Exclusion: none reported	PTSD: 85% TBI: 23% CVA: 8% Other physical disabilities: 69%	Therapeutic riding (equine assisted activity): 100%	13	36	77	NR
Lape 2018[65] (see also Blauwet 2017)[18]	Inclusion: participants from community-based adaptive sports program (see Blauwet 2017) who agreed to	SCI: 24% TBI: 18% Multiple sclerosis: 12% Cerebral palsy 18%	Multi-sport program: 53% Cycling: 47% Sailing 24% Golf: 24%	17	15-29: 18% 30-44: 24% 45-60: 41% 60+: 18%	18%	NR

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Cross-sectional (focus groups) US Veteran Population: No	be in focus groups, mobility or sensory impairment, no concomitant cognitive impairment, age 18-60 yrs, able to speak/write English Exclusion: none reported	Other: 29%	Rowing: 18% Kayaking: 18% Nordic skiing: 12% plus others (each ≤12%)				
Lastuka 2015[66] Cross-sectional (questionnaire) US Veteran Population: No	Inclusion: currently practicing wheelchair basketball or rugby Exclusion: none reported	SCI: 81% Limb amputation: 4% Muscular dystrophy: 2% Polio: 2% Spastic paraparesis: 2% Transverse myelitis: 2% Miscellaneous: 5%	Wheelchair basketball: 76% Wheelchair rugby: 24%	131	36	97%	32% from birth
Lindroth 2015[67] Pre-post case-series US Veteran Population: No	Inclusion: age 25-60 yrs; MS diagnosis, BBS score <51, no current exacerbation of MS or exacerbation within last 6 months; ability to stand unsupported for 10 seconds, no orthopedic or medical conditions related to MS diagnosis, no prior	Multiple sclerosis: 100%	Hippotherapy	3	52 (37-60)	33%	Range 5->30

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	hippotherapy or adaptive riding experience, physician referral for physical therapy Exclusion: none reported						
Litchke 2012[68] Cross-sectional (interview and observation) US Veteran Population: No	Inclusion: male, wheelchair rugby athletes (nationally competitive teams), injured at approximately 17 years, complete lesions at C6 or C7 Exclusion: none reported	SCI (tetraplegia): 100%	Wheelchair rugby: 100%	5	27 (range 17 to 35)	100%	10 (range: 0.8 to 18)
Littman 2017[69] Cross-sectional (semi-structured interview) US Veteran Population: Yes	Inclusion: lower limb amputation (unilateral or bilateral, toe or more proximal) ≥6 months prior to interview, US military Veteran, receiving care at the VA, and reporting >60 min per week of aerobic physical activity Exclusion: none reported	Limb amputation:100% (59% at or below knee, 19% above knee, 22% bilateral and/or upper and lower limb amputation)	Light exercise: sporadic sports or weightlifting, walking, wheeling, or cycling regularly for exercise High exercise: regular weightlifting, sports, running	27	54	100%	0.5-<1=15% 1-4=33% 5-9=19% 10-19=15% 20-29=0% 30-39=7% 40-44=11%

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Lundberg 2011[70] Pre-post (questionnaire) US Veteran Population: Yes	Inclusion: Veterans participating in Higher Ground adaptive sports program Exclusion: none reported	*Participants identified multiple acquired disabilities* TBI: 83% PTSD: 50% Visual impairment: 38% Amputation: 27% Orthopedic impairment (including SCI): 55% Depression: 28%	3 separate groups 1) water skiing, kayaking, river rafting, canoeing, and fly-fishing over 5 days (5 Veterans + significant others) 2) fly-fishing camp for 5 days (6 Veterans + significant others) 3) ski/snowboard, ice skating, Nordic skiing over 5 days (7 Veterans + significant others)	18	30-34 (average age)	NR	NR
Malinowski 2017[75] Pre-post (in-person administration) US Veteran Population: Yes	Inclusion: Veterans with previous PTSD diagnosis Exclusion: none reported	PTSD: 100%	Equine-Assisted Activities and Therapies (EAAT), 5 sessions/days with a licensed therapist and certified equine specialist.	7	58	86%	NR
McVeigh 2009[76] Cross-sectional (scripted semi-structured telephone interview)	Inclusion: Canadian residents, age ≥16 yrs, injury level at C5 or below of any etiology, injured ≥12 months prior to interview, community	SCI (C5 or below): 100%	Team: 76% Individual 24% Recreational: 18% Organized competitive: 33%	90 (45 sport participants, 45 non-sport participants)	16-30 yrs: 21% (22% sport, 20% non-sport) 31-50 yrs: 58% (71%	79% (84% sport group, 73% non-sport group)	All ≥12 months 1-5 yrs: 31% (24% sport, 38% non-sport)

Author, year Study Design (Method of Data Collection[a]) US Veteran Population (Yes/No)	Study Inclusion/ Exclusion Criteria	Medical Condition(s) (%)	Sport(s) (%) or Definition/ Characteristics	Number of Participants	Age (years) (mean unless noted)	Gender (% male)	Time from Injury or Diagnosis (years)
US Veteran Population: No	living, wheelchair dependent ≥1 hour per day outside of sport activity Exclusion: hospitalized at time of interview Recruited at outpatient clinic and fitness center of rehabilitation clinic and at organized wheelchair sporting events		Elite/professional: 49% ≥3 times/week: 78% 1-2 times/week: 22% 1-3 times/month: 0%		sport, 44% non-sport) >50 yrs: 21% (7% sport, 36% non-sport)		6-10 yrs: 13% (11% sport, 16% non-sport) >10 yrs: 56% (64% sport, 47% non-sport)
Miki 2012[77] Cross-sectional (self-administered questionnaire) US Veteran Population: No	Inclusion: persons with SCI participating in wheelchair basketball games in Japan Exclusion: none reported	Spinal cord injury: Tetraplegia: 26% Paraplegia: 74%	Wheelchair basketball: 74% (paraplegic participants) Wheelchair twin basketball (twin hoops at different heights for different shooting abilities): 26% (tetraplegic participants)	81	<30 yr: 34% 30-39 yr: 43% >40 yr: 23%	100%	<13 yrs: 48% >13 yrs: 43% NR: 9%
Molik 2010[78] Cross-sectional (self-	Inclusion: participants in Polish League of Wheelchair Basketball, Polish	NR	Wheelchair basketball: 26%	174	26	Wheelchair basketball: NR	NR

Author, year Study Design (Method of Data Collection[a]) US Veteran Population (Yes/No)	Study Inclusion/ Exclusion Criteria	Medical Condition(s) (%)	Sport(s) (%) or Definition/ Characteristics	Number of Participants	Age (years) (mean unless noted)	Gender (% male)	Time from Injury or Diagnosis (years)
administered questionnaire) US Veteran Population: No	League of Wheelchair Rugby, or "practicing boccia" Exclusion: none reported		Wheelchair rugby: 36% Boccia: 38%			Wheelchair rugby: 98% Boccia: NR	
Mowatt 2011[79] Cross-sectional (narratological study of letters from participants) US Veteran Population: Yes	Inclusion: participants in therapeutic fly-fishing program with confirmed diagnosis of PTSD Exclusion: none reported	PTSD: 100%	Fly-fishing: 100%	67	NR	NR	NR
Muñoz-Lasa 2011[80] Pre-post with comparator (CCT) (in-person assessment) US Veteran Population: No	Inclusion: age 18-65 yrs, able to walk at least 10 m (with or without technical aids) Exclusion: important comorbidity, previous riding experience, EDSS <2 or >6.5, pregnancy, or clinical instability	Multiple Sclerosis: 100%	Therapeutic horseback riding: 44% Traditional physiotherapy (comparator): 56%	27	46	41%	8
Muraki 2000[81] Cross-sectional (self-	Inclusion: individuals with SCI living in Western Japan who finished a hospital rehabilitation program	Spinal cord injury: Tetraplegia: 22% Paraplegia: 78%	Wheelchair basketball: 13% Wheelchair racing: 11%	32	41	100%	NR

Author, year Study Design (Method of Data Collection[a]) US Veteran Population (Yes/No)	Study Inclusion/ Exclusion Criteria	Medical Condition(s) (%)	Sport(s) (%) or Definition/ Characteristics	Number of Participants	Age (years) (mean unless noted)	Gender (% male)	Time from Injury or Diagnosis (years)
administered questionnaire) US Veteran Population: No	and were living in the community Exclusion: female or >60 yrs surveyed but excluded from analysis		Wheelchair tennis: 8% Archery: 4% Gateball: 2% Wheelchair table tennis: 2% Other: 3%				
Nam 2016[82] Cross-sectional (self-administered questionnaire) US Veteran Population: No	Inclusion: living in South Korean community, adequate communication function, regularly participating in activities at sports club for disabled Exclusion: none reported	Spinal cord injury: Tetraplegia: Paraplegia: 85% Tetraplegia: 15%	Wheelchair rugby: 47% Lawn bowling: 45% Wheelchair basketball: 8%	62	43	85%	13
Nettleton 2017[83] Pre-post (self-administered questionnaires) US Veteran Population: No	Inclusion: attendees of return to sport exhibition for people with a disability, age ≥18 yrs, any disability, able to provide consent Exclusion: none reported	Acquired brain injury: 15% Spinal cord injury: 36% Cerebral palsy: 8% Intellectual disability: 8% Neuromuscular disease: 8% Limb amputation: 14% Other: 13%	Multiple Examples: wheelchair rugby, climbing, ten-pin bowling, powerchair football	39	35	74%	NR

Author, year Study Design (Method of Data Collection[a]) US Veteran Population (Yes/No)	Study Inclusion/ Exclusion Criteria	Medical Condition(s) (%)	Sport(s) (%) or Definition/ Characteristics	Number of Participants	Age (years) (mean unless noted)	Gender (% male)	Time from Injury or Diagnosis (years)
O'Neill 2004[85] Cross-sectional (telephone administered questionnaire) US Veteran Population: No	Inclusion: admitted for de novo rehabilitation in hospital spinal cord unit serving Northern Ireland (surveyed 9-23 months post-discharge) Exclusion: none reported	Spinal cord injury: Paraplegia: 36% Tetraplegia: 45% Guillain-Barre Syndrome: 18%	Sports introduced during rehabilitation: Bowling: 58% Archery: 39% Swimming: 36% Table tennis: 21% Basketball: 3% Darts: 3%	33	<45 yrs: 61%	60%	NR
Perrier 2015[87] Perrier 2012[86] Cross-sectional with comparator (questionnaire/ interview) US Veteran Population: No	Inclusion: age ≥18 yrs, permanent physical disability acquired at age 16 or older; completed inpatient rehabilitation, no cognitive or memory impairments (by self-report), English speaking Exclusion: none reported	SCI: 76% Limb amputation: 15% Other: 9%	Defined as "structured physical activity between 2 or more people in a competitive event where a winner can be determined"	216 enrolled, 201 completed **Non-intenders** (not engaged in sport/not thinking about it): 28% **Intenders** (considering engaging in sport in next 6 months or making plans for sport): 10% **Actors** (currently involved in an adapted sport): 62%	44 Non-intenders: 52 Intenders: 43 Actors: 41	59 Non-intenders: 54 Intenders: 29 Actors: 67	16 Non-intenders: 21 Intenders: 11 Actors: 16
Pluym 1997[89] Cross-sectional	Inclusion: age 18-65 yrs, wheelchair-bound due to an acquired disability, and residing	SCI: 52% Limb amputation: 2%	Wheelchair tennis, wheelchair basketball, wheelchair	44	38	61%	NR

Author, year Study Design (Method of Data Collection[a]) US Veteran Population (Yes/No)	Study Inclusion/ Exclusion Criteria	Medical Condition(s) (%)	Sport(s) (%) or Definition/ Characteristics	Number of Participants	Age (years) (mean unless noted)	Gender (% male)	Time from Injury or Diagnosis (years)
US Veteran Population: No	independently in community Exclusion: none reported	Upper motor neuron leisure: 16% Orthopedic disease: 9% Neuromuscular disease: 5% Others: 16%	badminton, swimming, quad rugby, wheelchair dancing				
Ponchillia 2002[90] Cross-sectional (telephone survey) US Veteran Population: No	Inclusion: current USABA members with athlete status Exclusion: none reported	Visual impairment at B1 level: 37% Visual impairment at B2 level: 27% Visual impairment at B3 level: 36%	Highest level of participation in goalball, track and field, alpine skiing, swimming, wrestling, tandem cycling, power lifting, judo, Nordic skiing, and gymnastics	159	25 (24% under 15 yrs)	64%	55% from birth, 19% <12 yrs
Rauch 2014[92] Cross-sectional (survey) US Veteran Population: No	Inclusion: members of the Swiss Paraplegic Association with traumatic or non-traumatic SCI, age >18 yrs, and living in community ≥1 year Exclusion: none reported	SCI (paraplegia): 71% SCI (tetraplegia): 28%	NS, performed for ≥30 minutes	599	49	74%	18
Rogers 2014[93] Pre-post (questionnaires)	Inclusion: age ≥18 yrs, Veterans of OEF, OIF or both; seeking care for mental health	PTSD 79% Depression: 7% Both: 14%	Ocean Therapy (surfing): 100%	14	<24 yrs: 21% 24-30 yrs: 72% >30 yrs: 7%	93	NR

