

**Supplemental File 1.** List of studies included in analyses.

Study	Sample	Age (Mean ± SD) Age Range	Modality	Equation Used	Notes
Hjeltnes et al., 1984 [1]	8M/0F	16.2 (?) 15.5-17.0	Cycle	Astrand & Rodahl, 1977	As exact equation is not known, suitability for sex, age and modality cannot be established.
Edlund et al., 1986 [2]	14M/9F	? 7.0-14.0	Treadmill	ACSM, 1980	As exact equation is not known, suitability for sex, age and modality cannot be established.
Marcotte et al., 1986a [3]	15M/7F	? 16.0-38.0	Cycle	Jones & Campbell, 1982	References provides options for children 8 and above, and adults 20 and above. Not clear how old an individual paediatric data is applicable to and therefore how 18-19 year olds are accounted for. Therefore, only a partial match for age-appropriate risk of bias.
Marcotte et al.,1986b [4]	40M/10F	20 (6) 11.0-38.0	Cycle	Jones & Campbell, 1982	References provides options for children 8 and above, and adults 20 and above. Not clear how old an individual paediatric data is applicable to and therefore how 18-19 year olds are accounted for. Therefore, only a partial match for age-appropriate risk of bias.
Stanghelle et al., 1986 [5]	5M/5F	11.5 (?) 11-12	Cycle	Hermansen, 1973	
Versteegh et al., 1986 [6]	12M/12F	16 (?) 10-22	Cycle	Unknown	Equation not stated in manuscript.
Browning et al., 1990 [7]	7M/4F	21 (1)* 17-29  *SE, not SD	Cycle	Jones & Campbell, 1982	References provides options for children 8 and above, and adults 20 and above. Not clear how old an individual paediatric data is applicable to and therefore how 18-19 year olds are accounted for (also assuming 17 year olds are treated as children). Therefore, only a partial match for age-appropriate risk of bias.
Versteegh et al., 1990 [8]	12M/12F	16 (?) 10-22	Cycle	Unknown	Equation not stated in manuscript.
Heijerman et al., 1991 [9]	8M/8F	28.7 (5.0) 21-40	Cycle	Jones et al., 1985	
Regnis et al., 1991 [10]	12M/10F	23 (1)* 18-33  *SEM, not SD	Cycle	Unknown	States Jones et al., 1985 (Am Rev Resp Dis, 131:700-708), is used for W <sub>max</sub> , but not VO <sub>2max</sub> . Whilst it may be assumed this reference would also be for VO <sub>2max</sub> , it is not explicitly stated and is therefore listed as 'unknown'.
Heijerman et al., 1992 [11]	6M/4F	28.3 (5.7) 21-40	Cycle	Jones et al., 1985	
Nixon et al., 1992 [12]	57M/51F	17 (?) 7-35	Cycle	Orenstein, in press	<p>This is assumed to be the same reference as Orenstein (1993) as this is stated as ‘in press’ when the manuscript was published in 1992 and thus timelines would be appropriate.</p> <p>However, as this is an assumption and the reference cannot be verified, the agreement with regards to age, sex, and modality cannot be established.</p>

Study	Sample	Age (Mean ± SD) Age Range	Modality	Equation Used	Notes
Williams et al., 1992 [13]	1 (sex unknown)*	37.3 (6.7)* ?  Wider sample of all DLTx patients. Age of pwCF unknown.	Cycle	Jones, 1988	*Wider sample of n = 7 of various diseases (all undergoing DLTx).  Paper states: " <i>Reference values were derived from Jones and Campbell (9) and Cotes (10)</i> ".  Cotes is a lung function reference, so authors have assumed exercise data is from Jones, even though it is not explicitly stated which variable was obtained from which reference.  Exact equation used from Jones & Campbell (1988) is not known, but sex-specific equations are available. Age and modality of source equation not known from reference.
Freeman et al., 1993 [14]	15M/7F	22.1 (5.1) 15-35	Cycle	Jones, 1988	Reference explicitly refers to pages 306-307 of Jones (1988), which is appendix with tables of equations.
Henke et al., 1993 [15]	19M/14F	23 (7) 12-39	Cycle	Unknown	Equation not stated in manuscript.
Kaplan et al., 1996 [16]	20M/15F	dF508/dF508:* 16.0 (7.3) ?  dF508/-: 17.0 (8.7) ?	Cycle	Orenstein, 1993	Age data split into two groups based upon dF508 status.  The manuscript states " <i>This result was also normalised to predicted <math>VO_{2max}</math> according to the formula of Orenstein (27)</i> ".  However, reference #27 is Pate (1990, Endurance Exercise Trainability). Orenstein is actually reference #26.  Despite discrepancy in referencing, as Orenstein is explicitly stated, this reference is carried forward for analysis. Although issues with Orenstein, 1993 mean that age and modality are unknown for risk of bias.
Alison et al., 1997 [17]	18M/6F	26 (7.7) 17-44	Cycle	Jones et al., 1985	Only control group had data presented as % <sub>pred</sub> .
Evans et al., 1997 [18]	0M/1F*	39 (x) (n/a)  Wider sample: 49.7 (2.4) 39-57	Quadriceps exercise in MRI machine	Wasserman et al., 1987	*Wider sample of n = 9 (4M/5F), all LTx recipients.  Authors acknowledge use of cycle ergometry reference data as a study limitation, stating: " <i>Because there are no predicted <math>VO_{2max}</math> values for quadriceps exercise, the data were expressed as a percentage of predicted cycling <math>VO_{2max}</math> to decrease the confounding effects of age, sex, and height</i> ".  As several equations are available in Wasserman et al., 1987, it is unclear which is used and therefore age is given 'unknown' for risk of bias, but sex is appropriate as separate equations are given for males and females. Modality is acknowledged as being derived from cycle ergometry in the study, and can therefore be given a 'not appropriate' for risk of bias (despite authors acknowledgment above).
Moorcroft et al., 1997a [19]	52M/35F	19.8 (x) 15-40	Cycle	Jones, 1988	
Moorcroft et al., 1997b [20]	19M/11F	19.8 (1.1)* 16-40	Cycle	Jones, 1988	*Age data presented as Mean (SEM), not mean (SD).  Data for n = 30, of a wider n = 92. The n = 30 represents a 're-tested' cohort of patients amongst wider pool. This is the only sub-group that sex data is available for.

