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Title: A Different Perspective on Consumer Engagement: Exploring the Experience of Using Health Apps to Support Healthier Food Purchasing.

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Mary McCarthy is Professor of Marketing in the Department of Management and Marketing in the Cork University Business School at University College Cork. She is also a member of the Health Research Board Centre for Health & Diet Research in Ireland. Mary's research interests lie in the field of consumer food behaviours where she explores the social, cognitive, and economic factors that influence food consumption patterns and specific food choices. Mary has published widely in journals such as *Appetite, European Journal of Marketing, Health Communication,* and *Psychology and Marketing*.

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Abstract

Healthy food purchasing behaviour may be facilitated through the use of health apps if used for the necessary time period. However, little is known on the factors that influence the user experience and facilitate or impede their continued use. The purpose of the present research is to explore the lived experience of using a health app to support healthier food purchasing behaviour. Findings identify the presence of behaviour change motivation and anticipated effort levels as drivers of app engagement. It appeared that behavioural, cognitive, and emotional dimensions of engagement may influence one another, driven by contextual influences, to simultaneously contribute to the intrinsic experience of engagement. The research makes practical and theoretical contributions to the consumer engagement literature and highlights the need to focus on understanding and capturing the specific engagement context to better understand engagement.

Summary Statement of Contribution

The present research contributes in three ways. First, engagement dimensions are proposed to influence one another to concurrently contribute to the individual expression of engagement. Second, anticipated effort is proposed as a driver that steers the engagement process. Third, we illustrate in an applied setting that positive app engagement occurs when user self-congruence is supported. Findings emphasise the importance of contextual influences on consumer engagement and the need to capture such nuanced influences to gain an improved understanding of engagement.

Keywords: user experience, engagement, healthy eating, food purchasing, app, self-congruence.

Introduction

Unhealthy dietary patterns constitute a leading risk factor for ill health globally (Institute for Health Metrics and Evaluation, 2013, Global Burden of Disease (GBD) 2015 Risk Factors Collaborators, 2016) with inadequate dietary patterns, such as those low in fruit and vegetables, proposed to have contributed to approximately 32% of global deaths in 2017 (Stanaway et al., 2018). Implementation of consumer initiatives that support healthier food choice are needed, particularly amongst consumers from a lower socioeconomic background who typically report unhealthier dietary patterns (Department of Health and Ipsos MRBI, 2016; McCartney et al., 2013). Food purchasing represents an important step in the food consumption process (Sobal, Kettel Khan, & Bisogni, 1998) and the majority of food consumed is purchased in the supermarket (Department for Environment, 2015; safefood, 2013). Consequently, supporting healthier purchasing behaviour may improve the healthfulness of foods available for consumption in the home and offers a potential approach for improving dietary patterns.

Changing consumer behaviour towards healthier food purchasing, however, may be viewed as effortful for a number of reasons. Inadequate nutrition-related human capital resources, such as nutrition knowledge and cooking skills, may restrict the ability to make healthy food choices (Anderson, Milburn, & Lean, 1995; Hollywood et al., 2013; Larson, Perry, Story, & Neumark-Sztainer, 2006). Furthermore, a dominance of routine and habitual behaviours in existing purchasing patterns may limit the influence of newly-adopted health goals and the consumer's ability to draw upon deliberative decision-making processes to inform food choice (van't Riet, Sijtsema, Dagevos, & De Bruijn, 2011). However, consumers may be supported to address such challenges through introducing changes to the purchasing context, aiding individual self-regulation of purchasing behaviour, and appropriate reinforcement of the desired behaviour (van't Riet, et al., 2011).

Recent advances in technology position apps as a potential tool with which to support healthier food purchasing behaviour. Consumers spend the majority of the day within reach of their phones (Dey et al., 2011) and are claimed to spend approximately two hours using apps daily (App Annie, 2018). Such a strong attachment amplifies the possibilities for interacting with consumers at various times during the day and in those contexts of relevance for food purchasing. Furthermore, the high use of apps across all social groups (Deloitte, 2014; eir, 2015) suggests that they may be an appropriate tool for supporting behaviour change in lower socioeconomic groups and help address the health disparities that exist (Graham, Ostrowski, & Sabina, 2016). However, one of the challenges encountered in the area of health apps is encouraging their uptake by the intended audience and supporting their continued use for effective behaviour change (Michie, Yardley, West, Patrick, & Greaves, 2017). While apps are viewed by lower socioeconomic consumers as an appropriate means of supporting healthier food purchasing behaviour (Ball, Mouchacca, & Jackson, 2014; López et al., 2017), there is limited research on those factors that influence the user experience and contribute to or hinder continued app use in the context of healthier food purchasing behaviour. Such insight is necessary to inform the improved design of health apps and related interventions to support healthier food purchasing behaviour.