Author, year Study Design (Method of Data Collection[a]) US Veteran Population (Yes/No)	Study Inclusion/ Exclusion Criteria	Medical Condition(s) (%)	Sport(s) (%) or Definition/ Characteristics	Number of Participants	Age (years) (mean unless noted)	Gender (% male)	Time from Injury or Diagnosis (years)
US Veteran Population: Yes	concerns at VA Post Deployment Clinic; enrolled to attend program but hadn't participated yet; physician-reported diagnosis of PTSD, major depressive disorder, or both Excluded: non-English speaking						
Sa 2012[94] Cross-sectional (questionnaire) US Veteran Population: No	Inclusion: reduced mobility in greater Porto area, contacted through rehabilitation centers and physiotherapy clinics Exclusion: none reported	Paraplegia: 100% (25% with reduced upper limb mobility)	NS physical activity/sport	24 (5 active vs 19 inactive)	33	NR	NR
Scarpa 2011[95] Cross-sectional (questionnaire) US Veteran Population: No	Inclusion: age 13-28 yrs Sport group: regular practice for ≥12 months (1-1.5 hours, 2-3 times per week) Disabled group: Presence of peripheral (SCI) or central (cerebral palsy) paraplegia	SCI: 93% Cerebral palsy: 6%	Sport NS	143 (109 active and disabled, 34 inactive with disability)	20	50%	NR

Author, year Study Design (Method of Data Collection[a]) US Veteran Population (Yes/No)	Study Inclusion/ Exclusion Criteria	Medical Condition(s) (%)	Sport(s) (%) or Definition/ Characteristics	Number of Participants	Age (years) (mean unless noted)	Gender (% male)	Time from Injury or Diagnosis (years)
	Exclusion: none reported						
Schachten 2015[96] CCT (matched pairs) US Veteran Population: No	Inclusion: age 23-72 yrs, recovering from CVA Exclusion: none reported	CVA: 100%	Golf	14 (7 matched pairs)	54	NR	4
Shatil 2005[97] RCT US Veteran Population: No	Inclusion: cerebrovascular accident resulting in hemiparesis ≥6 months prior to study, medically stable, no coexisting neuro-musculoskeletal disorders affecting balance or quality of life, able to stand unsupported for 60 seconds, community living, interest in golf with no participation in regular activities >1 time per week, not participating in regular outpatient physiotherapy intervention	CVA: 100%	Golf	18 (10 golf training, 8 hand therapy) NOTE: Hand therapy group crossed over to golf	64	61%	4 yrs (50 months)

Author, year Study Design (Method of Data Collection[a]) US Veteran Population (Yes/No)	Study Inclusion/ Exclusion Criteria	Medical Condition(s) (%)	Sport(s) (%) or Definition/ Characteristics	Number of Participants	Age (years) (mean unless noted)	Gender (% male)	Time from Injury or Diagnosis (years)
	Exclusion: none reported						
Silkwood-Sherer 2007[99] CCT (non-equivalent pre-test/post-test) US Veteran Population: No	Inclusion: age ≥18 yrs, ability to stand with or without an assistive device for 1 minute, no orthopedic or medical problems unrelated to MS, no previous experience with hippotherapy or therapeutic riding, no allergies or aversions to horses, weight <240 lbs, and physician referral Exclusion: none reported	Multiple sclerosis: 100%	Hippotherapy	15 (9 intervention group, 6 control group)	Intervention group: 42 Control group: 48	Intervention group: 44% Control group: 33%	Intervention group: 10 (0.5-26) Control group: 13 (3-25)
Silveira 2017[100] Cross-sectional US Veteran Population: No	Inclusion: men, age ≥18 yrs, identify as having tetraplegia, involvement in competitive wheelchair rugby league as part of a team Exclusion: none reported	SCI: 87% Other injuries included cerebral palsy, cancer, and limb amputations	Wheelchair rugby	150	35	100%	16
Skordilis 2001[101]	Inclusion: involved in basketball or	SCI: 53% Spina Bifida: 9%	Basketball: 80%	243	NR	82%	Childhood (0-12 yrs): 33%

Author, year Study Design (Method of Data Collection[a]) US Veteran Population (Yes/No)	Study Inclusion/ Exclusion Criteria	Medical Condition(s) (%)	Sport(s) (%) or Definition/ Characteristics	Number of Participants	Age (years) (mean unless noted)	Gender (% male)	Time from Injury or Diagnosis (years)
Cross-sectional (questionnaire) US Veteran Population: No	marathon racing at national level Exclusion: participants in both sports or no sports	Limb amputation: 14% Polio: 9% Cerebral Palsy: 2% Other: 13%	Marathon racing: 20%				Adolescence (13-19 yrs): 32% Adulthood (≥20 yrs): 35%
Skučas 2013[102] Cross-sectional (questionnaire) US Veteran Population: No	Inclusion: age 18-45 yrs with SCI Exclusion: none reported	SCI: 100% (26% tetraplegic, 74% paraplegic)	Sport NS	106 (33 active, 73 inactive)	NR	70%	Range 2-15
Sporner 2009[103] (National Veterans Wheelchair Game and Winter Sports Clinic) Cross-sectional (self-report questionnaire) US Veteran Population: Yes	Inclusion: participants in WSC or NVWG expressing interest in research study Exclusion: none reported	SCI: 43% Limb amputation: 33% Visual impairment 6% Multiple sclerosis: 8% Other: 9%	Organized sports (rugby, basketball, skiing) Non-organized sports (“ball sports”, snow sports, outdoor recreation, “water sports”, track & field, cycling, physical fitness)	132	47.4	87%	13.5
Stephens 2012[104]	Inclusion: acquired SCI and permanent wheelchair user	SCI: 100% (57% tetraplegic, 43% paraplegic)	Wheelchair basketball: 29% Wheelchair rugby: 57%	7	38	86%	13 (4-33)

Author, year Study Design (Method of Data Collection[a]) US Veteran Population (Yes/No)	Study Inclusion/ Exclusion Criteria	Medical Condition(s) (%)	Sport(s) (%) or Definition/ Characteristics	Number of Participants	Age (years) (mean unless noted)	Gender (% male)	Time from Injury or Diagnosis (years)
Cross-sectional (semi-structured interview) US Veteran Population: No	Exclusion: none reported		Wheelchair tennis: 14%				
Tasiemski 2004[106] Tasiemski 2005[107] Cross-sectional (questionnaire) US Veteran Population: No	Inclusion: SCI (level C5 or below) for ≥1 year, wheelchair dependent, ASIA grade A, B, or C, age 18-50 yrs at time of injury; admitted to spinal unit within 6 months of injury, resident of United Kingdom Exclusion: none reported	SCI at C5 or below: 100%	International (Paralympic medalists and World Championship medalists), national, and regional athletes Swimming, archery, weigh-training, basket-ball, and table tennis most common (2005)	985	45 48 (2005)	84% 81% (2005)	19.5 (2005)
Tasiemski 2011[105] Cross-sectional (questionnaires) US Veteran Population: No	Inclusion: presence of SCI (level C5 of below) for ≥1 year before study; using manual wheelchair for all daily activities, age 18-50 yrs at time of injury, admitted to rehabilitation center within 6 months of injury, resident of Poland	SCI at C5 or below: 100%	Team and individual sports	1034	36	83%	9.8

Author, year Study Design (Method of Data Collection[a]) US Veteran Population (Yes/No)	Study Inclusion/ Exclusion Criteria	Medical Condition(s) (%)	Sport(s) (%) or Definition/ Characteristics	Number of Participants	Age (years) (mean unless noted)	Gender (% male)	Time from Injury or Diagnosis (years)
	Exclusion: none reported						
Tasiemski 2012[108] Cross-sectional (questionnaires) US Veteran Population: No	Inclusion: practiced competitive tandem cycling in Poland, belonged to sports clubs for visually impaired, held a competitive cycling license Exclusion: none reported	Blind: 52% Visual impairment: 48%	Tandem cycling	50 (25 disabled vs, 25 able bodied)	Dis-abled: 37 Able bodied: 33	72%	NR
Taylor 1996[109] Cross-sectional (interview) US Veteran Population: No	Inclusion: SCI who had participated in sea kayaking expeditions through an outdoor experience organization specifically created for persons with disabilities and nominated by a recreational therapist Exclusion: none reported	SCI: 100%	Sea kayaking	3	30	67%	5
Urbański 2013[110] Cross-sectional (questionnaires)	Inclusion: recruited from 2 rehabilitation units in Poland	SCI: 100%	Team sports: Wheelchair rugby (23%)	30 (15 individual sports, 15 team sports)	Team sport: 32	90%	NR

Author, year Study Design (Method of Data Collection[a]) US Veteran Population (Yes/No)	Study Inclusion/ Exclusion Criteria	Medical Condition(s) (%)	Sport(s) (%) or Definition/ Characteristics	Number of Participants	Age (years) (mean unless noted)	Gender (% male)	Time from Injury or Diagnosis (years)
US Veteran Population: No	Exclusion: none reported		Wheelchair basketball (10%) Boccia (10%) Unihockey (7%) Individual sports: Wheelchair racing (13%) Powerlifting (10%) Swimming (10%) Wheelchair fencing (10%) Alpine skiing (7%)		Individual sport: 31		
Velikonja 2010[112] RCT US Veteran Population: No	Inclusion: relapsing-remitting MS, primary progressive MS or secondary progressive MS, age 26-50 yrs, EDSS <6 and EDSS pyramidal functions score >2 Exclusion: none reported	Relapsing-remitting MS:100%	Sports climbing Yoga	20	Sports climbing: Median 42 Yoga: Median 41	NR	NR
Vella 2013[113] Pre-post (questionnaires) US Veteran Population: Yes	Inclusion: Veteran who served in a foreign country with confirmed diagnosis of PTSD or exhibiting a clinically relevant score on the PTSD checklist (military version); dual	PTSD: 100%	Fly-fishing	74 (96 randomized)	47	93%	NR

Author, year Study Design (Method of Data Collection[a]) US Veteran Population (Yes/No)	Study Inclusion/ Exclusion Criteria	Medical Condition(s) (%)	Sport(s) (%) or Definition/ Characteristics	Number of Participants	Age (years) (mean unless noted)	Gender (% male)	Time from Injury or Diagnosis (years)
	diagnosis of PTSD/ major depressive disorder or PTSD/ TBI permitted Exclusion: dual diagnosis with Axis 1 disorder from DSM IV other than PTSD or major depressive disorder						
Vermöhlen 2017[114] RCT US Veteran Population: No	Inclusion: age ≥18 yrs with confirmed MS, spasticity of lower limbs, and EDSS between 4 and 6.5 Exclusion: hippotherapy in last 12 months, body weight >90 kg, no balance while sitting, and acute exacerbation 4-weeks before start of therapy	Multiple sclerosis: 100%	Hippotherapy	ITT 67/70 randomized (30 interventions vs 37 control)	Median 51 yrs	19%	Median 17.3 yrs
Wickham 2000[115] Pre-post (questionnaires) US Veteran Population: No	Inclusion: participated in 1998 wheelchair sports camp; control group did not participate in camp Exclusion: none reported	Multiple sclerosis: 100%	Wheelchair basketball, quad rugby, wheelchair tennis, swimming, weight-lifting, and wheelchair racing	24 (camp participants vs non-camp participants)	35	67%	5

Author, year Study Design (Method of Data Collection[a]) US Veteran Population (Yes/No)	Study Inclusion/ Exclusion Criteria	Medical Condition(s) (%)	Sport(s) (%) or Definition/ Characteristics	Number of Participants	Age (years) (mean unless noted)	Gender (% male)	Time from Injury or Diagnosis (years)
Wu 2000[116] Cross-sectional (questionnaires) US Veteran Population: No	Inclusion: SCI individuals living in the United Kingdom Exclusion: none reported	SCI: 100%	Wheelchair basketball, wheelchair rugby, wheelchair tennis, and wheelchair athletics	143 (112 active vs 31 inactive)	33	92%	11
Yazicioglu 2012[117] Cross-sectional with comparator (questionnaires) US Veteran Population: No	Inclusion: age ≥18 yrs, injured ≥12 months, had physical disabilities that consisted of paraplegia or limb amputation Exclusion: none reported	Paraplegia: 52% Limb amputation: 48%	Basketball (30%), archery (30%), air pistol shooting (13%), amputee football (27%)	60 (participants vs non-participants)	30	87%	NR
You 2016[118] Cross-sectional (questionnaires) US Veteran Population: No	Inclusion: wheelchair athletes enrolled from March-May 2015 Exclusion: history of surgical treatment for injuries to upper extremity, history of visiting a clinic for shoulder pain in past 6 months; unwilling-ness to participate in research, or mean means of transportation was to a manual wheelchair	SCI: 89% Limb amputation: 9% Polio: 3%	Table-tennis (TT), archery (AR)	36 (19 TT vs 16 AR)	48	69%	25

Author, year Study Design (Method of Data Collection[a]) US Veteran Population (Yes/No)	Study Inclusion/ Exclusion Criteria	Medical Condition(s) (%)	Sport(s) (%) or Definition/ Characteristics	Number of Participants	Age (years) (mean unless noted)	Gender (% male)	Time from Injury or Diagnosis (years)
Zoerink 2015[119] Pre-post (questionnaires) US Veteran Population: No	Inclusion: adults recovering from CVA and referred by physician Exclusion: none reported	CVA: 100%	Golf	11	62	64%	NR
Zwierzchowska 2017[120] Cross-sectional with comparator (questionnaire) US Veteran Population: No	Inclusion: traumatic cervical SCI at C4-C7 level, >3 yrs post-injury; locomotion via manual active wheelchair Exclusion: injury at age ≤15 yrs, age ≤18	SCI: 100%	Wheelchair rugby	36 (24 rugby players, 12 sedentary wheelchair users)	33	100	12

