

Use of wearable technology for health and care outcomes: a rapid evidence map

NIHR Bristol Evidence Synthesis Group

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Bristol ESG propose to prepare a rapid evidence map covering the three use cases of wearable technologies provided by DHSC. In this update (13 August 2025), eligibility criteria for the second part of use case 1 is refined to include all systematic reviews of secondary prevention of cardiovascular disease.

Aims

Primary aim: to understand the synthesized evidence in relation to wearables according to each of three use cases:

- Use case 1 (UC1): Earlier detection of (primary and secondary) conditions, with a focus on clinical effectiveness.
- Use case 2 (UC2): Behaviour change for better health outcomes, and
- Use case 3 (UC3): Pre-operative assessment and post-operative recovery.

Secondary aim: to indicate where there are evidence gaps, to enable the targeting of evidence-gathering to inform development of wearables policy.

Rationale for approach

We initially undertook a comprehensive MEDLINE search for **overviews of systematic reviews** (“umbrella reviews”) on wearable technologies across the three use cases provided (see Appendix). This retrieved 44 articles, indicating that there is a substantial body of evidence on the topic. The majority of the overview evidence appeared to be most relevant to UC2.

We then expanded and refined the search to identify **systematic reviews** (see Appendix). This search retrieved 2110 articles, again indicating a very substantial amount of evidence. While most of the evidence again appeared relevant to UC2 (and not all of the articles will be systematic reviews), we observed systematic reviews covering the other two use cases.

Given the large volume of existing research summaries - such as systematic reviews and overviews of these systematic reviews - we propose to examine this body of evidence systematically, to produce an evidence map of synthesized research. We believe this should be do-able in the short time frame available.

Eligibility criteria

Population(s)	UC1: People worldwide (i) without symptoms [detection of primary conditions]; or (ii) with a cardiovascular event or other condition that is a risk factor for CVD [detection of secondary conditions] UC2: All people worldwide. UC3: People worldwide (i) who are being assessed for pre-operative fitness / need; or (ii) who are being assessed for post-operative recovery
Intervention(s)	Any type of electronic device designed to be worn on or attached to the body that is capable of measuring physiological parameters, such as heart rate (this includes, but is not limited to, wristbands, watches, rings, glucose monitors, wearable defibrillators, wearable respiratory monitors, ECG patches, ambulatory blood pressure devices, ambulatory ECDs, adhesive temperature patches, wearable insoles). For UC2, this also includes wearable devices capable of measuring physical parameters, such as step count and distance moved. Excluding virtual reality / augmented reality
Comparator(s)	Any comparator suitable for the study design, as determined by authors of included systematic reviews.
Outcome(s):	UC1: Measures of accuracy or clinical effectiveness UC2: Health-improving behaviours UC3: Pre-operative or post-operative assessments
Studies designs	Systematic reviews, published since 2020, of any suitable primary study type, or mixture of primary study types. (Note: If the number of systematic reviews retrieved for UC2 proves unmanageable, an option will be to switch to focusing on the overviews of systematic reviews to produce a matrix within the phase one time frame.)

Information we will extract from included systematic reviews

- Types of study designs included in the review (for example randomized trials, observational, test accuracy etc)
- Eligibility criteria for the review
- Intervention (type of wearable device)
- Health condition (UC1); health improving behaviour (UC2); or operation planned / received (UC3)
- Bottom line conclusions from the review

Deliverable for DHSC

A matrix showing categories of wearable type on one axis and purpose on the other axis. Purposes will be separated by use case (UC1: health conditions; UC2: health improving behaviour; UC3: operation planned / received) with a suitable breakdown of specific purposes within each use case.

