

CORRECTION

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Correction to: Attention to principles of exercise training: an updated systematic review of randomized controlled trials in cancers other than breast and prostate

Kelcey A. Bland¹, Sarah E. Neil-Sztramko², Kendra Zadavec³, Mary E. Medysky⁴, Jeffrey Kong⁵, Kerri M. Winters-Stone⁴ and Kristin L. Campbell^{3,5*}

Correction to: *BMC Cancer* 21, 1179 (2021)

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Following publication of the original article [1], the authors identified the following typesetting errors:

- 1) A small number of references were not inserted in-text correctly. As a result, some in-text citations are not correct for specific statements in our results section on pages 4-5. The corrected version should read as follows:

“There were 58 (54%) studies conducted among adults diagnosed with solid tumours [24, 34-90], 25 (23%) studies in haematological cancers [25, 91-114] and 24 (22%) studies including patients with mixed cancer diagnoses [26, 115-137]. For the studies in solid tumours, exercise interventions were delivered during cancer treatment in 20 (34%) studies [34-53], during and after treatment in 12 (21%) studies [24, 54-64], and entirely after treatment in 26 (45%) studies [65-90]. The most common solid tumour groups investigated were cancers of the colon or rectum (n

= 15, 26%), lung (n = 12, 21%), and head and neck (n = 10, 17%). For studies in haematological cancers, 13 (52%) delivered exercise interventions during treatment [91-103], specifically stem-cell transplant or chemotherapy, four (16%) during and after treatment [25, 104-106], and eight (32%) after treatment [107-114]. In studies that enrolled adults with mixed cancer diagnoses, seven (29%) of these studies delivered interventions during cancer treatment [26, 115-120], six (25%) during and after treatment [121-126], and 11 (46%) after treatment [127-137].”

This in-text error affects downstream citation numbering, including citations in Table 2. It also influences the reference list order.

- 2) One of the studies in Table 2 appears in the wrong location. The study by Grote et al. should appear under the section “Solid tumours, during treatment.”

Please see below for the corrected Table 2. The reference list has been corrected in the updated article [1].

These corrections were typesetting errors and do not influence the results of this article. The publishers apologise for this error. The original article [1] has been updated.

The original article can be found online at <https://doi.org/10.1186/s12885-021-08701-y>.

*Correspondence: kristin.campbell@ubc.ca

⁵ Department of Physical Therapy, University of British Columbia, 212-2177 Wesbrook Mall, Vancouver, BC V6T 1Z3, Canada

Full list of author information is available at the end of the article



Table 2 Reporting of the principles of exercise training, FITT prescription components and adherence

