Table S1.
Characteristics of the cross-sectional studies eligible for qualitative and quantitative analysis (alphabetical order)

Study (Author, Year)	**Sample Size** Total OSE CSE Control **(Female/male)**	**Sample Age in Years** OSE CSE, Control **(M/SD)** **(Age Category)**	**EFs**	**EF-measure**	**OSE**	**CSE**	**Level of performance / Experience**	**Outcome** Regarding the difference between OSE vs. CSE
Ballester et al. [30]	*N* = 66 22 (8/14) 22 (10/12) 22 (--/--)	 24.6 (0.9) 22.5 (0.9) 22.3 (0.6) (Adults)	IC	Oddball Task	Basketball, Football, Martial arts, Tennis, Volleyball	Athletics, Cycling, Swimming Triathlon	No differences in years of training (p = .285) but in hours per week (p = .019, d = .75, OSE < CSE)	- Sig. effect of type of sport on inhibition control (OSE > CSE)
Chang et al. [37]	*N* = 60 20 (5/15) 20 (6/14) 20 (7/13)	 21.15 (1.2) 21.20 (1.8) 21.60 (1.4) (Adults)	IC, CF	Stroop Task, WCST	Wushu training	Marathon running	No differences in training hours and training years between OSE and CSE, national level	- No sig. effects between groups in Stroop or WCST performance (OSE > CSE)
Chen et al. [53]	*N* = 60 23 (4/19) 24 (15/9) 23 (11/12)	 57.17 (3.2) 59.08 (7.2) 58.91 (4.8) (Adults)	WM	Spatial Working Memory Task	Badminton, Basketball, Table tennis, Tennis	Cycling, Running, Swimming	Sig. difference in IPAQ (F[2,67] = 8.30, p < .001, mean IPAQ scores: CSE > OSE > control)	- Sig. main effects of group (F[2,67] = 5.73, p < .01, η_p^2 = 0.15) for accuracy but no difference between OSE and CSE (ps < .05) - No sig. main effects for RT for group (F[2,67] = 0.69, p > 0.05, η_p^2 = 0.02)
Chueh et al. [38]	*N* = 48 16 (7/9) 16 (7/9) 16 (7/9)	 20.00 (1.2) 21.10 (2.3) 20.70 (1.1) (Adults)	WM	Non-delayed and delayed match-to-sample task	Badminton, Table tennis	Running, Swimming, Triathlon	Differences in years of training between OSE (10.8 ± 2.2) and CSE (9.7 ± 3.2)	- No main effects of group for accuracy results (F[2,45] = 0.025, p = .096) - Sig. effects of group for RT results (F[2,45] = 5.11, p < .05, η^2 = .185) but no

								sig. effects between OSE and CSE groups (OSE: 632.52 ms; CSE 655.03 ms < Con: 736.66 ms)
Dai et al. [39]	*N* = 48 16 (7/9) 16 (10/6) 16 (14/2)	 69.00 (3.6) 69.90 (3.6) 67.30 (3.0) (Older Adults)	CF	Task-switching paradigm	Table tennis, Tennis	Running, Swimming	Differences in years of training between OSE (13.0 ± 5.7) and CSE (11.1 ± 5.4)	- Sig. differences for RT compared with control group (*ts* (30) > 2.46, $p < .02$) for homogeneous condition, no sig. differences between OSE and CSE - Sig. main effect for exercise mode for global switch costs (F[2,45] = 3.52, $p = .03$, $\eta^2 = .14$) with differences between OSE and CSE but not for local switch cost (F[2,45] = .20, $p = .82$)
DeWaelle et al. [51]	*N* = 170 86 (86/--) 25 (25/--) 59 (59/--)	 10.20 (1.0) 10.30 (1.1) 10.40 (1.1) (Children)	IC, WM	Spatial Span Task, Token Search, Monkey Ladder, Double Trouble Task, Sustained Attention to Response Task	Basketball, Hockey, Korfball, Soccer, Volleyball	Athletics, Cycling, Swimming,	At least 2 h/week, no differences between OSE and CSE	- Sig. main effect for group (F[2,166] = 5.143, $p = .007$, $\eta_p^2 = .058$) with superior executive functions of OSE compared with CSE and control group
Gökce et al. [55]	*N* = 54 18 (9/9) 18 (9/9) 18 (11/7)	 20.44 (1.9) 21.00 (2.0) 22.33 (1.9) (Adults)	WM	Corsi's Block Tapping Test	Fencing	Swimming	No sig. differences in training history between OSE group (8.27 ± 2.13 years) and CSE group (8.22 ± 2.66 years)	- Sig. differences for right- and left-handed CBT, left hemispace accuracy was significantly different among the groups (right: $H(2) = 15.336$, $p < .001$, $\eta^2 = .28$; left: $H(2) = 12.318$, p = .002, $\eta 2 = .23$) - OSE higher than CSE($p = 0.034$, $r = -0.41$) and controls ($p < .001$, $r = -0.65$)