[a]Method of Data Collection (*eg*, focus group, questionnaire/survey [on-line or in-person], interview)

AIS=American spinal cord injury association Impairment Scale; B1=no or limited light perception, unable to recognize shape of hand; BK=below knee; C#=cervical level; CVA=cerebrovascular accident or stroke; DSM IV=Diagnostic and Statistical Manual of Mental Disorders, 4th Edition; EDSS=Expanded Disability Status Scale; ITT=intention to treat; m=meters; mo=month; MRI=magnetic resonance imaging; MS=multiple sclerosis; NR=not reported; NS=not specified; NVWG=National Veteran Wheelchair Games; OEF=Operation Enduring Freedom; OIF=Operation Iraqi Freedom; PTS=posttraumatic stress; PTSD=posttraumatic stress disorder; RCT=randomized controlled trial; SCI=spinal cord injury; TBI=traumatic brain injury; ULD=upper limb deficiency; USABA=US Association of Blind Athletes; WCS=Winter Sports Clinic (Veterans); VI=visual impairment; yrs=years

Appendix D Table 2. Adaptive Sports Program Description

Author, year Study Design (US Veteran Population (Yes/No) Medical Condition	Sport(s)	Program Duration (weeks)	Program Frequency (sessions per week)	Program Leadership (describe)	Program Component Description
Barbin 2008[9] Longitudinal study (questionnaire) US Veteran Population: No SCI	Skiing program	5 days	5 hours/day	20 specialized physical educators	Practice skiing with an adapted skiing wheelchair
Beinotti 2013[11] RCT US Veteran Population: No CVA	Horseback riding	16 weeks	Once a week, 3 minutes	Instructors and assistants followed specific procedures and comprehensive lesson plans. They were aware of contraindications to HBRT and took appropriate precautions for riders' safety	HBRT sessions were conducted in a sand arena. Patient undergoing HBRT was directed by an instructor and aided by a side-walker who offered as much assistance as necessary. Patients performed activities such as touching various parts of the horse's body, which involved crossing their midline while maintaining appropriate balance and posture. Physiotherapy sessions were 50 minutes, done 3 times/week
Beinotti 2010[12] CCT US Veteran Population: No CVA	Horseback riding	16 weeks	Once a week	NR	Hippotherapy sessions occurred at the Center for Therapeutic Riding Harmony, a sand arena. For the mount an American saddle was used in the first 5 sessions, to give greater balance and stability to the adult and in the other sessions, a suitable blanket for hippotherapy.
Bennett 2017[14] Pre-post US Veteran Population: Yes Combat-related disabilities including PTSD	Fly-fishing	1 week (4 days)	NR	Guides and support staff were experienced at working with veterans (a few were also veterans with combat-related disabilities and similar backgrounds to	Participants were taught basic fly-fishing skills that consisted of 2 days of fly-fishing with a guide, learning how to tie flies, and camping. The program was created to help improve the quality of life for Veterans with disabilities by impacting their emotional, social and physical

Author, year Study Design (US Veteran Population (Yes/No) Medical Condition	Sport(s)	Program Duration (weeks)	Program Frequency (sessions per week)	Program Leadership (describe)	Program Component Description
				the participants)	functioning. Participants for the program were recruited by word of mouth and through health professionals who have contact with Veterans.
Bennett 2014[13] CCT US Veteran Population: Yes PTSD	Skiing or snowboarding	1 week	Skiing and snowboarding twice a day with a mid-week break	Direct service staff, 2 recreational therapists, and the snow sports instructors	Skiing and snowboarding, discussions, and feedback. Higher Ground program specific themes included: (a) how to improve relationships with peers and significant others, (b) developing stress management skills through recreation, (c) learning or relearning recreation skills and how participation in recreation improves life, (d) the need for individual leisure and taking personal time to recharge, and (e) how to apply what they learned to their lives
Bennett 2014[15] Qualitative (focus groups) US Veteran Population: Yes Combat-related disabilities (*eg,* PTSD, TBI, hearing or visual impairment)	Therapeutic fly-fishing (TFF)	4 days	2 days of fly-fishing	Professional fly-fishing guides. The focus groups were conducted on the last night of the participants' TFF experience, around the campfire or the kitchen table to understand participants' perceptions of the TFF program	Program to assist Veterans and their families cope with symptoms related to disabilities and improve functioning. Help reduce negative symptoms of combat-related disabilities and increase positive outcomes
Calsius 2015[25] D'hooghe 2014[37] Pre-post (hiking) US Veteran Population: No MS	Hiking excursion	45 weeks	N/A	MS Center in Melsbroek, Belgium	Longitudinal data collected for 6 months before trip and for 4 months post-trip.

Author, year Study Design (US Veteran Population (Yes/No) Medical Condition	Sport(s)	Program Duration (weeks)	Program Frequency (sessions per week)	Program Leadership (describe)	Program Component Description
Carless 2013[31] Carless 2014[30] Cross-sectional (narrative life story interviews) US Veteran Population: No (UK Army members) Multiple conditions (military-related)	Basketball Badminton Volleyball Archery Bowling Kayaking Clay pigeon shooting Rock climbing Caving	5 days	N/A	UK military intervention for injured personnel	Men spent 5 days at a course and were housed and fed. · Breakfast · Psychological training · Sports/Adventure training with adaptive sport and technical advisor · Review/reflection · Dinner · Social activities
Earles 2015[38] CCT US Veteran Population: No Anxiety and PTSD	Hippotherapy	6 weeks	2 hours/week	Doctor	Group sessions with individual tasks Session 1: met horses and worked to develop noncritical self-awareness and improved concentration and listening skills Session 2: worked on nonverbal interactions with horses Session 3: learned to halter horses and worked on dealing with challenges in stressful situations Session 4: Learned to lead and back up horses Session 5: Learned to stay focused when faced with distraction or temptation Session 6: Review of learned skills and worked on inner stillness and stability
Hammer 2005[49] Pre- post US Veteran Population: No MS	Therapeutic riding	10-11 weeks (10 sessions) Additional 3-4 weeks follow-up	Once per week, 30 minutes per session	Physical therapists (established treatment plan, selected appropriate exercises) Riding instructor (riding safety, instruction) Worked together to select horse and equipment	Individually tailored to physical needs and ability to ride 1) physical exercise (a few minutes) 2) combination of physiotherapeutic components and riding skill

Author, year Study Design (US Veteran Population (Yes/No) Medical Condition	Sport(s)	Program Duration (weeks)	Program Frequency (sessions per week)	Program Leadership (describe)	Program Component Description
Hawkins 2011[52] Cross-sectional (interviews) US Veteran Population: Yes "Injured service members"	Multiple (cycling, strength and conditioning, archery, volleyball, swimming, track and field, rowing)	3 days		Sponsored by US Paralympics division of the US Olympic Committee Military and non-military Paralympians and Paralympic coaches assisted with leading events	
Herzog 2018[54] RCT US Veteran Population: No SCI	Curling (indoor, wheelchair)	8 weeks total (cross-over design with 4 weeks of curling training and 4 weeks of usual activity without curling training)	Twice per week	Experienced physiotherapists trained in wheelchair curling	90 min sessions with 10 min warm-up, 30 min technical training, 40 min playing, 10 min cooldown
Johnson 2018[58] RCT US Veteran Population: Yes PTSD	Therapeutic horseback riding (indoor or outdoor)	6 weeks	Once per week	-Conducted at Professional Associations of Therapeutic Horsemanship (PATH)-Accredited Riding Center -Sessions conducted by PATH-certified riding instructor -OT supervision of sessions -Horses led by riding center volunteer	-Occupational therapist conducted assessment of participants (needs, safety, appropriate horse) -Facility staff matched Veterans with a horse -Systematized curriculum developed by research team -1 hour sessions -Riders learned basic horsemanship skills and completed tasks including grooming and interacting with horse before riding, applying riding tack, mounting, riding, dismount -2 side-walkers for safety/balance

Author, year Study Design (US Veteran Population (Yes/No) Medical Condition	Sport(s)	Program Duration (weeks)	Program Frequency (sessions per week)	Program Leadership (describe)	Program Component Description
Jolk 2015[59] Case series, pre-post US Veteran Population: No MS	Sports climbing (indoor facility)	5 weeks	Once per week	-Experienced instructor (not told that participants had MS)	-2 hour group sessions -Maximum height=15 meters (49 feet) -Routes of varying difficulty -Rested when perceived exertion moderate or higher -Completed 5-20 climbs per session depending on fitness level
Lanning 2013[64] Pre-post (questionnaires and interview) US Veteran Population: Yes Mental and physical wounds	Therapeutic riding (equine assisted activity) Professional Association of Therapeutic Horsemanship (PATH) International Equine Service for Heroes	24 weeks	Once per week, 1-2 hours	PATH International certified instructors involved in training horses	1) Ground activities (grooming, leading, walking by hand) 2) Riding activities (walking, trotting, going around objects, riding over uneven ground) 3) Fellowship time (light meal, social interaction) Participants matched with Veteran volunteer and horse
Lindroth 2015[67] Case-series US Veteran Population: N MSo	Hippotherapy	6 weeks	Twice per week, 40 minutes	Horse handler and 2 side walkers, 1 being a physical therapist	Horses chosen based on participants size and rehabilitation needs. Participants asked to change position on horse.
Lundberg 2011[70] Pre-post (questionnaire) US Veteran Population: Yes Acquired disability (including PTSD, TBI, SCI, vision impairment, limb	Multiple (water sports, fishing, winter sports)	5 days	Time per day NR	NR	Sport participation Daily discussion topics Journaling Debriefing Processing

Author, year Study Design (US Veteran Population (Yes/No) Medical Condition	Sport(s)	Program Duration (weeks)	Program Frequency (sessions per week)	Program Leadership (describe)	Program Component Description
amputation, depression)					
Malinowski 2017[75] Pre-post US Veteran Population: Yes PTSD	Equine-Assisted Activities and Therapies (EAAT)	5 days	Single 1-hour session per day	Licensed therapist and certified equine specialist	Session 1: orientation Session 2: obstacle course & mindfulness Sessions 3-4: horse chalking and active feelings exercise Session 5: termination
Mowatt 2011[79] Cross-sectional US Veteran Population: Yes PTSD	Therapeutic fly-fishing program in Northeastern Utah	4 days (2 fishing)	NR	Professional guide leads fishing	Meals, lodging, transportation, and guides provided
Muñoz-Lasa 2011[80] Pre-post with comparator (CCT) US Veteran Population: No MS	Therapeutic horseback riding vs traditional physiotherapy	20 weeks (with a 4- week resting period between first 10 weeks and second 10 weeks)	Once per week, 30-40-minutes per session	"Instructor"	Progressive challenging of rider's motor skills while maintaining appropriate balance and posture in all body positions
Rogers 2014[93] Pre-post (questionnaires) US Veteran Population: Yes PTSD	Ocean Therapy (surfing)	5 weeks	Once per week, 4 hours	Occupational therapist competent in surf instruction, group processing, ocean lifeguarding, and first aid Program based on resiliency themes: role identity, leadership and trust, community building, problem solving, and transition	Each session: 1) introductory presentation 2) stretching warm-up 3) on-land instruction and practice 4) individual surf lesson with a surf instructor 5) group processing (shared experiences) 6) second surf lesson 7) communal lunch and group discussion
Schachten 2015[96] CCT (matched pairs)	Golf	10 weeks	Twice per week, 1 hour	NR	Instruction for specific golf exercises to enhance cognitive and motor performance.

Author, year Study Design (US Veteran Population (Yes/No) Medical Condition	Sport(s)	Program Duration (weeks)	Program Frequency (sessions per week)	Program Leadership (describe)	Program Component Description
US Veteran Population: No CVA			Mean of 19 sessions completed by participants		
Shatil 2005[97] RCT US Veteran Population: No CVA	Golf	6 weeks	3 times per week, 75 minutes	Golf professional and physiotherapist	Sessions at wheelchair accessible golf practice range. Golf swing analysis of stance, grip, swing plane, weight shift, and posture provided. Golf-related problem list developed for each subject. One session per week at driving range, putting green, or golf course. Goal to improve swing mechanics while maintaining balance and stance. Physiotherapy occurred for 45 minutes, twice weekly.
Silkwood-Sherer 2007[99] CCT (non-equivalent pre-test/post-test) US Veteran Population: No MS	Hippotherapy	14 weeks	Once per week, 40 minutes	Experienced horse handler with 2 side walkers	Held in indoor arena at therapeutic riding center. Subjects placed on horses to respond to changes in horse's movement, not instructed in riding skill.
Velikonja 2010[112] RCT US Veteran Population: No MS	Sports climbing Yoga	10 weeks	Once per week	Sports climbing supervised by 2 licensed instructors. Yoga instructed by a licensed specialist nurse.	Participants were asked to attend ≥9 out of 10 sessions) Climbing wall adjusted for patients with physical disabilities Yoga program adjusted for MS patients
Vella 2013[113] Pre-post US Veteran Population: Yes PTSD	Fly-fishing	3 nights, 2 days	N/A	Trained specialists	Total of 16 hours across 2 days. Excursions varied from 2-7 Veterans. Transportation provided by program.

