Electronic Supplementary Material Table S1: Modified quality assessment tool derived from Downs and Black [41].

Category	Item	Question	Score
Reporting	1	**Is the hypothesis/aim/objective of the study clearly described?**	Y / N
(Yes=1/No=0)	2	**Are the main outcomes to be measured clearly described in the Introduction or Methods section?** *If the main outcomes are first mentioned in the Results section, the question should be answered no.*	Y / N
	3	**Are the characteristics of the patients included in the study clearly described?** *In cohort studies and trials, inclusion and/or exclusion criteria should be given. In case-control studies, a case-definition and the source for controls should be given.*	Y / N
(Yes=2/Partially=1/No=0)	5	**Are the distributions of principal confounders in each group of subjects to be compared clearly described?** *A list of principal confounders is provided.*	Y / P / N
(Yes=1/No=0)	6	**Are the main findings of the study clearly described?** *Simple outcome data (including denominators and numerators) should be reported for all major findings so that the reader can check the major analyses and conclusions. (This question does not cover statistical tests which are considered below).*	Y / N
	7	**Does the study provide estimates of the random variability in the data for the main outcomes?** *In non-normally distributed data the inter-quartile range of results should be reported. In normally distributed data the standard error, standard deviation or confidence intervals should be reported. If the distribution of the data is not described, it must be assumed that the estimates used were appropriate and the question should be answered yes.*	Y / N
	9	**Have the characteristics of patients lost to follow-up been described?** *This should be answered yes where there were no losses to follow-up or where losses to follow-up were so small that findings would be unaffected by their inclusion. This should be answered no, where a study does not report the number of patients lost to follow-up.*	Y / N
	10	**Have actual probability values been reported(e.g. 0.035 rather than <0.05) for the main outcomes except where the probability value is less than 0.001?**	Y / N

External validity	11	**Were the subjects asked to participate in the study representative of the entire population from which they were recruited?** *The study must identify the source population for patients and describe how the patients were selected. Patients would be representative if they comprised the entire source population, an unselected sample of consecutive patients, or a random sample. Random sampling is only feasible where a list of all members of the relevant population exists. Where a study does not report the proportion of the source population from which the patients are derived, the question should be answered as unable to determine.*	Y / N / U
(Yes=1/No=0/Unable to determine=0)	12	**Were those subjects who were prepared to participate representative of the entire population from which they were recruited?** *The proportion of those asked who agreed should be stated. Validation that the sample was representative would include demonstrating that the distribution of the main confounding factors was the same in the study sample and the source population.*	Y / N / U
Internal validity - bias	16	**If any of the results of the study were based on "data dredging", was this made clear?** *Any analyses that had not been planned at the outset of the study should be clearly indicated. If no retrospective unplanned subgroup analyses were reported, then answer yes.*	Y / N / U
(Yes=1/No=0/Unable to determine=0)	17	**In trials and cohort studies, do the analyses adjust for different lengths of follow-up of patients, or in case-control studies, is the time period between the intervention and outcome the same for cases and controls?** *Where follow-up was the same for all study patients the answer should yes. If different lengths of follow-up were adjusted for by, for example, survival analysis the answer should be yes. Studies where differences in follow-up are ignored should be answered no.*	Y / N / U
	18	**Were the statistical tests used to assess the main outcomes appropriate?** *The statistical techniques used must be appropriate to the data. For example, nonparametric methods should be used for small sample sizes. Where little statistical analysis has been undertaken but where there is no evidence of bias, the question should be answered yes. If the distribution of the data (normal or not) is not described, it must be assumed that the estimates used were appropriate and the question should be answered yes.*	Y / N / U

	21	**Were the patients in the different intervention groups (trials and cohorts studies) or cases and controls (case control studies) recruited from the same population?** *For example, patients for all comparison groups should be selected from the same hospital. The question should be answered unable to determine for cohort and case control studies where there is no information concerning the source of patients included in the study.*	Y / N / U
(Yes=2/Partially=1/No=0)	25	**Was there adequate adjustment for confounding in the analyses from which the main findings were drawn?** *This question should be answered no for trials if: the main conclusions of the study were based on analyses of treatment rather than intention to treat; the distribution of known confounders in the different treatment groups was not described; or the distribution of known confounders differed between the treatment groups but was not taken into account in the analyses. In nonrandomised studies if the effect of the main confounders was not investigated or confounding was demonstrated but no adjustment was made in the final analyses the question should be answered as no.*	Y / P / N
(Yes=1/No=0/Unable to determine=0)	26	**Were losses of patients to follow-up taken into account?** *If the numbers of patients lost to follow-up are not reported, the question should be answered as unable to determine. If the proportion lost to follow-up was too small to affect the main findings, the question should be answered yes.*	Y / N / U
Power	27	**Did the study have a calculation of power and was this met?**	Y / N
(Yes=1/No=0)	29	**Was the rehabilitation of participants controlled and/or reported?** *Articles should provide a reference for rehabilitation protocol or thorough overview of rehabilitation protocol to be answered yes.*	Y / N

Electronic Supplementary Material Table S2: Quality assessment scores of included studies.