The present research seeks to attend to some of these gaps in the literature by addressing the following questions. First, what is the experience of consumers using a health app to support a change towards healthier food purchasing behaviour? Second, what are the factors, personal and app-specific, that influence this experience? Thus, the present research does not aim to examine individual food purchasing behaviour but focuses on the individual's interaction with the app and their reflection of this experience as they seek to change their behaviour. The limited literature available in this area necessitated the use of a qualitative, phenomenological exploration of the lived user experience to gain the in-depth insight desired. This approach

employed an inductive analysis of the lived user experience where no prior theoretical framework was applied but the relevant knowledge of the authors was drawn upon to refine and situate the findings in an appropriate theoretical context. It was through this inductive analysis that the relevance of consumer engagement theory was recognised as the main themes that were identified aligned with the existing theory of consumer engagement. Consequently, findings were positioned within this theoretical framework and shaped the subsequent discussion of these findings.

The paper is presented as follows. A review of the literature in relation to health apps and healthy food purchasing behaviour is outlined followed by an overview of consumer engagement theory. It is necessary to define our conceptualisation of engagement at the outset to ensure the reader can best understand the presented findings and subsequent discussion. The methods employed to explore the user experience are then described alongside an account of the thematic analysis undertaken. Our findings are then presented alongside a relevant conceptual model and discussed in relation to the extant literature. Theoretical and managerial implications are outlined and potential limitations are acknowledged.

Health Apps and Healthy Food Purchasing Behaviour

The rise in health apps in recent years has been substantial with an estimated 325,000 health apps currently available (Research2Guidance, 2017) and an increasing number of consumers looking to health apps as a source of nutrition information and to aid behaviour change (Lieffers, Vance, & Hanning, 2014; Schoeppe et al., 2016). The capabilities of apps have evolved vastly since their introduction in 2008 leading to their greater use as a means of interacting with consumers and influencing behaviour (Shankar et al., 2016). In the context of healthy food behaviour, existing apps have been used as an educational tool to increase nutrition knowledge, as a means of monitoring dietary goals, and as a social support network

through provision of access to online groups (DiFilippo, Huang, Andrade, & Chapman-Novakofski, 2015; Dunford et al., 2014; Lieffers, Arocha, Grindrod, & Hanning, 2018). Evidence suggests mixed, yet promising, results for their effectiveness in supporting healthier food behaviours (Covolo, Ceretti, Moneda, Castaldi, & Gelatti, 2017; DiFilippo, et al., 2015; Schoeppe, et al., 2016), although issues in relation to heterogeneity of study outcome, small sample sizes, and short study duration prevent definitive conclusions from being drawn.

The evidence for using health apps to support healthier food purchasing behaviour is more limited. Lopez et al. (2017) developed MyNutriCart which is an app that translates healthy eating guidelines into a shopping list taking preferences and financial resources into consideration. However, its impact on purchasing behaviour is less clear as family preferences and availability of recommended healthy food products remained as barriers. Another app, FoodSwitch, aims to support healthier purchasing behaviour through provision of nutrition information and advice on healthier in-store substitutions (Dunford et al., 2014). However, it is unclear if such behaviour change strategies are likely to address those routine and habitual elements that typically direct food purchasing behaviour (Wood and Neal, 2009). Addressing these elements are necessary if sustained behaviour change is to be achieved (van't Riet et al., 2011). Previous work undertaken by the authors (no reference at this point for anonymisation purposes) illustrated that some existing health apps may be effective at supporting healthier food purchasing behaviour as they integrated relevant behaviour change techniques (Michie, et al., 2017) and appropriate nutrition information (Franco, Fallaize, Lovegrove, & Hwang, 2016; Lieffers, et al., 2014). Thus, these apps warrant further consideration as a tool to support healthier food purchasing behaviour.