Author, year Study Design (US Veteran Population (Yes/No) Medical Condition	Sport(s)	Program Duration (weeks)	Program Frequency (sessions per week)	Program Leadership (describe)	Program Component Description
Vermöhlen 2017[114] RCT US Veteran Population: No MS	Hippotherapy	12 weeks	Once per week	Hippotherapists	Hippotherapy added on to standard care, which remained unchanged. Examinations and questionnaires completed at baselines, 6-7 weeks and after 12 wks.
Wickham 2000[115] Pre-post US Veteran Population: No SCI	Wheelchair basketball, quad rugby, wheelchair tennis, swimming, weight-lifting, and wheelchair racing	2 days	N/A	NR	Wheelchair sports camp designed to give persons with physical disabilities the opportunity to explore adapted sports.
Zoerink 2015[119] Pre-post US Veteran Population: No CVA	Golf	6 weeks	Once per week	Social worker, Certified Therapeutic Recreation Specialist, and exercise physiologist	3-hole short course. Each program consisted of 3 phases: (1) 15-20 min warm up, including physical exercise, goal setting, and safety precautions; (2) 30-45 min golfing period; (3) 15-20 min debriefing session

CCT=controlled clinical trial; CVA=cerebrovascular accident or stroke; MS=multiple sclerosis; NR=not reported; NS=not specified; PTSD=posttraumatic stress disorder; RCT=randomized controlled trial; SCI=Spinal Cord Injury; TBI=traumatic brain injury

Appendix D Table 3. Health and Wellness Outcomes – KQ1

Author, year Design Sport Population (n enrolled)	Health		Balance		Other	
	Intervention	Comparator	Intervention	Comparator	Intervention	Comparator
PROGRAM STUDIES						
Beinotti 2013[11] RCT Therapeutic horseback riding CVA (n=24)	*Riding + Conventional therapy* SF-36 General Health, mean (SD) Pre: 75.3 (17.8) Post: 85.9 (15.5) P=.11	*Conventional therapy* SF-36 General Health, mean (SD) Pre: 75.0 (24.4) Post: 77.7 (20.9)			*Riding + Conventional therapy* SF-36 Pain, mean (SD) Pre: 97.5 (7.9) Post: 91.9 (18.5) P=.58	*Conventional therapy* SF-36 Pain, mean (SD) Pre: 63.9 (30.8) Post: 70.6 (27.3)
Beinotti 2010[12] CCT Hippotherapy CVA (n=20)			*Riding + Conventional therapy* BBS, mean (SD) Pre: 46.1 (12.9) Post: 49.0 (13.0) P=.06	*Conventional therapy* BBS, mean (SD) Pre: 44.3 (12.3) Post: 45.1 (14.2)		
Calsius 2015[25] D'hooghe 2014[37] Pre-post Hiking MS (n=5)					Fatigue - FSMC total, median (range) Pre: 68 (23-79) End of training: 61 (24-79) Post hiking trip: 59 (27-82) Follow-up: 69 (26-84) Transient reduction in fatigue	No comparator group

Author, year Design Sport Population (n enrolled)	Health		Balance		Other	
	Intervention	Comparator	Intervention	Comparator	Intervention	Comparator
Earles 2015[38] Pre-post Equine-assisted therapy Anxiety/PTSD (n=16)	PHQ Somatic Symptoms, mean (SD) Pre: 7.9 (3.3) Post: 7.1 (3.1) ES=0.37, P NS	No comparator group			AUDIT-C, mean (SD) Pre: 3.3 (2.6) Post: 2.6 (2.1) ES=0.58, P<.05	No comparator group
Hammer 2005[49] Pre-post Hippotherapy MS (n=13)	SF-36 General Health 4 of 11 participants had positive score change ≥15 from pre-intervention 2 of 11 had negative score change ≥15	No comparator group	BBS 3 of 11 participants had clinically significant change from pre-intervention Timed Up and Go 2 of 10 had clinically significant change from pre-intervention	No comparator group	SF-36 Pain 3 of 11 had positive score change ≥15 from pre-intervention 1 of 11 had negative score change ≥15 Visual Analog Pain No participants showed clinically significant change in pain from pre-intervention	No comparator group
Herzog 2018[54] RCT (cross-over) Wheelchair curling SCI (n=13)			MFRT, medians, cm *Forward* Pre: 29.3 Post: 32.7 P=.22 *Sideward* Pre: 16.3 Post: 19.3 P=.06	No comparator group (groups combined due to no carry-over effect)		
Jolk 2015[59] Pre-post case series Sports Climbing			Postural Sway, mean (SD) Pre: 4.8 (0.8) Post: 4.3 (0.9)	No comparator group		

Author, year Design Sport Population (n enrolled)	Health		Balance		Other	
	Intervention	Comparator	Intervention	Comparator	Intervention	Comparator
MS (n=7)			P=.12 NOTE: score of 4-5 corresponds to healthy controls			
Lanning 2013[64] Pre-post Equine-assisted activity Mental/physical wounds (n=13)	SF-36 General Health Reported increase in group mean scores over 12 weeks (n=13) and 24 weeks (n=7 completers)	No comparator group				
Lindroth 2015[67] Pre-post Hippotherapy MS (n=3)			BBS 3 of 3 participants improved scores by 2 to 6 points over 6-week training; all continued improvement at 6-week follow-up	No comparator group		
Muñoz-Lasa 2011[80] Pre-post with comparator (CCT) Therapeutic horseback riding MS (n=27)			*Riding + Physiotherapy* POMA, mean (SD) Pre: 15.5 (6.9) Post: 19.4 (3.5) P<.005	*Physiotherapy* POMA, mean (SD) Pre: 17.2 (6.6) Post: 17.6 (6.5)		
Schachten 2015[96] CCT (matched pairs) Golf CVA (n=14)			*Golf training* BBS, mean (SD) Pre: 46.9 (15.9) Post: 50.7 (11.2) ES=0.26, P NS	*Social communication* BBS, mean (SD) Pre: 21.0 (21.7) Post: 23.7 (24.6)	*Golf training* Block Tapping Test (visual-spatial short-term memory), mean (SD) Pre: 3.3 (1.9)	*Social communication* Block Tapping Test (visual-spatial short-term memory), mean (SD)

Author, year Design Sport Population (n enrolled)	Health		Balance		Other	
	Intervention	Comparator	Intervention	Comparator	Intervention	Comparator
					Pre: 4.7 (1.1) Post: 6.1 (0.9) ES=0.95, P<.05	Post: 3.6 (1.9)
Shatil 2005[97] RCT Golf CVA (n=18)			*Therapeutic golf* BBS, mean (SD) Pre: 46.6 (8.6) Post: 49.8 (8.5) P=.0003 CMPCI, mean (SD) Pre: 4.6 (0.7) Post: 5.5 (1.0) P=.01	*Hand therapy* BBS, mean (SD) Pre: 43.8 (12.3) Post: 44.9 (13.1) CMPCI, mean (SD) Pre: 4.9 (1.1) Post: 4.9 (1.1)		
Silkwood-Sherer[99] 2007 CCT Hippotherapy MS (n=15)			*Hippotherapy* BBS, median Pre: 35.0 Post: 55.0 P<.05 (post-test) POMA, median Pre: 17.0 Post: 27.0 P=.08	*Wait list* BBS, median Pre: 41.5 Post: 41.0 POMA, median Pre: 19.0 Post: 19.0		
Velikonja 2010[112] RCT Sports Climbing MS (n=20)					*Sports climbing* Executive Function, median a. NAB – Mazes Pre: 14.0 Post: 16.0 P=.34 from pre P NS between groups b. Tower of London (number of moves) Pre: 34 Post: 26	*Yoga* Executive Function, median a. NAB – Mazes Pre: 20.5 Post: 19.0 P=.44 from pre b. Tower of London (number of moves) Pre: 23 Post: 33

Author, year Design Sport Population (n enrolled)	Health		Balance		Other	
	Intervention	Comparator	Intervention	Comparator	Intervention	Comparator
					P=.17 from pre P NS between groups Fatigue – MFIS total Pre: 40.0 Post: 27.0 P=.02 from pre P between groups NR	P=.06 from pre Fatigue – MFIS total Pre: 32.0 Post: 23.0 P=.06 from pre
Vella 2013[113] Pre-post Fly-fishing PTSD (n=74)					PSQI, mean (SD) Pre: 13.1 (3.6) 6-week follow-up: 11.6 (3.9) P<.001	No comparator group
Vermöhlen 2017[114] RCT Hippotherapy MS (n=70)			*Hippotherapy* BBS, mean (SD) Pre: 40.6 (11.5) Post: 47.0 (8.7) Mean change: 6.4 (5.4) Difference between groups at 12 weeks: 2.33 (95%CI 0.03, 4.63), P=.047	*Usual care* BBS, mean (SD) Pre: 42.1 (10.9) Post: 45.1 (10.9) Mean change: 3.1 (5.1)	*Hippotherapy* Visual Analog Pain, mean (SD) Pre: 32.3 (29.9) Post: 24.9 (27.6) Mean change: -7.4 (16.8) Difference between groups at 12 weeks: -3.1 (95%CI -13.4, 7.3), P=.56 Fatigue – FSS, mean (SD) Pre: 51.8 (10.5) Post: 42.6 (11.4) Mean change: -9.2 (10.3) Difference between groups at 12	*Usual care* Visual Analog Pain, mean (SD) Pre: 24.7 (29.3) Post: 23.4 (27.0) Mean change: -1.3 (28.0) Fatigue – FSS, mean (SD) Pre: 47.8 (11.9) Post: 46.8 (10.6) Mean change: -0.9 (8.4)

Author, year Design Sport Population (n enrolled)	Health		Balance		Other	
	Intervention	Comparator	Intervention	Comparator	Intervention	Comparator
					weeks: -6.8 (95%CI -11.0, -2.6), P=.002	
Zoerink 2015[119] Pre-post Golf CVA (n=11)			BBS, mean, sec a. Sit-stand Pre: 32.2 Post: 34.0 P=.38 b. 1-foot stand Pre: 26.9 Post: 24.0 P=.002 NOTE: authors report improved 1-foot stand but data show less time standing	No comparator group		
SPORTS ACTIVITY PARTICIPATION STUDIES						
Aydoğ 2006[7] Cross-sectional with comparator Goalball Visual impairment (n=40)			*Goalball* Dynamic Postural Stability (overall index) 6.2 (1.9) P NS	*Blind sedentary* Dynamic Postural Stability (overall index) 8.1 (4.7)		
Aytar 2012[8] Case series Soccer Limb amputation (n=11)			Static Balance, mean (SD) 319.00 (120.41)	No comparator group		

Author, year Design Sport Population (n enrolled)	Health		Balance		Other	
	Intervention	Comparator	Intervention	Comparator	Intervention	Comparator
Campayo-Piernas 2017[26] Cross-sectional with comparator Soccer Visual impairment (n=22)			*Blind soccer players* Balance (resultant distance of center of pressure displacement, mm), mean (SD) Pre: 45.5 (17.0) Post: 33.6 (7.2) P NS	*Sighted soccer players* Balance (resultant distance of center of pressure displacement, mm), mean (SD) Pre: 44.5 (13.4) Post: 32.0 (5.6)		
Côté-Leclerc 2017[33] Mixed methods with comparator Multiple Mobility limitations (n=34)	*Paraplegia* QLI Health and Functioning, mean (SD) 21.9 (4.1) P=.71 between groups Not clinically significant (defined as ≥3-point difference)	*General population* QLI Health and Functioning, mean (SD) 22.4 (3.2)				
da Silva 2018[35] Cross-sectional with comparator Football (soccer) and goalball) Visual impairment (n=24)			*Players with blindness* Static Balance (s), mean (SD) 42.0 (17.0) P=.04	*Physically active, sighted* Static Balance (s), mean (SD) 45.0 (0.0)	*Players with blindness* FES-I, mean (SD) 22.6 (3.4) P=.01	*Physically active, sighted* FES-I, mean (SD) 17.5 (3.0)
Garshick 2016[45] Cross-sectional with comparator Multiple SCI (n=347)					Dyspnea OR 0.61 (95%CI 0.33, 1.12) Participation in	

Author, year Design Sport Population (n enrolled)	Health		Balance		Other	
	Intervention	Comparator	Intervention	Comparator	Intervention	Comparator
					organized sports vs no participation	
Perrier 2015[87] Perrier 2012[86] Cross-sectional with comparator Multiple Multiple (largely SCI) (n=201)	*Involved in adaptive sport* Perceived risk of chronic disease, mean (SD) 12.1 (5.0) ES=.42, P NS	*Not Involved in adaptive sport* Perceived risk of chronic disease, mean (SD) 14.5 (6.1)				

Abbreviations follow Table 9.