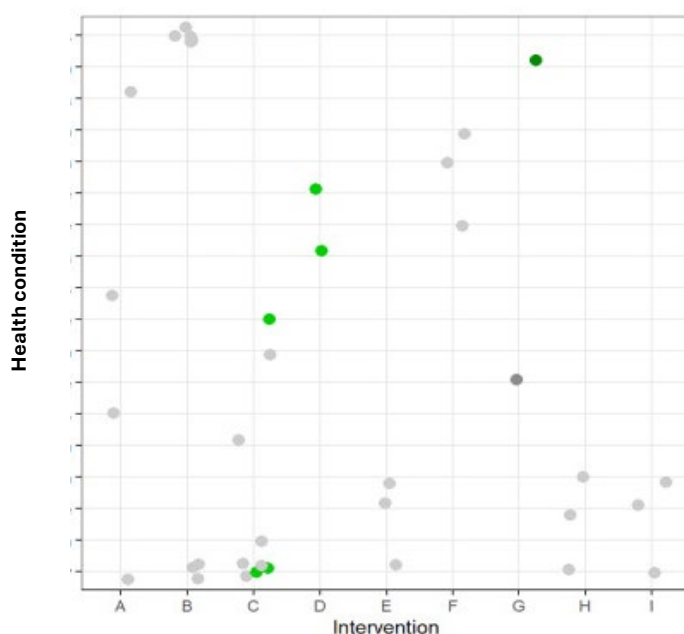
Cells or point(s) in the matrix will represent the availability of systematic reviews.

Each entry in the map will provide a clickable link to the evidence it represents.

Colour coding will be used, e.g. to indicate whether the results from the review are about accuracy or clinical effectiveness (UC1); or pre- or post-operation (UC3); or number of studies or other information that is deemed useful to have a visual representation.

A narrative summary of the bottom-line conclusions from each of the systematic reviews will be provided.

Here is an example of a matrix from a previous overview of systematic reviews (<https://dx.doi.org/10.2196/41042>). (Note that the matrix we produce may look quite different.)



Appendix

Medline search for reviews of SRs

Ovid multi-file search		
Embase <1974 to 2025 April 29>		
Ovid MEDLINE(R) ALL <1946 to April 29, 2025>		
1	WEARABLE DEVICE/	17017
2	WEARABLE ELECTRONIC DEVICES/	14996
3	wearable computer/	14996
4	head-mounted display/ or smart glasses/ or virtual reality head mounted display/	2990
5	wrist-worn device/	145
6	smart watch/ or activity tracker/ or wrist-worn accelerometer/	5525
7	wearable camera/ or wearable sensor/	4135
8	fitness trackers/	4141
9	*pedometer/	540
10	(pedomet* and (app or apps or device or devices or digital* or microprocessor? or sensor or sensors or software or tele* or monitor* or track* or feedback* or wear*)).mp.	4758
11	(pedomet* and (intervention* or monitor* or track* or feedback* or text messag* or ((count* or daily or record*) adj3 step*))).mp.	6821
12	(personal* activit* adj (monitor* or tracker?)).tw,kf.	69
13	wearables.mp.	8419
14	(wearable adj3 (computer or device or devices or monitor* or technolog* or tracker?)).mp.	47868
15	(sensewear* or sens* wear*).tw,kf.	2642
16	((body-worn or bodyworn) adj3 (computer* or device or devices or technolog* or tracker?)).tw,kf.	207
17	(head adj (mounted or worn or wear*) adj (device or devices or display or system)).tw,kf.	3630
18	((smart or augmented reality or AR) adj glasses).tw,kf.	778
19	((virtual reality or VR) adj (headset? or head set? or helmet? or HMD) or VRHMD).tw,kf.	1792
20	(wrist* adj3 (device or devices or tracker? or acceleromet*)).tw,kf.	5040
21	((wearable or body) adj2 (cam or camera?) or bodycam?).tw,kf.	1251
22	((wear* or body-worn or bodyworn) adj2 sensor?).tw,kf.	19462
23	or/1-22	86850
24	(systematic review? or evidence report* or technology assessment?).jw,jx.	67513
25	(meta-analys* or metaanalys* or meta-synth* or metasynth*).tw.	767229
26	(systematic or structured or evidence or trials or studies or interventions).ti. and ((review or overview or look or examination or update* or summary).ti. or review.pt.)	901246
27	((systematic* or quantitativ* or methodologic* or evidence) adj5 (review* or overview*)).tw.	1100988
28	(quantitativ* adj5 synthesis*).tw.	11762