As discussed earlier, one of the challenges faced in the area of health apps is ensuring that the app is used for the time period necessary to affect behaviour change, although this may differ for different behaviours and interventions which adds further complexity (Michie, et al., 2017).

An imbalance between the integration of theoretical content relevant to behaviour change and user quality features may decrease the acceptance of an app and the likelihood that it will be used for the time period necessary to support behaviour change (Hingle and Patrick, 2016; Tang, Abraham, Stamp, & Greaves, 2015). The extent to which the app is viewed as fun, enjoyable, and trustworthy by the user may also have an impact on its continued use (Bruner & Kumar, 2005; Lowe et al., 2015; Nysveen et al., 2005). However, the literature in relation to the healthier food purchasing context is limited. Ball et al. (2014) found that ease of use and provision of relevant information were associated with continued use while high perceived effort had a detrimental impact on usage. The need for personally relevant information was also important in the use of the SmartAPPetite app, which was designed to influence healthy food purchasing and consumption behaviour (Gilliland et al., 2015). However, these studies fail to give sufficient insight into the individual user experience. Differences in nutrition knowledge, behaviour change orientation, previous experience, and self-efficacy may influence the user's experience and their intention to continue use (Chen, Cade, & Allman-Farinelli, 2015; Franco, et al., 2016; Hsu and Lin, 2016; Lieffers, Haresign, Mehling, Arocha, & Hanning, 2016; Lowe, Fraser, & Souza-Monteiro, 2015). The authors proposed that understanding the influence of both personal and app-related factors on the user's experience and continuation of use will allow for an improved design of apps and related interventions to support healthier purchasing behaviour.

Consumer Engagement

Engagement has been employed across a wide variety of social fields including employee engagement, student engagement, and social engagement but most recent developments have emerged through the study of consumer engagement (Brodie, Hollebeek, Jurić, & Ilić, 2011; Brodie, Ilic, Juric, & Hollebeek, 2013). Our conceptualisation of consumer engagement aligns with that of Brodie et al. (2011, 2013) and Hollebeek (2011a) where it reflects an individual-

specific, context-dependent, psychological state that emerges through two-way interaction with an object. Engagement is conceptualised as existing in three distinct dimensions: behavioural, cognitive, and emotional. Behavioural engagement relates to the time and effort invested by the individual in a particular object; cognitive engagement is demonstrated through the cognitive processing of object content, such as interpretation or sharing of information; while emotional engagement signifies an affective connection between the user and object (Hollebeek, 2011a). In the present research, the health app represents the focal object of engagement for consumers set within the context of their daily lives. Engagement is regarded as an iterative, dynamic process that is characterised by fluctuating levels of intensity (Brodie, et al., 2011; Brodie, et al., 2013). Furthermore, engagement can be viewed as a process of positive self-control that ensures consistency with personal goals and congruency with the user's perception of their relevant self-concept (Calder, Malthouse, & Maslowska, 2016b). However, competing goals may generate negatively valenced engagement (Hollebeek and Chen, 2014a) that simultaneously contributes to the individual state of engagement and the intensity of engagement demonstrated (Dolan, Conduit, & Fahy, 2016; Heinonen, 2018).

The consumer engagement literature offers a number of antecedents that stimulate initiation of engagement. Participation, the extent to which a consumer contributes to service production and delivery, has been cited as an antecedent (Brodie, et al., 2011; Vivek, Beatty, & Morgan, 2012), although empirical findings offer mixed results (Leckie, Nyadzayo, & Johnson, 2016). Flow, a psychological state of optimal experience characterised by complete focus, control, and intrinsic enjoyment, is also posited as a potential antecedent (Hollebeek, 2011b; Mollen and Wilson, 2010). Furthermore, consumer involvement has been consistently demonstrated as an essential antecedent of engagement (Brodie, et al., 2011; Dessart, 2017; Hollebeek, Glynn, & Brodie, 2014b; Leckie, et al., 2016). In the engagement literature, involvement relates to "*an individual's level of interest and personal relevance in relation to a focal object/decision*

in terms of his or her basic values, goals, and self-concept" (Brodie, et al., 2011). It influences the extent to which an object is viewed as personally relevant and relates to the user's motivation to engage (Brodie, et al., 2011; Leckie, et al., 2016). Thus, different stimuli may drive consumer engagement.