Appendix D Table 4. Daily Functioning Outcomes – KQ1

Author, year Design Sport Population (n enrolled)	Activities of Daily Living		Gait		Other	
	Intervention	Comparator	Intervention	Comparator	Intervention	Comparator
PROGRAM STUDIES						
Beinotti 2013[11] RCT Therapeutic horseback riding CVA (n=24)					*Riding + Conventional therapy* SF-36 Functional Capacity, mean (SD) Pre: 40.5 (15.7) Post: 51.5 (14.3) P=.02	*Conventional therapy* SF-36 Functional Capacity, mean (SD) Pre: 50.0 (19.7) Post: 40.0 (26.0)
Beinotti 2010[12] CCT Hippotherapy CVA (n=20)			*Riding + Conventional therapy* FAC, mean (SD) Pre: 3.6 (0.8) Post: 3.8 (0.9) P=.93	*Conventional therapy* FAC, mean (SD) Pre: 3.2 (1.0) Post: 3.4 (1.0)		
Bennett 2017[14] Pre-post Fly-fishing Combat-related disabilities (n=40)					WRFIS, mean (SD) Pre: 35.7 (13.6) Post: 31.2 (10.9) 3-month follow-up: 35.2 (13.3) P≤.005 (Pre vs Post) P NS (Pre vs Follow-up)	No comparator group
Calsius 2015[25] D'hooghe 2014[37] Pre-post Hiking MS (n=5)			MSWS-12, median (range) Pre: 14 (12-39) End of training: 13 (12-26)	No comparator group		

Author, year Design Sport Population (n enrolled)	Activities of Daily Living		Gait		Other	
	Intervention	Comparator	Intervention	Comparator	Intervention	Comparator
			Post hiking trip: 13 (12-31) Follow-up: 14 (12-38) P NS over time			
Hammer 2005[49] Pre-post Hippotherapy MS (n=13)	PSFS 4 of 9 participants had clinically significant positive change from pre-intervention on at least 1 ADL; none had clinically significant negative change	No comparator group	Gait velocity - 10 meter walking test m/s 0 of 10 had clinically significant change from pre-intervention to post-intervention; 1 of 10 had clinically significant change at 3-week follow-up	No comparator group		
Herzog 2018[54] RCT (cross-over) Wheelchair curling SCI (n=13)	*Training* SCIM III No differences between groups at crossover (4 weeks) or final assessment (8 weeks)	*Non-training*				
Lanning 2013[64] Pre-post Equine-assisted activity Mental/physical wounds (n=13)					SF-36 Physical Functioning Reported no change in group mean scores over 12 weeks (n=13); increase over 24 weeks (n=7 completers)	No comparator group

Author, year Design Sport Population (n enrolled)	Activities of Daily Living		Gait		Other	
	Intervention	Comparator	Intervention	Comparator	Intervention	Comparator
Lindroth 2015[67] Pre-post Hippotherapy MS (n=3)			FGA 3 of 3 participants improved scores by 2 to 6 points over 6-week training; no to little change at 6 week follow-up	No comparator group		
Muñoz-Lasa 2011[80] Pre-post with comparator (CCT) Therapeutic horseback riding MS (n=27)	*Riding + Physiotherapy* BI, mean (SD) Pre: 89.6 (10.5) Post: 90.4 (8.9) P NS	*Physiotherapy* BI, mean (SD) Pre: 90.3 (10.9) Post: 90.7 (11.3)				
Zoerink 2015[119] Pre-post Golf CVA (n=11)			FFB agility, mean, sec Pre: 18.3 Post: 16.5 P=.16	No comparator group		
SPORTS ACTIVITY PARTICIPATION STUDIES						
da Silva 2015[35] Cross-sectional with comparator Multiple Visual Impairment (n=24)			*Goalball or football with blindness* Self-selected Walking Speed (m/s), mean (SD) 1.3 (0.3) P=.08	*Physically active, sighted* Self-selected Walking Speed (m/s), mean (SD) 1.4 (0.2)		
Hanson 2001[50]Cross-sectional Multiple SCI (n=48)					*Athletes* CHART Physical Independence, mean (SD) 95.3 (8.8) P=.006	*Non-athletes* CHART Physical Independence, mean (SD) 78.3 (33.3)

Author, year Design Sport Population (n enrolled)	Activities of Daily Living		Gait		Other	
	Intervention	Comparator	Intervention	Comparator	Intervention	Comparator
Miki 2012[77] Cross-sectional Wheelchair basketball SCI (n=82)	SCIM (Japanese version) Score <65: 44% (36/82) Score over 65: 48% (39/82) Not reported: 9% (7/82)	No comparator group				
Sporner 2009[103] Cross-sectional Multiple Multiple (n=132)					CHART Physical Independence, mean (SD) 69.1 (43.2)	No comparator group

Abbreviations follow Table 9.

Appendix D Table 5. Self-Esteem/Perceived Competence – KQ1

Author, year Design Sport Population (n enrolled)	Self-Esteem		Perceived Competence		Other	
	Intervention	Comparator	Intervention	Comparator	Intervention	Comparator
PROGRAM STUDIES						
Barbin 2008[9] Pre-post Skiing SCI (n=10)	PSI-6, mean (SD) Global self-esteem Pre: 6.4 (1.4) Post: 7.1 (1.6) P<.05	No comparator group			PSI-6, mean (SD) *Physical self-worth* Pre: 6.0 (1.5) Post: 6.9 (1.7) P<.001 *Sport Competence* Pre: 5.6 (1.2) Post: 6.9 (1.5) P<.01	No comparator group
Bennett 2017[14] Pre-post Fly-fishing Combat-related disabilities (n=40)			BNSLS, mean (SD) Pre: 99.3 (18.3) Post: 102.5 (20.9) 3-month follow-up: 101.4 (20.2) P NS	No comparator group		
Calsius 2015[25] D'hooghe 2014[37] Pre-post Hiking MS (n=5)					ESES, median (range) Pre: 36 (27-40) End of training: 37 (33-40) Post hiking trip: 37 (33-40) Follow-up: 37 (28-39) P NS over time	No comparator group
Earles 2015[38] Pre-post Equine-assisted therapy					GPSES, mean (SD) Pre: 28.6 (7.6) Post: 30.2 (5.8) ES=0.45, P NS	No comparator group

Author, year Design Sport Population (n enrolled)	Self-Esteem		Perceived Competence		Other	
	Intervention	Comparator	Intervention	Comparator	Intervention	Comparator
Anxiety/PTSD (n=16)						
Lundberg 2011[70] Pre-post Water sports, fly-fishing, winter sports Post-combat disability (n=18)			PCS, mean (SD) Pre: 16.3 (6.1) Post: 21.7 (5.5) P=.001	No comparator group		
SPORTS ACTIVITY PARTICIPATION STUDIES						
Adnan 2001[3] Cross-sectional Quad rugby Quadriplegia (n=30)					*Participants* SEADL Participants scored significantly higher on 5 of 28 activities of daily living; all items related to transferring ES=0.92 to 1.23	*Non-participants* SEADL
Laferrier 2015[63] Cross-sectional Multiple Multiple (n=220)	RSES, mean (SD) Overall: 24.0 (3.5) >10 years participation in sport/exercise/ recreation: 26.9 (SE 1.1)* 5-10 years: NR** 1-5 years: 22.9 (SE 0.6) <1 year: 21.6 (SE 0.6)	No comparator group				

Author, year Design Sport Population (n enrolled)	Self-Esteem		Perceived Competence		Other	
	Intervention	Comparator	Intervention	Comparator	Intervention	Comparator
	*P<.001 vs 1-5 yrs and <1 year **P=.02 vs <1 year Team sports: 22.3 (SE 1.1) Individual sports: 25.3 (SE 1.0)*** Combination: 25.1 (SE 0.7) ***P<.05 vs team or combination					
Perrier 2015[87] Perrier 2012[86] Cross-sectional with comparator Multiple Multiple (largely SCI) (n=201)					*Involved in adaptive sport* TEOSQ Task Self-efficacy, mean (SD) 40.8 (13.8) ES=1.34 Barrier Self-efficacy, mean (SD) 46.6 (14.6) ES=1.58	*Not Involved in adaptive sport* TEOSQ Task Self-efficacy, mean (SD) 21.3 (15.1) Barrier Self-efficacy, mean (SD) 24.9 (13.1)
Scarpa 2011[95] Cross-sectional Multiple Paraplegia (n=143)	*Physical disabled practicing sport* PSDQ Global Esteem, mean (SD) 4.9 (0.7) P<.001 (calculated)	*Physical disabled not practicing sport* PSDQ Global Esteem, mean (SD) 4.0 (1.3)			*Physical disabled practicing sport* PSDQ Global Physical, mean (SD) 4.4 (1.2) P=.004 (calculated)	*Physical disabled not practicing sport* PSDQ Global Physical, mean (SD) 3.7 (1.3)

Author, year Design Sport Population (n enrolled)	Self-Esteem		Perceived Competence		Other	
	Intervention	Comparator	Intervention	Comparator	Intervention	Comparator
Skordilis 2001[101] Cross-sectional Multiple Multiple (n=243)					TEOSQ, mean SD *Task Orientation:* 4.3 (0.5) *Ego Orientation:* 2.7 (0.8) NOTE: wheelchair marathoners scored higher (P=.001) than wheelchair basketball players on Ego orientation; no gender differences or interaction	No comparator group
Skučas 2013[102] Cross-sectional Multiple Tetraplegic or paraplegic (n=106)					AIMS, mean Paraplegic: 23 Tetraplegic: 18 P<.05 Male: 22 Female: 16 P<.05 Overall 10.6% had scores of 28 points (“athletic identity”) More hours/week of participation associated with higher athletic identity (data NR)	No comparator group
Sporner 2009[103] Cross-sectional Multiple Multiple (n=132)	RSES, mean (SD) 34.3 (5.5)	No comparator group				

Author, year Design Sport Population (n enrolled)	Self-Esteem		Perceived Competence		Other	
	Intervention	Comparator	Intervention	Comparator	Intervention	Comparator
Tasiemski 2004[106] Tasiemski 2005[107] Cross-sectional Multiple SCI (n=985)					AIMS, mean (SD) 16.5 (9.9) Male: 17.3 (10.1) Female: 12.4 (10.1) P<.01 Sports participation (hours/week) 6+: 26.9 (11.0) 3 to <6: 19.9 (9.7) 1 to <3: 16.2 (8.0) <1: 14.9 (8.9) None: 11.6 (7.2) P<.01 for all comparisons No gender X hours/week interaction	No comparator group
Tasiemski 2011[105] Cross-sectional Multiple SCI (n=1034)					AIMS, mean (SD) 20.6 (11.7) Age, gender, and current amount of sports participation per week were significant predictors of athletic identity (higher identity scores for younger, male, and higher self-reported activity) Those able to practice their favorite sport after	No comparator group

Author, year Design Sport Population (n enrolled)	Self-Esteem		Perceived Competence		Other	
	Intervention	Comparator	Intervention	Comparator	Intervention	Comparator
					SCI had higher AIMS scores (P<.001) No significant difference in AIMS scores for team vs individual sports	
Tasiemski 2012[108] Cross-sectional Tandem Cycling Visual Impairment (n=50)					*Visually impaired* AIMS, mean (range) 24.8 (7-49) P<.01 *Time when vision failed* From birth: 24.5 (8.5) Later in life: 25.1 (7.6) P NS *Hours per week training* 9-12: 21.6 (4.5) 13-16: 26.4 (8.8) P NS	"*Able-bodied*" AIMS, mean (range) 36.4 (7-49)

Abbreviations follow Table 9.

Appendix D Table 6. Mental Health (Mood, Depression, Anxiety, PTSD) Outcomes

Author, year Design Sport Population (n enrolled)	Mental Health		PTSD Symptoms		Depression/Anxiety		Mood/Other	
	Intervention	Comparator	Intervention	Comparator	Intervention	Comparator	Intervention	Comparator
PROGRAM STUDIES								
Beinotti 2013[11] RCT Therapeutic horseback riding CVA (n=24)	*Riding + Conventional therapy* SF-36 Mental Health, mean (SD) Pre: 73.2 (22.5) Post: 83.2 (16.9) P=.04	*Conventional therapy* SF-36 Mental Health, mean (SD) Pre: 72.4 (13.7) Post: 68.8 (18.5)						
Bennett 2017[14] Pre-post Fly-fishing Combat-related disabilities (n=40)			PCL-M, mean (SD) Pre: 51.1 (17.8) Post: 39.3 (14.4)* 3-month follow-up: 46.7 (16.9) *P<.05 pre to post	No comparator group	PHQ-9, mean (SD) Pre: 20.9 (6.7) Post: 15.9 (6.0)* 3-month follow-up: 19.8 (6.9) *P<.05 pre to post	No comparator group		
Bennett 2014[13] CCT Ski/snowboard PTSD (n=34)			*Group A: Higher Ground program* *Group B: Same with added communication training*	*No program*				

Author, year Design Sport Population (n enrolled)	Mental Health		PTSD Symptoms		Depression/Anxiety		Mood/Other	
	Intervention	Comparator	Intervention	Comparator	Intervention	Comparator	Intervention	Comparator
			PCL-M/C, mean (SD) Post-intervention A: 34.6 (9.5) B: 41.8 (19.3) Difference from pre, mean (SE) A: -15.6 (4.2)*^ B: -9.2 (3.9)* *P<.05 vs pre ^P<.05 vs control	PCL-M/C, mean (SD) Post-intervention 49.4 (21.6) Difference from pre, mean (SE) 1.19 (3.9)				
Earles 2015[38] Pre-post Equine-assisted therapy Anxiety/PTSD (n=16)			PCL-S, mean (SD) Pre: 50.9 (12.6) Post: 39.4 (16.7) ES=1.21, P<.001	No comparator group	PHQ-9, mean (SD) Pre: 20.5 (7.5) Post: 18.3 (6.3) ES=0.54, P<.05 GAD, mean (SD) Pre: 12.6 (6.2) Post: 8.3 (5.5) ES=1.01, P<.01	No comparator group		
Hammer 2005[49] Pre-post Hippotherapy MS (n=13)	SF-36 Mental Health 3 of 11 participants had positive score change ≥15 from pre-intervention	No comparator group						

