

Appendix 1

Comparative effectiveness of various physical exercise interventions on sociability and communication in children and adolescents with autism: A systematic review and network meta-analysis.

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S1. Search strategy

PubMed 325

- #1 "Autism Spectrum Disorder"[Mesh]
- #2 (((((((((((Autistic Spectrum Disorder[Title/Abstract]) OR (Autistic Spectrum Disorders[Title/Abstract])) OR (Disorder, Autistic Spectrum[Title/Abstract])) OR (Disorder, Autistic[Title/Abstract])) OR (Disorders, Autistic[Title/Abstract])) OR (Kanner's Syndrome[Title/Abstract])) OR (Kanner Syndrome[Title/Abstract])) OR (Kanners Syndrome[Title/Abstract])) OR (Autism, Infantile[Title/Abstract])) OR (Infantile Autism[Title/Abstract])) OR (Autism[Title/Abstract])) OR (Autism, Early Infantile[Title/Abstract])) OR (Early Infantile Autism[Title/Abstract])) OR (Infantile Autism, Early[Title/Abstract]))
- #3 #1 OR #2
- #4 (((((((("Child"[Mesh]) OR ("Adolescent"[Mesh])) OR (Adolescents[Title/Abstract])) OR (Adolescence[Title/Abstract])) OR (Youth[Title/Abstract])) OR (Youths[Title/Abstract])) OR (Teen[Title/Abstract])) OR (Teenagers[Title/Abstract])) OR (Teenager[Title/Abstract]))
- #5 "Sports"[Mesh]
- #6 "Exercise"[Mesh]
- #7 (((sport[Title/Abstract]) OR (Exercise[Title/Abstract])) OR (Locomotor Activit[Title/Abstract])) OR (Physical therap[Title/Abstract])) OR (physical activit[Title/Abstract])) OR (motor activit[Title/Abstract])) OR (Training[Title/Abstract])) OR (Movement[Title/Abstract])) OR (Workout[Title/Abstract])) OR (Energy expenditure[Title/Abstract])) OR (Athletic[Title/Abstract])) OR (Physical education[Title/Abstract])) OR (Physical Activity[Title/Abstract])) OR (Soccer[Title/Abstract])) OR (Swim[Title/Abstract])) OR

(Aquatic[Title/Abstract])) OR (Football[Title/Abstract])) OR (Ping-pong[Title/Abstract])) OR (Basketball[Title/Abstract])) OR (Cricket[Title/Abstract])) OR (Tennis[Title/Abstract])) OR (Rugby[Title/Abstract])) OR (Dance[Title/Abstract])) OR (Martial art[Title/Abstract])) OR (Netball[Title/Abstract])) OR (Hockey[Title/Abstract])) OR (Gym[Title/Abstract])) OR (Horse riding[Title/Abstract])) OR (Horseback riding[Title/Abstract])) OR (Equestrian[Title/Abstract])) OR (Baseball[Title/Abstract])) OR (Yoga[Title/Abstract])) OR (Badminton[Title/Abstract])) OR (Taekwondo[Title/Abstract])) OR (Judo[Title/Abstract])) OR (Cycling[Title/Abstract])) OR (Physical fitness[Title/Abstract])) OR (Bicycling[Title/Abstract])) OR (Boxing[Title/Abstract])) OR (Golf[Title/Abstract])) OR (Tai Ji[Title/Abstract])) OR (Skating[Title/Abstract])) OR (Snow sports skiing[Title/Abstract])) OR (Wrestling[Title/Abstract])) OR (Weight lifting[Title/Abstract])) OR (Games recreational[Title/Abstract])) OR (Weight bearing exercise[Title/Abstract])) OR (Strength training[Title/Abstract])) OR (Running[Title/Abstract])) OR (Trampoline[Title/Abstract])) OR (Snowshoeing[Title/Abstract])) OR (Exergaming[Title/Abstract])) OR (Walking[Title/Abstract])) OR (Treadmill[Title/Abstract]))

#8 #4 OR #5 OR #6

#9 "Randomized Controlled Trial"[Publication Type] OR "randomized"[Title/Abstract] OR "placebo"[Title/Abstract] OR "randomised"[Title/Abstract] OR "random"[Title/Abstract] OR "rct"[Title/Abstract] OR "controlled clinical trial"[Title/Abstract] OR "pilot study"[Title/Abstract]

#10 "Social Skills"[Mesh]

#11 (((((((((((((((Social skills[Title/Abstract]) OR (Social behavior[Title/Abstract])) OR (Social ability[Title/Abstract])) OR (Social

competence[Title/Abstract])) OR (Interpersonal skills[Title/Abstract])) OR
 (Social isolation[Title/Abstract])) OR (Social anxiety[Title/Abstract])) OR
 (Social dysfunction[Title/Abstract])) OR (Social disorder[Title/Abstract])) OR
 (Social segregation[Title/Abstract])) OR (Communication[Title/Abstract])) OR
 (Communicate[Title/Abstract])) OR (Social responsiveness[Title/Abstract])) OR
 (Sociability[Title/Abstract])) OR (Socialization[Title/Abstract])) OR (Social
 motivation[Title/Abstract])) OR (Social awareness[Title/Abstract])) OR (Social
 cognition[Title/Abstract])

#12 #9 OR #10

#13 #3 AND #4 AND #8 AND #9 AND #12

Web of Science 925

#1 TS=(Autism Spectrum Disorders or Autistic Spectrum Disorder or Autistic
 Spectrum Disorders or Disorder,Autistic Spectrum or Disorder,Autistic or
 Disorders,Autistic or Kanner's Syndrome or Kanner Syndrome or Kanners
 Syndrome or Autism,Infantile or Infantile Autism or Autism or Autism,Early
 Infantile or Early Infantile Autism or Infantile Autism,Early)

#2 TS=(sport or Exercise or Locomotor Activit or Physical therap or physical
 activit or motor activit or Training or Movement or Workout or Energy
 expenditure or Athletic or Physical education or Physical Activity or Soccer or
 Swim or Aquatic or Football or Pin pang or Ping-pong or Basketball or Cricket
 or Tennis or Rugby or Danc or Martial art or Netball or Hockey or Gym or
 Horse rid or Horseback rid or Equestrian or Baseball or Yoga or Badminton or
 Taekwondo or Judo or Cycling or Physical fitness or Bicycling or Boxing or
 Golf or Tai Ji or Skating or Snow sports skiing or Wrestling or Weight lifting or
 Games recreational or Weight bearing exercise or Strength training or Running
 or Trampoline or Snowshoeing or Exergaming or Walking or Treadmill)

- #3 TS=(Child or Adolescent or Young Adult or Minor)
- #4 AB=(randomized controlled trial or randomized or placebo or randomised or random or rct or controlled clinical trial or trial or Pilot Study)
- #5 AB=(Social skills or Social behavior or Social ability or Social competence or Interpersonal skills or Social isolation or Social anxiety or Social dysfunction or Social disorder or Social segregation or Communication or Communicate or Social responsiveness or Sociability or Socialization or Social motivation or Social awareness or Social cognition)
- #6 #1 AND #2 AND #3 AND #4 AND #5