Reference	Training principles				Exercise prescription				Adherence				Significant between group differences	
	Sp	Pr	Ov	IV	Rev	DR	F	I	T	F	I	T		T
	Solid tumours													
<i>During treatment</i>														
Arbane 2011 [34]	+	NR	NR	NR	NR	NR	?	?	?	NR	NR	NR	NR	↑ Leg strength (inpatient only)
Backman 2014 [35]	+	NR	+	NR	NR	?	+	NR	+	+	NR	+	+	None
Capozzi 2016 [36]	+	+	+	?	?	?	+	?	?	+	NR	+	NR	None
Christensen 2014 [37]	+	+	+	?	?	?	+	+	+	+	NR	NR	NR	None
Grote 2018 [38]	+	+	+	NR	NR	NR	+	+	+	+	+	?	?	None
Hammer 2020 [39]	+	NR	+	NR	NR	NR	+	+	+	NR	NR	NR	NR	None
Kamel 2020 [40]	+	+	+	NR	NR	NR	+	+	+	NR	NR	NR	NR	↑ 6 m walk test, 400 m walk test, chair rise test, isokinetic knee ext./elbow flex/ext., isometric knee ext./elbow flex/ext., LBM ↓ %BF
Lin 2014 [41]	?	?	NR	+	NR	NR	+	?	+	+	NR	NR	NR	None
Moller 2015 [42]	+	+	+	NR	?	?	+	?	+	+	NR	NR	NR	↑ VO ₂ peak
Mustian 2009 [43]	+	?	?	NR	?	+	+	+	+	?	NR	+	+	↓ Fatigue*
Rogers 2013 [44]	+	+	NR	+	NR	NR	+	+	+	+	NR	NR	?	None
Samuel 2013 [45]	+	?	NR	+	NR	NR	+	+	+	NR	NR	NR	NR	↑ 6MMWT*
Samuel 2019 [46]	+	NR	NR	+	?	?	+	+	+	+	NR	NR	NR	↑ 6MMWT*
Sandmael 2017 [47]	+	?	NR	+	?	?	+	?	+	+	NR	NR	NR	None
Stuecher 2019 [48]	+	?	?	+	?	?	+	+	+	?	?	?	+	↑ SPPB, postural stability, LBM
VanVulpen 2016 [49]	+	+	+	?	?	?	+	+	+	?	?	?	+	↓ Fatigue*
Vigario 2011 [50]	NR	NR	+	NR	NR	NR	+	+	+	NR	NR	NR	NR	None
Xu 2015 [51]	+	NR	NR	+	NR	NR	+	+	+	+	+	+	+	↑ BW*, 6MMWT*, HGS
Yen 2019 [52]	+	NR	?	+	NR	NR	+	+	+	NR	NR	NR	NR	↑ 6MMWT*, BPR/HRR ↓ HR/BP/MAP/RPP/RPE
Zhao 2016 [53]	+	?	+	+	?	?	+	+	+	+	NR	NR	NR	↑ Knee ext
<i>During/after treatment</i>														
Courneya 2003 [54]	+	NR	?	NR	NR	NR	+	+	+	NR	?	+	+	None
DeLysssen 2011 [55]	+	?	+	+	?	NR	+	+	+	+	+	+	?	None
Donnelly 2011 [24]	+	NR	NR	+	?	?	+	NR	?	NR	NR	?	NR	↓ Fatigue*
Edwardsen 2015 [56]	+	?	?	+	NR	NR	+	+	?	+	NR	NR	NR	↑ VO ₂ peak*, leg press 1RM, stair climb, 30s sit-to-stand, BMI, total muscle mass, Tlco
Granger 2013 [57]	+	+	+	NR	NR	NR	+	+	+	+	NR	NR	NR	↑, 6MMWT
Hoffman 2017 [58]	+	NR	+	NR	NR	NR	+	+	+	+	NR	NR	NR	↑ 6MMWT
Kalbori 2013 [59]	+	NR	?	NR	NR	NR	+	+	+	NR	NR	NR	NR	↑ VO ₂ peak/AT VO ₂ , platelet count test, branched-chain amino acid/tyrosine ratio (high frequency subgroup) ↓ BW, FM, insulin, insulin resistance
Onerup 2020 [60]	+	?	NR	+	?	?	+	+	+	+	?	?	+	None
Quist 2018 (EE) [61]	+	?	+	+	?	?	+	+	+	NR	NR	NR	NR	↑ VO ₂ peak* (26 wks), ↑ 6MMWT (14 wks) ↑ FEV1 (14, 26, 52 wks)

Table 2 (continued)

