

ELECTRONIC SUPPLEMENTARY MATERIAL from the article by Muntaner-Mas et al. “A Systematic Review of Fitness Apps and Their Potential Clinical and Sports Utility for Objective and Remote Assessment of Cardiorespiratory Fitness”

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Table 1. Scientific literature search strategy used and number of articles found in Pubmed.

Search criteria 1	Search criteria 2	
	2.1 Assessment terms	2.2 Cardiorespiratory fitness
Mobile Applications (Mesh) OR Cell Phones (Mesh) OR Smartphone (Mesh) OR Smartphone App OR Smartphone Application OR iPhone App OR Android App	Exercise Tolerance (Mesh) OR Exercise Test (Mesh) OR Physical Fitness (Mesh) OR Athletic Performance (Mesh) OR Reproducibility Of Results (Mesh) OR Task Performance And Analysis (Mesh)	Cardiorespiratory Fitness (Mesh) OR Oxygen Consumption OR (Mesh) Walk Test (Mesh) OR Walking Speed (Mesh) OR Cardiovascular Fitness OR Aerobic Fitness OR Aerobic Capacity OR Maximal Oxygen Consumption OR VO ₂ max
Items found (Combining Criteria (1 “AND” 2.1) OR (1 “AND” 2.1))	561	35
Total items found (after deleting duplicates)	575	

General search equation (n = 575):

((((((((((("Mobile Applications"[Mesh]) OR "Cell Phones"[Mesh]) OR "Smartphone"[Mesh])) OR smartphone app) OR smartphone application) OR iPhone app) OR Android App)) AND (((("Exercise Tolerance"[Mesh]) OR "Exercise Test"[Mesh]) OR "Physical Fitness"[Mesh]) OR "Athletic Performance"[Mesh]) OR "Reproducibility of Results"[Mesh]) OR "Task Performance and Analysis"[Mesh]) AND ("2000/01/01"[PDat]: "2018/09/30"[PDat]))) OR (((((((((((("Mobile Applications"[Mesh]) OR "Cell Phones"[Mesh]) OR "Smartphone"[Mesh])) OR smartphone app) OR smartphone application) OR iPhone app) OR Android App)) AND (((((((("Cardiorespiratory Fitness"[Mesh]) OR "Oxygen Consumption"[Mesh]) OR "Walk Test"[Mesh]) OR "Walking Speed"[Mesh])) OR cardiovascular fitness) OR aerobic fitness) OR aerobic capacity) OR maximal oxygen consumption) OR VO₂max) AND ("2000/01/01"[PDat] : "2018/09/30"[PDat])))

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Table 2. Scientific literature search strategy used and number of articles found in Web of Science®.

Search criteria 1	Search criteria 2	
	2.1 Assessment terms	2.2 Cardiorespiratory fitness
Mobile Applications OR Smartphone OR Smartphone App OR Smartphone Application OR iPhone App OR Android App	Physical Fitness OR Physical Condition	Cardiorespiratory Fitness OR Oxygen Consumption OR Cardiovascular Fitness OR Aerobic Fitness OR Aerobic Capacity OR Maximal Oxygen Consumption OR VO ₂ max
Items found (Combining Criteria (1 “AND” 2.1) OR (1 “AND” 2.1))	771	79
Total items found (after deleting duplicates)	804	

General search equation (n = 804):

(TS=(mobile applications) OR TS=(smartphone) OR TS=(smartphone app) OR TS=(smartphone application) OR TS=(iPhone App) OR TS=(Android App)) AND (TS=(physical fitness) OR TS=(physical condition)) OR (TS=(mobile applications) OR TS=(smartphone) OR TS=(smartphone app) OR TS=(smartphone application) OR TS=(iPhone App) OR TS=(Android App)) AND (TS=(cardiorespiratory fitness) OR TS=(oxygen consumption) OR TS=(cardiovascular fitness) OR TS=(aerobic fitness) OR TS=(aerobic capacity) OR TS=(maximal oxygen consumption) OR TS=(VO₂max))

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Table 3. Scientific literature search strategy used and number of articles found in Scopus™.

Search criteria 1	Search criteria 2	
	2.1 Assessment terms	2.2 Cardiorespiratory fitness
Mobile Applications OR Smartphone OR Smartphone App OR Smartphone Application OR iPhone App OR Android App	Physical Fitness OR Exercise Test	Cardiorespiratory Fitness OR Oxygen Consumption OR Cardiovascular Fitness OR Aerobic Fitness OR Aerobic Capacity
Items found (Combining Criteria (1 “AND” 2.1) OR (1 “AND” 2.1))	528	428
Total items found (after deleting duplicates)	826	

General search equation (n = 826):

(ALL ("mobile applications") OR ALL ("smartphone") OR ALL ("smartphone app") OR ALL ("smartphone application") OR ALL ("iPhone App") OR ALL ("Android App") AND (ALL ("Physical Fitness") OR ALL ("Exercise test")) AND PUBYEAR > 2000) OR ((ALL ("mobile applications") OR ALL ("smartphone") OR ALL ("smartphone app") OR ALL ("smartphone application") OR ALL ("iPhone App") OR ALL ("Android App")) AND (ALL ("Cardiorespiratory Fitness") OR ALL ("Cardiovascular Fitness") OR ALL ("Aerobic Fitness") OR ALL ("Oxygen Consumption") OR ALL ("Aerobic Capacity")) AND PUBYEAR > 2000)

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Table 4. Scientific literature search strategy used and number of articles found in SPORTDiscus.