Cochrane Library 573

- #1 (Autism Spectrum Disorder):ti,ab,kw OR (Autistic Spectrum Disorder):ti,ab,kw OR (Autistic Spectrum Disorders):ti,ab,kw OR (Disorder, Autistic Spectrum):ti,ab,kw OR (Disorder, Autistic):ti,ab,kw OR (Disorders, Autistic):ti,ab,kw OR (Kanner's Syndrome):ti,ab,kw OR (Kanner Syndrome):ti,ab,kw OR (Kanners Syndrome):ti,ab,kw OR (Autism, Infantile):ti,ab,kw OR (Infantile Autism):ti,ab,kw OR (Autism):ti,ab,kw OR (Autism, Early Infantile):ti,ab,kw OR (Early Infantile Autism):ti,ab,kw OR (Infantile Autism, Early):ti,ab,kw
- #2 (sport):ti,ab,kw OR (Exercise):ti,ab,kw OR (Locomotor Activit):ti,ab,kw OR (Physical therap):ti,ab,kw OR (physical activit):ti,ab,kw OR (motor activit):ti,ab,kw OR (Training):ti,ab,kw OR (Movement):ti,ab,kw OR (Workout):ti,ab,kw OR (Energy expenditure):ti,ab,kw OR (Athletic):ti,ab,kw OR (Physical education):ti,ab,kw OR (Physical Activity):ti,ab,kw OR (Soccer):ti,ab,kw OR (Swim):ti,ab,kw OR (Aquatic):ti,ab,kw OR (Football):ti,ab,kw OR (Pin pang):ti,ab,kw OR (Ping-pong):ti,ab,kw OR (Basketball):ti,ab,kw OR (Cricket):ti,ab,kw OR (Tennis):ti,ab,kw OR (Rugby):ti,ab,kw OR (Danc):ti,ab,kw OR (Martial art):ti,ab,kw OR (Netball):ti,ab,kw OR (Hockey):ti,ab,kw OR (Gym):ti,ab,kw OR (Horse rid):ti,ab,kw OR (Horseback rid):ti,ab,kw OR (Equestrian):ti,ab,kw OR (Baseball):ti,ab,kw OR (Yoga):ti,ab,kw OR (Badminton):ti,ab,kw OR (Taekwondo):ti,ab,kw OR (Judo):ti,ab,kw OR (Cycling):ti,ab,kw OR (Physical fitness):ti,ab,kw OR (Bicycling):ti,ab,kw OR (Boxing):ti,ab,kw OR (Golf):ti,ab,kw OR (Tai Ji):ti,ab,kw OR (Skating):ti,ab,kw OR (Snow sports skiing):ti,ab,kw OR (Wrestling):ti,ab,kw OR (Weight lifting):ti,ab,kw OR (Games recreational):ti,ab,kw OR (Weight bearing exercise):ti,ab,kw OR (Strength training):ti,ab,kw OR (Running):ti,ab,kw OR (Trampoline):ti,ab,kw

OR (Snowshoeing):ti,ab,kw OR (Exergaming):ti,ab,kw OR (Walking):ti,ab,kw
OR (Treadmill):ti,ab,kw

#3 (randomized controlled trial):ti,ab,kw OR (randomized):ti,ab,kw OR
(placebo):ti,ab,kw OR (randomised):ti,ab,kw OR (random):ti,ab,kw OR
(rct):ti,ab,kw OR (controlled clinical trial):ti,ab,kw OR (trial):ti,ab,kw OR (Pilot
Study):ti,ab,kw

#4 (Social skills):ti,ab,kw OR (Social behavior):ti,ab,kw OR (Social
ability):ti,ab,kw OR (Social competence):ti,ab,kw OR (Interpersonal
skills):ti,ab,kw OR (Social isolation):ti,ab,kw OR (Social anxiety):ti,ab,kw OR
(Social dysfunction):ti,ab,kw OR (Social disorder):ti,ab,kw OR (Social
segregation):ti,ab,kw OR (Communication):ti,ab,kw OR (Communicate):ti,ab,kw
OR (Social responsiveness):ti,ab,kw OR (Sociability):ti,ab,kw OR
(Socialization):ti,ab,kw OR (Social motivation):ti,ab,kw OR (Social
awareness):ti,ab,kw OR (Social cognition):ti,ab,kw

#5 #1 And #2 And #3 And #4

Embase 453

#1 Autism Spectrum Disorders or Autistic Spectrum Disorder or Autistic
Spectrum Disorders or Disorder, Autistic Spectrum or Disorder, Autistic or
Disorders, Autistic or Kanners Syndrome or Kanner Syndrome or Kanners
Syndrome or Autism, Infantile or Infantile Autism or Autism or Autism, Early
Infantile or Early Infantile Autism or autism

#2 sport or Exercise or Locomotor Activit or Physical therap or physical activit or
motor activit or Training or Movement or Workout or Energy expenditure or
Athletic or Physical education or Physical Activity or Soccer or Swim or Aquatic
or Football or Pin pang or Ping-pong or Basketball or Cricket or Tennis or Rugby
or Danc or Martial art or Netball or Hockey or Gym or Horse rid or Horseback
rid or Equestrian or Baseball or Yoga or Badminton or Taekwondo or Judo or
Cycling or Physical fitness or Bicycling or Boxing or Golf or Tai Ji or Skating or

Snow sports skiing or Wrestling or Weight lifting or Games recreational or
Weight bearing exercise or Strength training or Running or Trampoline or
Snowshoeing or Exergaming or Walking or 'treadmill exercise'

#3 randomized controlled trial or randomized or placebo or randomised or
random or rct or controlled clinical trial or trial or 'pilot study'

#4 Social skills or Social behavior or Social ability or Social competence or
Interpersonal skills or Social isolation or Social anxiety or Social dysfunction or
Social disorder or Social segregation or Communication or Communicate or
Social responsiveness or Sociability or Socialization or Social motivation or
Social awareness or 'social cognition'

#5 #1 And #2 And #3 And #4

Scopus 1006

#1 "Autism Spectrum Disorder" OR "Autistic Spectrum Disorder" OR
"Autistic Spectrum Disorders" OR "Disorder, Autistic Spectrum" OR
"Disorder, Autistic" OR "Disorders, Autistic" OR "Kanner's Syndrome"
OR "Kanner Syndrome" OR "Kanners Syndrome" OR "Autism, Infantile"
OR "Infantile Autism" OR "Autism" OR "Autism, Early Infantile" OR
"Early Infantile Autism" OR "Infantile Autism, Early"

#2 "sport" OR "Exercise" OR "Locomotor Activit" OR "Physical therap"
OR "physical activit" OR "motor activit" OR "Training" OR "Movement"
OR "Workout" OR "Energy expenditure" OR "Athletic" OR "Physical
education" OR "Physical Activity" OR "Soccer" OR "Swim" OR
"Aquatic" OR "Football" OR "Pin pang" OR "Ping-pong" OR
"Basketball" OR "Cricket" OR "Tennis" OR "Rugby" OR "Danc" OR
"Martial art" OR "Netball" OR "Hockey" OR "Gym" OR "Horse rid" OR
"Horseback rid" OR "Equestrian" OR "Baseball" OR "Yoga" OR
"Badminton" OR "Taekwondo" OR "Judo" OR "Cycling" OR "Physical
fitness" OR "Bicycling" OR "Boxing" OR "Golf" OR "Tai Ji" OR

"Skating" OR "Snow sports skiing" OR "Wrestling" OR "Weight lifting"
OR "Games recreational" OR "Weight bearing exercise" OR "Strength
training" OR "Running" OR "Trampoline" OR "Snowshoeing" OR
"Exergaming" OR "Walking" OR "Treadmill"

#3 "randomized controlled trial" OR "randomized" OR "placebo" OR
"randomised" OR "random" OR "rct" OR "controlled clinical trial " OR
"trial" OR "Pilot Study"