Study	1	2	3	5	6	7	9	10	11	12	16	17	18	21	25	26	27	29	Score	Percent	Quality
Arangio et al. 1997 [51]	1	1	1	2	1	1	1	0	0	1	1	1	1	1	0	1	0	1	15	75	High
Arvidsson et al. 1986 [52]	1	1	0	0	1	1	1	0	0	0	1	1	1	1	1	1	0	1	12	60	Low
Burks et al. 2005 [53]	1	1	1	2	1	1	1	0	0	1	1	1	1	1	0	1	0	1	15	75	High
Eriksson et al. 2001 [54]	1	1	1	2	1	1	1	1	0	0	1	1	1	0	1	1	0	0	14	70	High
Fluck et al. 2018 [55]	1	1	0	0	1	1	1	1	0	0	1	1	1	0	0	1	0	1	11	55	Low
Friedmann-Bette et al. 2018 [24]	1	1	1	1	1	1	1	1	0	0	1	1	1	0	0	1	0	1	13	65	Low
Gandolfi et al. 2018 [56]	1	1	1	1	1	1	1	1	1	0	1	1	1	1	0	1	1	1	16	80	High
Garcia et al. 2020 [57]	1	1	1	1	1	1	1	1	0	0	1	1	1	0	1	1	0	1	14	70	High
Gerber et al 2007 [75]	1	1	1	1	1	1	1	1	1	0	1	1	1	1	0	1	1	1	16	80	High
Grapar et al. 2016 [43]	1	1	1	2	1	1	1	1	1	1	1	1	1	1	2	1	1	1	20	100	High
Grapar et al 2017 [25]	1	1	1	2	1	1	1	1	1	1	1	1	1	1	2	1	1	1	20	100	High
Hunnicutt et al. 2019 [76]	1	1	1	1	1	0	1	1	0	0	1	1	1	1	2	1	1	0	15	75	High
Hunnicutt et al. 2020 [77]	1	1	1	2	1	0	1	1	0	0	1	1	1	1	0	1	0	0	13	65	Low
Irie and Tomatsu 2002 [78]	1	1	0	0	1	1	1	1	0	0	1	1	1	0	0	1	0	0	10	50	Low
Janssen et al. 2013 [58]	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	0	16	80	High
Karagiannidis et al. 2017 [82]	1	1	1	2	1	1	1	1	0	0	1	0	1	1	0	1	0	1	14	70	High
Kariya et al. 1989 [59]	0	1	0	0	1	1	1	0	0	0	1	1	0	0	0	1	0	0	7	35	Low
Kellis et al. 2015 [79]	1	1	1	2	1	1	1	0	0	0	1	1	1	1	2	1	0	1	16	80	High
Kilgas et al. 2019 [83]	1	1	1	1	1	1	1	1	0	0	1	1	1	0	1	1	0	1	14	70	High
Konishi and Fukubayashi 2010 [60]	0	1	0	1	1	1	1	0	0	0	1	1	1	1	1	1	0	0	11	55	Low
Konishi et al. 2007 [61]	1	1	0	1	1	1	1	0	0	0	1	1	1	1	0	1	0	0	11	55	Low
Konishi et al. 2012 [62]	1	1	0	0	1	1	1	0	0	0	1	1	1	1	0	1	0	0	10	50	Low
Konishi et al. 2012 [63]	1	1	0	1	1	1	1	1	0	0	1	1	1	1	0	1	0	0	12	60	Low
Konrath et al. 2016 [19]	1	1	1	2	1	1	1	0	0	0	1	1	1	1	2	1	0	1	16	80	High
Lepley et al. 2019 [26]	1	1	1	1	1	1	1	1	0	0	1	0	1	1	0	1	1	0	13	65	Low
Lindstrom et al. 2013 [20]	1	1	1	2	1	1	1	1	1	0	1	1	1	1	2	1	1	1	19	95	High
Longo et al. 2014 [84]	1	1	1	2	1	1	1	1	1	0	1	1	1	1	2	1	0	1	18	90	High
Lopresti et al. 1988 [64]	1	0	0	0	1	1	1	1	0	0	1	1	1	1	0	1	0	1	11	55	Low

