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Exploring young adult perspectives on the use of gamification and social media in a smartphone platform for improving vegetable intake

Monica Marina Nour*, Anika Saiyara Rouf, Margaret Allman-Farinelli

The University of Sydney, School of Life and Environmental Sciences, Charles Perkins Centre, Sydney, New South Wales, 2006, Australia

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ABSTRACT

Young adults are the poorest consumers of vegetables. Social media and smartphones are frequently used by this demographic and could serve as an engaging medium for nutrition promotion. Five focus groups were conducted to capture participants' perceptions of a theory-based gamified self-monitoring app for improving vegetable intake of young adults. Ranking activities were used to gather feedback on preferences for social media posts. Data arising from group discussion were analysed using NVivo software using a deductive approach to group common ideas into themes. Thirty two participants (14 males) attended (mean age 23.1 (SD 2.7) years). Qualitative analyses of open discussion revealed two major themes regarding preferred features for a smartphone app; (1) the use of visual guides for estimating quantities of vegetables and tracking progress, and (2) a simple interface. Gamification strategies such as earning badges were viewed more positively than the use of a self-reward framework. Social media posts which presented food pictures and recipes were ranked most motivating, while awareness-raising posts received lower scores. Participants indicated a preference for viewing but reluctance to post information onto social media. "Just in time" situational cues were ranked highly and the use of an "authoritative" tone was preferred and associated with credibility. Young adults also ranked messages containing "Gen Y" language highly, with a preference for those which were personally relevant. The proposed use of social media and mobile-gaming was seen as an acceptable approach for improving vegetable intake. Materials should be visually appealing, simply designed, credible, and personally relevant to appeal to this population. This feedback may inform future mobile-phone based interventions targeting improved nutrition in young adults.

1. Introduction

Young adults aged 18–34 years are the poorest consumers of vegetables among Australian adults (Australian Health Survey, 2013). Increasing vegetable intake can reduce chronic disease risk (Oyebode, Gordon-Dseagu, Walker, & Mindell, 2014) and improve indicators of psychological well-being such as life-satisfaction and happiness (Mujcic, 2016; Nguyen, Ding, & Mihrshahi, 2017). However, the lower likelihood of chronic disease during this life stage, and competing priorities may reduce the motivation of young adults to engage in longer-term behaviour change (Bibbins-Domingo & Burroughs Peña, 2010).

Research highlights that young adults lack self-efficacy for practicing healthful dietary behaviours (Strong, Parks, Anderson, Winett, & Davy, 2008). Specific barriers to consuming vegetables include low levels of cooking literacy, the perceived cost of vegetables, the time/effort required to prepare them and their undesirable flavour (Brug, Debie, van Assema, & Weijts, 1995; Hartman, Wadsworth, Penny, van Assema, & Page, 2013; Soliah, Walter, & Antosh, 2006). A meta-regression of 122 studies showed that self-monitoring is one of the best predictors of change in eating habits (Michie, Abraham, Whittington, McAteer, & Gupta, 2009). The process of monitoring can provide reflective insights on one's current behaviour, facilitating self-awareness, enhancing motivation for change (Li et al., 2011; Rapp & Tirassa, 2017) and increasing ability to achieve dietary goals (West et al., 2017). There is growing evidence to suggest that this process supports behaviour change (Kersten-van Dijk, Westerink, Beute, & IJsselsteijn, 2017; Lieffers & Hanning, 2012; West et al., 2017) and can also be useful in the maintenance phase for assessing divergence from the goal (Li et al.,

Abbreviations: SEIFA, socioeconomic index for areas.

* Corresponding author. Level 4 EAST, Charles Perkins Centre D17, John Hopkins Drive, The University of Sydney, NSW, 2006, Australia.
E-mail address: mnou2973@uni.sydney.edu.au (M.M. Nour).

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2011). This may be particularly relevant to young adults who usually struggle with self-regulation (Strong et al., 2008). With 95% of 18–34 year olds owning a smartphone in 2016 (Poushter), mobile applications (apps) may be a suitable platform through which young adults can easily self-monitor their diet (McGloin & Eslami, 2015).

Social media and mobile-gaming may also serve as an engaging way to deliver nutrition interventions to young adults, with 91% of 18–29 year olds interacting on social networks and a further 91% of smartphone owners using their devices for gaming (Our Mobile Planet, 2013; Smith). Gamification, defined as the incorporation of game elements in a non-gaming context to evoke motivation (Cugelman, 2013), has been harnessed by researchers for the delivery of nutrition interventions (Nour, Yeung, Partridge, & Allman-Farinelli, 2017). Information sharing in online networks has also been proposed as a means to further promote positive health behaviours (Heaney & Israel, 2008, pp. 189–210). While evidence for use of these technologies is still emerging, some positive effects have been reported among young adults (Nour et al., 2017) and the general public (Hamari et al., 2014). A study by Orji, Vassileva, and Mandryk (2013) used a socially connected virtual reality mobile game app to effectively improve the knowledge and attitudes of young adults regarding selection of healthy options when eating out (Orji et al., 2013). Another study harnessed Facebook as a platform for the delivery of a group-based weight loss program, with improvements in fruit and vegetable intake observed post intervention (Cavallo et al., 2016).