#4 "Social skills" OR "Social behavior" OR "Social ability" OR "Social
competence" OR "Interpersonal skills" OR "Social isolation" OR "Social
anxiety" OR "Social dysfunction" OR "Social disorder" OR "Social
segregation" OR "Communication" OR "Communicate" OR "Social
responsiveness" OR "Sociability" OR "Socialization" OR "Social
motivation" OR "Social awareness" OR "Social cognit

#5 #1 AND #2 AND #3 AND #4

Wanfang Data 331

#1 Title or Keywords:(Autism OR Autistic OR Autism Spectrum Disorder OR
Autism)

#2 Abstract:(Randomized Controlled OR Randomized OR Quasi-Experimental OR
Clinical Trial OR Placebo)

#3 Abstract:(Social OR Social Competence OR Socialization OR Social
Competence OR Social Motivation OR Social Awareness OR Communication OR
Language OR Expression OR Interaction OR Interpersonal Relationships)

#4 Title or Keywords:(sport OR exercise OR activity OR physical therapy OR
game OR training OR mobility OR fitness OR yoga OR athletics OR physical
education OR soccer OR swimming OR ball games OR judo OR cycling)

#5 #1 AND #2 AND #3 AND #4

CNKI 230

- #1 (Topic: Autism) OR (Topic: Autism) OR (Topic: Autism Spectrum Disorders)
- #2 (Topic: Exercise) OR (Topic: Exercise) OR (Topic: Activity) OR (Topic: Physical Therapy) OR (Topic: Games) OR (Topic: Exercise) OR (Topic: Fitness) OR (Topic: Yoga) OR (Topic: Balls) OR (Topic: Cycling)
- #3 (Abstract: Randomized Controlled) OR (Abstract: Randomized) OR (Abstract: RCT) OR (Abstract: Quasi-Experimental (Precision)) OR (Abstract: Clinical Trial (Precision)) OR (Abstract: Placebo)
- #4 (Topic: Socialization) OR (Topic: Social Competence) OR (Topic: Socialization) OR (Topic: Social Competence) OR (Topic: Socially Motivated) OR (Topic: Socially Aware) OR (Topic: Communication) OR (Topics: Expression) OR (Topics: Interaction) OR (Topics: Interpersonal Relationships)
- #5 #1 AND #2 AND #3 AND #4

S2. Study quality assessment

Table S1. Quality assessment for RCTs and quasi-RCTs

Reference	Item 1	Item 2	Item 3	Item 4	Item 5	Item 6	Item 7	Item 8	Item 9	Item 10	Item 11	Score
Bahrami et al. (2016)	1	1	0	1	0	0	0	1	1	1	1	6/10
Bass et al. (2009)	1	1	0	1	0	0	0	1	0	1	1	5/10
Borgi et al. (2016)	1	0	0	1	0	0	0	1	1	1	1	5/10
Caputo et al. (2018)	1	0	0	1	0	0	0	1	1	1	1	5/10
Chan et al. (2013)	1	1	0	1	0	0	1	1	0	1	1	6/10
Gabriels et al. (2015)	1	1	0	1	0	0	0	1	1	1	1	6/10
Howells et al. (2020)	1	0	0	1	0	0	0	1	1	1	1	5/10
Movahedi et al. (2013)	1	1	0	1	0	0	0	1	1	1	1	6/10
Najafabadi et al. (2018)	1	1	0	1	0	0	0	1	1	1	1	6/10
Zachor et al. (2017)	1	0	0	1	0	0	0	1	1	1	1	5/10
Zhao et al. (2018)	1	1	0	1	0	0	0	1	1	1	1	6/10
Cai et al. (2020) (a)	1	0	0	1	0	0	0	1	1	1	1	5/10
Cai et al. (2020) (b)	1	0	0	1	0	0	0	1	1	1	1	5/10
Pan et al. (2010)	1	0	0	1	0	0	0	1	1	1	1	5/10
Sansi et al. (2021)	1	1	0	1	0	0	0	1	1	1	1	6/10
Silva et al. (2009)	1	1	0	1	0	0	0	1	1	1	1	6/10
Steiner (2015)	1	0	0	1	0	0	0	1	1	1	1	5/10
Yang (2021)	1	1	0	1	0	0	0	1	1	1	1	6/10
Zhao (2021)	1	1	0	1	0	0	0	1	1	1	1	6/10
Liu (2021)(a)	1	1	0	1	0	0	0	0	1	1	1	5/10

Reference	Item 1	Item 2	Item 3	Item 4	Item 5	Item 6	Item 7	Item 8	Item 9	Item 10	Item 11	Score
Liu (2024)	1	1	0	1	0	0	0	1	1	1	1	6/10
Liu (2021) (b)	1	1	0	1	0	0	0	1	1	1	1	6/10
Zhang (2017)	1	1	0	1	0	0	0	1	1	1	1	6/10
Özyurt (2017)	1	1	0	1	0	0	0	1	1	1	1	6/10
Zanobini (2019)	1	0	0	1	0	0	0	1	1	1	1	5/10
Xu (2018)	1	1	0	1	0	0	0	1	1	1	1	6/10
Pan (2019)	1	1	0	1	0	0	0	1	1	1	1	6/10
Wang (2023)	1	1	0	1	0	0	0	1	1	1	1	6/10
Lei (2022)	1	1	0	1	0	0	0	0	1	1	1	5/10
Luan (2023)	1	1	0	1	0	0	0	1	1	1	1	6/10
Zhao (2022)	1	1	0	1	0	0	0	1	1	1	1	6/10
Yan (2021)	1	1	0	1	0	0	0	1	1	1	1	6/10
Zhai (2022)	1	1	0	1	0	0	0	0	1	1	1	5/10
Pan (2023)	1	1	0	1	0	0	0	1	1	1	1	6/10
Zheng (2022)	1	1	0	1	0	0	0	1	1	1	1	5/10
Wang (2020)	1	1	1	1	0	0	0	1	1	1	1	7/10
Ma (2020)	1	0	0	1	0	0	0	1	1	1	1	5/10
Shanker (2023)	1	1	0	1	0	0	0	1	1	1	1	6/10

Item1, eligibility criteria; Item 2, random allocation; Item 3, concealed allocation; Item 4, baseline comparability; Item 5, blind subjects; Item 6, blind therapists; Item 7, blind assessors; Item 8, adequate follow-up; Item 9, intention-to-treat analysis; Item 10, between-group comparisons; Item 11, estimates and variability.

S3. Summary table of pairwise comparison results

Table S2. Direct comparison treatment effect for sociability

Types	SMD	95%CI	I ²	P-Value	n
AC, PC	0.20	(-0.96, 1.00)	0.00%	0.970	1
SG, PC	1.25	(0.85, 1.64)	62.7%	<0.001	4
AE, PC	0.50	(-0.12, 1.12)	0.00%	0.111	2
TBS, PC	1.04	(0.55, 1.54)	0.00%	<0.001	3
OE, PC	0.76	(0.51, 1.01)	77.3%	<0.001	6
FMS, PC	2.08	(1.45, 2.71)	0.00%	<0.001	1
MBE, PC	0.66	(0.29, 1.02)	84.00%	<0.001	4
SG, AC	1.05	(0.44, 1.66)	83.6%	0.001	4
AE, AC	0.19	(-0.60, 0.97)	0.00%	0.643	1
TBS, AC	0.97	(0.56, 1.37)	84.1%	<0.001	3
CT, AC	0.45	(0.01, 0.89)	100.0%	0.046	1
OE, AC	0.84	(0.55, 1.13)	87.7%	<0.001	4
MBE, AC	0.74	(0.12, 1.36)	0.00%	0.020	1
CT, SG	0.51	(-0.35, 1.36)	0.00%	0.243	1
SG, FMS	1.19	(0.69, 1.70)	0.00%	<0.001	1
CT, MBE	0.94	(-0.10, 1.98)	0.00%	0.077	1