Reference	Training principles										Exercise prescription					Adherence			Significant between group differences
	Sp	Pr	Ov	IV	Rev	DR	F	I	T	T	F	I	T	F	I	T	T		
Quist 2018 (LE) [61]	+	?	+	+	?	?	+	+	+	+	+	NR	NR	NR	NR	NR	NR	↑ 6MMWT ↑ FEV1 (26 wks)	
Salmi 2015 [62]	+	NR	+	+	NR	NR	+	+	+	+	?	NR	NR	NR	NR	NR	NR	↑ 6MMWT*	
Sommer 2016 (EE) [63]	+	+	+	+	?	?	+	+	+	+	?	?	?	?	?	?	?	None	
Sommer 2016 (LE) [63]	+	?	+	?	?	?	+	+	+	+	+	?	NR	?	NR	?	NR	None	
Stigt 2013 [64]	NR	NR	?	+	?	?	+	+	?	NR	?	+	NR	NR	NR	NR	NR	↑ 6MMWT	
<i>After treatment</i>																			
Adams 2017 [65]	+	+	+	+	?	?	+	+	+	+	+	+	+	+	+	NR	?	↑ VO ₂ peak *, HRR, respiratory sinus arrhythmia, carotid distensibility, carotid diameter, velocity time integral ↓ HR, DBP, carotid intima-media thickness, carotid-femoral PWV, femoral-toe PWV, CRP, LDL	
Arbane 2014 [66]	+	?	+	+	NR	NR	+	+	?	+	NR	NR	NR	NR	NR	NR	NR	↑ Leg strength (subgroup)	
Bourke 2011 [67]	+	NR	NR	+	NR	NR	+	+	+	+	+	+	+	+	+	+	+	↑ Aer capacity, 30s sit-to-stand	
Brocki 2014 [68]	+	+	+	+	?	?	+	+	+	+	NR	NR	NR	NR	NR	NR	NR	None	
Brown 2017 (high dose) [69]	+	+	+	+	NR	NR	?	+	+	+	+	+	+	+	+	+	+	↑ BMD, 6MMWT ↓ Visceral adipose tissue, WC, sICAM-1	
Brown 2017 (low dose) [69]	+	+	+	+	NR	NR	?	+	+	+	+	+	+	+	+	+	+	↑ BMD, 6MMWT ↓ Insulin resistance, sICAM-1	
Cavalheri 2017 [70]	+	?	+	+	NR	NR	+	+	+	+	NR	NR	NR	NR	NR	NR	NR	↑ VO ₂ peak*, 6MMWT	
Chang 2020 [71]	+	NR	?	+	NR	NR	+	+	+	+	NR	NR	NR	NR	NR	NR	NR	↑ VO ₂ peak, 6MMWT, albumin	
Christensen 2019 [72]	+	?	+	+	?	?	?	+	+	+	?	+	+	+	+	+	+	↓ Glucose AUC, FM ↑ Matsuda index,	
Crawford 2017 [73]	?	+	NR	+	NR	NR	+	+	NR	+	+	NR	NR	?	+	+	+	↑ 6MMWT, 30s sit-to-stand, arm curl test, HGS, 8 ft. up-and-go, sit-and-reach	
Devin 2016 (HIE) [74]	+	NR	+	NR	NR	NR	+	+	+	+	+	+	+	+	+	+	+	↑ VO ₂ peak, PPO ↓ BW	
Devin 2016 (MIE) [74]	+	NR	+	NR	NR	NR	+	+	+	+	+	+	+	+	+	+	+	None	
Devin 2018 (HIE) [75]	+	NR	+	?	?	?	+	+	+	+	+	+	+	+	+	+	+	↑ VO ₂ peak ↓ FM	
Devin 2018 (HIE-T) [75]	+	NR	+	?	?	?	+	+	+	+	+	+	+	+	+	+	+	↑ VO ₂ peak	
Devin 2018 (MICE) [75]	+	NR	+	?	?	?	+	+	+	+	+	+	+	+	+	+	+	None	
Gehring 2018 [76]	+	?	+	+	NR	NR	+	+	NR	+	+	+	+	+	+	+	+	None	
Hausmann 2018 [77]	+	NR	NR	NR	?	?	+	+	?	+	NR	NR	NR	NR	NR	NR	NR	↑ VO ₂ peak	
Lee 2013 [78]	+	?	NR	NR	NR	NR	?	?	?	?	?	?	?	?	?	?	?	None	
Lee 2017 [79]	?	?	NR	?	NR	NR	+	?	?	?	NR	NR	NR	NR	NR	NR	NR	↓ Insulin*, TNF-α, ↑ 30s sit-to-stand, push-up, HGS	
Lee 2018 [80]	?	NR	NR	?	NR	NR	+	NR	?	?	?	NR	NR	NR	NR	NR	NR	↑ PA levels*, step test, push-up test	
Lönbro 2013 (EE) [81]	+	?	NR	NR	?	NR	+	+	+	+	+	NR	NR	NR	NR	NR	NR	↑ LBM, isometric knee ext., isokinetic knee flex (wk 12)	
Lönbro 2013 (DE) [81]	+	?	NR	NR	?	NR	+	+	+	+	+	NR	NR	NR	NR	NR	NR	↑ LBM, isometric knee ext./flex, sit-to-stand, arm curl (wk 24)	
Martin 2015 (HIG) [82]	+	?	+	NR	+	?	+	+	+	+	?	+	?	?	?	NR	NR	↑ VO ₂ peak	

Table 2 (continued)