Drawing upon social exchange theory, individuals are proposed to engage with an object as a means of reciprocating positive thoughts, feelings, and behaviours when receiving related benefits (Hollebeek, 2016). During any engagement interaction, consumers continually assess the perceived personal value attained and the personal investment required in behavioural, cognitive, and emotional terms (Hollebeek, 2016). The degree to which an object can support goal attainment or ensure congruency with an individual's self-concept contributes to perceived personal value (Calder, et al., 2016b; Viswanathan et al., 2017). The perceived value of engagement is important as a consumer is more likely to continue their engagement if the interaction is considered valuable leading to the formation of a relationship (Brodie, et al., 2013; Viswanathan, et al., 2017). In contrast, a perceived imbalance between perceived value and personal investment may prompt the consumer to disengage on a temporary or permanent basis (Dolan, Conduit, Fahy, & Goodman, 2016; O'Brien and Toms, 2008). In the context of the present research, such disengagement is likely to reduce exposure to the necessary behaviour change techniques which may negatively influence the potential effectiveness of the app to facilitate change.

Drawing on the presented literature, the following research questions were developed: 1) what is the experience of consumers using a health app to support a change towards healthier food purchasing behaviour?; and 2) what are the factors, personal and app-specific, that influence this experience? The methods employed to address these research questions will next be described, followed by the findings and a discussion of their relationship to the extant literature.

Methodology

A qualitative approach, drawing upon phenomenological and experience-centered design perspectives (Patton, 2002; Wright and McCarthy, 2010), was adopted to explore the lived experience of using health apps to change food purchasing behaviour among a lower socioeconomic cohort. This exploratory approach allowed in-depth insight into the lived experience while taking account of the personal, social, and environmental factors that may influence the user experience. Rigour was ensured by applying the strategies outlined by Nicholls (2009) during data collection and analysis. Ethical approval was granted by the University Ethics Committee.

Sample

A purposive sample of 12 women aged between 18 – 50 years from a lower socioeconomic background participated. Consumers from a lower socioeconomic background were chosen as they typically report unhealthier dietary patterns and are likely to benefit from an app-led dietary intervention (Bender et al., 2014; Department of Health and Ipsos MRBI, 2016; McCartney et al., 2013; Miller Jr et al., 2017; Vandelanotte et al., 2016). Socioeconomic status was determined by the occupation (current or most recent) and employment status of the household's primary income earner which is in line with the national approach for socioeconomic group classification (Central Statistics Office, 2012). Individuals were classified as lower socioeconomic if the primary occupation was in any of the following categories: non-manual, manual skilled, semi-skilled, or unskilled (Central Statistics Office, 2012)[1]. This approach classifies individuals into different socioeconomic categories on the

[1] Examples of occupations included in the eligible socioeconomic categories - Non-manual: waitress, beautician, administration assistant; Manual skilled: electrician, plasterer, butcher; Semi-skilled: security guard, scaffolder, care assistant; Unskilled: labourer, refuse collector, cleaner.

basis of the level of skill or educational attainment required rather than income alone (Central Statistics Office, 2012). This age category was chosen as they were considered most likely to use a health app (Bhuyan et al., 2016; Bol, Helberger, & Weert, 2018; Deloitte, 2014).

Women were chosen as they are typically primarily responsible for the acquisition and preparation of food in the home (Inglis, Ball, & Crawford, 2005). Participants were required to hold primary or equal responsibility for food purchasing in the household, own a smartphone capable of downloading an app, have previously downloaded an app, and not previously used the apps being examined. As an individual's motivation to change can influence behaviour change, participants were required to be contemplating, preparing, or have attempted a change towards healthier food behaviour in the previous six months, in line with the transtheoretical model of change (Glanz, Rimer, & Viswanath, 2008, pp 98-102). An adapted version of Armitage's (2006) measure was used to determine stage of change. This single-item measure asks respondents to choose one of five categories that best reflects their current stage of change in relation to healthy eating. Pregnant women or those diagnosed with diet-related health conditions, where restricted diets were necessary, were not eligible to participate as clinical support was not available. Table 1 outlines participant characteristics. Pseudonyms have been used to protect identity.

