

# Development and Validation of a Tool to Measure Dietitians' Self-Efficacy with Using Mobile Health Apps in Dietetic Practice

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## ABSTRACT

**Objective:** To develop and validate a tool for assessing dietitians' self-efficacy with using mobile health (mHealth) apps in dietetic practice.

**Design and Participants:** A tool for measuring mHealth app self-efficacy among dietitians was constructed based on a literature review, consultation with experts, and Bandura's self-efficacy scales development guide. Senior dietetic students and new graduate dietitians in Australia ( $n = 100$ ) tested the tool.

**Outcome Measures and Analysis:** Validation of the tool was conducted using factor analysis. Reliability testing was undertaken to examine internal consistency and repeatability.

**Results:** Construct validity was demonstrated through extraction of 4 factors with significant loadings accounting for 68% of variance: efficiency and effectiveness of nutrition care, training and support, integration into dietetic work systems, and familiarity with apps. Internal consistency reliability overall was 0.90; 3 of 4 constructs had Cronbach  $\alpha > .70$ . Weighted kappas for test-retest reliability indicated moderate to substantial agreement (0.43–0.76).

**Conclusions and Implications:** This tool will be useful to researchers and dietetic associations interested in measuring dietitians' levels of mHealth app self-efficacy, developing interventions to enhance self-efficacy, and/or evaluating changes in self-efficacy after professional training. Testing of the tool in a more diverse sample of dietitians and among other health professional groups could enhance the applicability of the tool.

**Key Words:** dietetics, mHealth, self-efficacy, smartphones, survey development and validation (*J Nutr Educ Behav.* 2018;■■:■■–■■.)

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## INTRODUCTION

Mobile health (mHealth) apps are ubiquitous in major app stores (eg, Google Play Store, Apple App Store), with reports from 2017 indicating that 325,000 commercial mHealth apps exist globally.<sup>1</sup> These mHealth apps typically focus on overall health and wellness, including addressing diet and physical activity behaviors, and support the self-management of chronic diseases such as diabetes and

mental health conditions.<sup>2</sup> In the face of rising health and economic costs associated with obesity and related chronic diseases,<sup>3</sup> apps present opportunities to support existing frontline health services in nutrition behavior change, in a cost-effective and wide-reaching manner.<sup>4,5</sup>

Specializing in the provision of medical nutrition therapy (MNT), dietitians counsel patients and deliver treatments and therapies effective for modifying lifestyle behaviors and

promoting weight management.<sup>6,7</sup> Recommending mHealth apps to patients is common among dietitians; approximately 83% were reported in the US and other countries.<sup>8,9</sup> However, although these apps present an array of benefits to the nutrition care process (for example, to streamline dietary assessment and improve patient-provider communication<sup>10</sup>), it is rarer for dietitians to use mHealth apps directly to deliver MNT.<sup>9</sup> In particular, dietitians perceived that inadequate capability relating to familiarity and knowledge regarding the best apps available were barriers to using mHealth apps in their practice and patient care.<sup>9,11</sup>

An individual's belief in the capability to perform a task, such as using apps in patient nutrition care, is referred to as perceived self-efficacy.<sup>12</sup> With regard to adopting new technologies, self-efficacy is a predictor of the frequency of technological use and persistence in using them despite challenges.<sup>13</sup> A small number of

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validated tools were previously established to measure self-efficacy with other technologies, such as computers<sup>14,15</sup> and the Internet.<sup>16</sup> Bandura<sup>17</sup> advised that when measuring a particular domain of perceived self-efficacy, the scales developed must be tailored and specific to that domain. Existing tools designed to assess self-efficacy specifically with using apps and in the context of dietetic practice were unable to be located in the literature. The aim of this study was to develop and validate a tool designed to measure dietitians' self-efficacy with using mHealth apps in their practice.