Search criteria 1	Search criteria 2	
	2.1 Assessment terms	2.2 Cardiorespiratory fitness
Mobile Applications OR Smartphone OR Smartphone App OR Smartphone Application OR iPhone App OR Android App	Physical Fitness OR Exercise Tests OR Reproducibility Of Results	Cardiorespiratory Fitness OR Oxygen Consumption OR Cardiovascular Fitness OR Aerobic Fitness OR Aerobic Capacity OR Maximal Oxygen Consumption OR VO2max
Items found (Combining Criteria 1 “AND” 2)	523	187
Total items found (after deleting duplicates)	591	

General search equation (n = 591):

(TX (mobile applications OR smartphone OR smartphone app OR smartphone application OR iPhone App OR Android App) AND TX (physical fitness OR exercise tests OR Reproducibility Of Results)) OR (TX (mobile applications OR smartphone OR smartphone app OR smartphone application OR iPhone App OR Android App) AND TX (Cardiorespiratory Fitness OR Oxygen Consumption OR Cardiovascular Fitness OR Aerobic Fitness OR Aerobic Capacity OR Maximal Oxygen Consumption OR VO2max))

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Table 5. Apps’ markets search strategy used and a number of apps in the iTunes and Google Play stores.

Limits	Search criteria	
	1.1 Assessment terms	1.2 Cardiorespiratory fitness
Smartphone applications the focus in cardiorespiratory fitness testing	Fitness test	Walk test OR VO2max OR Yo-Yo test
Items found	97	595
Total items found	692	

App Store (iTunes)

Dates of the search: October 2018 Total #Hits = 201

#Hits by search terms:

Fitness test [97], walk test [14], VO2max [33], yo-yo test [58]

Google Play

Dates of the search: October 2018 Total #Hits = 490

#Hits by search terms:

Walk test [249], VO2max [241]

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Table 6. Mobile App Rating Scale (MARS) mean and domains scores of fitness apps stored in App Store (iTunes).

	App name	Engagement	Functionality	Aesthetics	Information	MARS Mean	Subjective	Perceived Impact
1	<u>HRV4Training</u>	5.00	5.00	5.00	5.00	5.00	5.00	5.00
2	<u>MyHeart Counts</u>	4.20	5.00	5.00	3.86	4.51	4.50	4.50
3	<u>Fitness Test pro</u>	3.60	5.00	5.00	3.83	4.36	4.50	4.17
4	<u>AeroExaminer - Aerobic VO2 Max Test & Conditioning</u>	4.40	3.75	4.33	4.57	4.26	4.50	2.83
5	<u>CardioCoach</u>	4.00	3.75	5.00	3.86	4.15	4.00	4.00
6	<u>iWalkAssess</u>	2.40	4.75	4.00	4.67	3.95	3.25	2.50
7	<u>Team Bleep Test</u>	3.80	4.25	4.33	3.29	3.92	3.25	3.83
8	<u>CycleCoach - Fitness Test</u>	3.60	4.00	4.33	3.20	3.78	4.25	2.67
9	<u>Multi Stage Pacer Test</u>	2.80	4.75	4.00	3.25	3.70	2.00	1.17
10	<u>Police Fitness</u>	2.80	4.75	4.00	3.17	3.68	1.75	1.00
11	<u>Bleep Test Pro - 15m & 20m - Beep Test Shuttle Run</u>	2.60	5.00	4.33	2.75	3.67	1.00	1.50
12	<u>BEEP TEST TRAINER</u>	3.40	4.25	4.00	3.00	3.66	3.25	2.67
13	<u>Max O2</u>	3.00	4.00	4.33	3.00	3.58	1.00	1.33
14	<u>examen de aptitud</u>	2.40	4.50	3.67	3.50	3.52	2.00	2.50
15	<u>Multi Stage VO2 max Beep Test</u>	4.00	4.00	3.67	2.33	3.50	4.00	2.33
16	<u>Eklblom-Bak Cycle Test</u>	2.80	4.00	2.33	4.60	3.43	1.25	2.00
17	<u>AF Fitness Assessment</u>	2.40	4.00	2.33	4.83	3.39	1.75	2.67
18	<u>BEEP TEST TEAM TRAINER</u>	2.80	4.00	4.33	2.40	3.38	1.50	2.00
19	<u>Bleep Test - Fitness Tests</u>	3.40	3.75	4.00	2.00	3.29	1.75	2.33
20	<u>3 Minute Step Test - DIY Fitness Assessment</u>	2.80	4.50	3.33	2.50	3.28	2.00	2.50
21	<u>Bleep.Test</u>	2.80	4.25	2.67	3.00	3.18	2.00	1.33
22	<u>Beep Test Training Guide</u>	2.40	4.00	2.00	4.29	3.17	1.75	4.17
23	<u>Treadmill Tracker</u>	3.00	3.50	2.33	3.75	3.15	2.25	2.00
24	<u>Beep Fitness Test</u>	2.80	4.00	3.67	2.00	3.12	2.25	1.00
25	<u>UFT - Uber Fitness Test</u>	2.80	4.50	2.67	2.50	3.12	2.00	1.00
26	<u>The Beep Test</u>	2.60	3.50	3.67	2.57	3.08	2.50	2.83
27	<u>FitnessMeter - Test & Measure</u>	2.80	3.00	2.33	4.17	3.08	3.25	2.33