Study	Sample	Age (Mean ± SD) Age Range	Modality	Equation Used	Notes
Oelberg et al., 1988 [21]	7M/3F	26.9 (2.5) 18-41	Cycle	Hansen et al., 1984	DLTx cohort.  Hansen et al., (1984) reference group is in men aged from 34-74 years, so only a partial match for sex and age for risk of bias.
Pellegrino et al., 1998 [22]	4 (sex unknown)*	? (?) ?  Whole sample: 37 (11) ?	Cycle	Unknown	*Wider sample of n = 8 (5M/3F) patients, all are post-DLTx.  Equation not stated in manuscript.
Tuzin et al., 1998 [23]	2M/1F*	11.3 (2.3) 10-14  Wider sample: * 9.4 (2.3) 7-14	Cycle	Unknown	*Wider sample of n = 10 (8M/2F).  This manuscript reports three separate sets of studies, whereby only one incorporated fitness testing to obtain VO <sub>2max</sub> (n = 3, 2M/1F).  Equation not stated in manuscript.
Boas et al., 1999 [24]	25M/0F	11.6 (2.8) 7-18*	Cycle	Orenstein, 1991	*Age range for whole study sample, including patients with asthma, and control group.  Orenstein (1993) states in preface: " <i>This book is a compilation of presentations made at the Standards for Pediatric Exercise Testing Workshop in October 1991 in Scottsdale, AZ</i> ".  Therefore, as a 1991 book cannot be identified, it is assumed that the 1991and 1993 reference are the same (particularly as reference page numbers match), and thus the same issues associated with Orenstein (1993) are applicable.
Bradley et al., 1999 [25]	14M/6F	25 (7) ?	Treadmill	Unknown	Equation not stated in manuscript.
McKone et al., 1999 [26]	6M/3F	26.3 (8.3) ?	Cycle	Jones, 1988	Explicitly states equation used:  VO <sub>2max</sub> = 0.83 height <sup>2.73</sup> x (1 – 0.007 age) x (1 – 0.25 Sex)
Schwaiblmair et al., 1999 [27]	19* (sex unknown)	SLTx: 49.3 (10.6) ?  DLTx: 30.7(9.9) ?  HLTx: 28.7 (10.1) ?	Cycle	Wasserman et al., 1994	*Wider sample of n = 103 pts, all recipients of LTx or HLTx. The stated sample of n = 19 for pwCF is a minimum. 23% of 78 LTx patients have CF, equalling n = 18. 4% of 25 HLTx patients have CF, equalling n = 1. There are additional patients with congenital CF within a sample of 14% of 'miscellaneous' LTx patients, but exact number is not known.  Reference states pages 1-97 of Wasserman et al., (1994). However, page 97 finishes in middle of chapter on 'protocols for exercise testing', with no reference to any normative equations. In other textbooks from Wasserman, the chapter on 'normal values' covers normative equations.  As it is unclear where (and which) the reference equation is from, all sections are unknown with regards to risk of bias.

Study	Sample	Age (Mean ± SD) Age Range	Modality	Equation Used	Notes
Boas et al., 2000a [28]	7M/8F	13.4 (?) 8-21	Cycle	Orenstein, 1991	<p>Orenstein (1993) states in preface: "<i>This book is a compilation of presentations made at the Standards for Pediatric Exercise Testing Workshop in October 1991 in Scottsdale, AZ</i>".</p> <p>Therefore, as a 1991 book cannot be identified, it is assumed that the 1991and 1993 reference are the same (particularly as reference page numbers match), and thus the same issues associated with Orenstein (1993) are applicable.</p>
Boas et al., 2000b [29]	6M/6F	12.0 (?) 8-17	Cycle	Orenstein, 1991	<p>This manuscript doesn't state the equation used in the methodology but does in results section.</p> <p>Orenstein (1993) states in preface: "<i>This book is a compilation of presentations made at the Standards for Pediatric Exercise Testing Workshop in October 1991 in Scottsdale, AZ</i>".</p> <p>Therefore, as a 1991 book cannot be identified, it is assumed that the 1991and 1993 reference are the same (particularly as reference page numbers match), and thus the same issues associated with Orenstein (1993) are applicable.</p>
Fink et al., 2000 [30]	1M/0F	28 (x) (n/a)	Unknown	Unknown	Equation not stated in manuscript.
Moser et al., 2000 [31]	8M/14F	10.3 (0.7) 6-18	Cycle	Own Reference Data (unpublished)	<p>Reference equation not provided.</p> <p>The exact statement from the manuscript reads: "<i>Exercise data from 54 healthy children (37 females and 17 males) who had been recently tested under the supervision of one of the authors (D.M.C.) were used to establish normal values for gas exchange responses to exercise</i>".</p> <p>Therefore, as both sexes were included in this reference data, it can be assumed that sex-appropriate data is used for risk of bias purposes. Age can be assumed for risk of bias as it is stated to be derived from children, but the exact age range is not known. Modality data is not known for risk of bias purposes.</p>
Frangolias & Wilcox, 2001 [32]	32M/38F	27.3 (8.7) 17-53	Cycle	Jones, 1988	<p>Explicitly states equation used: <math>VO_{2max} = 3.20 \text{ height} - 0.024 \text{ age} + 0.019 \text{ weight} - 0.49 \text{ sex} - 3.17</math></p> <p>Manuscript explicitly states page 306 of Jones (1988), which directs to Appendix D with aforementioned equation.</p>
Karila et al., 2001 [33]	6 (sex unknown)*	? (?) ?  Wider sample: 12 (3.04) 5-17	Cycle/Tread mill	Wasserman et al., 1994	<p>*Wider sample of n = 92 (56M/36F) consisted of multiple conditions, including asthma, spasmodic cough, congenital heart disease, bronchopulmonary dysplasia, and interstitial lung disease, amongst others.</p> <p>Choice of modality was stature dependent, with a minimum stature of 125 cm for cycle ergometry. Total cycle n = 55, treadmill n = 37.</p> <p>Purpose of study was to assess feasibility of implementing individualised workloads, hence difference in modalities.</p>
Pouliou et al., 2001 [34]	9M/9F	24 (13) 14-61	Cycle	Unknown	Equation not stated in manuscript.
Blau et al., 2002 [35]	6M/7F	16 (4) 9-25	Cycle	Unknown	Cites Wasserman et al., (1987) for exercise protocol, but gives no further details on reference equations used for outcome measures.