Note. AC means Active control; PC means Passive control; SG means Sport games; AE means Aquatic exercise; TBS means Team ball sports; CT means Combination therapy; OE means Outdoor exercise; FMS means Fundamental motor skill; MBE means Mind-Body exercise

Table S3. Direct comparison treatment effect for communication

Types	SMD	95%CI	I ²	P-Value	n
AC, PC	0.14	(-0.84, 1.13)	0.0%	0.773	1
SG, PC	0.89	(0.23, 1.56)	0.0%	0.009	2
AE, PC	0.63	(-0.16, 1.42)	0.0%	0.118	1
TBS, PC	1.04	(0.55, 1.54)	0.0%	<0.001	3
OE, PC	0.61	(0.32, 0.90)	54.8%	<0.001	3
MBE, PC	1.61	(0.73, 2.49)	0.0%	<0.001	1
SG, AC	1.09	(0.38, 1.80)	27.3%	0.003	3
AE, AC	0.19	(-0.60, 0.97)	0.0%	0.643	1
TBS, AC	0.65	(0.27, 1.04)	0.0%	0.001	3
OE, AC	0.88	(0.60, 1.16)	0.0%	<0.001	4
MBE, AC	0.49	(0.05, 0.93)	15.6%	0.028	2
CT, SG	0.51	(-0.35, 1.36)	0.0%	0.243	1
SG, FMS	1.14	(0.64, 1.64)	0.0%	<0.001	1
CT, MBE	0.94	(-0.10, 1.98)	0.0%	0.077	1

Note. AC means Active control; PC means Passive control; SG means Sport games; AE means Aquatic exercise; TBS means Team ball sports; CT means Combination therapy; OE means Outdoor exercise; FMS means Fundamental motor skill; MBE means Mind-Body exercise

S4. Analysis for sociability

Figure S1. Inconsistency test for sociability

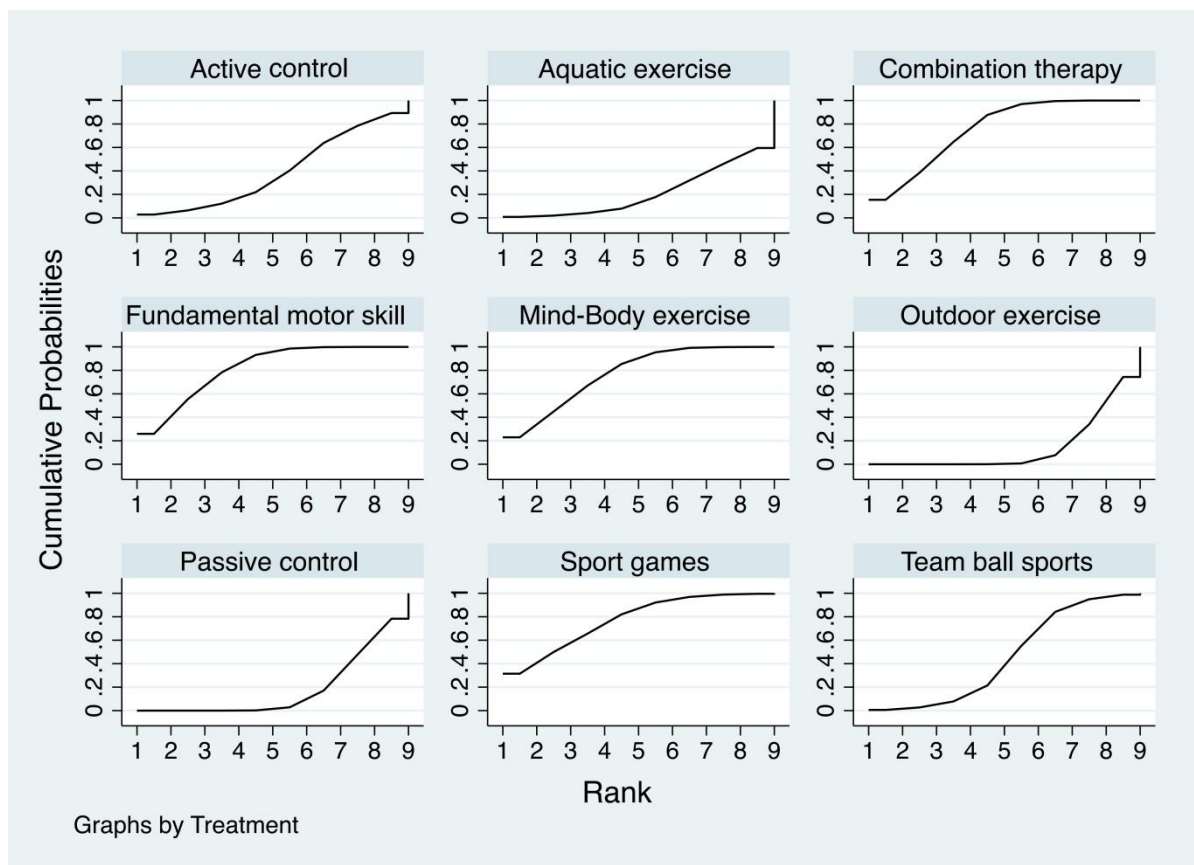
```

Testing for inconsistency:
( 1)  [_y_H]des_AH = 0
( 2)  [_y_G]des_BG = 0
( 3)  [_y_E]des_CE = 0
( 4)  [_y_H]des_CH = 0
( 5)  [_y_D]des_DH = 0
( 6)  [_y_G]des_EG = 0
( 7)  [_y_G]des_FG = 0
( 8)  [_y_H]des_GH = 0
( 9)  [_y_I]des_GI = 0

      chi2( 9) =      1.95
      Prob > chi2 =    0.9923
mvmeta command stored as F9; test command stored as F8

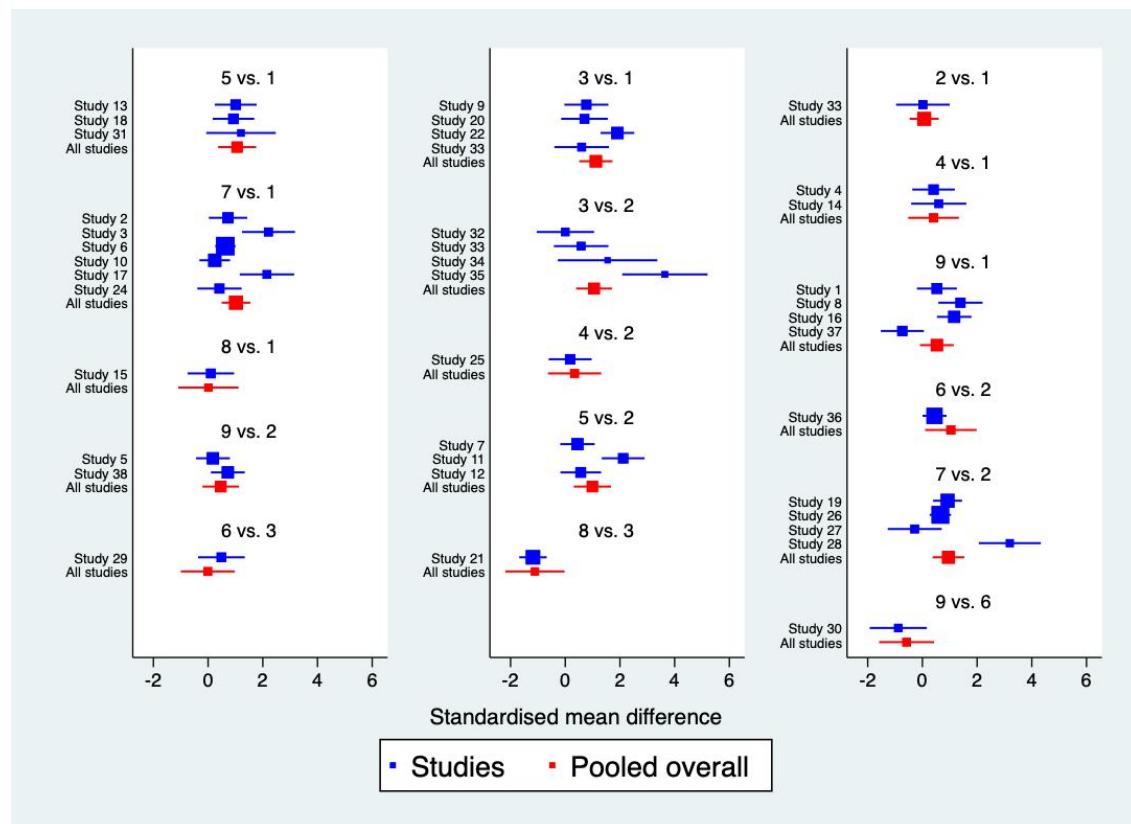
```