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28	<u>6MWT Lite</u>	3.80	2.50	3.33	2.50	3.03	1.50	1.50
29	<u>6MWT</u>	3.60	2.50	3.00	2.50	2.90	1.00	1.50
30	<u>6MWD</u>	2.40	4.50	2.67	2.00	2.89	1.00	1.00
31	<u>The Beep Test Free</u>	2.60	3.75	2.00	3.00	2.84	2.75	1.67
32	<u>Fit Test</u>	3.40	4.25	2.67	1.00	2.83	2.50	1.00
33	<u>Beep Test</u>	2.20	4.00	3.33	1.67	2.80	2.00	1.00
34	<u>Bleep Test Lite</u>	2.60	3.75	3.33	1.50	2.80	1.75	1.00
35	<u>Bleep Test Solo</u>	2.60	3.75	3.33	1.50	2.80	1.75	1.00
36	<u>T4T - Test4Training</u>	2.00	4.00	3.00	2.00	2.75	1.00	1.00
37	<u>Prueba Pacer VO2 Max Cardio y Shuttle Bleep</u>	2.60	3.75	2.33	2.00	2.67	2.75	2.33
38	<u>VO2 Prueba De Pitidos Max - Pacer, Bleep & Shuttle</u>	3.20	3.25	2.00	1.67	2.53	1.00	1.67
39	<u>BEEP TEST SLIM</u>	1.40	3.25	2.00	2.80	2.36	1.50	1.17
40	<u>Music Beep Test - Pacer & Shuttle Run Fitness Test</u>	2.20	4.00	2.00	1.00	2.30	1.75	1.50
41	<u>Shuttle Fit Trainer</u>	2.00	3.25	2.33	1.50	2.27	1.25	1.00
42	<u>Test de Cooper</u>	2.40	3.25	1.33	2.00	2.25	1.00	1.50
43	<u>YO YO Endurance Test</u>	2.20	2.00	1.33	3.25	2.20	1.00	1.00
44	<u>Beep Test: Examen de Ejército Policía Militares</u>	1.80	3.50	2.33	1.00	2.16	1.00	1.00
45	<u>Beep Test (Multi-Stage)</u>	1.80	3.75	1.33	1.00	1.97	1.00	1.00
46	<u>VO2max Calculator</u>	1.20	2.00	2.33	1.00	1.63	1.00	1.00
	Average (SD)	2.86 (0.77)	3.89 (0.71)	3.19 (1.04)	2.76 (1.11)	3.17 (0.70)	2.20 (1.15)	2.00 (1.08)

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Table 7. Mobile App Rating Scale (MARS) mean and domains scores of fitness apps stored in Google Play apps.

	App name	Engagement	Functionality	Aesthetics	Information	MARS Mean	Subjective	Perceived Impact
1	<u>HRV4Training</u>	5.00	5.00	5.00	5.00	5.00	5.00	5.00
2	<u>Fitness Test pro</u>	3.60	5.00	5.00	3.83	4.36	4.50	4.17
3	<u>iWalkAssess</u>	2.40	4.75	4.00	4.67	3.95	3.25	2.50
4	<u>Bruce Treadmill Test Lite</u>	2.60	5.00	3.33	4.00	3.73	1.75	1.83
5	<u>Bruce Treadmill Test Protocol</u>	2.80	4.50	3.33	3.20	3.46	1.50	1.50
6	<u>Physical V02 Fitness Beep Test</u>	3.00	4.25	3.33	3.20	3.45	2.25	1.50
7	<u>Marine Corps PT Calculator - USMC Physical Fitness</u>	2.80	5.00	3.33	2.60	3.43	1.50	1.33
8	<u>TOHRC Walk Test</u>	3.00	4.25	3.33	3.14	3.43	2.25	1.00
9	<u>3 Minute Step Test</u>	2.80	4.75	2.33	3.60	3.37	2.50	1.67
10	<u>blp - The Bleep Test App</u>	2.40	4.25	3.00	3.20	3.21	1.50	1.17
11	<u>Functional Assessment + G-Code</u>	2.60	3.75	3.33	3.00	3.17	2.00	1.50
12	<u>Run U2</u>	3.00	4.00	2.67	2.50	3.04	2.00	1.00
13	<u>Fitness Assessments</u>	2.40	4.25	2.67	2.75	3.02	1.75	1.50
14	<u>Test de Léger</u>	1.80	3.75	3.00	3.00	2.89	1.25	1.00
15	<u>12 Minute Vo2 Max Run Test</u>	2.80	3.25	3.33	2.00	2.85	1.25	1.17
16	<u>Physical Fitness V02 Beep Test</u>	2.80	3.25	3.33	2.00	2.85	1.25	1.17
17	<u>Shuttle Run VO2Max Pacer Test</u>	2.80	3.25	3.33	2.00	2.85	1.25	1.17
18	<u>Calculadora Funcional Trainer</u>	2.20	4.00	2.67	2.50	2.84	1.00	1.00
19	<u>Beep Test Pro</u>	2.60	4.25	1.67	2.75	2.82	2.50	1.00
20	<u>Yo-Yo Intermittent Pro</u>	3.00	3.75	2.00	2.40	2.79	2.00	1.00
21	<u>Test de marcha de 6 minutos</u>	2.60	2.75	3.33	2.25	2.73	1.25	1.00
22	<u>Beep Test Calculator</u>	1.80	5.00	2.00	2.00	2.70	1.25	1.00
23	<u>Bruce Protocol Stress Calci</u>	1.80	5.00	2.00	2.00	2.70	1.25	1.00
24	<u>Army Fitness Calculator - APFT</u>	1.80	3.75	2.67	2.50	2.68	1.00	1.00
25	<u>Cardio Exercise Prescription</u>	2.20	4.25	2.00	2.00	2.61	1.00	1.50
26	<u>Astrand Cycle Fitness Calci</u>	1.00	4.50	2.33	2.50	2.58	1.00	1.00
27	<u>VO2 Max Calculator</u>	1.00	4.50	2.33	2.50	2.58	1.00	1.00