Study	Sample	Age (Mean ± SD) Age Range	Modality	Equation Used	Notes
Hutler et al., 2002 [36]	7M/3F	12.1 (1.7) 9.7-14.3	Cycle	1. Rowland, 1996 2. Orenstein, 1993	1. Rowland reference used for sex & age predicted values. 2. Orenstein reference used for sex & height predicted values.  Use of two different equation produces different % <sub>pred</sub> values within this study, and therefore this ends up with one significant result, and one non-significant result, after an intervention (Table 5, Hutler 2002).
McKone et al., 2002 [37]	7M/1F	26 (1) ?	Cycle	Wasserman et al., 1999	Explicitly states equation used: $VO_{2max} = 0.83 \text{ height}^{2.73} \times (1 - 0.007 \text{ age}) \times (1 - 0.25 \text{ Sex})$  This is the equation from Jones (1988) and would follow with the group of McKone et al., using this in other work within this review. However, the citation is for #28 (Wasserman et al., 1999), and Jones is #27.  It is assumed that this is likely a mistake in citations, but all items are given 'unknown' status for purposes of risk of bias, apart from sex, as this is explicitly built into equation given.
Thin et al., 2002 [38]	23M/7F*	Mild CF: 24.3 (6.0) ?  Moderate CF: 23.2 (5.5) ?  Severe CF: 25.3 (3.2) ?	Cycle	Wasserman et al., 1994	*n = 36 originally recruited, but only n = 30 analysed due to exclusions (e.g., non-identification of gas exchange threshold).  Cited chapter is on 'Normal Values'.
Frangolias et al., 2003a [39]	44M/24F	Normal: 27.0 (1.6) ?  Osteopenic: 30.6 (1.1) ?  Osteoporotic: 37.5 (4.0) ?	Cycle	Jones, 1988	Sample split into 3 groups based upon bone mineral density z-score.  Cites Frangolias & Wilcox (2001), which used Jones (1988).
Frangolias et al., 2003b [40]	46M/27F	29.6 (1.0) ?	Cycle	Jones, 1988	Cites Frangolias & Wilcox (2001), which used Jones (1988).

Study	Sample	Age (Mean ± SD) Age Range	Modality	Equation Used	Notes
Klijn et al., 2003a [41]	65 (sex unknown)	10.5 (2.9) 4-18	Cycle & Treadmill	Binkhorst et al., 1986	<12 years = Treadmill ≥ 12 years = Cycle ergometry  Manuscript acknowledges modality difference, stating: “ <i>VO<sub>2peak</sub> as a percentage of predicted (VO<sub>2peak</sub>%) values were obtained from an age- and gender-matched Dutch reference population, which used the same modes of exercise</i> ”.  Source data is conducted in 6-18 year olds, whereas the citing study is in 4-18 year olds, so age is only partially appropriate for risk of bias.
Klijn et al., 2003b [42]	39 (sex unknown)	13.2 (1.8) 9-17	Cycle	Binkhorst et al., 1992	Source data is conducted in 12-14 and 16-18 year olds, whereas the citing study is in 9-17 year olds, so age is only partially appropriate for risk of bias.
Sexauer et al., 2003 [43]	24M/16F	VL: 29 (1.3) 19-42  NVL: 29 (1.2) 19-39	Cycle	Jones, 1988	2 groups based upon presence of ventilatory limitation (VL) or no ventilatory limitation (NVL).
Klijn et al., 2004 [44]	20 (sex unknown)	Training: 13.6 (1.3)  Control: 14.2 (2.1)  *Whole Group Range: 9-18	Cycle	Binkhorst et al., 1986	Cohort split into two groups – training and control. Mean (± SD) age given for both groups, but age range only given for entire cohort.  Source data for cycle ergometry is conducted in 12-18 year olds, whereas the citing study is in 9-18 year olds, so age is only partially appropriate for risk of bias
Moorcroft et al., [45]	48 (sex unknown)	Training: 23.5 (6.4) ?  Control: 23.6 (5.5) ?	Cycle & Arm	Jones, 1988	Participants underwent both maximal cycle ergometry and arm ergometry exercise tests. Despite VO <sub>2peak</sub> (% <sub>pred</sub> ) being stated in methodology, no results are presented.  Modality can only be listed as ‘partial’ due to lack of data for arm ergometry, as Jones (1988) is assumed to be cycle ergometry.
Pinet et al., 2004 [46]	8M/4F	33.8 (8.6)	Cycle	Hansen et al., 1984	Source data from Hansen et al., (1984) is conducted in males only, and in 34-74 year olds. Therefore, both sex and age can only be given a ‘partial’ match for risk of bias.
Dodd et al., 2005 [47]	7M/1F	24 (7) ?	Cycle	Jones, 1988	Explicitly states equation used: VO <sub>2max</sub> = 0.83 height <sup>2.73</sup> x (1 – 0.007 age) x (1 – 0.25 Sex)  Page range for Jones (1988) cited in reference list includes the appendices.

Study	Sample	Age (Mean ± SD) Age Range	Modality	Equation Used	Notes
Fournier et al., 2005 [48]	7M/8F	30.1 (12.5) ?	Cycle	Unknown	Equation not stated in manuscript.
Hebestreit et al., 2005 [49]	11M/7F	15.8 (6.1) 9.8-33.8	Cycle	Orenstein, 1993	
McKone et al., [50]	15*  Study 1: 6M/3F  Study 2: 7M/2F	Study 1: 26.7 (3.1) ?  Study 2: 23.7 (1.5) ?	Cycle	Jones, 1988	*Two studies were run in one paper, with overlap of participants between studies, so an exact breakdown of sex cannot be determined.  Explicitly states equation used: $VO_{2max} = 0.83 \text{ height}^{2.73} \times (1 - 0.007 \text{ age}) \times (1 - 0.25 \text{ Sex})$
Moorcroft et al., 2005 [51]	63M/41F	24.6 (7.1) 16-49	Cycle	Jones, 1988	
Dodd et al., 2006a [52]	3M/4F	23 (4.1) 19-30	Cycle	Jones, 1988	Explicitly states equation used: $VO_{2max} = 0.83 \text{ height}^{2.73} \times (1 - 0.007 \text{ age}) \times (1 - 0.25 \text{ Sex})$
Dodd et al., 2006b [53]	13M/9F	22 (5.9) 17-41	Cycle	Jones, 1988	Explicitly states equation used: $VO_{2max} = 0.83 \text{ height}^{2.73} \times (1 - 0.007 \text{ age}) \times (1 - 0.25 \text{ Sex})$
Hebestreit et al., 2006 [54]	35M/36F	20.5 (6.0) 12.2-40.0	Cycle	Orenstein, 1993	
Reinsma et al., 2006 [55]	2M/3F*	31.4 (8.8)** 17-38**	Cycle	Wasserman et al., 2001	*Wider sample of LTx pts = 17M/8F. **Age data for pwCF only. Wider sample = 43 (10), 17-56.  All pwCF are DLTx recipients.  This study cites Wasserman et al., (2001), yet it appears that a 2001 version of this textbook does not exist. The 3 <sup>rd</sup> edition (1999) and 4 <sup>th</sup> edition (2004) are referenced by other studies in this analysis, yet this is the only to mention a copy from 2001. An edition is not provided by the authors in their reference list, and so the exact copy cannot be identified. As the reference cannot be explicitly identified, everything is given 'unknown' status for risk of bias.
Barry & Gallagher, 2007 [56]	7M/8F	25.5 (8.6) ?	Cycle	Jones, 1988	Description of experimental procedures refers to McKone et al., (1999), who utilised Jones (1988). However, no further referencing is made for outcomes measures (i.e., $VO_{2max}$ ).
Barry et al., 2008 [57]	15M/0F	23.9 (?) 19-40	Cycle	Jones, 1988	Explicitly states equation used: $VO_{2max} = 0.83 \text{ height}^{2.73} \times (1 - 0.007 \text{ age})$  No sex offset included, as only male participants involved.