Author, year Design Sport Population (n enrolled)	Mental Health		PTSD Symptoms		Depression/Anxiety		Mood/Other	
	Intervention	Comparator	Intervention	Comparator	Intervention	Comparator	Intervention	Comparator
	2 of 11 had negative score change ≥15							
Johnson 2018[58] RCT Therapeutic horseback riding PTSD (29)			*Therapeutic riding* PCL-M, mean (SD) Pre: 57.7 (14.6) 3 weeks: 53.2 (13.8) 6 weeks: 47.0 (14.7) (includes riding group plus wait list group when enrolled in riding program) P<.05 for week 3 vs Pre and week 6 vs week 3	*Wait list* PCL-M, mean (SD) Pre: 58.4 (16.4) 3 weeks: 57.6 (13.2) 6 weeks: 59.2 (14.3)				
Lanning 2013[64] Pre-post Equine-assisted activity Mental/physical wounds (n=13)	SF-36 Mental Health Reported increase in group mean scores over 12 weeks (n=13); and 24 weeks (n=7 completers)	No comparator group			BDI-II Reported decreased depressive symptoms over 12 weeks (n=13) and 24 weeks (n=7 completers) but remaining in moderate	No comparator group		

Author, year Design Sport Population (n enrolled)	Mental Health		PTSD Symptoms		Depression/Anxiety		Mood/Other	
	Intervention	Comparator	Intervention	Comparator	Intervention	Comparator	Intervention	Comparator
					depression range			
Lundberg 2011[70] Pre-post Water sports, fly-fishing, winter sports Post-combat disability (n=18)							POMS-Brief, mean (SD) Pre: 60.4 (24.0) Post: 33.7 (16.9) P<.001	No comparator group
Malinowski 2017[75] Pre-post Equine-assisted therapy PTSD (n=7)	BSI, mean (SE) Pre: 65.4 (2.7) Post: 54.1 (3.2) P=.003	No comparator group	PCL-5, mean (SE) Pre: 59.4 (3.9) Post: 48.6 (3.7) P=.049	No comparator group				
Rogers 2014[93] Pre-post Ocean Therapy PTSD (n=14, 11 completers)			PCL-M, median Pre: 55 Post: 34 Median of differences: 18.2, P<.0005 ES=.77 Clinically subthreshold PTSD symptoms: Pre: 9% (1/11) Post: 73% (8/11)	No comparator group	MDI, median Pre: 33 Post: 14 Median of differences: 11.3, P=.03 ES=.61 Severe depression Pre: 36% (4/11) Post: 18% (2/11)	No comparator group		

Author, year Design Sport Population (n enrolled)	Mental Health		PTSD Symptoms		Depression/Anxiety		Mood/Other	
	Intervention	Comparator	Intervention	Comparator	Intervention	Comparator	Intervention	Comparator
Schachten 2015[96] CCT (matched pairs) Golf CVA (n=14)					*Golf training* CES-D, mean (SD) Pre: 5.6 (3.4) Post: 1.6 (2.0) ES=0.31, P NS	*Social communication* CES-D, mean (SD) Pre: 9.1 (9.5) Post: 6.7 (8.5)		
Velikonja 2010[112] RCT Sports Climbing MS (n=20)					*Sports climbing* CES-D, median Pre: 10.0 Post: 5.0 P=.68 from pre	*Yoga* CES-D, median Pre: 9.5 Post: 3.0 P=.21 from pre		
Vella 2013[113] Pre-post Fly-fishing PTSD (n=74)	BSI, mean (SD) Pre: 28.1 (13.5) Last day: 11.4 (10.3) 6-week follow-up: 18.4 (12.4) P<.001 for baseline vs other times	No comparator group	PCL-M, mean (SD) Pre: 59.4 (13.6) 6-week follow-up: 49.6 (15.1) P<.001	No comparator group			PANAS Negative Affect, mean (SD) Pre: 26.6 (7.9) Last day: 16.3 (6.8) 6-week follow-up: 22.5 (7.4) P<.001 for baseline vs other times PANAS Positive Affect, mean (SD) Pre: 25.6 (7.2) Last day: 36.4 (7.7)	

Author, year Design Sport Population (n enrolled)	Mental Health		PTSD Symptoms		Depression/Anxiety		Mood/Other	
	Intervention	Comparator	Intervention	Comparator	Intervention	Comparator	Intervention	Comparator
							6-week follow-up: 26.9 (7.7) P<.001 for baseline vs last day	
SPORTS ACTIVITY PARTICIPATION STUDIES								
Bauerfeind 2015[10] Longitudinal case series Wheelchair rugby Tetraplegia (n=14)							CAAS, mean (SD) Offensive players: 81.7 (11.9) Defensive players: 73.0 (8.6) P=.19 CAAS not associated with incidence of sports injuries not requiring medical intervention	No comparator group
Fiorilli 2013[42] Cross-sectional Wheelchair basketball SCI or Limb amputation (n=46)	*Participants* SCL-90-R mean (SD) 0.34 (0.31) P=.008	*Non-participants* SCL-90-R, mean (SD) 0.61 (0.31)						

Author, year Design Sport Population (n enrolled)	Mental Health		PTSD Symptoms		Depression/Anxiety		Mood/Other	
	Intervention	Comparator	Intervention	Comparator	Intervention	Comparator	Intervention	Comparator
Foreman 1997[43] Cross-sectional Multiple Paraplegia or quadriplegia (n=121)					*Participants* CES-D, mean (SD) 11.9 (10.5) P=.10 STAI-trait, mean (SD) 36.8 (10.7) P=.048	*Non-participants* CES-D, mean (SD) 13.0 (10.7) STAI-trait, mean (SD) 40.5 (9.8)		
Muraki 2000[81] Cross-sectional Multiple Tetraplegia or paraplegia (n=169)					*High active* SDS, mean (SD) Tetra: 38.2 (2.9) Para: 38.4 (7.0) No difference between Tetra and Para; P<.05 for high active vs inactive, high active vs low active, and middle active vs inactive (all data not shown) STAI state, mean (SD) Tetra: 39.7 (6.5) Para: 39.0 (6.8) No difference between Tetra	*Inactive* SDS, mean (SD) Tetra: 46.4 (7.1) Para: 47.4 (7.4) No difference between Tetra and Para STAI state, mean (SD) Tetra: 44.2 (9.0) Para: 45.6 (9.4)	POMS No differences on any POMS subscale between tetraplegia and paraplegia POMS Depression: Lower scores for high active vs inactive and high active vs low active, P<.05 POMS Vigor: Higher scores for high active vs inactive, low active, or middle active and middle active vs inactive, P<.05 No differences on other POMS subscales NOTE: no differences in SDS, STAI, or POMS outcomes across sports (basketball, racing, tennis, or "minor" modes) despite	

Author, year Design Sport Population (n enrolled)	Mental Health		PTSD Symptoms		Depression/Anxiety		Mood/Other	
	Intervention	Comparator	Intervention	Comparator	Intervention	Comparator	Intervention	Comparator
					and Para; P NS for high active vs inactive STAI trait, mean (SD) Tetra: 37.6 (11.9) Para: 37.7 (7.2) No difference between Tetra and Para; P<.05 for high active vs inactive	No difference between Tetra and Para STAI trait, mean (SD) Tetra: 45.1 (10.1) Para: 44.8 (11.3) No difference between Tetra and Para	differences in intensity, frequency (days/week), or duration (min/day) for the sports	
Silveira 2017[100] Cross-sectional Wheelchair rugby Tetraplegia (n=150)					CES-D, mean (SD) 5.6 (4.4) 17% (26/150) scored 10 or higher (further assessment for clinical depression recommended) *Practice frequency* ≤1/week: 6.5 (4.8) ≥2/week: 5.2 (4.0) P<.10	No comparator group		
Tasiemski 2004[106] Tasiemski 2005[107]					HADS anxiety, mean (SD) 6.9 (4.2)	No comparator group		

Author, year Design Sport Population (n enrolled)	Mental Health		PTSD Symptoms		Depression/Anxiety		Mood/Other	
	Intervention	Comparator	Intervention	Comparator	Intervention	Comparator	Intervention	Comparator
Cross-sectional Multiple SCI (n=985)					HADS depression, mean (SD) 5.5 (3.7)			
Tasiemski 2011[105] Cross-sectional Multiple SCI (n=1034)					HADS-Depression, mean (SD) 13.2 (4.0) Those able to practice their favorite sport after SCI had lower depression scores (P<.001) Team sports participants had lower depression scores (P<.05) HADS-Anxiety, mean (SD) 14.2 (4.1) Team sports participants had lower anxiety (P<.005)	No comparator group		

Abbreviations follow Table 9.

Appendix D Table 7. Quality of Life

Author, year Design Sport Population (n enrolled)	Health-Related Quality of Life		Satisfaction with Life		Other	
	Intervention	Comparator	Intervention	Comparator	Intervention	Comparator
PROGRAM STUDIES						
Beinotti 2013[11] RCT Therapeutic horseback riding CVA (n=24)	*Riding + Conventional therapy* SF-36 Total, mean Pre: 77.0 Post: 93.6 P=.004	*Conventional therapy* SF-36 Total, mean Pre: 79.6 Post: 73.5				
Bennett 2017[14] Pre-post Fly-fishing Combat-related disabilities (n=40)					LSS, mean (SD) Pre: 48.6 (17.9) Post: 52.0 (7.6) 3 month follow-up: 53.7 (14.7) P=.08 pre- to follow-up	No comparator group
Bennett 2014[13] CCT Ski/snowboard PTSD (n=34)					*Group A: Higher Ground program* *Group B: Same with added communication training* RDAS, mean (SD) Post-intervention A: 45.5 (6.5) B: 41.2 (6.8) Difference from pre, mean (SE) A: 0.6 (1.4) B: 3.9 (1.3)* *P<.05 vs pre	*No program* RDAS, mean (SD) Post-intervention 45.6 (12.6) Difference from pre, mean (SE) 2.4 (1.3)

Author, year Design Sport Population (n enrolled)	Health-Related Quality of Life		Satisfaction with Life		Other	
	Intervention	Comparator	Intervention	Comparator	Intervention	Comparator
					P=.25 between groups	
Earles 2015[38] Pre-post Equine-assisted therapy Anxiety/PTSD (n=16)			SWLS, mean (SD) Pre: 17.8 (6.1) Post: 19.1 (7.7) ES=0.25, P NS	No comparator group		
Lundberg 2011[70] Pre-post Water sports, fly-fishing, winter sports Post-combat disability (n=18)					WHOQoL-BREF, mean (SD) Pre: 74.4 (15.0) Post: 78.8 (13.9) P=.004	No comparator group
Shatil 2005[97] RCT Golf CVA (n=18)			*Therapeutic golf* SIP, mean (SD) Pre: 26.2 (14.3) Post: 18.1 (12.5) P=.04 (for change between groups)	*Hand therapy* SIP, mean (SD) Pre: 27.9 (6.3) Post: 23.9 (12.6)		
Vermöhlen 2017[114] RCT Hippotherapy MS (n=70)	*Hippotherapy* MSQoL-54, mean (SD) *Physical Health* Pre: 46.0 (14.2) Post: 57.0 (15.1) Mean change: 11.0 (12.0) Difference between groups at 12 weeks: 12.0	*Usual care* MSQoL-54, mean (SD) *Physical Health* Pre: 53.7 (14.6) Post: 51.3 (15.9) Mean change: -2.4 (9.3)				

Author, year Design Sport Population (n enrolled)	Health-Related Quality of Life		Satisfaction with Life		Other	
	Intervention	Comparator	Intervention	Comparator	Intervention	Comparator
	(95%CI 6.2, 17.7), P<.001 *Mental Health* Pre: 62.6 (18.0) Post: 75.7 (15.0) Mean change: 13.1 (15.2) Difference between groups at 12 weeks: 14.4 (95%CI 7.5, 21.3), P<.001	*Mental Health* Pre: 67.1 (17.2) Post: 64.2 (19.9) Mean change: -2.9 (14.8)				
SPORTS ACTIVITY PARTICIPATION STUDIES						
Aytar 2012[8] Case series Soccer Limb amputation (n=11)	ODI, mean (SD) 5.3 (6.7)	No comparator group				
Côté-Leclerc 2017[33] Mixed methods with comparator Multiple Mobility limitations (n=34)			*Paraplegia* QLI Total, mean (SD) 21.9 (3.3) P=.64 between groups; "good" quality of life Not clinically significant (defined as ≥3-point difference)	*General population* QLI Total, mean (SD) 22.3 (2.9)		
Garshick 2016[45] Cross-sectional with comparator Multiple			*Participation in organized sports* SWLS, mean (95%CI)	*No participation* SWLS, mean (95%CI)		

Author, year Design Sport Population (n enrolled)	Health-Related Quality of Life		Satisfaction with Life		Other	
	Intervention	Comparator	Intervention	Comparator	Intervention	Comparator
SCI (n=347)			25.6 (23.9, 27.3) P=.009 Participation in organized sports vs no participation	23.0 (22.2, 23.9)		
Laferrier 2015[63] Cross-sectional Multiple Multiple (n=221)					WHOQoL-BREF Scores not reported Positive relationship between overall quality of life and number of years participating in sport, exercise, recreation since onset of disability (P<.001) No significant relationship between type of activity (team, individual, combination) and quality of life	No comparator group
McVeigh 2009[76] Cross-sectional Multiple Tetraplegia or paraplegia (n=90)					*Sport participant* RNL, mean (SD) 100.2 (10.2) P<.05 between groups	*Non-sport participant* RNL, mean (SD) 83.6 (18.0)
Sporner 2009[103] Cross-sectional Multiple Multiple (n=132)					WHOOoL-BREF, mean (SD) 63.6 (9.1)	No comparator group

Author, year Design Sport Population (n enrolled)	Health-Related Quality of Life		Satisfaction with Life		Other	
	Intervention	Comparator	Intervention	Comparator	Intervention	Comparator
Tasiemski 2004[106] Tasiemski 2005 Cross-sectional Multiple SCI (n=985)			LiSat-9, mean (SD) 3.9 (1.0)	No comparator group		
Tasiemski 2011[105] Cross-sectional Multiple SCI (n=1034)			LiSat-9, mean (SD) 32.1 (8.8) Those able to practice their favorite sport after SCI had higher LiSat-9 scores (P<.001) Team sports participants had higher LiSAT-9 scores (P<.01)	No comparator group		
Yazicioglu 2012[117] Cross-sectional with comparator Multiple SCI or Limb amputation (n=60)			*Adaptive sport participants with physical disabilities* SWLS, mean (SD) 20.5 (7.8) P=.002	*Non-sport participants with physical disabilities* SWLS, mean (SD) 15.1 (6.9)	*Adaptive sport participants with physical disabilities* WHOQoL-BREF Reported significantly higher in sport participant group (P=.003)	*Non-sport participants with physical disabilities* WHOQoL-BREF
Zwierzchowska 2017[120] Cross-sectional with comparator Wheelchair rugby SCI (n=36)			*Low point or high point players* LiSat-9, mean Low point: 3.9 High point: 4.7 P NS	*Sedentary disabled* LiSat-9, mean 4.0		

Abbreviations follow Table 9.