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28	<u>FitCal - Fitness Calculators</u>	2.40	3.50	1.33	2.80	2.51	1.25	2.50
29	<u>Test VMA Pro</u>	2.80	2.50	2.00	2.60	2.48	2.00	1.17
30	<u>V02 Calculadora</u>	1.80	3.50	1.67	2.80	2.44	1.00	1.00
31	<u>eRunners</u>	2.40	3.25	1.00	2.80	2.36	1.50	1.50
32	<u>Prueba Beep</u>	1.80	3.00	1.67	2.00	2.12	1.00	1.00
33	<u>Yo-Yo Test Intermitente</u>	1.80	3.00	1.67	2.00	2.12	1.00	1.00
34	<u>AG-Evaluapp - Fitness Tests</u>	1.40	4.25	1.00	1.60	2.06	1.00	1.00
35	<u>FitCalc+ Fitness & Health Calculator - Gym Tools</u>	1.20	4.25	1.00	1.67	2.03	1.00	1.00
36	<u>2.4 Km Run Test (Fitness Test)</u>	1.20	3.00	1.00	2.60	1.95	1.00	1.00
37	<u>Beep Test vocacional Ejército</u>	1.20	3.50	1.00	2.00	1.93	1.00	1.00
38	<u>Fitga Fitness Tracker</u>	1.40	2.50	1.00	2.60	1.88	1.00	1.00
39	<u>Fitness Test</u>	1.40	2.25	1.00	2.75	1.85	1.00	1.00
40	<u>12 Minute Run Test (Cooper Test)</u>	1.00	2.75	1.00	2.60	1.84	1.00	1.00
41	<u>Astrand Treadmill Test (Vo2max Test)</u>	1.00	2.75	1.00	2.60	1.84	1.00	1.00
42	<u>Balke Vo2max Test</u>	1.00	2.75	1.00	2.60	1.84	1.00	1.00
	Average	2.20 (0.83)	3.83 (0.80)	2.36 (1.08)	2.69 (0.71)	2.77 (0.70)	1.59 (0.89)	1.38 (0.81)

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Table 8. Qualitative assessment of fitness apps stored in App Store (iTunes).

	App name	Score	Ratings	Price	Test mode	Test instructions	HR	GPS	VO2 estimation	External devices needed
1	HRV4Training	4.2	13	10.99 €	Published algorithms	Yes	Yes	-	Yes	-
2	MyHeart Counts	4.5	132	0.00 €	6 minutes walk test	Yes	-	Yes	Yes	-
3	Fitness Test pro	0	0	3.49 €	Coopers 12-min run, Bruce treadmill test, Any distance run test, Beep-test	Yes	-	-	Yes	-
4	AeroExaminer - Aerobic VO2 Max Test &	0	0	4.49 €	beep test, Yo-Yo Intermittent and a Treadmill Tests	Yes	-	-	Yes	Yes (treadmill)
5	CardioCoach	0	0	0.00 €	-	-	-	-	-	-
6	iWalkAssess	0	0	0.00 €	10-metre walk test; 6-minute walk test	Yes	-	-	-	-
7	Team Bleep Test	0	0	1.09 €	YO YO Endurance Test, Standard Beep Test, Uk police test, UK Fire	-	-	-	-	-
8	CycleCoach - Fitness Test	0	0	0.00 €	Cycling test	Yes	-	-	-	Yes (bike)
9	Multi Stage Pacer Test	0	0	0.00 €	20 meter shuttle run test	-	-	-	Yes	-
10	Police Fitness	0	0	2.29 €	Chester test & 20 meter shuttle run test	Yes	-	-	-	-
11	Bleep Test Pro - 15m & 20m - Beep Test Shuttle Run	0	0	1.09 €	15 & 20 meter shuttle run test	-	-	-	-	-
12	BEEP TEST TRAINER	0	0	3.49 €	20 meter shuttle run test	Yes	-	-	Yes	-
13	Max O2	0	0	0.00 €	Ebbeling 1, Balke 1, Rockport walking test & 1-mile	-	-	-	Yes	-
14	examen de aptitud	0	0	0.00 €	Step test	Yes	-	-	Yes	Yes (step)
15	Multi Stage VO2 max Beep Test	0	0	0.00 €	20 meter shuttle run test	Yes	-	-	Yes	-
16	Ekblom-Bak Cycle Test	0	0	0.00 €	Calculator	Yes	-	-	Yes	-
17	AF Fitness Assessment	0	0	2.29 €	Calculator	Yes	-	-	-	-
18	BEEP TEST TEAM TRAINER	0	0	4.49 €	20 meter shuttle run test	Yes	-	-	-	-
19	Bleep Test - Fitness Tests	0	0	1.09 €	20 meter shuttle run test, Pull Ups test, Press Ups test & Sit Ups test	-	-	-	Yes	-
20	3 Minute Step Test - DIY Fitness Assessment	0	0	5.49 €	3 Minute Step Test	Yes	-	-	Yes	Yes (step)
21	Bleep.Test	0	0	0.00 €	Standard Beep Test, YO YO Endurance Test	-	-	-	-	-
22	Beep Test Training Guide	0	0	0.00 €	20 meter shuttle run test	Yes	-	-	-	-
23	Treadmill Tracker	0	0	3.49 €	-	-	Yes	Yes	Yes	-
24	Beep Fitness Test	0	0	1.09 €	15, 20 & 40 meter shuttle run test	Yes	-	-	Yes	-
25	UFT - Uber Fitness Test	0	0	0.00 €	Cooper test, 300m run test	Yes	-	-	-	-
26	The Beep Test	0	0	2.29 €	20 meter shuttle run test, YO YO Endurance Test	Yes	-	-	Yes	-
27	FitnessMeter - Test & Measure	0	0	2.29 €	15 & 20 meter shuttle run test, Jump test, Abdominals test & Sprint test	Yes	-	-	Yes	-
28	6MWT Lite	0	0	0.00 €	6 minutes walk test	-	-	-	-	-
29	6MWT	0	0	0.00 €	6 minutes walk test	-	-	-	-	-
30	6MWD	0	1	0.00 €	6 minutes walk test	-	-	-	-	-
31	The Beep Test Free	0	0	0.00 €	20 meter shuttle run test	Yes	-	-	Yes	-