Study	Sample	Age (Mean ± SD) Age Range	Modality	Equation Used	Notes
Dodd et al., 2008 [58]	25 (sex unknown)*	25.5 (?) 17-52	Cycle	Jones, 1988	*Wider sample of n = 169 (94M/75F), age 27.3 (10.4), 16-52 years, with a sub-sample of n = 25 chosen at random to also undergo CPET for study.  Explicitly states equation used: $VO_{2max} = 0.83 \text{ height}^{2.73} \times (1 - 0.007 \text{ age}) \times (1 - 0.25 \text{ Sex})$  Page range for Jones (1988) cited in reference list includes the appendices.
Hubert et al., 2009 [59]	23M/11F	19 (?) 15-25	Cycle	Wasserman et al., 2005	Cited chapter is on 'Normal Values', although unclear which is used.
Ruf & Hebestreit, 2009 [60]	39M/36F	Female: 19.8 (6.9) ?  Male: 21.8 (6.9) ?  *Whole Group Range: 12-41	Cycle	Orenstein, 1993	
Troosters et al., 2009 [61]	35M/29F	Female: 27 (9) ?  Male: 25 (6) ?	Cycle	Jones, 1988	
Zavorsky et al., 2009 [62]	3M/9F	9.8 (2.0) ?	Cycle	Cooper & Weiler-Ravell, 1984	
Groen et al., 2010 [63]	8M/5F	15.8 (1.8) ?	Cycle	Binkhorst et al., 1992	Source data is conducted in 12-14 and 16-18 year olds, whereas the citing study has a mean of 15.8 (±1.8) years, so any 15 years olds will not be accounted for and therefore age is only partially appropriate for risk of bias.  Study also cites Takken et al., (2007, Int J Sports Med, 28, 580 – 584), which in turn cites Binkhorst et al., 1992. Reason for additional citation unclear.
Gruet et al., 2010 [64]	25M/6F	29.6 (6.0) ?	Cycle	Unknown	Equation not stated in manuscript.
McBride et al., 2010 [65]	33M/31F	9.3 (0.9) ?	Cycle	Cooper et al., 1984	



Study	Sample	Age (Mean ± SD) Age Range	Modality	Equation Used	Notes
Nguyen et al., 2010 [66]	21M/30F	30.2 (?) 16-67	Cycle	ATS/ACCP, 2003	<p>Unclear from paper which equation was used. As issues exist regarding sex-appropriateness of Hansen et al., 1984, a ‘partial’ can only be given for risk of bias.</p> <p>In addition, age can only be ‘unknown’ status as it may be appropriate if Jones et al., (1985) were used, but not if Hansen et al., (1984) were used.</p> <p>Modality can be assumed as both Jones et al., (1985) and Hansen et al., (1984) used cycle ergometry.</p> <p>As ATS/ACCP document itself is the article cited, &lt;5 years is awarded a ‘yes’ (as it is unclear which underlying equation was used to counter this).</p>
Bartels et al., 2011 [67]	35 (sex unknown)*	?(?) ?  *Wider sample: 51 (14) ?	Cycle	Unknown	<p>*Wider sample of n= 153 LTx patients (78M/75F), although CF breakdown not known.</p> <p>CF group is a combined CF &amp; Bronchiectasis sample.</p> <p>Equation not stated in manuscript. Study cites ATS/ACCP 2003 for CPET termination criteria, but not reference data.</p>
Dwyer et al., 2011 [68]	10M/4F	27 (7) 18-44	Cycle & Treadmill	1: Jones et al., 1985 (Cycle) 2: Drinkwater et al., 1975 (Treadmill) 3. Froelicher et al., 1974 (Treadmill)	<p>Crossover trial examining effect of different modalities upon sputum expectoration, hence different equations for different modalities.</p> <p>Treadmill data references are sex-specific, hence why two sets of treadmill values given.</p> <p>Data from Froelicher et al., (1974) is in males aged 20-53, so any males aged &lt;20 years will not match equation. As it is not known from manuscript if, and how many, males were &lt;20 years, age can only be given a ‘partial’ match for risk of bias.</p>
Gruber et al., 2011 [69]	186M/158F	Female: 19.9 (8.1) ?  Male: 22.0 (7.5) ?  Whole Group Range: 7-43	Cycle	Orenstein, 1993	
Hulzebos et al., 2011 [70]	0M/1F	16 (x) n/a	Cycle	Unknown	Equation not stated in manuscript.
Leroy et al., 2011 [71]	4M/14F	32 (12.6) 20-67	Cycle	ERS, 1997	<p>Unknown which exact equations used. As ERS cites several studies, including Hansen et al., (1984) [males only, aged 34-74 years] and Blackie et al., (1989) [aged &gt;55 years only], both sex and age can only be given ‘partial’ appropriateness for risk of bias.</p> <p>All studies cited by ERS used cycle ergometry, so this can be awarded an appropriate match for risk of bias.</p>