Figure S2. The ranking of effects for sociability



Plots of the surface under the cumulative ranking curves (SUCRA) for all comparisons in the sociability network.

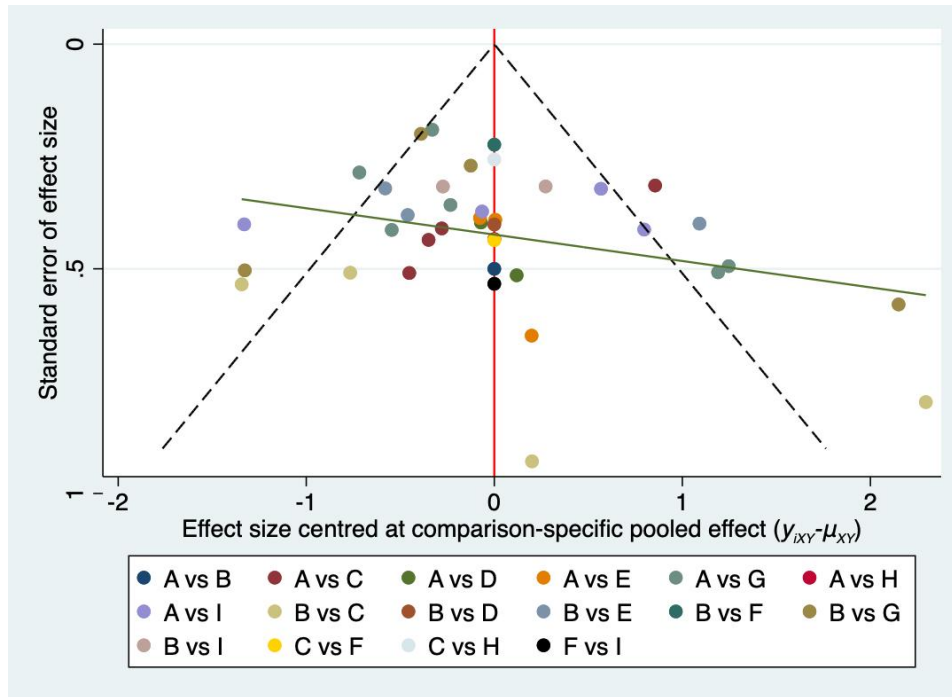
Figure S3. Forest plots of network meta-analysis showing the effect estimate among different interventions for sociability.



Note. 1 means Passive control (PC); 2 means Active control (AC); 3 means Sport games (SG); 4 means Aquatic exercise (AE); 5 means Team ball sports (TBS); 6 means Combination therapy (CP); 7 means Outdoor exercise (OE); 8 means Fundamental motor skill(FMS); 9 means Mind-Body exercise (MBE).