## METHODS

### Subjects and Recruitment

The University of Sydney Human Research Ethics Committee provided approval for this study, which was conducted in Australia. Eligible respondents for the validation of this mHealth app self-efficacy tool had to be senior students (second year) of the masters of nutrition and dietetics program with clinical experience, or new graduate dietitians (graduated within the past 5 years) because these individuals would have had experience with seeing patients and therefore had potential opportunities to use or recommend apps to them. No restrictions were placed on whether respondents had previous experience with using apps. Junior dietetics students (first year of masters studies) were excluded because they had no patient experience. Dietitians who had graduated >5 years ago were also excluded from this study to avoid possible contamination, because this mHealth app self-efficacy tool was to be used as the instrument for assessing the primary outcome in another study where this population of dietitians would be recruited.

The researchers recruited respondents using a range of convenience sampling strategies including advertising on Australian dietitian-related websites, dietitian association e-newsletters, and social media groups. Dietitians were encouraged to share the survey link to this tool with their colleagues to achieve snowball sampling. The link was also distributed via e-mails to senior students and new

graduates of the masters of nutrition and dietetics program of an Australian university. Each respondent who completed the survey a second time for reliability test purposes was reimbursed with a \$10 shopping voucher, but there was no compensation for the first completion only.

### Development of the Tool

To develop this mHealth app self-efficacy tool, the researchers followed a systematic process for constructing survey tools,<sup>18</sup> particularly that of reviewing the literature, developing or adapting tool items, constructing the tool, and pilot-testing the draft tool.<sup>18</sup>

Relevant literature was searched on the use of mHealth apps by dietitians. Existing publications were reviewed to identify potential barriers and enablers to app use in dietetic practice and areas of continuing professional development that could influence dietitians' self-efficacy with using apps.<sup>8,9,11,19,20</sup> A range of personal mobile device, app, and workplace issues were identified as affecting the capability, opportunity, and motivation for dietitians to gain mastery experiences with using apps.<sup>9,11</sup> Some examples included poor awareness and inadequate training regarding which apps to recommend and a lack of workplace infrastructure to support smartphone and app use.<sup>9,11</sup> These aspects were thus considered important to explore in this mHealth app self-efficacy tool.

Compeau and Higgins' validated computer self-efficacy measure<sup>14</sup> has been adapted by other researchers<sup>21</sup> examining technology self-efficacy in rehabilitation settings, as well as self-efficacy with other emerging technologies such as e-learning systems<sup>22,23</sup> and mobile-assisted education and learning.<sup>24</sup> Questions from the computer self-efficacy measure were examined for relevance; where relevant, they were modified to assess mHealth app self-efficacy specifically. Bandura's<sup>17</sup> theoretical and practical advice for constructing self-efficacy scales guided the structure of items and design of this tool.

An expert group of 5 dietitians experienced in delivery of MNT in hospitals, private practice, and community

settings was consulted on the development of this mHealth app self-efficacy tool. They had practiced for 3–35 years and were currently working in research in a university public health nutrition and dietetics group in Australia. Members of the group had experience with applying behavioral theories such as self-efficacy constructs to various population groups and via mHealth technologies. Two rounds of iterations were undertaken to refine the content and wording of items in the tool.

The resulting 23-item mHealth app self-efficacy tool asked respondents to rate their certainty regarding using apps in the situations in dietetic practice posed by the items. The rating scale of answers was from 0, indicating *I am not able at all*, to 5, indicating *Moderately certain I am able*, and to 10, indicating *Completely certain I am able*. Additional information was collected concerning dietitians' personal and frequency of professional use and recommendation of mHealth apps, taken from a previous survey of dietitians' use of apps.<sup>9</sup> The survey questionnaire containing this mHealth app self-efficacy tool was made available online (SM-Create-Version 224.1; SurveyMonkey, LLC, Palo Alto, CA; 2017) between June 26, 2017 and August 26, 2017.

The repeatability of the tool was determined by re-administering the survey to more than half of the respondents a week after their initial response. A 1-week period was selected to allow sufficient washout,<sup>25</sup> while ensuring that practice and habits with using and recommending apps had not changed.

### Analysis and Psychometric Evaluation

To assess the psychometric properties of this mHealth app self-efficacy tool, statistical analyses were undertaken in SPSS software (version 24.0, SPSS, Inc, Chicago, IL, 2016).

**Validity.** Content validity was ascertained by involving 5 expert researchers in dietetics who had applied and theoretical experience with mHealth and self-efficacy. They reviewed and examined the content of

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