Study	Sample	Age (Mean ± SD) Age Range	Modality	Equation Used	Notes
Tejero Garcia et al., 2011 [72]	23M/27F	Female: 23.5 (19.5-27)* ?  Male: 25 (19-30)* ?	Cycle	Unknown	* Age data presented as median (IQR).  Equation not stated in manuscript.
Traylor et al., 2011 [73]	13M/5F*	23 (7) ?	Cycle	Unknown	*Total n = 18, with Table 2 stating 26% are female. However, 26% of 18 = 4.68, and therefore n = 5 female (and consequently n = 13 male) is assumed.  Equation not stated in manuscript.
Vallier et al., 2011 [74]	11M/0F	26.8 (6.9) ?	Cycle	Jones, 1988	Explicitly states equation used: $VO_{2max} = 0.83 \text{ height}^{2.73} \times (1 - 0.007 \text{ age}) \times (1 - 0.25 \text{ Sex})$
Vivodtzev et al., 2011 [75]	4M/0F*	36.5 (10.5)* 20-49  *Wider sample: 47 (13) 20-70	Cycle	Unknown	*Wider population of n = 12 (10M/2F), a mixture of SLTx, DLTx and HLTx recipients. All pwCF were DLTx.  Equation not stated in manuscript.
Werkman et al., 2011 [76]	69M/50F	13.8 (1.7) 12-18	Cycle	1: Gulmans et al., 1997  2: Saris et al., 1985	Unclear which equation is referenced for VO <sub>2</sub> , and which is W <sub>peak</sub> , as the manuscript states: " <i>Reference values for VO<sub>2peak</sub> and W<sub>peak</sub> from healthy children and adolescents were obtained from previously studied Dutch children and adolescents (23,24)</i> ".  Reference #23 = Gulmans, et al., (1997) Reference #24 = Saris et al., (1985)  Therefore, this statement would imply that VO <sub>2peak</sub> is from Gulmans et al., but no VO <sub>2</sub> data or any equation is in Gulmans et al., (only W <sub>max</sub> ). In addition, Saris et al., does not appear to have any equations to actually use.  Therefore, both sets of equations given ‘unknown’ status for risk of bias purposes.
Wheatley et al., 2011 [77]	12M/5F	23 (8) ?	Cycle	Hansen et al., 1984	Age range of group is assumed to be 15-31 (± 1SD from mean). Therefore, age is not appropriate for risk of bias.  Sex is only partially appropriate as original data is in males only.
Armstrong et al., 2012 [78]	46 (sex unknown)	? (?) ?  *Wider sample: 58 (?) 38-63	Cycle	Jones et al., 1985	*Wider sample of n = 183 (50% female), all LTx recipients. Within sample, n = 46 had CF/bronchiectasis.

Study	Sample	Age (Mean ± SD) Age Range	Modality	Equation Used	Notes
Bongers et al., 2012 [79]	13M/9F	15.7 (1.5) 11.8-18.7	Cycle	Ten Harkel et al., 2011	As reference data is for males only, sex can only be given 'partial' for risk of bias purposes.
Manika et al., 2012 [80]	11M/6F	23.9 (3.5) ?	Cycle	Unknown	Equation not stated in manuscript.
Nguyen et al., 2012 [81]	10M/2F	14.7 (2.3) 11.3-17.5	Cycle	Unknown	Manuscript states: " <i>Percent predicted of VO2peak was calculated using reference data obtained from our laboratory</i> ". Therefore, as sex, age and modality cannot be identified, all criteria are given 'unknown' for risk of bias purposes.
Ruf et al., 2012 [82]	18M/23F	Female: 17.4 (6.4) ?  Male: 15.9 (4.5) ?  Whole Group Range: 12-42	Cycle	Orenstein, 1993	
van de Weert-van Leeuwen et al., 2012 [83]	85M/64F	13.29 (1.24) 12-18	Cycle	Binkhorst et al., 1992	
Armstrong et al., 2013 [84]	27 (sex unknown)*	CF not known.  Wider sample (survivors): 56 (?) ?  Wider sample (non-survivors): 59 (?) ?  Whole group range: 41-64	Unknown	Unknown	*Wider sample of n = 135 (82M/53F), all LTx recipients, split into survivors vs. non-survivors (1 year after surgery). 27/135 were pwCF.  Equation not stated in manuscript.
Ledger et al., 2013 [85]	4M/12F	10.9 (2.93) 4-15	Cycle	Unknown	Equation not stated in manuscript.
Moco et al., 2013 [86]	12M/9F	25.5 (6.0) ?	Treadmill	Neder et al., 1999	
Poore et al., 2013 [87]	5M/10F	12.6 (3.4) 7-18	Cycle	Unknown	Equation not stated in manuscript.

Study	Sample	Age (Mean ± SD) Age Range	Modality	Equation Used	Notes
Prevotat et al., 2013 [88]	14M/16F	27.1 (8.4) 18-49	10m Shuttle (15 Levels)	Unknown	Equation not stated in manuscript.  Within the study, VO <sub>2max</sub> is predicted from the shuttle test, citing Selvadurai et al., 2003, Ped Pulm, 35, 133-138, who in turn cite Leger et al., 1988, J Sport Sci, 6, 93-101.
Savi et al., 2013 [89]	15M/5F	33 (8) ?	Cycle	Unknown	Equation not stated in manuscript.
Sovtic et al., 2013 [90]	18M/19F	11.98 (3.04) 8-17	Cycle	Unknown	Equation not stated in manuscript.
Vivodtzev et al., 2013 [91]	9M/5F	Intervention:* 28 (6) ?  Control:* 32 (11) ?	Cycle	Unknown	*Participants split into two groups: intervention and control. Age mean (SD) only available for individual groups.  Equation not stated in manuscript.
Barry & Horsley, 2014 [92]	1M/0F	20 (x) n/a	Cycle	Unknown	Equation not stated in manuscript.
Brun et al., 2014 [93]	1M/0F	19 (x) n/a	Cycle	Unknown	Equation not stated in manuscript.
Cohen & Orenstein, 2014 [94]	15M/9F	12.8 (?) 8-19	Treadmill	Unknown	Equation not stated in manuscript.
Hebestreit et al., 2014 [95]	39M/37F	20.6 (5.8) ?	Cycle	Orenstein, 1993	
Hulzebos et al., 2014 [96]	70M/57F	12.7 (0.9) 11-14	Cycle	Ten Harkel & Takken, 2011	All categories are technically appropriate for risk of bias, but equation for females is limited to a singular value and therefore confidence in results is unclear.
Pastre et al., 2014 [97]	53M/49F	28 (11) 17-67	Cycle	Hansen et al., 1984	
van de Weert-van Leeuwen et al., 2014 [98]	13 (sex unknown)	? (?) 12-18	Cycle	Binkhorst et al., 1992	
Armstrong et al., 2015 [99]	14 (sex unknown)*	*Wider sample: 57 (?) 40-62	Cycle	Unknown	*Wider sample of n = 54 LTx recipients. A total of n = 14 had CF/Bronchiectasis.
Bongers et al., 2015 [100]	17M/23F	14.7 (1.7) 11-18	Cycle	Bongers et al., 2012	Bongers et al., 2012 utilises boys and girls, of appropriate age, using cycle ergometry, and would therefore normally be appropriate for risk of bias. However, no explicit equations are given in this edition of the book (they are provided in Bongers et al., 2014), and therefore as the exact method for deriving %pred for VO2max is unknown, this must be given 'unknown' for risk of bias purposes.
Erickson et al., 2015 [101]	6M/7F	20.2 (11.2) 7-42	Cycle	Unknown	Equation not stated in manuscript.