INSERT TABLE 1 HERE

Recruitment

Participants were recruited through community groups in identified areas of urban disadvantage in Cork city, which is the second largest city in the Republic of Ireland. A study overview was sent via email to an identified group coordinator who was asked to share the information with relevant community groups. Interested individuals could contact the lead

author directly. The lead author also spoke with community groups that expressed an interest in the study but desired further information before consenting to participate. Upon contact with the lead author, further information was provided which detailed the commitment required from the participant. Participants were subsequently asked to complete a questionnaire assessing eligibility. In total, twenty-four women expressed an interest in taking part and six were considered ineligible due to incorrect stage of change or the presence of a diet-related health condition. Theoretical data saturation was considered to be achieved after ten participants and no new themes were apparent in the final two interviews. Participant recruitment was subsequently discontinued whilst also ensuring a varied sample of women were recruited in relation to age and parental status. Variation in terms of ethnicity was not emphasised as approximately 85% of the city's population report being from a White Irish background (Central Statistics Office, 2016). Rather sample homogeneity was focused on socioeconomic status, motivation to change, and food purchasing responsibility in the household. This sample size was considered sufficient as the homogeneity of the sample, due to the strict eligibility criteria, means that saturation can be achieved with a lower number of participants and allows for theme generation (Braun and Clarke, 2013, pp 42-74). Recruitment took place between February and June 2017.

Knowledge levels may influence information processing and subsequent acceptance of information (Lien, 2001). Nutrition knowledge may influence the degree to which the information provided in the app is processed and accepted by the user, which may subsequently influence their app use. As there is often a discrepancy in nutrition knowledge between health professionals and the public (Blake, Bisogni, Sobal, Devine, & Jastran, 2007; Povey, Conner, Sparks, James, & Shepherd, 1998), it was necessary to obtain an objective measure of nutrition knowledge to gain a fuller understanding of this relationship. Consequently, upon confirmation of eligibility and receipt of consent, participants were asked to complete a baseline

questionnaire to assess their nutrition knowledge. This nutrition knowledge index was developed by Turrell and Kavanagh (2006) using a consensus approach by an expert group of nutritionists and dietitians. It was chosen for use in this study as it was designed specifically to assess general nutrition knowledge of relevance to food purchasing in different socioeconomic groups. Twenty statements were presented to participants and they were asked to confirm whether they believed each statement was true, false, or didn't know the answer. A score of one was given for each correct response and zero was given for an incorrect or 'don't know' response, in line with the scoring guidelines provided by the authors. Table 1 outlines participants' nutrition knowledge levels where 0 represents low nutrition knowledge and 20 represents high nutrition knowledge. The average score was 15 for the present sample which is similar to the average score of 16 in the original study undertaken by Turrell and Kavanagh (2006).

Procedure

The apps chosen for use in this study were drawn from a content analysis of existing apps that was conducted previously by the authors (no reference for anonymisation purposes). This content analysis assessed the quality of existing apps in relation to nutrition information, behaviour change theory, and user quality. This previous analysis found that existing apps primarily focus on weight-loss as the main goal and that healthy food purchasing behaviour is addressed as a component of this broader goal in some apps. Apps were considered to be potentially effective at supporting a change towards healthier food purchasing behaviour if they provided appropriate nutrition information to build human capital resources (Franco, et al., 2016; Lieffers, et al., 2014), had good overall user quality (Stoyanov et al., 2015), and integrated behaviour change techniques (Michie et al., 2013) of relevance to supporting healthier purchasing behaviour. The three apps that best met these criteria, based on the aforementioned content analysis, were chosen for use in this study. Table 2 provides further

details on the study apps. All apps were free and publicly available on both GooglePlay and iTunes app stores.