								- Both OSE (p = .017, r = -.46) and CSE (p = .003, r = -0.53) higher accuracy scores than controls
Guo et al. [40]	N = 111 36 (19/17) 38 (23/15) 37 (21/16)	 67.6 (5.9) 66.7 (5.8) 66.9 (5.9) (Older Adults)	WM	Visuospatial WM, short-term memory & mental rotation task	Badminton Table Tennis	Running, Swimming	No differences in training hours and training years between OSE and CSE	- Sig. effect of group on short-term memory task accuracy ($F(2, 99)$ = 3.68, p = .02), but no differences between OSE and CSE - No sig. differences in reaction time among the groups ($F(2, 99)$ = 0.54 p = .58)
Holfelder et al. [56]	N = 86 46 (23/23) 40 (20/20)	 13.85 (0.7) 14.05 (0.8) (Preadolescents)	IC, WM, CF	Flanker Task, n-Back Task, Trail Making Task	Handball	Athletics	Amateur and elite athletes of OSE and CSE	- No effect of type of sport on working memory, inhibitory control or cognitive flexibility - specific Trail Walking Task sig. group effect (p < .01; no standard EF-measure)
Huang et al. [41]	N = 60 20 (9/11) 20 (11/9) 20 /14/6)	 69.4 (3.0) 70.55 (2.6) 68.3 (2.3) (Older Adults)	IC	Ericsen Flanker Task	Table Tennis, Tennis, Badminton	Running, Swimming	Differences in participation regularity (OSE > CSE), exercise duration (OSE > CSE) and weekly frequency (OSE < CSE)	- Sig. effect of goup on inhibition control ($F(2,57)$ = 3.33, p = .043) - OSE (441.94 ms) and CSE athletes (446.45 ms) exhibiting shorter RTs than controls (476.11 ms)
Jacobson & Matteaus [8]	N = 54 22 (8/14) 17 (14/3) 15 (9/6)	 20.05 (1.2) 20.18 (1.5) 20.20 (1.3) (Adults)	IC	D-KEFS Tower Test & Color-Word interference Test	Soccer, Tennis	Running, Swimming	Differences between high-skilled and recreational Athletes	- Sig. effect of group on inhibition control ($t(52)$ = 2.94, p = .003, r = .37); OSE > CSE
Koch & Krenn [27]	N = 75 44(18/26) 31(12/19) -	 22.89 (4.2) 23.23 (4.7) (Adults)	WM, IC, CF	Design Fluency Test, Trail Making Task, Flanker Task, 2-back Task	American football, Basketball, Canoe slalom, Handball,	Archery, Athletics, Cross-country skiing,	Elite athletes	- Sig. main effect of group on cognitive flexibility ($F(3, 70)$ = 2.55, p = .03) and working memory ($F(3, 70)$ = 3.05, p = .02); OSE > CSE