29	(integrative research review* or research integration).tw.	440
30	(rapid review or mixed method? review or scoping review).tw.	79067
31	(umbrella review or "review of reviews" or "overview of reviews").mp.	8445
32	(0266-4623 or 1469-493X or 1366-5278 or 1530-440X or 2046-4053).is.	48209
33	or/24-32	1697482
34	23 and 33	4235
35	reviews.ti.	31889
36	31 or 35	37363
37	23 and 36	69
38	remove duplicates from 37	44

Medline search for SRs

Ovid MEDLINE(R) ALL <1946 to May 07, 2025>		
Concept-1: Wearables		
1	WEARABLE ELECTRONIC DEVICES/	11463
2	wearable computer/	11463
3	wearables.mp.	4117
4	(wearable adj3 (smart or computer or device or devices or monitor* or biomonitor* or biometric* or biosensor* or sensor or sensors or technolog* or tracker?)).tw,kf.	25285
5	(sensewear* or sens* wear*).tw,kf.	967
6	(smartwear or smart wear or (smart adj (glove? or hat or hats or shoe? or insole? or clothing or shirt? or trousers or textiles))).tw,kf.	966
7	((body-worn or bodyworn) adj3 (computer* or device or devices or technolog* or tracker?)).tw,kf.	90
8	(head adj (mounted or worn or wear*) adj (device or devices or display or system)).tw,kf.	1691
9	(wrist* adj3 (device or devices or tracker?)).tw,kf.	1131
10	(smartband* or (smart adj2 (band* or wristband*))).tw,kf.	231
11	(smartwatch* or (smart adj2 watch*) or scanwatch* or scan watch*).tw,kf.	1975
12	(smartring* or (smart adj2 ring?)).tw,kf.	46
13	(smart adj (glasses or digital eye)).tw,kf.	254
14	((wearable or body) adj2 (cam or camera?) or bodycam?).tw,kf.	573

15	((body-worn or bodyworn) adj2 (sensor? or biosensor?)).tw,kf.	336
16	(digital adj3 (biomarker* or bio* marker*)).mp.	1029
17	or/1-16	37054
Concept-2a: Fitness Trackers		
18	FITNESS TRACKERS/	1293
19	((((activity or fitness) adj (monitors or trackers)) or (wearable adj (activit* or fit*) adj (device or devices or tracker*))).tw,kf.	2345
20	((personal* activit* adj (monitor* or tracker?)) or fitbit*).tw,kf.	1718
21	(actiwatch or acti watch* or stepwatch* or step watch*).tw,kf.	651
22	((pedomet* or actimet*) and (app or apps or device or devices or digital* or microprocessor? or sensor or sensors or software or tele* or monitor* or track* or feedback* or wear*)).mp.	1934
23	((pedomet* or actimet*) and (intervention* or monitor* or track* or feedback* or text messag* or ((count* or daily or record*) adj3 step*))).mp.	2765
24	(wrist* adj3 (tracker? or acceleromet*)).tw,kf.	1271
25	or/18-24	8590
Concept-2b: Tracking exercise/movement - other		
26	((physical activit* or physical* fit* or cardio* fit* or exercis* or movements or (movement* and (count* or quanti*)) or steps or step count* or walking or daily activit* or sedentary behavi* or (sedentary adj (infants or children or adolescents or adults)) or prolonged sitting or (sit* and stand*) or prolonged inactivit* or inactive adult*) adj7 (armband* or arm band* or wristband* or wrist band* or device* or sensor or sensors or App or Apps or smartwatch* or smart watch* or wearable device* or wearable tracker* or wearables or sensewear* or sens* wear* or (mobile and tech*) or tech* based or novel or innovat* or mobile health or ehealth* or e-health or mhealth intervention* or m-health intervention*))).tw,kf.	29097
27	(track* fitness or track* physical or movement tracker* or track movement* or step counter* or steps counter*).tw,kf.	514
28	((acceleromet* or actigraph*) and (physical activit* or physical* fit* or cardio* fit* or exercis* or movements or (movement* and (count* or quanti*)) or steps or step count* or walking or daily activit* or sedentary behavi* or (sedentary adj (infants or children or adolescents or adults)) or prolonged sitting or (sit* and stand*) or prolonged inactivit* or inactive adult*))).mp.	22606
29	or/26-28	49749