INSERT TABLE 2 HERE

Upon recruitment, participants were randomly assigned to use two of these three apps separately for a one week period (i.e. app A for week one and app B for week two). Participants were asked to use two different apps to ensure exposure to different variations of features in terms of behaviour change techniques and user quality. This would allow for an implicit comparison of the apps by the individual and provide a greater insight into the lived user experience. Assignment order was randomised using an online randomisation programme (www.randomizer.org) to minimise order bias. A text message was sent to participants with a link to download their first app. They were asked to confirm that they had received the message and downloaded the app. Support was provided if there were any problems with downloading and using the specific app. A week later, another text message was sent with a link to download their second app. They were asked to stop using the first app and focus on the second app for a week. In order to imitate a real-life setting, participants were asked to use the apps as they would normally and were not required to use either app in a specific manner or for a set amount of time throughout the study.

Semi-structured interviews were conducted once participants had used both apps for the required time in a neutral location easily accessible for the participant. The interview topic guide was developed collaboratively by all authors drawing on relevant literature and focused on understanding the lived experience of using the apps, and beliefs and attitudes towards healthy eating, behaviour change, and apps. Interviews were audio recorded apart from two interviews where notes were taken during and immediately after the interview at the request of

the participants. The average interview time was 43 minutes and ranged from 25 to 54 minutes. All interviews were conducted by the lead author, transcribed verbatim, and checked for accuracy and completeness against the original audio material.

Analysis

Inductive thematic analysis was conducted in line with the guidelines provided by Braun & Clarke (2006) using the NVivo 11 software package. A thematic analysis approach was employed as it was of interest to explore common patterns across participants' experiences (Braun and Clarke, 2006). Familiarisation comprised of listening to the recorded interviews, multiple readings of the transcripts, and note-taking. Initial codes were defined and applied to the data and newer codes identified upon subsequent readings were also applied. Initial themes and relationships were subsequently developed. Coding and initial theme development was undertaken by the lead author. Initial themes were subsequently discussed with co-authors in the context of relevant theoretical perspectives. The research team is comprised of researchers in the field of public health nutrition, economics, and consumer behaviour which allows a broad knowledge set to be drawn upon during the analytical process which supports credibility of findings.

As discussed previously, it was through such discussion that the relevance of recent research in the area of engagement, and in particular the conceptualisation of consumer engagement (Brodie, et al., 2011; Calder, et al., 2016b; Hollebeek, 2011a; Hollebeek, et al., 2014b) became apparent. Drawing on relevant literature, further refinement of themes and relationships was conducted with continuous discussion between co-authors to ensure credibility. This literature was subsequently used to frame the positioning of themes and relationships and a conceptual model was developed which best illustrated the proposed relationships. Refinement of themes,

relationships, and the final conceptual model continued until a final agreement was reached between co-authors.

Results

Drawing on the main themes developed through the inductive analytical process, the conceptual model (Figure 1) outlines the engagement process as experienced by participants. Motivation to change behaviour and anticipated effort are proposed as drivers that steer initial engagement with the app. The intrinsic expressions represent the way in which engagement was experienced at an intrinsic level by the participant. It is proposed that behavioural, cognitive, and emotional engagement do not necessarily occur in isolation and that dimensions of engagement may influence, mediate, and moderate one another depending on the particular engagement context. This swirl of engagement is represented in the model by the arrows between engagement dimensions. Driven by contextual influences, individuals may engage behaviourally, cognitively, or emotionally to a different extent leading to variation in the particular configuration experienced at a given point in time. It is this particular configuration that is experienced in a real-life context and may be expressed intrinsically as a sense of personal autonomy, a perceived increased capacity to change, and the perception of the app as a confidential and empathetic ally. Furthermore, relationship formation, dormancy, and disengagement were considered potential consequences in the engagement process as experienced by participants. The following sections discuss these findings further.

INSERT FIGURE 1 HERE

Drivers of Engagement

Particular factors were demonstrated as drivers of engagement and consequently needed to be satisfied for engagement to take place. The participant's motivation to change their behaviour and the anticipated level of required effort were of importance in this context.