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32	Fit Test	0	0	3.49 €	Calculator	-	-	-	Yes	-
33	Beep Test	0	0	3.49 €	20 meter shuttle run test	Yes	-	-	Yes	-
34	Bleep Test Lite	0	0	0.00 €	20 meter shuttle run test	-	-	-	Yes	-
35	Bleep Test Solo	0	0	1.09 €	20m Bleep Test, Yo-Yo Intermittent Recovery, Yo-Yo Endurance and the official tests used by UK Police & Fire Services,	Yes	-	-	Yes	-
36	T4T - Test4Training	0	0	0.00 €	-	-	-	-	Yes	-
37	Prueba Pacer VO2 Max Cardio y Shuttle Bleep	0	0	5.49 €	20 meter shuttle run test	Yes	-	-	Yes	-
38	VO2 Prueba De Pitidos Max - Pacer, Bleep & Shuttle	0	0	0.00 €	20 meter shuttle run test	-	-	-	Yes	-
39	BEEP TEST SLIM	0	0	1.09 €	20 meter shuttle run test	Yes	-	-	Yes	-
40	Music Beep Test - Pacer & Shuttle Run Fitness Test	0	0	2.29 €	15 & 20 meter shuttle run test	-	-	-	Yes	-
41	Shuttle Fit Trainer	0	0	1.09 €	20 meter shuttle run test	Yes	-	-	-	-
42	Test de Cooper	0	0	0.00 €	Cooper Test	-	-	-	-	-
43	YO YO Endurance Test	0	0	3.49 €	YO YO Endurance Test	Yes	-	-	-	-
44	Beep Test: Examen de Ejército Policía Militares	0	0	0.00 €	15 & 20 meter shuttle run test	Yes	-	-	-	-
45	Beep Test (Multi-Stage)	0	0	1.09 €	20 meter shuttle run test	Yes	-	-	-	-
46	VO2max Calculator	0	0	0.00 €	Calculator	-	-	-	Yes	-
Total number of "Yes"						28	2	2	27	4

"-" means the app doesn't contain the item

If the direct link does not work is because the app has been removed from the market

ELECTRONIC SUPPLEMENTARY MATERIAL from the article by Muntaner-Mas et al. “A Systematic Review of Fitness Apps and Their Potential Clinical and Sports Utility for Objective and Remote Assessment of Cardiorespiratory Fitness”

Table 8, Qualitative assessment of fitness apps stored in App Store (iTunes) (Continued),