Despite these positive outcomes, there is limited use of robust experimental designs (Seaborn & Fels, 2015) and many studies report low user engagement or drop-off in usage over time (Kelders, Kok, Ossebaard, & Van Gemert-Pijnen, 2012; Nour et al., 2017). Use of techniques for maintaining participant engagement is often neglected in intervention planning (Short, Rebar, Plotnikoff, & Vandelanotte, 2015) and future work should consider engagement in the design process to combat this.

Supported by the Elaboration Likelihood Model (Petty, Barden, & Wheeler, 2002), researchers in the field of engagement have highlighted the importance of persuasive design (Kelders et al., 2012; Short et al., 2015); whereby an individual is more likely to engage with and process intervention material when it is personally relevant. Focus groups provide valuable insights into the needs and expectations of users (Thompson, 2014). However, participant responses may sometimes result in incongruence between researcher learning objectives based on theory and the design elements participants suggest (Vasalou et al., 2012). For example, users may suggest a certain feature for inclusion in a smartphone intervention that is unlikely to support the intended change in behaviour. Contrastingly, involving the target population as "informants" who provide feedback on the relevance and motivational capacity of intervention strategies developed by professionals has been shown to enhance the effectiveness of digital interventions (DeSmet et al., 2016).

Our primary aim was to test the feasibility and acceptability of a theory-based smartphone intervention for young adults that combines social media, self-monitoring and mobile-gaming to address the most salient psycho-social and environmental determinants of vegetable intake reported in the literature including taste, cost, availability, knowledge and self-efficacy (Hartman et al., 2013). This formative research will inform the framing of the smartphone intervention by gathering prioritised, objective, and quantified feedback from the target group on the proposed content (behaviour change messages and social media posts). Perceptions of the planned approach which uses social media and a mobile-application will also be captured.

2. Methods

2.1. Development of intervention materials

The COM-B framework (Michie, van Stralen, & West, 2011) and Taxonomy of behaviour change techniques (Abraham & Michie, 2008) were used to translate the determinants of vegetable intake into context-specific behaviour change strategies for use in an intervention to improve vegetable consumption of young adults. The COM-B framework is a psychological model which supports the process of changing human behaviour by addressing the "pre-requisites" for a given behaviour. This involves ensuring the individual is capable of physically performing the behaviour (i.e. they have the necessary skills) and is psychologically equipped with the necessary knowledge. The model also addresses the opportunity an individual has to engage in the behaviour, including physical opportunity such as triggers within the environment and social opportunity such as addressing cultural norms. Finally, instilling motivation by targeting reflective motivation such as one's beliefs and automatic motivation such as reflex and habitual responses is important (Michie et al., 2011).

We developed the prototype for a smartphone application (app) for monitoring vegetable intake. Research on self-regulation of health behaviours has indicated that goal setting is an important component of habit formation (Mann, De Ridder, & Fujita, 2013). Thus, on initial log in to the app, users are prompted to set a goal for daily vegetable serves. To cater to the experience level of non-expert trackers, simple visual representations of progress were used to minimise cognitive load and ensure easy interpretation of personal data (Rapp & Cena, 2016). As shown in the wire frames utilised for acceptability testing (Fig. 1a–d), progress toward the personal goal can be reviewed through the carrot gauge which fills up as intake is entered (Fig. 1a and b). A traffic light system is used to provide an overview of weekly achievements, where green indicates goal attainment and amber represents progress towards the intake goal (Fig. 1a). Intake is tracked according to type of vegetable and the meal in which it is consumed (Fig. 1c). Self-monitoring may be short-lived (Rapp, 2015), and users may struggle with maintaining personal data records as they forget to track or purposely skip entries (Rapp, 2017). For this reason, we proposed the use of gaming rewards such as points and badges to maintain engagement. In this virtual reward prototype (Fig. 1a), achieving ones goal allows for the accumulation of points, rewarded with 'in app' badges. Experts in the field have questioned the effectiveness of these gamified rewards (Rapp, 2015), and highlighted the importance of using meaningful rewards that reflect user's needs and desires (Rapp, 2017). As such we also designed a self-elected reward prototype for testing (Fig. 1b) in which users elect their own rewards to self-administer after completing each challenge level (e.g. level 1: meet your goal 2 times this week and reward with a new book).

Additional components that could be integrated were also tested. This included a series of push notifications for delivery through the mobile app. Messages were one to two sentences long and addressed barriers such as taste, included tips on how to substitute vegetables into the diet, and provided motivational messages describing the health benefits of vegetables. Some messages used short hand writing known as "text talk", replacing words with characters to reduce length for delivery to the notifications screen. To test the acceptability of this style of writing we developed messages in both short hand and standard language. For example, *"RU adding Veg 2 ur diet? Make the change - replace those chips with Veggie sticks"* (short hand); *"Worried about the taste of vegetables? Up the flavour! Add some herbs and spices"* (standard).

Advertisements often manipulate the tone of voice in messages