Motivation to Change Behaviour

Sufficient motivation to change food behaviour was perceived to be essential for engagement. While sufficient motivation to change was a requirement for study participation, the level of motivation between participants clearly differed. The app was viewed as more relevant to individuals in earlier stages of behaviour change when motivation was perceived to be higher. Louise, a mother with average nutrition knowledge, viewed the apps as more relevant to those beginning their journey of behaviour change: '*it would benefit somebody a lot more that's only starting off, that's not 100% with their shopping or don't know where they are on buying proper healthy food*'. Louise believed that such individuals had a greater interest in changing their behaviour which she viewed as necessary for engagement. In contrast, Louise saw herself as further progressed in her behaviour change and acknowledged that her current motivation and interest was lower than during earlier stages of change. She subsequently viewed the apps as less personally relevant and was less likely to engage.

A similar sentiment was expressed by Bridget, a stay-at-home mother of four children, who had previously used health apps to facilitate behaviour change. She also viewed the apps as more relevant for those in an earlier stage of behaviour change but did not perceive herself as currently being in the appropriate stage: "*it was just me and where I'm at*". Consequently, she considered herself less likely to engage with the apps at present but that she may engage in the future if she relapsed to unhealthier patterns of consumption and her motivation to change behaviour increased. The importance of motivation to change was also expressed by Patricia, who considered herself in an earlier stage of change where she was preparing to make changes

to her food behaviour: "*I think it depends on where you are, you have to be ready to change…it's right for now*". Thus, she was prompted to engage with the app as she was sufficiently motivated to change and considered the app an appropriate tool to facilitate such change.

Anticipated Effort

Anticipated effort relates to both the cognitive effort and time commitment that was assumed to be required to use an app effectively to change behaviour. Drawing on previous experience of app use and existing family and work commitments, participants set acceptable levels of effort for their app use. Anticipated effort needed to be within these acceptable boundaries for engagement to occur. Louise had previously used healthy eating apps and was cognisant of the effort associated with their use. She viewed the integration of self-monitoring features as particularly effortful especially in the absence of smart features which simplified the monitoring process. Louise had previously used an app where a barcode scanner was used to monitor food intake. She viewed the inclusion of a scanner as a means of minimising effort while maintaining accuracy: *'when I was scanning the barcode it was actually handy because it was telling me…if I was going over…I wasn't typing in all the carbs…and everything I was just scanning it'*. The integration of self-monitoring features without a complementary scanning feature resulted in an app being viewed as '*too time consuming*' as it wasn't expected to meet the acceptable effort level set by Louise. She subsequently did not engage with the app despite acknowledging that that app was *'pretty much the same as the other app [with the barcode scanner]'* in terms of potential effectiveness to support behaviour change. Thus, anticipated effort within acceptable individual levels was viewed as an important driver of the engagement process.

Intrinsic Expressions

Three intrinsic expressions of engagement are outlined in figure one. These relate to a sense of personal autonomy, where one experiences sufficient choice and control in their engagement; a perceived increased capacity to change, where the user viewed themselves as possessing a greater ability to change behaviour; and perception of the app as a confidential and empathetic ally, where the app was viewed as a trusted ally working with the individual to achieve change. These expressions reflect the lived experience of engagement and the way in which it may be experienced at an intrinsic level. It acknowledges that individuals do not experience engagement in individual, discrete compartments but a continuous and concurrent evaluation is undertaken which contributes to the subsequent user experience. Dimensions of engagement may influence, mediate, and moderate one another, as depicted by the connecting arrows in figure one, depending on the particular engagement context as users attempt to attain balance between personal investment and value attained. Differing contexts may prompt particular configurations of engagement and it is these different configurations that form the intrinsic experience. In the present context of engaging with a health app, a sense of personal autonomy, a perceived increased capacity to change, and the perception of the app as a confidential and empathetic ally, are proposed as the user's intrinsic expressions that are underpinned by differing configurations of engagement dimensions. The following sections discuss these intrinsic expressions, and the influence of underlying engagement dimensions, in further detail.

Sense of Personal Autonomy

A sense of personal autonomy relates to the user's perception of personal choice throughout their interaction with the app. It further encompasses the user's perceived ability to exert control over app use to ensure that behaviour change was congruent with their personal goals. This appeared to be underpinned by an investment of time and effort in app use and an in-depth cognitive processing of content to draw on the choices available in the app to take control of behaviour change. Apps were viewed as naturally suitable to fostering a sense of autonomy

due to their transferability to different contexts. This allowed the user to obtain appropriate information in a personally-relevant context. Carol, who is in her thirties and lives with her partner, highlighted the importance of such access: '*the convenience of it…just so versatile bringing it with you, around the place… if there was something on the shopping that you were like, "Oh, what, you know now, like, I'm going to check" [it]'*. Thus, the ability to engage behaviourally and cognitively in diverse contexts prompted this sense of choice and control.