30	(coach* or ecoach* or counsel* or mentor* or buddy or buddies or gamification or gaming or exergaming).mp.	243609
31	(feedback or feed-back or incentives or incentivise or incentivize or (motivat* adj2 (interview* or support* or talk*)) or support call* or behavi* support or reminders or general advice).mp.	266443
32	((behavi* adj1 chang*) or change strateg* or transtheoretical or (goal? adj3 set*) or coping plan* or logbook* or log book*).mp.	75608
33	(SMS or messages or messaging or texts or (email* and (correspondence* or communication* or day or daily or week or weekly or month or monthly or motivat*))).mp.	84134
34	(selfmonitor* or self-monitor* or selfregulat* or self-regulat* or individualised or individualized or personalised or personalized or personal assistant* or personal train* or person* tailor*).mp.	221969
35	(teleconferenc* or tele-conferenc* or group meet* or social network* or online network* or online communit* or workshop* or work shop*).mp.	92527
36	((face adj2 face) or contact session*).mp.	329042
37	(augmented or guided or supervised or synchronous or asynchronous).mp.	458757
38	or/30-37	1647581
39	29 and 38	8189
Study Type: Systematic Reviews		
40	"systematic review"/	291662
41	(systematic review? or evidence report* or technology assessment?).jw.	27195
42	meta-analysis/ or network meta-analysis/	219567
43	(meta-analys* or metaanalys* or meta-synth* or metasynth*).tw,kf.	345893
44	(systematic or structured or evidence or trials or studies or interventions or diagnostic* or predicti* or economic* or cost or costs).ti. and ((review or overview or look or examination or update* or summary).ti. or review.pt.)	486630
45	((systematic* or quantitativ* or methodologic* or evidence) adj5 (review* or overview*)).tw,kf.	510253
46	quantitativ* synthesis*.tw,kf.	2843
47	(integrative research review* or research integration).tw,kf.	213
48	(rapid review or mixed method* review or scoping review).tw,kf.	39262
49	(umbrella review or "review of reviews" or "overview of reviews").mp.	4061

50	(0266-4623 or 1469-493X or 1366-5278 or 1530-440X or 2046-4053).is.	22476
51	review.pt. and (medline or medlars or embase or pubmed or scisearch or psychinfo or psycinfo or psychlit or psyclit or cinahl or electronic database* or bibliographic database* or computeri#ed database* or online database* or pooling or pooled or mantel haenszel or peto or dersimonian or der simonian or fixed effect or ((hand adj2 search*) or (manual* adj2 search*))).tw,kf,hw.	255735
52	exp Technology Assessment, Biomedical/	12698
53	(technology assessment* or HTA or HTAs or technology overview* or technology appraisal*).tw,kf.	12932
54	or/40-53	941409
55	17 and 54 [Wearables]	2137
56	25 and 54 [Fitness Trackers]	529
57	39 and 54 [Tracking exercise/movement – other]	624
58	or/55-57	2861
59	limit 58 to yr="2020 -Current"	2127
60	limit 59 to english language	2110