Reference	Training principles				Exercise prescription				Adherence				Significant between group differences		
	Sp	Pr	Ov	IV	Rev	DR	F	I	T	T	F	I		T	T
	Martin 2015 [LIg] [82]	+	?	+	NR	+	?	+	+	+	?	NR		NR	NR
Mascherini 2020 [83]	+	?	+	+	NR	?	+	+	+	?	NR	?	?	↑ 6MMWT, 30s sit-to-stand, sit and reach ↓ BW, BMI, HC	
McNeely 2008 [84]	+	+	+	+	NR	NR	+	+	+	+	NR	NR	NR	↓ Pain & disability* ↑ Chest press/seated row 1RM	
Messaggi-Sartor 2019 [85]	+	+	+	+	NR	NR	+	+	+	+	NR	NR	+	↑ VO ₂ peak ↑ peak ventilation, max inspiratory pressure, max expiratory pressure, [GFBP-3	
Meyerhardt 2020 [86]	+	+	?	+	NR	NR	?	+	+	?	?	?	?	↓ Insulin*, hs-CRP, IL6, insulin resistance, BW, BMI, WC	
Nuri 2016 [87]	+	NR	NR	NR	+	?	+	+	?	NR	NR	NR	NR	↑ Ghrelin*, estimated VO ₂ peak ↓ %BF	
Pinto 2013 [88]	+	+	+	+	?	?	+	+	+	?	NR	+	NR	↑ PA levels*, estimated VO ₂ peak*	
Porserud 2014 [89]	+	NR	NR	NR	?	?	+	NR	+	?	NR	?	NR	↑ 6MMWT*	
Rossi 2016 [90]	+	?	?	+	NR	NR	+	+	+	+	NR	?	?	↑ 6MMWT ↓ WC	
Haematological cancer															
<i>During treatment</i>															
Alibhai 2015 [91]	+	+	+	+	?	?	+	+	+	+	NR	+	NR	↑ 6MMWT, HGS, 10-chair stand test	
Baumann 2010 [92]	+	NR	+	+	NR	NR	+	+	+	+	NR	NR	NR	↑ Aer capacity (W, min)*, knee ext.*, QoL*, IVC, FVC	
Baumann 2011 [93]	+	NR	?	NR	NR	NR	+	+	+	+	NR	NR	NR	↑ Aer capacity (W/kg)*	
Bryant 2018 [94]	+	+	?	+	NR	NR	+	+	+	+	NR	NR	NR	None	
Coleman 2003 [95]	+	NR	?	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	↑ LBM	
Coleman 2012 [96]	+	NR	NR	+	NR	?	+	+	?	NR	NR	NR	NR	None	
Duregon 2019 [97]	+	?	?	+	NR	NR	+	+	NR	NR	NR	NR	NR	None	
Jarden 2009 [98]	+	?	?	NR	?	NR	+	+	+	+	NR	NR	+	↑ Chest press/leg ext. 1RM, isometric knee ext	
Larsen 2019 [99]	+	?	?	+	?	?	+	+	+	?	?	?	?	None	
Oechsle 2014 [100]	+	NR	?	+	NR	NR	+	+	+	NR	NR	NR	NR	↑ estimated VO ₂ , VE	
Santa-Mina 2020 [101]	+	?	+	+	?	?	+	+	+	?	?	?	?	None	
Streckmann 2014 [102]	+	NR	?	+	?	?	+	+	+	?	NR	NR	?	↑ QoL*, peripheral deep sensitivity, balance control on static/dynamic surface & with perturbation	
Wehrle 2019 (AER) [103]	+	NR	+	+	NR	NR	+	+	+	+	NR	NR	NR	None	
Wehrle 2019 (RET) [103]	+	NR	NR	+	NR	NR	+	+	+	+	NR	NR	NR	↑ Knee ext./flex	
<i>During/after treatment</i>															
Courneya 2009 [25]	+	+	+	NR	?	?	+	+	+	+	+	+	+	↑ QoL*, VO ₂ peak, LBM ↓ %BF	
Koutoukidis 2020 [104]	+	+	+	+	?	?	+	?	?	?	NR	?	?	↑ Leg ext	
Mello 2003 [105]	?	?	NR	NR	NR	NR	+	+	+	NR	NR	NR	NR	↑ Hip flex*	
Wiskemann 2011 [106]	+	?	+	+	?	?	+	+	+	+	NR	NR	NR	↑ 6MMWT, lower body strength ↓ Total mortality (after discharge)	

Table 2 (continued)