App name	Historic measurements	Export results	Prompt self-monitoring	Social Network	Reference values	Scientific validation	Multiple users	Language	Update date	Sum of "Yes"
1 HRV4Training	Yes	Yes	Yes	-	-	Yes	-	English & Italian	26/09/2018	7
2 MyHeart Counts	Yes	Yes	Yes	-	Yes	-	-	English	09/07/2018	7
3 Fitness Test pro	Yes	Yes	-	Yes	Yes	-	Yes	English	19/09/2017	7
4 AeroExaminer - Aerobic VO2 Max Test & Conditioning	Yes	Yes	Yes	Yes	-	-	Yes	English	10/01/2017	8
5 CardioCoach	-	-	-	-	-	-	-	English	04/10/2017	0
6 iWalkAssess	Yes	Yes	-	Yes	Yes	Yes	-	English	05/20/2018	6
7 Team Bleep Test	Yes	Yes	-	Yes	Yes	-	Yes	English	26/07/2017	5
8 CycleCoach - Fitness Test	Yes	-	Yes	Yes	-	-	-	English & Japanese	06/05/2016	4
9 Multi Stage Pacer Test	-	-	-	Yes	-	-	-	English	27/09/2017	2
10 Police Fitness	Yes	-	-	-	-	-	-	English	13/10/2017	2
11 Bleep Test Pro - 15m & 20m - Beep Test Shuttle Run	Yes	-	-	Yes	-	-	Yes	English	13/10/2017	3
12 BEEP TEST TRAINER	Yes	Yes	-	Yes	-	-	Yes	English	25/01/2017	6
13 Max O2	Yes	-	-	-	Yes	-	-	English	14/12/2011	3
14 examen de aptitud	-	-	-	Yes	Yes	-	-	English	01/04/2014	4
15 Multi Stage VO2 max Beep Test	Yes	Yes	-	Yes	Yes	-	Yes	Spanish & English	20/08/2018	7
16 Ekblom-Bak Cycle Test	-	Yes	-	-	Yes	-	-	English & Swedish	07/11/2017	4
17 AF Fitness Assessment	-	-	-	-	Yes	-	-	English	15/01/2018	3
18 BEEP TEST TEAM TRAINER	Yes	Yes	-	-	-	-	Yes	English	25/01/2017	4
19 Bleep Test - Fitness Tests	Yes	-	-	-	-	-	-	English, French & Portuguese	27/04/2017	2
20 3 Minute Step Test - DIY Fitness Assessment	-	Yes	-	Yes	Yes	-	-	English	09/02/2017	5
21 Bleep.Test	Yes	-	-	-	-	-	Yes	English	27/10/2018	2
22 Beep Test Training Guide	-	-	-	-	Yes	-	-	English	24/11/2015	2
23 Treadmill Tracker	Yes	Yes	-	-	-	-	-	English	20/11/2015	3
24 Beep Fitness Test	Yes	-	-	-	Yes	-	-	English	08/09/2017	4
25 UFT - Uber Fitness Test	-	-	-	-	Yes	-	-	English	03/08/2015	2
26 The Beep Test	-	-	-	Yes	-	-	Yes	English	05/10/2014	4
27 FitnessMeter - Test & Measure	-	Yes	-	-	Yes	-	Yes	English	21/02/2018	6
28 6MWT Lite	Yes	Yes	-	Yes	-	-	-	Spanish, German & English	11/10/2013	3
29 6MWT	Yes	Yes	-	Yes	-	-	-	Spanish, German & English	07/11/2013	3
30 6MWD	Yes	Yes	-	Yes	-	-	-	Spanish, German & English	14/05/2017	3
31 The Beep Test Free	-	-	-	Yes	-	-	Yes	English	16/09/2014	4

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32	Fit Test	-	Yes	-	Yes	-	-	-	English	17/10/2014	3
33	Beep Test	Yes	Yes	-	-	-	-	Yes	English	22/02/2017	5
34	Beep Test Lite	-	-	-	-	-	-	-	English	28/07/2017	1
35	Beep Test Solo	Yes	Yes	-	-	-	-	Yes	English	26/07/2017	5
36	T4T - Test4Training	Yes	Yes	-	-	Yes	-	-	Spanish & English	18/01/2018	4
37	Prueba Pacer VO2 Max Cardio y Shuttle Bleep	Yes	Yes	-	Yes	-	-	Yes	Spanish & English	16/03/2017	6
38	VO2 Prueba De Pitidos Max - Pacer, Bleep & Shuttle	Yes	-	-	-	-	-	-	English	16/03/2017	2
39	BEEP TEST SLIM	Yes	Yes	-	-	-	-	-	English	25/01/2017	4
40	Music Beep Test - Pacer & Shuttle Run Fitness Test	-	-	-	-	Yes	-	-	English	08/05/2014	2
41	Shuttle Fit Trainer	Yes	-	-	-	-	-	-	English	30/11/2016	2
42	Test de Cooper	-	-	-	-	Yes	-	-	English	15/09/2016	1
43	YO YO Endurance Test	-	-	-	-	-	-	-	English	24/10/2018	1
44	Beep Test: Examen de Ejército Policía Militares	-	-	-	-	-	-	-	Spanish, German, French, English,	22/06/2017	1
45	Beep Test (Multi-Stage)	-	-	-	-	-	-	-	English	20/02/2018	1
46	VO2max Calculator	-	-	-	-	-	-	-	English	08/04/2015	1
Total number of "Yes"		27	22	4	18	17	2	14			

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ELECTRONIC SUPPLEMENTARY MATERIAL from the article by Muntaner-Mas et al. “A Systematic Review of Fitness Apps and Their Potential Clinical and Sports Utility for Objective and Remote Assessment of Cardiorespiratory Fitness”