Study	Sample	Age (Mean ± SD) Age Range	Modality	Equation Used	Notes
Fielding et al., 2015 [102]	6M/10F	13.1 (3.9) ?	Cycle	Unknown	Equation not stated in manuscript.
Quon et al., 2015 [103]	12M/7F	30 (9) ?	Cycle	Jones, 1988	
Savi et al., 2015 [104]	20M/10F	33 (9) ?	Cycle	Jones et al., 1985	
Stevens et al., 2015 [105]	9M/10F	13.4 (3.2) ?	Cycle	Unknown	Equation not stated in manuscript.
Van Iterson et al., 2015 [106]	13M/5F	22 (2) ?	Cycle	Hansen et al., 1984	
Visschers et al., 2015 [107]	6M/9F	9.59 (3.33) 5.0-15.6	Cycle	Unknown	Equation not stated in manuscript.
Wheatley et al., 2015a [108]	12M/2F	22 (8) ?	Cycle	Hansen et al., 1984	
Wheatley et al., 2015b [109]	12M/2F	22 (8) ?	Cycle	Hansen et al., 1984	Does not explicitly state Hansen et al., 1983, but does cite the other reference from Wheatley et al., 2015 [above, 2015a], who in turn cite Hansen et al., 1984.
Avramidou et al., 2016 [110]	13 (sex unknown)	14.09 (5.16) ?	Cycle	Orenstein, 1993	
Gruet et al., 2016a [111]	12M/3F	28 (6) ?	Cycle	Jones, 1988	References Jones, 1988 in supplemental file, but not main text.
Gruet et al., 2016b [112]	17M/8F	30 (9) 18-45	Cycle	Unknown	Manuscript states further information is in supplemental file, but file cannot be found on journal web page, so ‘unknown’ status must be given for risk of bias.
Hatziagorou et al., 2016 [113]	10M/18F	14.9 (4.0) ?	Cycle	Orenstein, 1993	
Radtke et al., 2016 [114]	6M/8F	30.4 (6.1) ?	Cycle	Godfrey et al., 1971	States that Godfrey et al., 1971 is used, but equations are only present for incremental W <sub>max</sub> , not VO <sub>2max</sub> , so it is not clear how %pred values were obtained and is therefore given ‘unknown’ status for risk of bias.
Rodriguez-Miguel ez et al., 2016 [115]	7M/9F	22 (9) 13-43	Cycle	Unknown	Equation not stated in manuscript.
Tomlinson et al., 2016 [116]	0M/1F	11 (x) n/a	Cycle	Bongers et al., 2014	
Vallier et al., 2016 [117]	17M/3F	32.6 (8.3) ?	Cycle	Unknown	Equation not stated in manuscript.
Van Iterson et al., 2016a [118]	12M/4F	23 (4) ?	Cycle	Hansen et al., 1984	
Van Iterson et al., 2016b [119]	13M/4F	23 (2) ?	Cycle	Unknown	Equation not stated in manuscript.

Study	Sample	Age (Mean ± SD) Age Range	Modality	Equation Used	Notes
Decorte et al., 2017 [120]	12M/3F	28.1 (6.2) ?	Cycle	Jones, 1988	Paper does not cite Jones (1988) explicitly, but cites Gruet et al., (2016, J Cyst Fib, 15, e1-e8) as this is the same data. Gruet et al., 2016, in turn cites Jones (1988).
Dwyer et al., 2017 [121]	15M/9F	30 (8) 19-48	Treadmill	Unknown	Equation not stated in manuscript.
Edvardsen et al., 2017 [122]	21M/11F*	34.2 (11.81) ?	Treadmill	Unknown	*Only n = 14 underwent CPET.  Equation not stated in manuscript.
Layton et al., 2017 [123]	7 (sex unknown)	?(?) ?  *Wider sample: 57 (11) ?	Cycle	Unknown	*Wider sample of n= 68 (33M/35F), all LTx recipients.  Equation not stated in manuscript.
Radtke et al., 2017 [124]	6M/8F	29 (25.5-36.0)*	Cycle	1.Godfrey et al., 1971  2.Orenstein, 1993	*Age data given as median (IQR).  Manuscript states: “ <i>Data for VO<sub>2peak</sub> and Watt<sub>max</sub> are presented as % predicted values [22,23]</i> ”.  Ref #22 = Godfrey et al., 1971 Ref #23 = Orenstein, 1993  Therefore, it could be assumed that VO <sub>2peak</sub> is solely from Godfrey et al., (1971), but this is not completely clear, so both references are carried forward for risk of bias.
Tucker et al., 2017 [125]	17M/16F	19 (9) 9-43	Cycle	Unknown	Manuscript references ECFS Exercise Working Group Statement (Hebestreit et al., 2015, Respiration, 90, 332-351), although does not explicitly state which equation is used.
Vandekerckhove et al., 2017 [126]	24M/23F	12.3 (2.4) 7-17	Cycle	Wasserman et al., 2012	
Weir et al., 2017 [127]	17M/21F	11.0 (2.39) 7.3-15.7	Cycle	Cooper et al., 1984	Study cites Cooper et al., (1984, Pediatr Res, 18, 845-851).  However, this study only provides equations for O <sub>2</sub> pulse and therefor given ‘unknown’ status for risk of bias purposes.
Avramidou et al., 2018 [128]	45M/52F	14.9 (4.6) ?	Cycle	Orenstein, 1993	

Study	Sample	Age (Mean ± SD) Age Range	Modality	Equation Used	Notes
Causer et al., 2018 [129]	30M/15F	Adults: 31.3 (12.1) ?  Children: 12.9 (2.6) ?  Whole Group Range: 9.2-62.9	Cycle	Orenstein, 1993	
Chelabi et al., 2018 [130]	12 (sex unknown)	Normal LCI: 13.5 (2.6) ?  Elevated LCI: 14.0 (1.8) ?	Cycle	Jones et al., 1985	Participants split into two groups based upon Lung Clearance Index (LCI).  Cites Soumange et al., 2016, Thorax, 71, 804-811, who in turn cites Jones et al., 1985.  Population in Jones et al., 1985, starts at 15 years of age, so only some participants will be age-appropriate in this study for risk of bias purposes.
Chen et al., 2018 [131]	10 (sex unknown)	? (?) 8-20	Cycle	Unknown	Manuscript states: “Percent predicted peak VO <sub>2</sub> was calculated based on Medgraphics pediatric norms”.
Foster et al., 2018 [132]	39M/44F	14.4 (3.2) ?	Cycle	1. Orenstein, 1993 (<18 years) 2.Jones et al., 1985 (≥18 years)	Different equations used dependent upon age.
Gruet et al., 2018 [133]	23M/12F	31 (9) ?	Cycle	Jones et al., 1985	
Puppo et al., 2018 [134]	13M/8F	8.8 (2.0) ?	Cycle	Cooper & Weiler-Ravell, 1984	
Radtke et al., 2018 [135]	396M/330F	16.4 (13.0-22.1)*	Cycle	1.Orenstein, 1993 2.Jones et al., 1985	*Age data given as median (IQR).  No indication given for why two different reference equations given.
Savi et al., 2018 [136]	23M/11F	33.1 (8.5) ?	Cycle	Jones et al., 1985	