Reference	Training principles										Exercise prescription			Adherence			Significant between group differences	
	Sp	Pr	Ov	IV	Rev	DR	F	I	T	T	F	I	T	F	I	T		
<i>After treatment</i>																		
Alibhai 2014 [107]	+	NR	NR	+	?	?	+	?	+	+	+	+	NR	?	NR	?	NR	None
Furzer 2016 [108]	+	+	NR	+	+	+	+	+	+	+	?	+	+	+	NR	+	NR	↓ Fatigue* ↑ Aer capacity (W/kg), chest/arms/legs/total strength 1RM, %BF, LBM, BMD
Hacker 2011 [109]	+	?	?	+	NR	NR	+	+	+	+	+	+	NR	NR	NR	NR	NR	None
Hacker 2017 [110]	+	+	?	+	NR	NR	+	+	NR	+	+	+	NR	NR	NR	NR	NR	↑ Timed stair climb, TUG
Jarden 2013 [111]	+	?	?	+	NR	NR	+	+	+	+	+	+	NR	NR	NR	NR	NR	↑ 6MWT*, estimated VO ₂ peak, 30s sit-to-stand, arm curl test
Knols 2011 [112]	+	?	?	?	?	?	+	+	+	+	+	+	NR	NR	NR	NR	NR	↑ 6MWT*, knee ext.*
Pearson 2017 [113]	+	+	+	+	NR	NR	+	+	+	+	+	+	NR	NR	NR	NR	NR	None
Shelton 2009 (Sup) [114]	+	?	NR	+	NR	NR	+	?	+	+	+	+	NR	NR	NR	NR	NR	None
Shelton 2009 (HB) [114]	+	?	NR	+	NR	NR	+	?	+	+	+	NR	NR	NR	NR	NR	NR	None
Mixed cancer types																		
<i>During treatment</i>																		
Adamsen 2009 [26]	+	?	+	NR	NR	NR	+	+	+	+	+	+	NR	NR	NR	NR	NR	↓ Fatigue* ↑ estimated VO ₂ peak, leg press/chest press/pull down 1RM
Arrieta 2019 [115]	+	?	NR	+	?	?	?	?	?	?	?	?	?	?	?	?	?	↑ SPPB* (breast cancer, female, normal nutritional status subgroups only)
Griffith 2009 [116]	+	NR	?	+	NR	NR	+	+	+	+	+	+	NR	+	NR	+	+	↑ VO ₂ peak (prostate vs non-prostate)
Marechal 2019 [117]	+	?	?	+	NR	NR	+	+	+	+	+	NR	NR	NR	NR	NR	NR	↑ Sit-to-stand, global physical capacity score
Peterson 2018 [118]	+	+	?	+	NR	NR	+	+	+	+	+	NR	NR	NR	NR	NR	NR	None
Sturm 2014 [119]	?	NR	NR	+	NR	NR	+	NR	+	+	+	+	NR	NR	+	NR	+	↑ 6MWT ↓ Fatigue*
Wenzel 2013 [120]	+	NR	+	+	NR	NR	+	+	+	+	+	NR	NR	NR	NR	NR	NR	↓ Sleep quality* ↑ Vigour
<i>During/after treatment</i>																		
Courneya 2003 [121]	+	NR	?	NR	NR	NR	+	+	+	+	+	NR	?	+	NR	?	NR	↑ QoL* ↓ %BF
Courneya 2008 [122]	+	NR	+	NR	NR	NR	+	+	NR	+	+	+	+	+	NR	+	+	↑ VO ₂ peak, PPO, VT
Irwin 2017 [123]	?	?	NR	NR	NR	NR	+	NR	?	?	?	+	NR	?	NR	?	NR	↑ 6MWT
Mayo 2014 [124]	+	+	+	?	?	?	+	NR	+	+	+	+	NR	+	NR	+	+	None
Schuler 2017 (Sup + HB) [125]	+	NR	NR	+	?	?	+	+	+	+	?	NR	NR	NR	NR	NR	NR	None
Schuler 2017 (HB) [125]	+	NR	NR	+	?	?	+	+	+	+	?	NR	NR	NR	NR	NR	NR	None
Schwartz 2009 (AER) [126]	+	NR	NR	+	NR	NR	+	+	NR	+	+	+	NR	NR	NR	NR	NR	↓ Weight gain*, %BF* ↑ 12MWT, overhead press/seated row/leg press 1RM
Schwartz 2009 (RET) [126]	+	?	+	+	NR	NR	+	+	NR	+	+	+	NR	NR	NR	NR	NR	None
<i>After treatment</i>																		
Broderick 2013 [127]	+	+	+	+	+	+	+	+	+	+	+	+	+	+	NR	+	NR	None
Burnham 2002 [128]	+	+	+	NR	NR	NR	+	+	+	+	+	+	NR	NR	NR	NR	NR	↑ VO ₂ peak, flexibility ↓ %BF
Jones 2014 [129]	+	+	+	+	+	+	+	+	+	+	+	?	NR	+	NR	+	+	↑ Cardiovascular mortality/hospitalization