Table 9, Qualitative assessment of fitness apps stored in Google Play,

	App name	Score	Ratings	Downloads	Price	Test mode	Test instructions	HR	GPS	VO2 estimation	External devices needed
1	HRV4Training	4.4	329	5,000+	9.99 €	Published algorithms	Yes	Yes	-	Yes	-
2	Fitness Test pro	4	67	1,000+	2.41 €	Coopers 12-min run, Bruce treadmill test, Any distance run test, Beep-test (Yo-Yo endurance test, The Andersen test, Watt-max	Yes	-	-	Yes	-
3	iWalkAssess	-	-	100+	0.00 €	10m walk test and 6-min walking test	Yes	-	-	-	-
4	Bruce Treadmill Test Lite	3.4	8	1,000+	0.00 €	Bruce treadmill test	-	-	-	Yes	-
5	Bruce Treadmill Test Protocol	0	0	10+	4.99 €	Bruce treadmill test	Yes	-	-	Yes	-
6	Physical VO2 Fitness Beep Test	3.8	16	500+	4.99 €	20 meter shuttle run test	Yes	-	-	Yes	-
7	Marine Corps PT Calculator - USMC Physical	3.8	19	5,000+	0.00 €	3 mile run, MC Combat fitness test, MC physical fitness test	-	-	-	-	-
8	TOHRC Walk Test	3.5	2	100+	0.00 €	2 and 6-min walking test	-	-	-	-	Yes
9	3 Minute Step Test	4	5	500+	6.49 €	YMCA step test	Yes	-	-	Yes	-
10	blp - The Bleep Test App	3.5	67	10,000+	0.00 €	20 meter shuttle run test	Yes	-	-	Yes	-
11	Functional Assessment + G-Code	4.8	22	500+	0.79 €	6-min walking test	Yes	-	-	-	-
12	Run U2	4.4	76	5,000+	0.00 €	7 minutes, Astrand-treadmill, Balke-track, Balke treadmill, Bruce-	Yes	-	-	Yes	-
13	Fitness Assessments	3.7	12	500+	3.34 €	Rockport test	-	-	-	Yes	-
14	Test de Léger	4.2	331	50,000+	0.00 €	20 meter shuttle run test	Yes	-	-	-	-
15	12 Minute Vo2 Max Run Test	3.8	65	10,000+	0.00 €	Cooper Test	Yes	-	Yes	Yes	-
16	Physical Fitness VO2 Beep Test	3.9	283	50,000+	0.00 €	20 meter shuttle run test	Yes	-	-	Yes	-
17	Shuttle Run VO2Max Pacer Test	3.8	78	10,000+	0.00 €	15 meter shuttle run test	Yes	-	-	Yes	-
18	Calculadora Funcional Trainer	4.6	33	1,000+	0.00 €	1,5 miles test	-	-	-	Yes	-
19	Beep Test Pro	4	45	5,000+	0.99 €	20 meter shuttle run test	-	-	-	Yes	-
20	Yo-Yo Intermittent Pro	3.9	21	1,000+	0.99 €	20 meter shuttle run test	-	-	-	Yes	-
21	Test de marcha de 6 minutos	4.1	64	5,000+	0.00 €	6-min walking test	-	-	-	Yes	-
22	Beep Test Calculator	4.5	2	1,000-5,000	0.00 €	20 meter shuttle run test	-	-	-	Yes	-
23	Bruce Protocol Stress Calci	1	1	100+	0.00 €	Bruce treadmill test	-	-	-	Yes	-
24	Army Fitness Calculator - APFT	2.7	3	100 - 500	0.00 €	2 mile run	-	-	-	-	-
25	Cardio Exercise Prescription	4.4	5	1,000+	0.00 €	6MWT	-	-	-	Yes	-
26	Astrand Cycle Fitness Calci	-	-	100+	0.00 €	Astrand Cycle Fitness Test	-	-	-	Yes	-
27	VO2 Max Calculator	1	1	500+	0.00 €	-	-	-	-	Yes	-
28	FitCal - Fitness Calculators	4.5	12	500+	0.75 €	-	-	-	-	Yes	-
29	Test VMA Pro	3	55	10,000+	0.00 €	Test piste Léger-Boucher	Yes	-	-	-	-
30	VO2 Calculadora	2.8	4	1,000+	0.00 €	Rockport Walking test	Yes	-	-	Yes	-
31	eRunners	5	1	5+	1.49 €	Test de Cooper	Yes	-	Yes	Yes	-
32	Prueba Beep	3.8	723	100,000+	0.00 €	20 meter shuttle run test	-	-	-	Yes	-

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33	<u>Yo-Yo Test Intermitente</u>	4.5	243	50,000+	0.00 €	20 meter shuttle run test	-	-	-	Yes	-
34	<u>AG-Evaluapp - Fitness Tests</u>	4.7	15	1,000+	0.00 €	Course Navette, Yo-yo test	-	-	-	Yes	-
35	<u>FitCalc+ Fitness & Health Calculator - Gym Tools</u>	5	5	500+	0.00 €		-	-	-	Yes	-
36	<u>2,4 Km Run Test (Fitness Test)</u>	-	-	100+	0.00 €	Test de Cooper	-	-	-	Yes	-
37	<u>Beep Test vocacional Ejercicio</u>	3.9	533	100,000+	0.00 €	20 meter shuttle run test	-	-	-	-	-
38	<u>Fitga Fitness Tracker</u>	4	10	500+	0.00 €	Rockport Fitness Walk Test and Treadmill test	Yes	-	-	Yes	-
39	<u>Fitness Test</u>	3.8	40	10,000+	0.00 €	20 meter shuttle run test	-	-	-	Yes	-
40	<u>12 Minute Run Test (Cooper Test)</u>	5	4	500+	0.00 €	Test de Cooper	Yes	-	-	Yes	-
41	<u>Astrand Treadmill Test (Vo2max Test)</u>	5	1	100+	0.00 €	Astrand Treadmill Test	Yes	-	-	Yes	-
42	<u>Balke Vo2max Test</u>	5	1	100+	0.00 €	Balke VO2max test	Yes	-	-	Yes	-
Total number of "Yes"							21	1	2	34	1