S5. Publication bias assessed with funnel plots for sociability

Figure S4. Comparison-adjusted funnel plot for the sociability network



S6. Meta-regression analyses for sociability

Figure S5. The results of meta-regression analyses for sociability

	2.5%	25%	50%	75%	97.5%		2.5%	25%	50%	75%	97.5%
d.Active.Aquatic	-2.7409	1.655	3.8468	6.0535	10.433	d.Active.Aquatic	-3.2131	1.1651	3.3834	5.601	9.951
d.Active.Combination	-1.9185	2.258	4.3324	6.4172	10.501	d.Active.Combination	-130.7799	-1.8032	6.9690	15.325	53.245
d.Active.Mind	4.2668	6.978	8.3258	9.6464	12.143	d.Active.Mind	0.2929	3.2957	4.8297	6.370	9.436
d.Active.Outdoor	2.4070	4.195	5.0569	5.9029	7.588	d.Active.Outdoor	1.5038	4.3699	5.8009	7.210	10.040
d.Active.Passive	-1.9912	-0.253	0.5743	1.3663	2.824	d.Active.Passive	-5.2777	-1.9663	-0.2713	1.438	4.859
d.Active.Sport	1.2136	2.985	3.8610	4.7478	6.537	d.Active.Sport	0.6707	3.1497	4.3959	5.629	8.079
d.Active.Team	0.6156	3.651	5.1909	6.7276	9.715	d.Active.Team	3.1668	6.7240	8.4879	10.222	13.642
d.Passive.Fundamental	-2.5192	0.194	1.4754	2.7027	5.060	d.Passive.Fundamental	-14.5907	-9.5054	-6.6863	-3.855	1.565
sd.d	1.3488	1.829	2.1406	2.5121	3.421	sd.d	1.7145	2.3109	2.6966	3.144	4.272
beta[1]	-4.8596	-2.010	-0.6050	0.7758	3.542	beta[1]	-3.9756	2.4187	5.4848	8.486	14.454
beta[2]	-20.0648	-4.294	3.4229	11.4481	29.000	beta[2]	-13.2152	-3.7787	0.9693	5.761	15.064
beta[3]	-10.9181	-2.334	2.0968	6.3773	15.450	beta[3]	-120.5525	-19.8448	0.8626	22.919	360.558
beta[4]	2.8035	12.970	18.2457	23.4282	33.488	beta[4]	-37.4281	-24.9908	-17.7282	-10.545	2.629
beta[5]	-14.1017	-10.790	-9.0684	-7.2884	-3.772	beta[5]	-7.0587	-0.7807	2.0714	4.877	10.488
beta[6]	-5.5888	-2.516	-0.9747	0.5746	3.675	beta[6]	-5.9639	1.8333	4.4680	7.080	12.331
beta[8]	-4.5801	-1.105	0.6005	2.3881	6.189	beta[8]	-8.0507	-1.3469	1.4939	4.362	10.095
beta[9]	-16.9572	-9.819	-6.0986	-2.4150	4.738	beta[9]	-7.0869	-1.6684	0.9930	3.633	8.789
-- Model fit (residual deviance):						-- Model fit (residual deviance):					
Dbar pD DIC						Dbar pD DIC					
72.51158 64.49110 137.00268						75.95208 66.70509 142.65718					
77 data points, ratio 0.9417, I ² = 0%						77 data points, ratio 0.9864, I ² = 0%					
-- Regression settings:						-- Regression settings:					
Regression on "age", unrelated coefficients, "Passive" as control						Regression on "intensity", unrelated coefficients, "Passive" as control					
Input standardized: x' = (age - 7.761316) / 5.393811						Input standardized: x' = (intensity - 2.078947) / 2.433175					
Estimates at the centering value: age = 7.761316						Estimates at the centering value: intensity = 2.078947					
Age						Intensity					
	2.5%	25%	50%	75%	97.5%		2.5%	25%	50%	75%	97.5%
d.Active.Aquatic	-12.3578	-2.8704	1.4839	5.809	15.797	d.Active.Aquatic	-5.1692	-1.1534	0.9265	3.0151	7.123
d.Active.Combination	-2.5626	3.8317	7.0016	10.176	16.784	d.Active.Combination	-1.3984	3.7651	6.3735	9.0091	14.316
d.Active.Mind	-1.0748	1.4864	2.7780	4.062	6.612	d.Active.Mind	-1.0190	1.6400	2.9790	4.3477	7.063
d.Active.Outdoor	-0.9028	1.6320	2.9077	4.167	6.639	d.Active.Outdoor	-1.3731	1.3176	2.6816	4.0791	6.904
d.Active.Passive	-7.1157	-4.2105	-2.6801	-1.132	1.911	d.Active.Passive	-7.8961	-4.9178	-3.3332	-1.7347	1.485
d.Active.Sport	-0.6536	1.5126	2.6119	3.713	5.909	d.Active.Sport	-1.5854	0.7858	2.0060	3.2399	5.784
d.Active.Team	2.0651	4.6502	5.9245	7.182	9.644	d.Active.Team	0.7482	4.0206	5.6716	7.3222	10.517
d.Passive.Fundamental	-27.4210	-16.4880	-10.5483	-5.011	4.349	d.Passive.Fundamental	-6.8765	-3.2231	-1.4657	0.2903	3.769
sd.d	1.8069	2.4209	2.8135	3.267	4.373	sd.d	1.6212	2.2125	2.5931	3.0346	4.091
beta[1]	-9.7502	-2.7493	0.8450	4.655	11.064	beta[1]	-8.4527	-2.0552	0.9044	3.9184	9.842
beta[2]	-39.4577	-9.9781	1.8940	13.856	45.199	beta[2]	-10.8098	-2.0709	2.2908	6.6533	14.974
beta[3]	-18.9564	-7.3084	-1.8813	3.534	13.915	beta[3]	-18.7931	-7.5481	-1.9950	3.3720	13.909
beta[4]	-80.2234	-47.9003	-30.0649	-14.109	13.392	beta[4]	-18.7359	-10.7004	-7.0486	-3.2529	4.327
beta[5]	-7.0701	0.3699	4.1759	8.024	15.068	beta[5]	-5.1971	2.0141	5.6868	9.2017	16.092
beta[6]	-7.0974	0.4563	4.0861	8.054	14.054	beta[6]	-3.3969	2.7935	5.3981	8.0967	13.008
beta[8]	-9.3804	-1.6560	2.2766	6.000	12.902	beta[8]	-5.7889	0.1419	3.0271	5.8153	11.032
beta[9]	-7.2821	-1.8466	0.9526	3.733	9.067	beta[9]	-8.0395	-1.8944	1.2206	4.2547	10.210
-- Model fit (residual deviance):						-- Model fit (residual deviance):					
Dbar pD DIC						Dbar pD DIC					
75.16223 67.07362 142.23585						76.17777 66.45372 142.63150					
77 data points, ratio 0.9761, I ² = 0%						77 data points, ratio 0.9893, I ² = 0.2%					
-- Regression settings:						-- Regression settings:					
Regression on "min", unrelated coefficients, "Passive" as control						Regression on "week", unrelated coefficients, "Passive" as control					
Input standardized: x' = (min - 748.4211) / 2014.754						Input standardized: x' = (week - 5.631579) / 12.72088					
Estimates at the centering value: min = 748.4211						Estimates at the centering value: week = 5.631579					
Duration						Total weeks					

S7. GRADE assessment for sociability

Table S4. Summary of GRADE assessment for the certainty in sociability

Comparisons	Nature of evidence	Certainty	Reason for downgrading
Active control vs. Passive control	Mixed	Low	Imprecision, risk of bias
Sport games vs. Passive control	Mixed	Low	Inconsistency
Aquatic exercise vs. Passive control	Mixed	Low	Imprecision, risk of bias
Team ball sports vs. Passive control	Mixed	Moderate	Other considerations
Outdoor exercise vs. Passive control	Mixed	Low	Inconsistency
Fundamental motor skill vs. Passive control	Mixed	Low	Imprecision
Mind-Body exercise vs. Passive control	Mixed	Low	Inconsistency
Sport games vs. Active control	Mixed	Very low	Imprecision, Inconsistency
Aquatic exercise vs. Active control	Mixed	Very low	Imprecision, inconsistency
Team ball sports vs. Active control	Mixed	Very low	Imprecision, inconsistency
Combination therapy vs. Active control	Mixed	Low	Inconsistency, risk of bias
Outdoor exercise vs. Active control	Mixed	Low	Inconsistency
Mind-Body exercise vs. Active control	Mixed	Low	Risk of bias, other considerations
Combination therapy vs. Sport games	Mixed	Low	Imprecision, risk of bias
Sport games vs. Fundamental motor skill	Mixed	Moderate	Risk of bias
Combination therapy vs. Mind-Body exercise	Mixed	Low	Imprecision, risk of bias

S8. Analysis for communication

Figure S6. Inconsistency test for communication

Testing for inconsistency:

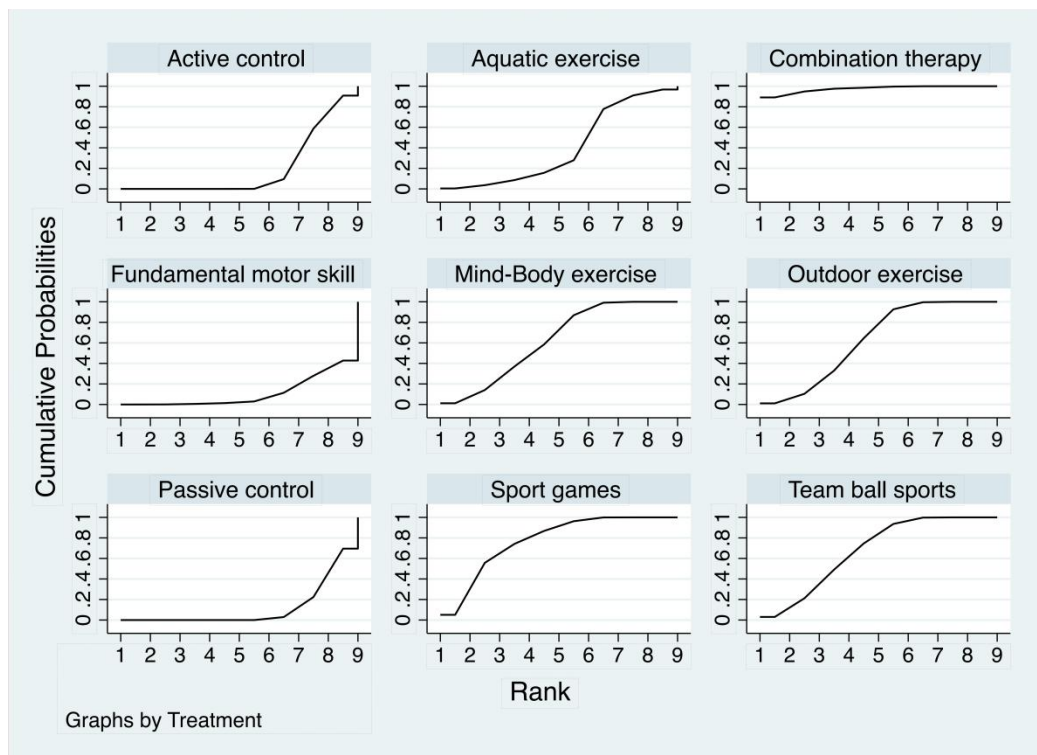
- (1) `[_y_C]des_AC = 0`
- (2) `[_y_C]des_BC = 0`
- (3) `[_y_D]des_BD = 0`
- (4) `[_y_E]des_BE = 0`
- (5) `[_y_G]des_BG = 0`
- (6) `[_y_I]des_BI = 0`
- (7) `[_y_F]des_FI = 0`