Table 2 (continued)

Reference	Training principles					Exercise prescription					Adherence					Significant between group differences
	Sp	Pr	Ov	IV	Rev	DR	F	I	T	T	F	I	T	T		
Kampshoff 2015 (HI) [130]	+	+	+	?	NR	NR	+	+	+	+	+	+	+	+	+	↑ VO ₂ peak*, PPO*, VT* (HI/LMI) ↓ Fatigue*
Kampshoff 2015 (LMI) [130]	+	+	+	?	NR	NR	+	+	+	+	+	+	+	+	+	None
Kneis 2019 (AER) [131]	+	?	+	+	NR	NR	+	+	+	+	+	NR	NR	NR	NR	↑ Jump height/P _{max_jump} , vibration sense
Kneis 2019 (AER + balance) [131]	+	?	+	+	NR	NR	+	+	+	+	+	NR	NR	NR	NR	↑ MS _{EUnstable} duration, patella vibration ↓ ST _{Eo}
Knobf 2017 [132]	+	?	+	+	NR	NR	+	+	+	+	+	NR	?	NR	NR	↑ Aer capacity, HRR ↔ Insulin
LaStayo 2011 [133]	+	+	NR	+	NR	NR	+	+	+	+	+	+	+	NR	+	↑ Muscle CSA, 6MWT, stair descent
Midtgaard 2013 [134]	+	+	+	+	NR	NR	+	+	+	+	+	?	NR	NR	NR	↑ PA levels*, VO ₂ peak*, leg press/chest press 1RM
Pisu 2017 [135]	+	NR	NR	+	NR	NR	+	+	+	+	+	NR	NR	NR	NR	None
Thorsen 2005 [136]	?	NR	?	NR	NR	NR	+	+	+	+	+	NR	NR	+	+	↑ VO ₂ peak*
Toohy 2016 (LVHIT) [137]	+	+	+	+	NR	NR	+	+	+	+	+	?	?	?	+	↑ 6MWT
Toohy 2016 (CLMIT) [137]	+	NR	+	+	NR	NR	+	+	+	+	+	?	?	?	+	None

*Primary outcome where specifically stated, +: clear reporting, NR not reported, ? unclear reporting, %BF body fat %, TRM 1-repetition maximum, 12MWT 12-min walk test, 6MWT 6-min walk test, AER aerobic exercise, BM body mass, BMD bone mineral density, BP blood pressure, BW body weight, CG control group, CRP C-reactive protein, CSA cross-sectional area, DE delayed exercise, EE early exercise, FM fat mass, FVC forced vital capacity, HC hip circumference, hs-CRP high-sensitivity C-reactive protein, HGS handgrip strength, HI high intensity exercise, HIG high-intensity group, HIE-I high-intensity interval exercise-tapered, HR heart rate, HRR heart rate recovery, IG intervention group, IL6 interleukin 6, JVC inspiratory vital capacity, LBM lean body mass, LDL low-density lipoprotein, LIG low-to-moderate intensity exercise, LVHIT low-volume high intensity interval training, MAP mean arterial pressure, MICE moderate intensity continuous exercise, MIPT maximum isokinetic peak torque, MSEO monopodal stance on stable surface, MSEOUnstable monopodal stance on unstable surface, MVIC maximum voluntary isometric contraction, Pmax_jump maximum jump power output, PPO peak power output, PIWV pulse wave velocity, QoL quality of life, RET resistance training, ROM range of motion, RPP rate pressure product, SPPB short physical performance battery, STEO semi-tandem stance with eyes open, Sup supervised, TC total cholesterol, TG triglycerides, Tlco carbon monoxide transfer factor, TUG timed up and go, VE ventilatory equivalent, VO₂ oxygen consumption, VO₂peak peak oxygen consumption, VT ventilatory threshold, W watts, WC waist circumference

Author details

¹Mary MacKillop Institute for Health Research, Australian Catholic University, Melbourne, Victoria, Australia. ²Department of Health Research Methods, Evidence and Impact, McMaster University, Hamilton, Ontario, Canada. ³Rehabilitation Sciences, University of British Columbia, Vancouver, British Columbia, Canada. ⁴Knight Cancer Institute, Oregon Health & Science University, Portland, OR, USA. ⁵Department of Physical Therapy, University of British Columbia, 212-2177 Wesbrook Mall, Vancouver, BC V6T 1Z3, Canada.

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