Study	Sample	Age (Mean ± SD) Age Range	Modality	Equation Used	Notes
Stevens, 2018 [137]	68M/39F	SH: * 30.8 (9.8) ?  No SH: 29.5 (9.3) ?	Cycle	Wasserman et al., 2005	*Participants split into two groups, based upon presence of static hyperinflation (SH) (n = 61), or no SH (n = 46).  Static hyperinflation defined as RV/TLC ≥30%.
Stevens & Neyedli, 2018 [138]	58M/30F	30.4 (9.4) 18-54	Cycle	Wasserman et al., 2005	
Tomlinson et al., 2018 [139]	21M/15F	13.4 (2.7) ?	Cycle	Bongers et al., 2014	
Tucker et al., 2018 [140]	6M/8F	14 (3) 8-20	Cycle	Unknown	Equation not stated in manuscript.
Bar-Yoseph et al., 2019 [141]	31M/18F	19.7 (9.7) ?	Cycle	Unknown	Equation not stated in manuscript.
Di Paolo et al., 2019 [142]	45M/27F	Group 1: 27.5 (24-32.5) ?  Group 2: 30 (27-34) ?  Group 3: 29 (25-34) ?	Cycle	Unknown	*Age data presented as median (IQR). Participants split into three groups based upon pulmonary function.  Group 1: ‘Normal’ lung function; FEV <sub>1</sub> /FVC ≥ 0.7, and FEV <sub>1</sub> ≥ 80% predicted value, and FVC ≥ 80% predicted value; n = 14.  Group 2: ‘Mild Impairment’ in lung function; not satisfying criteria for G1 and FEV <sub>1</sub> ≥ 70% predicted value; n = 23.  Group 3: ‘Moderate Impairment’ in lung function; not satisfying criteria for G1 and 40% ≤ FEV <sub>1</sub> < 70% predicted value; n = 35.  Equation not stated in manuscript.
Dwyer et al., 2019 [143]	10M/5F	27 (9) 18-48	Treadmill	Unknown	Equation not stated in manuscript.
Hebestreit et al., 2019 [144]	249M/184F	16.6 (6.1) 10.0-44.5	Cycle	1.Godfrey et al, 1971 2.Orenstein, 1993	Manuscript states: “ <i>Data from lung function testing and CPET were converted to %predicted (11–13)</i> ”.  Ref #11 = Godfrey et al., 1971. Ref #12 = Orenstein, 1993 Ref #13 = Quanjer et al., 2012.  As this latter reference from Quanjer et al., (2012, Eur Resp J, 40; 1324-1343) is explicitly focused upon spirometry, it can be assumed that it is the equations of Godfrey et al, 1971, and Orenstein, 1993, used for VO <sub>2peak</sub> . However, it is unclear if only one was utilised for VO <sub>2peak</sub> , and therefore both are carried forward for risk of bias.

Study	Sample	Age (Mean ± SD) Age Range	Modality	Equation Used	Notes
Kampouras et al., 2019a [145]	31M/47F	14.9 (4.68) ?	Cycle	Unknown	Explicit equations given girls and boys:  Girls: $VO_{2max} \text{ (L/min)} = 0.0308806 \times \text{Height (cm)} - 2.877$ Boys: $VO_{2max} \text{ (L/min)} = 0.044955 \times \text{Height (cm)} - 4.64$  The manuscript states: " <i>VO2peak% predicted was calculated using the Orenstein gender specific equations [17]</i> ".  However, upon examination of the reference list, reference #17 is Avramidou et al., (2018, Ped Pulm, 53,1,81-87). Within the list, Orenstein, 1993 is actually reference #16. Therefore, as per McKone et al., 2002, all items (apart from sex, whereby individual equations are provided), all items are 'unknown' for risk of bias.
Kampouras et al., 2019b [146]	77 (sex unknown)	14.9 (4.7) 11-20	Cycle	Unknown	Explicit equations given girls and boys:  Girls: $VO_{2max} \text{ (L/min)} = 0.0308806 \times \text{Height (cm)} - 2.877$ Boys: $VO_{2max} \text{ (L/min)} = 0.044955 \times \text{Height (cm)} - 4.64$  The manuscript states: " <i>VO2peak in % predicted (VO2peak%) was calculated with the Orenstein equations (28)</i> ".  However, upon examination of the reference list, reference #28 is Gustafsson et al., (2003, Ped Pulm, 35; 42-49). Within the list, Orenstein, 1993 is actually reference #31. Therefore, as per McKone et al., 2002, (and Kampouras et al., 2019a) all items (apart from sex, whereby individual equations are provided), all items are 'unknown' for risk of bias.
Rodriguez-Miguel ez et al., 2019 [147]	8M/7F	23 (11) ?	Cycle	Unknown	Equation not stated in manuscript.
Ruf et al., 2019 [148]	14M/6F	21.7 (8) 12-42	Cycle	Unknown	Equation not stated in manuscript.
Savi et al., 2019 [149]	3M/0F	42 (13) 30-60	Cycle	Unknown	Equation not stated in manuscript.
Tucker et al., 2019 [150]	10M/10F	Female: 15.1 (6.9) ?  Male: 20.4 (11.4) ?  Whole Group Range: 8-42	Cycle	Unknown	Equation not stated in manuscript.
Boutou et al., 2020 [151]	6M/5F	27.2 (4.15) ?	Cycle	Unknown	Equation not stated in manuscript.

Study	Sample	Age (Mean ± SD) Age Range	Modality	Equation Used	Notes
Burghard et al., 2020 [152]	4M/3F	15.4 (5.8) 9-26	Cycle	1. Bongers et al., 2012 (≤18 years) 2. Mylius et al., 2019 (>18 years)	Bongers et al., 2012 utilises boys and girls, of appropriate age, using cycle ergometry, and would therefore normally be appropriate for risk of bias. However, no explicit equations are given in this edition of the book (they are provided in Bongers et al., 2014), and therefore as the exact method for deriving %pred for VO2max is unknown, this must be given 'unknown' for risk of bias purposes.
Causer et al., 2020 [153]	26M/20F	NGT: * 27.5 (7.6) ?  IGT: 23.4 (7.6) ?  CFRD: 27.8 (6.9) ?	Cycle	Orenstein, 1993	*Three groups based upon glycaemic status: NGT (normal glucose tolerance); IGT (impaired glucose tolerance); CFRD (cystic fibrosis related diabetes).  This manuscript does not directly state Orenstein, 1993, but cites previous work by Causer et al., (2018), who in turn cite Orenstein, 1993.
Di Paolo et al., 2020 [154]	0M/1F	24 (x) n/a	Cycle	Unknown	Equation not stated in manuscript.
Sawyer et al., 2020 [155]	8M/6F	31 (28-35)*	Cycle	Unknown	*Age data given as median (IQR).  Equation not stated in manuscript.
Torvanger et al., 2020 [156]	69M/47F	Female: 32.6 (11.0) 18-65  Male: 31.8 (11.0) 18-68	Treadmill	Edvardsen et al., 2013	Edvardsen et al., 2013 uses adults from 20+ years, whereas Torvanger uses 18+ years. Therefore, people aged 18-19 years will not be covered by reference equation and therefore is only given a partial match for risk of bias purposes.
Ulvestad et al., 2020a [157]	0M/2F*	? (?) ?  Wider population range: 20-67	Treadmill	Edvardsen et al., 2013	*Wider population, n = 54 (27M/27F), all LTx recipients.