Appendix D Table 8. Community Reintegration/Participation in Social Activities

Author, year Design Sport Population (n enrolled)	Community Reintegration		Social Functioning		Other	
	Intervention	Comparator	Intervention	Comparator	Intervention	Comparator
PROGRAM STUDIES						
Beinotti 2013[11] RCT Therapeutic horseback riding CVA (n=24)			*Riding + Conventional therapy* SF-36 Social, mean (SD) Pre: 81.3 (19.3) Post: 90.0 (12.9) P=.53	*Conventional therapy* SF-36 Social, mean (SD) Pre: 48.8 (28.5) Post: 58.8 (36.8)		
Hammer 2005[49] Pre-post Hippotherapy MS (n=13)			SF-36 Social Functioning 3 of 11 participants had positive score change ≥15 from pre-intervention 3 of 11 had negative score change ≥15	No comparator group		

Author, year Design Sport Population (n enrolled)	Community Reintegration		Social Functioning		Other	
	Intervention	Comparator	Intervention	Comparator	Intervention	Comparator
Johnson 2018[58] RCT Therapeutic horseback riding PTSD (29)					*Therapeutic riding* SELSA, mean (SD) Pre: 50.4 (11.9) 3 weeks: 53.5 (13.7) 6 weeks: 57.0 (10.3) (includes riding group plus wait list group when enrolled in riding program) P=.33 between groups at 6 weeks (calculated)	*Wait list* SELSA, mean (SD) Pre: 49.4 (5.1) 3 weeks: 52.1 (12.5) 6 weeks: 53.6 (8.0) NOTE: unexpected, increased loneliness
Lanning 2013[64] Pre-post Equine-assisted activity Mental/physical wounds (n=13)			SF-36 Social Functioning Reported decrease in group mean scores over 12 weeks (n=13); no change over 24 weeks (n=7 completers)	No comparator group		

Author, year Design Sport Population (n enrolled)	Community Reintegration		Social Functioning		Other	
	Intervention	Comparator	Intervention	Comparator	Intervention	Comparator
Wickham 2000[115] Pre-post Wheelchair sports SCI (n=24)					*Camp participants* LMS Social, mean (SD), pre-test minus post-test -5.0 (10.9) ES=-0.70 P=.12 LMS Stimulus-Avoidance, mean (SD), pre-test minus post-test 6.8 (10.0) ES=-1.07 P=.02	*Non-participants* LMS Social, mean (SD), pre-test minus post-test -0.9 (6.1) LMS Stimulus-Avoidance, mean (SD), pre-test minus post-test 2.3 (7.0)
SPORTS ACTIVITY PARTICIPATION STUDIES						
Fiorilli 2013[42] Cross-sectional Wheelchair basketball SCI or Limb amputation (n=46)					*Participants* PS, mean (SD) 7.2 (9.2) P<.01	*Non-participants* PS, mean (SD) 38.1 (23.7) Less social restriction in participant group
Hanson 2001[50]Cross-sectional Multiple SCI (n=48)			*Athletes* CHART Social Integration, mean (SD) 94.7 (12.1) P=.001	*Non-athletes* CHART Social Integration, mean (SD) 76.8 (20.4)		

Author, year Design Sport Population (n enrolled)	Community Reintegration		Social Functioning		Other	
	Intervention	Comparator	Intervention	Comparator	Intervention	Comparator
McVeigh 2009[76] Cross-sectional Multiple Tetraplegia or paraplegia (n=90)	*Sport participant* CIQ, mean (SD) 19.0 (3.2) P<.05 between groups	*Non-sport participant* CIQ, mean (SD) 14.1 (4.4)				
Sporner 2009[103] Cross-sectional Multiple Multiple (n=132)			CHART Social Integration, mean (SD) 92.4 (19.8)	No comparator group		
Urbański 2013[110] Cross-sectional Multiple SCI (n=30)	CIQ, mean (SD) Individual sports: 22.7 (3.2) Team sports: 22.3 (3.4) P NS No correlation between level of activity, time from injury, level of injury, or age and CIQ score	No comparator group				

Abbreviations follow Table 9.

Appendix D Table 9. Employment

Author, year Design Sport Population (n enrolled)	Employment
SPORTS ACTIVITY PARTICIPATION STUDIES	
Blauwet 2013[16] Cross-sectional Multiple SCI (n=149)	Participation in organized sports and employment (paid full time or part time, regularly volunteering) OR 2.04 (95%CI 0.98, 4.69); P=.06
Kim 2017[61] Cross-sectional Multiple Paraplegia or tetraplegia (n=302)	Working before attending NVWG: 28% (84/302) Working after NVWG: 16% (47/302) Volunteering before attending NVWG: 15% (45/302) Volunteering after NVWG: 20% (59/302) *Positive influence of NVWG on employment* a) among those currently working: RR 1.52 (95%CI 1.21, 1.92) b) among those currently volunteering: RR 1.77 (95%CI 1.45, 2.17)
Lastuka 2015[66] Cross-sectional Multiple Multiple (n=131)	Additional year of participating in adaptive sports is associated with increase in employment rate through the first 10 years of playing sports (P=.03); association weakens if playing adaptive sports up to 15 years and disappears if playing adaptive sports up to 20 years

ADL=activities of daily living; AIMS=Athletic Identity Measurement Scale; AUDIT-C=Alcohol Use Disorders Identification Test; BBS/BBT=Berg Balance Scale/Test; BI=Bartel Index; BDI=Beck Depression Inventory; BNSLS=Basic Needs Satisfaction in Life Scale; BSI=Brief symptom Inventory; BTT=Block-Tapping task; CES-D=Center for Epidemiologic Studies Depression Scale; CHART=Craig Handicap Assessment Reporting Technique; CIQ=Community Integration Questionnaire; CMPCI=Chedoke-McMaster Postural Control Inventory; CSES=Coping Self Efficacy Scale; CVA=cerebrovascular accident or stroke; DERS=Difficulties in Emotion Regulation Scale; EAAT=equine assisted activities and therapies; EDSS=Expanded Disability Status Scale; EMG=Electromyography; ES=effect size; ESES=Exercise Self-Efficacy Scale; FAC=Functional Ambulation Category Scale; FES-I=Falls Efficacy Scale – International; FFB=Functional Fitness Battery; smoking cessation, alcohol control); FGA=Functional Gait Assessment; FSMC=Fatigue Scale for Motor and Cognition; FSS=Fatigue Severity Scale; GAD=Generalized Anxiety Disorder Scale; GPSES=General Perceived Self-Efficacy Scale; HADS=Hospital Anxiety and Depression Scale; IMF=Index of Muscle Function; IPAQ = International Physical Activity Questionnaire; LAM=Leisure Attitude Measurement; LiSat-9= Life Satisfaction Questionnaire-9 item; LMS=Leisure Motivation Scale; LSS=Leisure Satisfaction Scale; MAS=Modified Ashworth Scale; MDI=Major Depression Inventory; MRT=Mental Rotation Test; MFISt=Modified Fatigue Impact Scale (total); MFRT=Modified Functional Reach Test; MS=multiple sclerosis; MSQoL-54=Multiple Sclerosis Quality of Life-54; MSWS=Multiple Sclerosis Walking Ability Scale; NAB=Mazes subtest of Executive module from the Neuropsychosocial assessment battery; NR=not reported; NS=not statistically significant; NVWG=National Veterans Wheelchair Games; OR=odds ratio; PANAS=Positive Affect and Negative Affect Schedule; PCL-C=PTSD Checklist-Civilian; PCL-M=PTSD Checklist-Military; PCL-S=PTSD Checklist-Specific;

PCL-5=PTSD checklist for Diagnostic and Statistical Manual of Mental Disorders (DSM-5); PCI=Proactive Coping Inventory; PCS=Perceived Competence Scale; PHQ=Patient Health Questionnaire; POMA=Performance Oriented Mobility Assessment; POMS(-B)=Profile of Mood States (-Brief); PS=Participation Scale; PSDQ=Physical Self-Description Questionnaire; PSFS=Patient-Specific Functional Scale; PSI-6=Physical Self Inventory; PSQI=Pittsburgh Sleep Quality Inventory; PSS=Perceived Stress Scale; PTGI=Posttraumatic Growth Inventory; PTSD=post-traumatic stress disorder; QLI=Quality of Life Index; RDAS=Revised Dyadic Adjustment Scale; RNL=Reintegration to Normal Living Index; RSES=Rosenberg Self-Esteem; SCI=spinal cord injury; SCIM=Spinal Cord Independence Measure; SCL-90-R=Symptom Checklist 90; SDS=self-rating depression scale; SEADL=Self-Efficacy for Activities of Daily Living; SELSA=Social and Emotional Loneliness Scale for Adults – short version; SF-36=Medical Outcomes Study Short Form; SIP=Sickness Impact Profile; SOQ=Sport Orientation Questionnaire; SOT=Sensory Organization Test; STAI=State-Trait Anxiety Inventory; SWLS-Satisfaction with Life Scale; TEOSQ=Task and Ego Orientation in Sport Questionnaire; TOLnm=Tower of London Test (number of moves);TOLtt=Tower of London Test (total time); TUG=timed up and go; WRFIS=Walter Reed Functional Impairment Scale; WSC=Winter Sports Clinic (Veterans); VAS=Visual Analog Scale; WHOQoL-BREF=World Health Organization Quality of Life-Brief; WUSPI=Wheelchair User's Shoulder Pain Index

APPENDIX E. QUALITY CHARACTERISTICS

Appendix E Table 1. Quality Characteristics of Included Qualitative Studies

Author, year	Congruity between theory and research methods	Congruity between methodology and research questions	Statement locating researcher culturally or theoretically	Participants adequately represented	Evidence of ethical approval	Comments
Bennett 2014[15] n=28	Unclear	Yes	No	Yes	Yes	Program was 'theory-based,' but no further detail on the theory behind the program or research methods; focus groups
Braganca 2018[20] n=61	No	Yes	No	Yes	Yes	Refers to researcher expertise in developing recommendations, but does not describe researchers' backgrounds or beliefs/values; self-completed questionnaire
Bragaru 2013[23] n=26	Yes	Yes	No	Yes	Yes	States no formal ethical permission was needed; interviews
Carin-Levy 2007[29] n=3	Yes	Yes	No	Yes	Yes	First author participates in the sport (diving) but does not describe how values/beliefs may influence research; semi-structured telephone interview
Carless 2013[31] Carless 2014[30] n=11	Yes	Yes	Unclear	Yes	Yes	Doesn't include statement about researcher's beliefs/values but describes in detail how researcher was embedded in adaptive program (2014); in-person interview
Chard 2016[32] n=45	No	Yes	No	Yes	Yes	Telephone interview
Giacobbi 2008[46] n=26	Yes	Yes	No	Yes	Yes	Third author is adaptive sports coach but does not describe how values/beliefs may influence research; semi-structured interviews (3rd author did not conduct interviews)
Hawkins 2011[52] n=10	Yes	Yes	Unclear	No	Yes	Semi-structured interview questions; 3 researchers independently interpreted interview data; only 10 of 50 program participants agreed to be interviewed