`chi2( 7) = 8.51`

`Prob > chi2 = 0.2894`

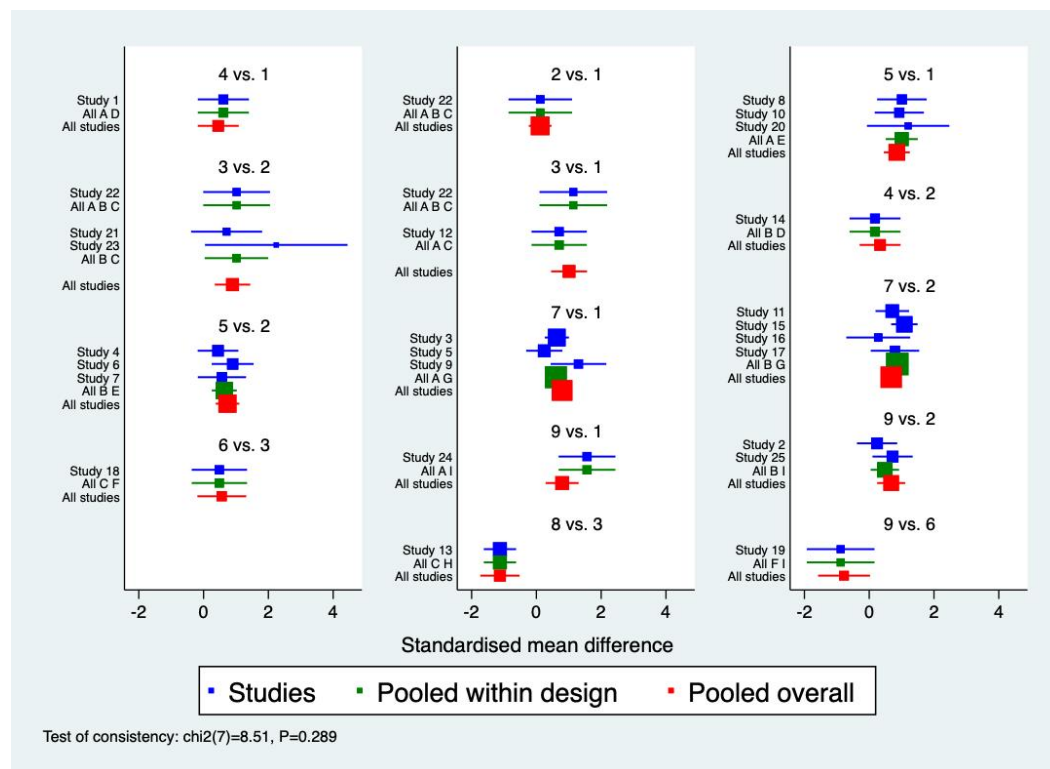
`mvmeta` command stored as F9; test command stored as F8

Figure S7. The ranking of effects for communication



Plots of the surface under the cumulative ranking curves (SUCRA) for all comparisons in the communication.

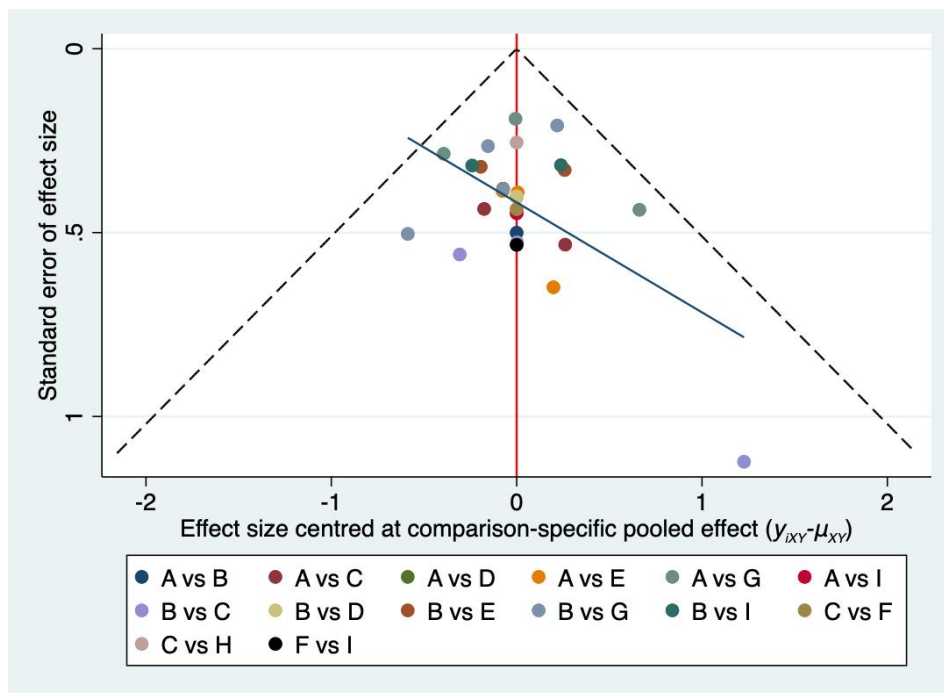
Figure S8. Forest plots of network meta-analysis showing the effect estimate among different interventions for communication.



Note. 1 means Passive control (PC); 2 means Active control (AC); 3 means Sport games (SG); 4 means Aquatic exercise (AE); 5 means Team ball sports (TBS); 6 means Combination therapy (CP); 7 means Outdoor exercise (OE); 8 means Fundamental motor skill(FMS); 9 means Mind-Body exercise (MBE).

