

Apps-olutely fabulous? - The quality of PFMT smartphone app content and design rated using the Mobile App Rating Scale, Behaviour Change Taxonomy, and guidance for exercise prescription

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### Hypothesis/aims of the study

Mobile health is increasingly popular to support self-management of health. Smartphone apps may be a useful addition to the health professional 'toolkit' to support PFMT self-management, but only if apps 'engage' users, provide behavioural support, and contain an effective exercise program. This systematic review of smartphone apps, designed to support PFMT in women, aimed to assess app quality against recognised 'gold standards' for content and design in order to: (a) support clinicians recommending apps, (b) outline a repeatable review process for use as new apps enter the market, and (c) support app developers to make better choices about app design and content.

### Study design, materials and methods

Apple and Android smartphone app stores were searched ("kegel", "pelvic exercise", and "pelvic training") using fnd.io and Google Play respectively. Included apps were: designed and marketed to support PFMT in women, in English, were free or had a one-off install or upgrade cost. Excluded apps were: education only, men only, for use with a biofeedback or electrical device. Apps were downloaded to a smartphone (Apple iPhone 6 iOS 11.1.2 or Vodafone Smart N8 Android 7.0); if the app was on both app stores, the iOS version was assessed. Methods typical of systematic review – standardised templates,<sup>2</sup> or more independent raters, disagreements resolved through discussion – were used in screening, data extraction, and quality assessment. The Mobile App Rating Scale (MARS)[1] was used to extract general descriptive and technical information, and assess app design quality in 4 domains – engagement (5 items), functionality (4 items), aesthetics (3 items), information (7 items) – and subjective app quality (4 items). Domain, total domain, mean scores were calculated. MARS inter-rater reliability was estimated using the single measures intraclass correlation coefficient (ICC) via a two-way random effects model with absolute agreement. Data extraction for PFMT content was based on the Consensus on Exercise Reporting Template (CERT)[2] adapted app-based exercise. 1 CERT item (intervention fidelity) was not applicable and 3 CERT items were extended to capture maximum detail about behaviour change support (using a behaviour change technique (BCT) taxonomy[3]) and exercise prescription (using the American College of Sports Medicine (ACSM) recommended components of resistance exercise). We decided a priori that a clinically sound app it must offer users a potentially effective resistance PFMT program based on two core criteria (2 or more exercise sets/day; 8-12 contractions per set).

### Results

From 535 apps, 43 were second screened and 34 included (28 apps, with 6 upgrades; 18 Android, 8 iOS and 8 on both platforms; 17 free). **Exercise Content:** The number of CERT items addressed per app was 7 to 13 out of a maximum of 17. The majority of apps focused on strength training, and most recommended that users train daily. Apps tended to cover the frequency, sets, repetitions, contraction and relaxation times of exercise. Exercise intensity, rest time between sets, and how long to continue exercising were usually missing. Few apps distinguished a progressive from a maintenance exercise dose. **Behavioural Content:** The mean number of BCTs included was 14.2 out of 93 possible (Standard Deviation (SD) 5.5; range of 2-24). All apps had at least 2 BCTs, as the app itself is a prompt and cue (BCT 15) and the exercise instruction (e.g contract now, relax now) conserves mental resources of the user (BCT 6). The activity recording function in most apps also enabled users to review their behavioural goals (BCT 69), provided them with feedback on behaviour (BCT 8) and showed discrepancies between past and present behaviour (BCT 73). **App Quality:** The mean app quality score was 3.9 out of a maximum of 5 (SD 0.4; range 2.9-4.4). For the subjective quality scores, the mean was 3.1 out of 5 (SD 0.9, range 1.3-4.8). There was a moderate level of agreement between the two raters (ICC 0.75, 95% CI 0.55 to 0.87 for overall quality score; ICC 0.79, 95% CI 0.58 to 0.89 for subjective quality score). **Clinically sound apps:** 11 apps (7 Android, 4 both platforms; 7 free) out of 34 met the criteria for a potentially effective resistance PFMT program (Table 1). Only one app had been tested for efficacy in a randomised trial.

### Interpretation of results

Many apps scored reasonably for app design, but about two thirds of the apps reviewed were potentially ineffective to support PFMT to increase muscle strength; some of these had concurrent problems with limited coverage of other important exercise elements (e.g. exercise positions not clearly described)

and/or few behavioural supports (e.g. no exercise log). Eleven apps stood out as likely to support users to commence and maintain effective PFMT. Interestingly, these apps all addressed more CERT items, and included better than average numbers of BCTs. Therefore the best exercise apps also seemed to offer behavioural support, reinforcing the recommendation to choose an app from within this grouping. We noted two apps, developed by health professionals, included high density information and potential users might need a high level of language literacy.

Some limitations are that the app-specific findings will date quickly if existing apps are revised and as new apps become available, and our search is not complete (e.g. only English language apps). However, we have documented an explicit systematic process for finding and assessing apps that can be replicated to assess new PFMT apps.

Table 1: Apps that potentially supported effective resistance training, with MARS quality scores, number of CERT items addressed, and number of embedded BCTs

App Name	Platform	MARS Quality Score	MARS Subjective Quality Score	CERT items addressed (n/17)	Number of BCTs (n/93)
Healthy Bladder: Diary & Kegel	Android	3.46	3.00	10	15
Kegel Exercise	Android	3.36	2.00	11	15
Kegel Guide	Android	3.90	3.50	12	16
Kegel Guide (upgrade)	Android	3.90	3.25	12	16
Kegel Talent	Android	3.95	3.75	9	17
Kegel Talent (upgrade)	Android	4.09	4.75	11	17
Kegel Trainer - Pelvic Floor Exercises (base)	Android & iOS	4.00	3.75	10	15
Kegel Trainer Pro (upgrade)	Android & iOS	4.15	4.25	11	17
Kegel Workout: Exerciser	Android	3.58	3.50	10	15
Squeezy NHS Pelvic Floor App	Android & iOS	4.32	4.67	13	24
Tät	Android & iOS	4.16	4.25	12	17

### Concluding message

There are a number of clinically sound apps available to support PFMT self-management in women. These apps offer progressive resistance training likely to strengthen pelvic floor muscles and are similar regarding behaviour change support, functionality, aesthetics, etc. From this group of apps women, and health professionals working with them, could select an app that was preferred on the basis of cost, type of smartphone, or personal preference. Our systematic review used established methods of documenting app design and content quality, and demonstrated what is lacking in many apps; app developers can do a lot more to produce good quality content. In addition our methods are replicable and could be used by others to assess new versions of existing apps, or apps new to the market.