Author, year	Congruity between theory and research methods	Congruity between methodology and research questions	Statement locating researcher culturally or theoretically	Participants adequately represented	Evidence of ethical approval	Comments
Lape 2017[65] n=17	Unclear	Yes	No	Yes	Yes	Used "thematic analysis… that does not rely on a particular theory or epistemology"; focus groups
Litchke 2012[68] n=5	No	Yes	No	Yes	Yes	Participants were "purposefully selected" (injured at approximately same time in their lives); semi-structured interview and field observation by investigator and research assistants
Littman 2017[69] n=27	No	Yes	No	Yes	Yes	Semi-structured interview
Mowatt 2011[79] n=67	Yes	No	No	Yes	Yes	Research questions not stated; a co-investigator also served as program staff; analysis of participant's letters
Stephens 2012[104] n=7	Yes	Yes	No	Yes	Yes	Clearly designed and described study; in-person interviews
Taylor 1996[109] n=3	Yes	Yes	No	Yes	No	Series of interviews; author practiced ethnographic interviewing techniques

NA=not applicable

Appendix E Table 2. Quality Characteristics of Included Experimental and Observational Studies

Author, year	Inclusion criteria clearly defined	Subjects and setting described in detail	Strategies to deal with confounding factors	Outcomes measured in valid and reliable way	Evidence of ethical approval	Comments (include questionnaire/survey response rate, if applicable)
Adnan 2001[3] n=30	No	Yes	No	No	No	"Selected" participants; study-created questionnaires; adjusted for age only; 41% response in rugby group; unknown response in non-participant group; self-completed assessments
Akbar 2015[4] n=296	Yes	Yes	Unclear	Yes	Yes	Unclear if accounted for other factors besides sports participation; had institutional approval and informed consent; blinded clinical assessment
Aydoğ 2006[7] n=40	Yes	Yes	NA	Yes	Yes	Informed consent; objective outcome measure
Aytar 2012[8] n=11	Yes	Yes	NA	Yes	Yes	Objective balance measure; unclear how disability was rated
Barbin 2008[9] n=10	No	No	No	Yes	Yes	Informed consent; limited demographic information; self-report (pre-post design)
Bauerfeind 2015[10] n=14	No	Yes	No	Yes	No	Injury registries; unclear how subjective outcome was assessed
Beinotti 2013[11] n=24	Yes	No	NA	Yes	Yes	RCT; limited demographic information; concealed allocation; surveys administered by researchers blinded to treatment allocation
Beinotti 2010[12] n=20	Yes	No	NA	Yes	Yes	Non-random allocation; surveys administered by therapist with no bonds to the research
Bennett 2017[14] n=40	No	Yes	NA	Yes	Yes	Pre-post design
Bennett 2014[13] n=34 (17 couples)	Yes	Yes	NA	Yes	No	Non-random allocation; self-report; couples completes questionnaires separately
Blauwet 2017 n=134[18]	Yes	Yes	Yes	Yes	No	Secondary analysis of participant data from program logs

Author, year	Inclusion criteria clearly defined	Subjects and setting described in detail	Strategies to deal with confounding factors	Outcomes measured in valid and reliable way	Evidence of ethical approval	Comments (include questionnaire/survey response rate, if applicable)
Blauwet 2013[16] n=149[19]	Yes	Yes	Yes	No	Yes	Study-created questionnaire (self-report); response rate unclear
Boninger 1996[19] n=12	No	Yes	Yes	Yes	Yes	Individuals were invited to participate in training camp so applicability to all wheelchair racers is unknown
Bragaru 2013[22] n=780	No	Yes	Yes	Unclear	NA	Secondary analysis of larger database (self-report questionnaire data; 34% response rate; stated no formal ethical permission was needed; participants signed consent form
Bragaru 2015[21] n=175	Yes	Yes	Yes	No	Yes	Questionnaire (self-report) not previously validated; 45% response rate
Calsius 2015[25] D'hooghe 2014[37] n=9	No	Yes	NA	Yes	Yes	Pre-post; self-report
Campayo-Piernas 2017[26] n=21	No	Yes	NA	Yes	Yes	Objective balance measure
Côté-Leclerc 2017[33] n=68	Only for athletes	Only for athletes	NA	Yes	Yes	Control group derived from previous study; matching was inadequate; self-completed assessments
Curtis 1999[34] n=46	No	Yes	No	Yes	Yes	48% response rate to survey; self-report
da Silva 2018[35] n=24	No	Yes	NA	Yes	Yes	Groups not matched; researchers administered outcome assessments (questionnaires and performance measures)
Earles 2015[38] n=16	No	Yes	NA	Yes	Yes	Pre-post design; consent form and questionnaires administered by research assistant with no role in the therapy
Fiorilli 2013[42] n=46	Yes	No	NA	Yes	Yes	Informed consent; 1 researcher administered all assessments
Foreman 1997[43] n=121	No	Yes	Yes	Yes	Yes	Informed consent; response rate 60%; self-completed assessments

Author, year	Inclusion criteria clearly defined	Subjects and setting described in detail	Strategies to deal with confounding factors	Outcomes measured in valid and reliable way	Evidence of ethical approval	Comments (include questionnaire/survey response rate, if applicable)
Fullerton 2003[44] n=257	No	No	Yes	No	Yes	Unclear what percentage of responders was identified using the different recruitment approaches; little demographic data; study-created survey; self-reported assessment
Garshick 2016[45] n=347	No	Yes	Yes	Yes	Yes	97% response rate; interview (89%) or self-completed questionnaires
Hammer 2005[49] n=11	Yes	Yes	NA	Yes	Yes	Pre-post design; objective and self-report outcomes
Hanson 2001[50] n=48	No	No	NA	Yes	No	100% completed assessments either by interview or in writing (self-completing)
Haykowsky 1999[53] n=11	Yes	No	NA	No	Yes	Retrospective data collection (recall), reported injury rates only
Herzog 2018[54] n=13	Yes	Yes	NA	Yes	Yes	RCT cross-over design; “randomized by an independent person”; blinded objective outcome assessment
Jaarsma 2014[55] n=648	No	No	Yes	No	Yes	Did not separate on-line responses from telephone interview responses; adapted a questionnaire developed for Paralympic athletes; 13% response rate
Jackson 1996[57] n=33	No	Yes	NA	Yes	Unclear	Clinical criteria for diagnosis; patients provided informed consent; self-completed questionnaire and clinical assessment
Johnson 2018[58] n=29	Yes	No	NA	Yes	Yes	RCT; randomized based on identification number to treatment or wait-list; wait-list group data included in final outcomes data following completion of program; limited demographic information
Jolk 2015[59] n=7	Yes	No	NA	Yes	Yes	Pre-post design; limited demographic information; objective outcome measure
Kars 2009[60] n=105	Yes	No	No	No	Yes	Study-created questionnaire (self-report via mail); 36% response rate

Author, year	Inclusion criteria clearly defined	Subjects and setting described in detail	Strategies to deal with confounding factors	Outcomes measured in valid and reliable way	Evidence of ethical approval	Comments (include questionnaire/survey response rate, if applicable)
Kim 2017[61] n=302	Yes	Yes	No	No	Yes	Study-created questionnaire (self-report); 53% response rate
Laferrier 2015[63] n=220	Yes	Yes	NA	Yes	Yes	Study-created questionnaire (self-report); authors established face validity and reliability
Lanning 2013[64] n=13	No	No	NA	Yes	Yes	Pre-post design; limited demographic information
Lastuka 2015[66] n=131	No	Yes	Yes	No	No	Study-created survey (unclear how data were collected); no formal pilot; response rate unclear
Lindroth 2015[67] n=3	Yes	Yes	NA	Yes	Yes	Pre-post
Lundberg 2011[70] n=18	No	No	NA	Yes	Yes	Pre-post; limited demographic information
Malinowki 2018 n=7	No	Yes	NA	Yes	Yes	Pre-post
McVeigh 2009[76] n=90	Yes	Yes	Yes	Yes	No	Verbal consent; telephone interview; 97% response rate
Miki 2012[77] n=81	No	Yes	Yes	Yes	Yes	Self-report; response rate not reported
Molik 2010[78] n=174	No	No	NA	Yes	Yes	Self-report questionnaire
Muñoz-Lasa 2011[80] n=27	Yes	No	NA	Yes	Yes	Non-random allocation; limited demographic information
Muraki 2000[81] n=169	No	No	NA	Yes	No	54% response rate; little demographic data
Nam 2016[82] n=62	Yes	Yes	No	No	Yes	Descriptive statistics only; study-created interview/questionnaire based on ICF
Nettleton 2017[83] n=32	Yes	Yes	No	Yes	Yes	Self-report; 82% follow-up rate for 1 questionnaire, 78% for second questionnaire

Author, year	Inclusion criteria clearly defined	Subjects and setting described in detail	Strategies to deal with confounding factors	Outcomes measured in valid and reliable way	Evidence of ethical approval	Comments (include questionnaire/survey response rate, if applicable)
O'Neill 2004[85] n=33	No	No	NA	No	No	Study-created questionnaire administered by telephone; also encouraged "free speech responses"; 85% response rate
Perrier 2015[87] Perrier 2012[86] n=201	Yes	Yes	NA	No	Yes	Study-created questionnaire; self-report; 93% response rate for 1st questionnaire; 87% response rate for 2nd questionnaire
Pluym 1997[89] n=44	No	Yes	NA	No	No	Study-created questionnaire; in-home interview by 2 interviewers; 96% response
Ponchillia 2002[90] n=159	No	Yes	No	Yes	No	Telephone survey of "selected" members; cross-sectional study likely not appropriate to answer research questions about *predictors* of athletes' participation and beliefs; study-created survey but authors established validity/reliability
Rauch 2014[92] n=505	Yes	Yes	Yes	No	No	Secondary analysis; 27% response rate to full survey; study-created survey
Rogers 2014[93] n=13	Yes	Yes	NA	Yes	Yes	Pre-post design
Sá 2012 n=24	No	No	NA	No	No	Study-created survey (self-report)
Scarpa 2011[95] n=143	No	No	Yes	Yes	No	Participants identified through many sources including open on-line; little demographic data; written consent; self-report; we included data from 2 groups: disabled practicing sport and disabled not practicing sport
Schachten 2015[96] n=14 (7 matched pairs)	No	No	NA	Yes	Yes	Pre-post with matched pairs assigned to intervention and control groups (assignment method not reported); limited demographic information
Shatil 2005[97] n=18	Yes	Yes	NA	Yes	Yes	RCT; randomized by selecting 1 of 2 cards (representing the 2 groups); blinded outcome assessment

Author, year	Inclusion criteria clearly defined	Subjects and setting described in detail	Strategies to deal with confounding factors	Outcomes measured in valid and reliable way	Evidence of ethical approval	Comments (include questionnaire/survey response rate, if applicable)
Silkwood-Sherer 2007[99] n=15	Yes	No	NA	Yes	Yes	Pre-post with non-randomized comparison group; limited demographic information; blinding of outcome assessment not reported
Silveira 2017[100] n=150	Yes	Yes	Yes	Yes	Yes	Self-report; response rate unknown (individuals at rugby events were invited to participate)
Skordilis 2001[101] n=243	No	No	No	Yes	Yes	27% response rate (mailed questionnaire); distributed questionnaires via coaches of sports clubs so little information on inclusion criteria; informed consent; little demographic data and limited adjustment for confounders
Skučas 2013[102] n=106	No	No	NA	Yes	No	Little information about participant identification or demographics; no information on response rate; unclear if self-report
Sporner 2009[103] n=132	Yes	Yes	Yes	Yes	Yes	Response rate unclear (included individuals who volunteered to participate)
Tasiemski 2004[106] Tasiemski 2005[107] n=28	Yes	No	No	Yes	Yes	Piloted questionnaire prior to study; self-report 56% response rate; unclear if demographic data for questionnaire completers or all participants
Tasiemski 2011[105] n=1034	Yes	Yes	No	Yes	Yes	59% response rate; self-report; limited consideration of potential confounders
Tasiemski 2012[108] n=50	No	Yes	NA	Yes	No	Little information on identification of study participants
Urbański 2013[110] n=28	No	Yes	NA	Yes	No	Telephone survey
Velikonja 2010[112] n=20	Yes	No	NA	Yes	Yes	RCT; allocation not reported; limited demographic information; blinded outcome assessment
Vella 2013[113]	Yes	Yes	NA	Yes	Yes	Pre-post design; on-line outcomes assessment

Author, year	Inclusion criteria clearly defined	Subjects and setting described in detail	Strategies to deal with confounding factors	Outcomes measured in valid and reliable way	Evidence of ethical approval	Comments (include questionnaire/survey response rate, if applicable)
n=74						
Vermöhlen 2017[114] n=40	Yes	Yes	NA	Yes	Yes	RCT; adequate sequence generation and allocation concealment; blinded outcome assessment
Wickham 2000[115] n=24	No	No	NA	Yes	No	Non-random (control group selected to match intervention group) pre-post; limited demographic information
Wu 2000[116] n=143	No	Yes	NA	Yes	No	Subset from larger project; study-created questionnaire piloted and revised before administration; self-report
Yazicioglu 2012[117] n=60	Yes	Yes	NA	Yes	Yes	Self-report
You 2016 n=35[118]	Yes	Yes	NA	Yes	Yes	Survey (unclear how administered) and clinical assessment; incidence and correlation data
Zoerink 2015[119] n=11	No	No	NA	Yes	Yes	Pre-post design; each participants data collected at both time points by same research assistant
Zwierzchowska 2017[120] n=36	Yes	Yes	NA	Yes	Yes	Self-report

ICF=International Classification of Functioning, Disability, and Health; NA=not applicable; RCT=randomized controlled trial

APPENDIX F. MOTIVATORS OF PARTICIPATION

Figure 1. Motivators to Adaptive Sports Participation