Study	Sample	Age (Mean ± SD) Age Range	Modality	Equation Used	Notes
Ulvestad et al., 2020b [158]	2 (sex unknown)*	Training Group: 52.3 (11.9) ?  Control Group: 51.1 (13.5) ?	Treadmill	Edvardsen et al., 2013	*Wider population, n = 54 (27M/27F), all LTx recipients. People with CF assigned to training group.
Du Berry et al., 2021 [159]	25M/24F	13.8 (?) 8.9-18.5	Cycle	Wasserman et al., 2005	Reference provided for Wasserman et al., 2005 explicitly cites page #585. However, this page is the last page of index, and therefore it cannot be ascertained which equation may have been used and all categories are awarded 'unknown' status.
Kampouras et al., 2021 [160]	78 (sex unknown)	14.9 (4.7) ?	Cycle	Orenstein, 1993	Explicitly states equations used:  Girls: $VO_{2peak} \text{ (l/min)} = 0.0308806 \times \text{Height (cm)} - 2.877$ .  Boys: $VO_{2peak} \text{ (l/min)} = 0.044955 \times \text{Height (cm)} - 4.64$ .
Rodriguez-Miguel <span>­</span> ez et al., 2021 [161]	8M/7F	23 (11) ?	Cycle	Unknown	Equation not stated in manuscript.  There is no equation in this manuscript, but it does cite Rodriguez-Miguel <span>­</span> ez et al., 2019, although this paper does not in turn cite an equation.
Saez-Gimenez et al., 2021 [162]	14 (sex unknown)*	? (?) ?  Whole sample: 48.7 (13.6) ?	Cycle	Unknown	*Whole sample of n = 29, all LTx recipients.  Equation not stated in manuscript.
Sawyer et al., 2021 [163]	8M/6F	31 (28-35)*	Cycle	Jones et al., 1985	*Age data given as median (IQR).
Vendrusculo et al., 2021a [164]	33M/14F	15.9 (6.5) ?	Treadmill	Unknown	Equation not stated in manuscript.
Vendrusculo et al., 2021b [165]	10M/6F	19.4 (6.9) ?	Treadmill	Unknown	Equation not stated in manuscript.
Willmott et al., 2021 [166]	1M/0F	25 (x) n/a	Cycle	Orenstein, 1993	Manuscript doesn't directly state Orenstein, 1993, but cites Causer et al., 2018, who in turn utilise Orenstein, 1993.
Curran et al., 2022 [167]	13M/20F	26.2 (7.1) ?	Cycle	Nixon et al., 2001	Paper was ePub ahead of print in 2021, but given full record in 2022. Appeared in 2021 search, so included in this review.  The cited paper of Nixon et al., 2001, does not appear to have an equation for $VO_{2max}$ . The paper states: " <i>Peak oxygen uptake was expressed per kg body mass, and PWC was expressed as % of predicted</i> ", although the cited work of Godfrey et al., 1971, only has equations for %predicted for peak work capacity, but it is not clear where the estimation of $VO_{2max}$ has come from.  Therefore, age, sex, and modality are all given 'unknown' status for risk of bias.

Study	Sample	Age (Mean ± SD) Age Range	Modality	Equation Used	Notes
Hebestreit et al., 2022 [168]	52M/65F*	Intervention: 25.3 (11.4) ?  Control: 22.8 (10.8) ?  Whole Group Range: >12 years	Cycle	Orenstein, 1993	*Sample of n = 117 is at baseline. Data for VO <sub>2peak</sub> at 12-month follow up of n = 103.  Paper was ePub ahead of print in 2021, but given full record in 2022. Appeared in 2021 search, so included in this review.  Paper does not explicitly state procedures, but refers to a previously published protocol paper (Hebestreit et al., 2018, BMC Pulm Med, 18(1):31) which indicates cycle ergometry and use of Orenstein: "A detailed description of the methodology is available in the online supplementary material and elsewhere".
Reuveny et al., 2022 [169]	12M/8F	Low BR: * 33 27-40  Normal BR: 35 16-58	Cycle	Hansen et al., 1984	*Participants split into two groups, based upon breathing reserve (BR): Low BR (<15%); Normal BR (>15%). Median age and range for both groups provided.  Paper was ePub ahead of print in 2021, but given full record in 2022. Appeared in 2021 search, so included in this review.
Revuelta-Iniesta et al., 2022 [170]	48M/42F*	16.6 (13.0-25.4)* median (IQR)	Cycle	Unknown	*Age data presented as median (IQR). Of whole sample, only n = 78 (87%) performed CPET.  Paper was ePub ahead of print in 2021, but given full record in 2022. Appeared in 2021 search, so included in this review.  Equation not stated in manuscript.

ACCP: American College of Chest Physicians; ACSM: American College of Sports Medicine; ATS: American Thoracic Society; BR: breathing reserve; CFRD: cystic fibrosis related diabetes; CPET: cardiopulmonary exercise test; dF508: delta-F508 mutation [Class 2 mutation causing CF]; DLTx: double lung transplant; ECFS: European Cystic Fibrosis Society; ERS: European Respiratory Society; F: female; FEV<sub>1</sub>: forced expiratory volume in one second; FVC: forced vital capacity; HLTx: heart-lung transplant; IGT: impaired glucose tolerance; IQR: interquartile range; LCI: lung clearance index; LTx: lung transplant; M: male; MRI: magnetic resonance imaging; NGT: normal glucose tolerance; NVL: no ventilatory limitation; pwCF: person with cystic fibrosis; RV: residual volume; SD: standard deviation; SE: standard error; SEM: standard error of mean; SH: static hyperinflation; SLTx: single lung transplant; TLC: total lung capacity; VL: ventilatory limitation; VO<sub>2max</sub>: maximal oxygen uptake; W<sub>max</sub>: maximal workload.

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