S9. Publication bias assessed with funnel plots for communication

Figure S9. Comparison-adjusted funnel plot for the communication network



S10. Meta-regression analyses for communication

Figure S10. The results of meta-regression analyses for communication

	2.5%	25%	50%	75%	97.5%		2.5%	25%	50%	75%	97.5%
d.Active.Aquatic	-6.073	1.1455	4.8927	8.829	17.668	d.Active.Aquatic	-5.22005	1.7810	5.53445	9.3185	17.7699
d.Active.Mind	-3.007	2.4942	5.3835	8.375	14.167	d.Active.Mind	1.57483	3.6018	4.56949	5.5391	7.5470
d.Active.Outdoor	-1.340	0.5694	1.4189	2.252	4.093	d.Active.Outdoor	0.08052	1.4943	2.06451	2.5887	3.8136
d.Active.Passive	-5.975	-4.0219	-3.1072	-2.210	-0.389	d.Active.Passive	-5.24498	-3.4161	-2.59077	-1.8325	-0.3994
d.Active.Sport	-0.371	2.0414	3.1629	4.289	6.680	d.Active.Sport	-1.01466	2.0156	3.55937	5.0661	8.2184
d.Active.Team	-2.344	1.0669	2.7913	4.556	8.264	d.Active.Team	1.29430	2.9148	3.71034	4.5370	6.3733
d.Sport.Combination	-19.559	-1.2362	3.2662	7.845	24.203	d.Sport.Combination	-41.38114	-1.4346	4.66586	11.7206	54.8743
d.Sport.Fundamental	-50.183	-16.9357	-10.8628	-4.626	30.959	d.Sport.Fundamental	-32.81876	-15.8212	-10.64144	-5.1795	28.6679
sd.d	1.012	1.7265	2.1654	2.696	4.095	sd.d	0.21306	0.9949	1.43020	1.9262	3.1808
beta[1]	-4.200	-0.9662	0.5797	2.189	5.967	beta[1]	-9.31891	-3.2562	-0.17600	3.0066	9.1874
beta[2]	-19.570	-2.9885	3.9755	12.460	38.118	beta[2]	-16.00377	-2.1446	4.26260	12.0868	33.7635
beta[3]	-45.848	-9.2046	-0.3021	8.408	49.425	beta[3]	-96.77531	-9.6823	0.52748	12.4810	101.2798
beta[4]	-80.035	-8.9747	0.9309	11.409	87.427	beta[4]	-96.62659	-11.6841	-1.06373	8.4153	51.3285
beta[5]	-15.103	-6.7595	-2.3726	1.787	10.011	beta[5]	-14.05949	-7.5179	-4.20354	-0.8648	5.6731
beta[6]	-3.427	0.0999	1.7895	3.572	7.807	beta[6]	-10.86696	-4.5604	-1.36640	1.9428	8.3257
beta[8]	-8.938	-2.6177	0.4910	3.643	10.079	beta[8]	-12.13559	-4.0520	-0.05374	3.9546	12.3256
beta[9]	-14.803	-6.2076	-2.1885	1.736	9.948	beta[9]	-6.71493	-0.4112	2.90882	6.2247	13.0152
-- Model fit (residual deviance):						-- Model fit (residual deviance):					
Dbar pD DIC						Dbar pD DIC					
47.74307 44.50506 92.24814						47.45008 42.25014 89.70022					
51 data points, ratio 0.9361, I ² = 0%						51 data points, ratio 0.9304, I ² = 0%					
-- Regression settings:						-- Regression settings:					
Regression on "age", unrelated coefficients, "Passive" as control						Regression on "intensity", unrelated coefficients, "Passive" as control					
Input standardized: x' = (age - 8.04) / 6.160252						Input standardized: x' = (intensity - 2.08) / 2.230097					
Estimates at the centering value: age = 8.04						Estimates at the centering value: intensity = 2.08					
Age						Intensity					
	2.5%	25%	50%	75%	97.5%		2.5%	25%	50%	75%	97.5%
d.Active.Aquatic	-15.82217	-2.249009	2.2196	6.2356	17.318	d.Active.Aquatic	-4.01200	1.1906	3.8937	6.596	11.8284
d.Active.Mind	0.38588	1.840147	2.6035	3.4789	5.722	d.Active.Mind	0.14205	2.4191	3.6032	4.842	7.5654
d.Active.Outdoor	-2.13518	-0.818852	-0.1294	0.6719	2.718	d.Active.Outdoor	-1.47192	0.5466	1.5304	2.527	4.6600
d.Active.Passive	-8.27746	-6.133060	-4.9773	-3.7951	-1.475	d.Active.Passive	-9.01786	-6.0698	-4.5910	-3.099	-0.1012
d.Active.Sport	0.20203	1.729978	2.4833	3.2346	4.933	d.Active.Sport	-0.08489	1.9286	2.9334	3.951	6.0917
d.Active.Team	0.55570	1.851343	2.5177	3.3580	5.574	d.Active.Team	0.17129	2.4047	3.5729	4.780	7.3901
d.Sport.Combination	-9.30452	-0.321117	2.6219	5.3528	12.844	d.Sport.Combination	-3.18832	1.0882	2.9869	4.911	9.3485
d.Sport.Fundamental	-40.05198	-15.838333	-11.7078	-7.6865	9.911	d.Sport.Fundamental	-166.99742	-17.0481	-11.1269	-6.031	19.0296
sd.d	0.05562	0.566519	1.1227	1.7312	3.090	sd.d	0.97809	1.6338	2.0666	2.590	3.9364
beta[1]	-7.72972	-3.134280	-0.9463	1.3261	5.806	beta[1]	-5.53467	-0.6483	1.8498	4.160	8.8396
beta[2]	-52.81248	-11.934406	-2.2301	5.9531	35.903	beta[2]	-17.80474	-7.1834	-2.3645	2.159	11.5734
beta[3]	-33.91967	-6.940845	1.2141	10.0308	44.444	beta[3]	-47.75561	-9.0008	0.1208	9.328	48.3541
beta[4]	-96.49168	-11.079625	-0.1373	10.2421	71.001	beta[4]	-81.16228	-8.8083	1.4607	14.968	432.0209
beta[5]	-5.93954	-0.477260	2.1820	4.8431	10.151	beta[5]	-7.52436	-0.8591	2.4366	5.807	12.7733
beta[6]	-4.08038	0.380822	2.5758	4.7569	9.084	beta[6]	-3.88631	0.6756	2.9909	5.310	9.8886
beta[8]	-6.56006	-1.210420	1.5288	4.2532	9.762	beta[8]	-5.38941	-0.2554	2.3907	4.985	9.9563
beta[9]	-4.17172	0.001243	2.1181	4.2345	8.362	beta[9]	-7.32570	-2.2831	0.3235	2.942	8.0552
-- Model fit (residual deviance):						-- Model fit (residual deviance):					
Dbar pD DIC						Dbar pD DIC					
50.73889 42.20237 92.94126						48.21421 44.74607 92.96028					
51 data points, ratio 0.9949, I ² = 1%						51 data points, ratio 0.9454, I ² = 0%					
-- Regression settings:						-- Regression settings:					
Regression on "min", unrelated coefficients, "Passive" as control						Regression on "week", unrelated coefficients, "Passive" as control					
Input standardized: x' = (min - 964.8) / 2067.512						Input standardized: x' = (week - 7.48) / 12.47825					
Estimates at the centering value: min = 964.8						Estimates at the centering value: week = 7.48					
Duration						Total weeks					

S11. GRADE assessment for communication

Table S5. Summary of GRADE assessment for the certainty in communication

Comparisons	Nature of evidence	Certainty	Reason for downgrading
Active control vs. Passive control	Mixed	Very low	Imprecision, inconsistency
Sport games vs. Passive control	Mixed	Low	Imprecision
Aquatic exercise vs. Passive control	Mixed	Low	Imprecision, risk of bias
Team ball sports vs. Passive control	Mixed	Moderate	Other considerations
Outdoor exercise vs. Passive control	Mixed	Low	Inconsistency
Mind-Body exercise vs. Passive control	Mixed	Low	Risk of bias, other considerations
Sport games vs. Active control	Mixed	Low	Inconsistency
Aquatic exercise vs. Active control	Mixed	Very low	Imprecision, inconsistency
Team ball sports vs. Active control	Mixed	Low	Risk of bias, other considerations
Outdoor exercise vs. Active control	Mixed	Moderate	Risk of bias, other considerations
Mind-Body exercise vs. Active control	Mixed	Very low	Inconsistency, imprecision
Combination therapy vs. Sport games	Mixed	Very low	Imprecision, inconsistency
Sport games vs. Fundamental motor skill	Mixed	Low	Risk of bias, other considerations
Combination therapy vs. Mind-Body exercise	Mixed	Very low	Imprecision, inconsistency