Lorentzon et al. 1989 [65]	1	1	0	1	1	1	1	0	0	0	1	1	1	1	0	1	0	0	11	55	Low
Macleod et al. 2014 [22]	1	1	1	1	1	1	1	1	0	0	1	1	1	0	0	1	1	0	13	65	Low
Macleod et al. 2013 [66]	1	1	1	0	1	0	1	0	0	0	1	1	1	0	0	1	0	0	9	45	Low
Marcon et al. 2015 [67]	1	1	1	2	1	1	1	1	1	0	1	1	1	1	0	1	0	0	15	75	High
Marcon et al. 2014 [68]	1	1	1	2	1	1	1	1	0	0	1	1	1	0	2	1	0	0	15	75	High
Messer et al. 2020 [27]	1	1	1	2	1	1	1	1	0	0	1	1	1	0	2	1	1	0	16	80	High
Nishino et al. 2006 [69]	1	1	0	0	1	1	1	1	0	0	1	1	1	0	0	1	0	1	11	55	Low
Noehren et al. 2016 [44]	1	1	1	1	1	1	1	1	0	0	1	0	1	0	0	1	0	1	12	60	Low
Nomura et al. 2015 [21]	1	1	1	0	1	1	1	1	0	0	1	1	1	0	0	1	0	0	11	55	Low
Reeves et al. 2009 [70]	1	1	0	0	1	1	1	0	0	0	1	0	1	0	0	1	0	0	8	40	Low
Setuain et al. 2017 [45]	1	1	1	2	1	1	1	0	1	0	1	1	1	1	2	1	1	1	18	90	High
Simonian et al. 1997 [71]	1	1	0	0	1	1	1	0	0	0	1	1	1	0	0	1	0	0	9	45	Low
Snow et al. 2012 [80]	1	1	1	2	1	1	1	1	1	0	1	1	1	1	2	1	0	0	17	85	High
Strandberg et al. 2013 [72]	1	1	0	2	1	1	1	1	0	0	1	1	1	1	2	1	0	0	15	75	High
Takahashi et al. 2012 [81]	1	1	0	2	0	0	1	0	1	0	1	1	0	1	2	1	0	1	13	65	Low
Thomas et al. 2016 [29]	1	1	1	2	1	1	1	1	0	0	1	1	1	1	2	1	0	0	16	80	High
Timmins et al. 2016 [85]	1	1	1	1	1	1	1	1	0	0	1	1	1	1	1	1	1	0	15	75	High
Wigerstad-Lossing et al. 1988 [46]	1	1	0	0	1	1	1	0	0	0	1	1	1	0	0	1	0	1	10	50	Low
Williams et al. 2005 [23]	1	1	1	2	1	1	1	1	0	0	1	1	1	1	2	1	0	0	16	80	High
Williams et al. 2005 [74]	1	1	1	2	1	1	1	1	0	0	1	1	1	1	2	1	0	0	16	80	High
Williams et al. 2004 [73]	1	1	1	2	1	1	1	1	0	0	1	1	1	1	2	1	0	0	16	80	High

Electronic Supplementary Material Table S3: Meta-analysis results for muscle volume of the ACL reconstructed limb compared to a healthy control group.

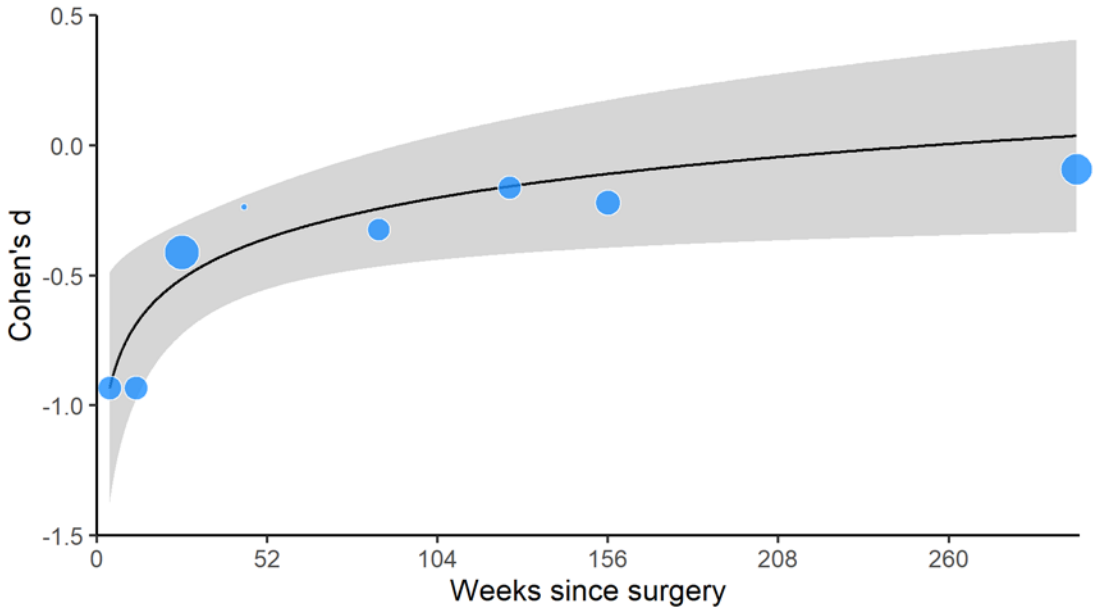
Muscle	Number of studies	Number of participants (Injured/Control)	Results
Quadriceps	3 [26, 61, 63]	105/68	X
Rectus Femoris	3 [26, 61, 63]	105/68	X
Vastus Intermedius	3 [26, 61, 63]	105/68	X
Vastus Lateralis	3 [26, 61, 63]	105/68	X
Vastus Medialis	3 [26, 61, 63]	105/68	X