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Table 9, Qualitative assessment of fitness apps stored in Google Play (Continued),

App name	Historic measurements	Export results	Prompt self-monitoring	Social Network	Reference values	Scientific validation	Multiple users	Update date	Sum of "Yes"
1 HRV4Training	Yes	,csv Format	Yes	-	-	Yes	-	10/10/2018	7
2 Fitness Test pro	Yes	Yes	-	Yes	Yes	-	Yes	18/03/2013	7
3 iWalkAssess	Yes	-	Yes	-	Yes	-	Yes	22/08/2018	5
4 Bruce Treadmill Test Lite	-	-	-	Yes	-	-	Yes	04/05/2014	3
5 Bruce Treadmill Test Protocol	Yes	-	-	Yes	-	-	Yes	04/05/2014	5
6 Physical V02 Fitness Beep Test	Yes	-	-	Yes	Yes	-	Yes	11/01/2017	6
7 Marine Corps PT Calculator - USMC	Yes	-	-	-	-	-	-	23/05/2017	1
8 TOHRC Walk Test	Yes	,csv Format, .pdf	-	-	-	Yes	-	03/08/2017	3
9 3 Minute Step Test	-	-	-	Yes	Yes	-	-	01/04/2014	4
10 blp - The Bleep Test App	Yes	-	-	-	-	-	Yes	04/02/2014	4
11 Functional Assessment + G-Code	-	-	-	-	Yes	-	-	24/10/2018	2
12 Run U2	-	-	-	-	-	-	-	18/02/2017	2
13 Fitness Assessments	Yes	,xml Format	-	Yes	-	-	Yes	09/03/2015	5
14 Test de Léger	-	-	-	-	-	-	-	15/06/2015	1
15 12 Minute Vo2 Max Run Test	Yes	-	-	Yes	Yes	-	-	12/01/2017	6
16 Physical Fitness V02 Beep Test	Yes	-	-	Yes	Yes	-	-	11/01/2017	5
17 Shuttle Run VO2Max Pacer Test	Yes	-	-	Yes	Yes	-	-	11/01/2017	5
18 Calculadora Funcional Trainer	-	-	-	-	-	-	-	21/08/2017	1
19 Beep Test Pro	Yes	Yes	-	Yes	-	-	Yes	25/10/2018	5
20 Yo-Yo Intermittent Pro	Yes	,csv Format	-	Yes	-	-	Yes	26/10/2018	5
21 Test de marcha de 6 minutos	Yes	-	-	Yes	-	-	Yes	09/10/2013	4
22 Beep Test Calculator	-	-	-	-	-	-	-	03/10/2018	1
23 Bruce Protocol Stress Calci	-	-	-	-	-	-	-	01/10/2018	1
24 Army Fitness Calculator - APFT	Yes	-	-	-	-	-	-	27/12/2016	1
25 Cardio Exercise Prescription	-	-	-	-	-	-	-	16/06/2014	1
26 Astrand Cycle Fitness Calci	-	-	-	-	Yes	-	-	23/10/2018	2
27 VO2 Max Calculator	-	-	-	-	Yes	-	-	27/06/2017	2
28 FitCal - Fitness Calculators	-	-	-	-	-	-	-	17/10/2013	1
29 Test VMA Pro	Yes	-	-	-	-	-	Yes	20/09/2017	3
30 V02 Calculadora	-	-	-	-	Yes	-	-	25/08/2017	3
31 eRunners	-	-	-	-	-	-	-	17/11/2013	3
32 Prueba Beep	-	-	-	-	-	-	-	25/10/2018	1
33 Yo-Yo Test Intermitente	-	-	-	-	-	-	-	26/10/2018	1

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34	AG-Evaluapp - Fitness Tests	Yes	-	-	Yes	-	-	Yes	24/08/2017	4
35	FitCalc+ Fitness & Health Calculator - Gym	-	-	-	-	-	-	-	29/06/2018	1
36	2,4 Km Run Test (Fitness Test)	Yes	-	-	-	-	-	Yes	04/06/2018	3
37	Beep Test vocacional Ejército	-	-	-	-	-	-	-	29/01/2016	0
38	Fitga Fitness Tracker	Yes	-	-	-	-	-	-	30/04/2015	3
39	Fitness Test	-	-	-	-	-	-	-	03/01/2014	1
40	12 Minute Run Test (Cooper Test)	-	-	-	-	Yes	-	Yes	14/06/2018	4
41	Astrand Treadmill Test (Vo2max Test)	-	-	-	-	Yes	-	Yes	15/06/2018	4
42	Balke Vo2max Test	-	-	-	-	Yes	-	Yes	15/06/2018	4
Total number of "Yes"		20	6	2	13	14	2	16		

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