					Olympic sailing	Marathon, Shooting, Swimming, Track-bike, Triathlon		
Li et al. [57]	*N* = 75 25 (10/15) 25 (17/8) 25 (21/4)	69.04 (3.4) 69.80 (3.1) 67.80 (2.9) (Older Adults)	IC, CF	Stroop Task, Task-switching	Table tennis, tennis	Running, Brisk walking	No differences in physical activity in exercise groups	- Sig. effect of group on inhibition control (*F(2,66)* = 4.60, *p* = .013) and global switch costs in task switching (*F(2,24)* = 7.03, *p* = .004) - No reported difference between OSE and CSE
Nakamoto & Mori [50]	*N = 18* 9 (--/9) 9 (--/9)	--	IC	Go/NoGo Task	Baseball	Athletics, Gymnastics	OSE group spent 25 h/week for baseball training, no data for CSE group	- No significant group difference (*t*(16)=1.65, p < .05) for simple reaction time - Sig. group differences for Spatial-BB, Spatial-Mix and color condition(*p* < .01)
Tsai & Wang [22]	*N* = 64 21 (7/14) 22 (8/14) 21 (8/13)	 65.35 (4.2) 66.03 (4.1) 63.94 (3.4) (Older Adults)	CF	Task switching	Badminton, Tabletennis	Running, Swimming	No differences in training (3 x 30 min/week) and training years (2 years)	- OSE responded faster in switch condition than CSE - sig. main effect of group on specific RT switch costs (*F*[2,61] = 7.30, *p* = .001) -
Wang & Guo [42]	*N* = 259 85 (45/40) 87 (49/38) 87 (46/41)	66.8 (5.5) 65.5 (5.8) 65.9 (6.3) (Older Adults)	IC	Attention network test (ANT)	Badminton, Tennis	Running, Swimming	No differences in training (3 x 30 min/week) and training years (1 year)	- OSE significantly higher executive network efficiency than CSE (*p* < .01) - No differences for alerting and orienting networks (*p* > .05) and for proportion scores of alerting and orienting networks
Wang et al. [26]	*N* = 60 20 (-/20) 20 (-/20) 20 (-/20)	 20.70 (2.4) 19.31 (0.8) 20.40 (2.1)	IC	Stop-signal task	Tennis	Swimming	No sig. differences [t(39) =.89, p= .381, d= 0.28] in years of training between OSE	- OSE had shorter stop-signal reaction times than CSE *(t*(39) = 3.76, *p* = .001)

		(Adolescents/Adults)					(5.50 ± 2.80) and CSE (4.85 ± 1.64)	- no differences on RTs between OSE and CSE - No significant differences among groups on inhibition function ($F(2, 57) = .02$, $p = .981$, $\eta_p^2 = .00$)
Yamashiro et al. [52]	*N* = 24 12 (-/12) 12 (-/12) --	 21.2 (0.8) 22.7 (3.4) -- (Adults)	IC	Go/Nogo paradigm	Basketball	Athletics, Swimming	No differences	- Go/Nogo RT shorter for OSE than CSE ($p = .07$).
Yu et al. [43]	*N* = 54 18 (8/10) 18 (7/11) 18 (9/9)	 21.1 (2.2) 21.1 (2.2) 21.8 (2.1) (Adults)	CF	Cued task-switching paradigm task	Badminton	Athletics	No differences in years of training levels of skill competencies between OSE and CSE	- sig. fewer switch costs in OSE than CSE in 100% validity condition ($p = .023$) - No significant differences in switch costs between OSE and CSE ($p = .473$)

Note: EFs = Executive Functions, OSE = Open-Skill-Exercise, CSE = Closed-Skill-Exercise, WM = Working-Memory, IC = Inhibition Control, CF = Cognitive Flexibility, RT = reaction time, ACC = accuracy