X = no significant finding.

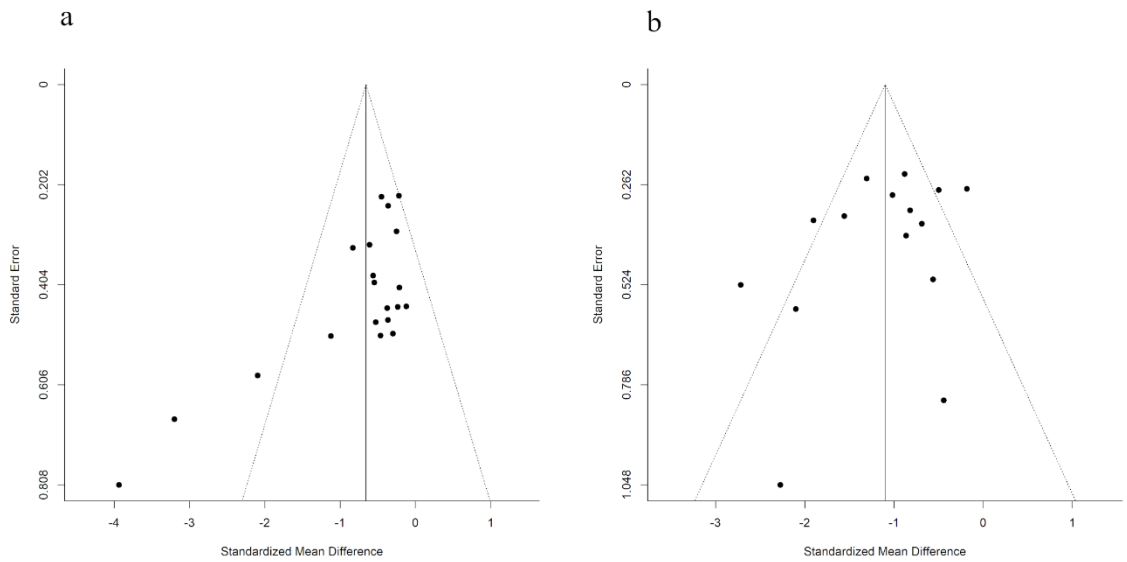
Electronic Supplementary Material Table S4: Meta-regression results comparing between the ACL reconstructed limb and the contralateral uninjured limb.

Measure	Results
Gracilis muscle cross sectional area.	Intercept -1.14, p = <0.0001; coefficient 0.0019, p = 0.485.
Gracilis muscle volume.	Intercept -0.937, p = 0.036; coefficient 0.001, p = 0.664.
Quadriceps femoris muscle cross sectional area	Intercept -1.333, p = 0.003; coefficient 0.411, p = 0.135.
Quadriceps femoris muscle volume	Intercept -1.245, p = 0.0002; coefficient 0.517, p = 0.008.
Semitendinosus muscle cross sectional area.	Intercept -1.005, p = 0.0002; coefficient -0.002, p = 0.471.
Semitendinosus muscle volume	Intercept -0.777, p = 0.0003; coefficient -0.0026, p = 0.175.
Total hamstrings muscle volume.	Intercept -0.1949, p = 0.376; coefficient -0.001, p = 0.610
Vastus lateralis muscle volume.	Intercept -0.619, p = 0.022; coefficient 0.0025, p = 0.207.
Vastus medialis muscle volume.	Intercept -0.329, p = 0.083; coefficient 0.0008, p = 0.615.

Electronic Supplementary Material Figure S1: Meta-regression plots comparing between the ACL reconstructed limb and the contralateral uninjured limb for quadriceps femoris muscle volume.



Electronic Supplementary Material Figure S2: Funnel plots assessing publication bias for meta-analyses with >10 included studies. a) Quadriceps femoris cross sectional area, and b) semitendinosus cross sectional area. Trim-fill (metafor) was used to estimate missing studies, however, both plots returned 0 inputted studies.



Benjamin Dutaillis, Nirav Maniar, David Opar, Jack Hickey and Ryan Timmins declare that they have no conflicts of interest relevant to the content of this review.