The integration of features that could be tailored to individual needs, such as goal-setting and prompts, were of central importance in supporting this sense of autonomy. The process of exercising control allowed individuals to ensure the app was reflective of the self and ensure lower-order goals were aligned with more abstract goals. Marie, a mother of two sons and living with her partner, praised the ability to tailor behaviour prompts to individual needs: '*brilliant…everyone's schedules is different… a lot more amenable to…individual circumstances rather than you know eight o clock every morning you get this alert*'. Marie had set a daily prompt to bring a healthy lunch to work which she had identified as personally important. However, she expressed her dislike at being forced to choose a weight-loss goal in an app as this was not viewed as congruent with her self-concept: '*[I] would prefer to eat healthy and have weight-loss as an end product rather than having [to] track it'.* This conflict between lower-order and abstract goals resulted in cognitive dissonance which appeared to negatively influence her perceived sense of choice and control. Thus, a lack of congruency between the goals of the user and the app may negatively influence the user experience.

The importance of personal autonomy for continued app use was further demonstrated by Jennifer, a mother of three children who works two days a week. The apps that she used incorporated healthy meal plans that recommended different meal options for a weekly period. These plans could be tailored but the extent to which meals could be adapted was considered too restrictive by Jennifer. She was responsible for food shopping and cooking in her household

and meal options needed to meet the needs of her three children and husband and align with her weekly work schedule. A perceived inability to tailor the meal plans to "*accommodate whether you're a single person, whether you're a family of two or you're a family of three or four*" rendered such features unusable for Jennifer. This perceived lack of choice meant that she ended up "*making a dinner for me and a dinner for the kids*". This resulted in a conflict between individual health goals and family relationship goals and added further burden to the acquisition and preparation of food for the household. Consequently, it was not considered a sustainable approach for behaviour change by Jennifer. She desired a solution that allowed sufficient choice and control to enable alignment with goals and family food practices. This perceived lack of autonomy meant that the apps were not viewed as valuable and she subsequently terminated their use.

The nutrition-related human capital resources held by the user, such as nutrition knowledge and cooking skills, influenced the user's experience. The possession of such resources encouraged a greater investment in using the app as users were better able to adapt and apply information according to their particular needs. Patricia, a mother of one child with higher than average nutrition knowledge, expressed confidence in her cooking skills: "*I'm ok (with cooking)…I will probably put a twist of my own preferences into it…I like to try new things, sometimes I even buy things I don't know*", and enjoyed the opportunity afforded by the app to demonstrate such skills. Such competence and confidence prompted an investment of time and cognitive effort to utilise those app features of personal relevance and adapt accordingly to ensure the app was reflective of her goals. This simultaneous demonstration of behavioural and cognitive engagement appeared to foster a greater sense of personal autonomy.

Perceived Increased Capacity for Change

This intrinsic expression relates to the user's perceived increased capacity to change individual behaviour as a result of engaging with the app. Many participants felt that they understood what constituted a healthy diet, but also believed that they lacked the capacity to implement behaviour change and translate intentions into the desired healthier behaviours. App features that built human capital resources, such as nutrition knowledge, and facilitated self-regulation, such as monitoring of relevant behaviours, prompted different dimensions of engagement. The specific configuration of engagement subsequently contributed to the user's perceived increased capacity to change.

An enthusiasm to build nutrition knowledge was expressed by some participants to address some of the challenges faced when making healthy food purchasing choices. Andrea, in her thirties and living with her parents and brother, spoke of her confusion in relation to nutrition claims present on food products: '*there's stuff that you think that are kind of healthy or low fat are not low fat at all, because they'd be saying that the fat free is full of sugar is it no? Is it fat free? And what's the one that's fat free, low fat, so you're better off to go for a low fat one over a fat free one isn't it'.* She valued the opportunity afforded by the app to increase her knowledge as it would help to minimise this confusion and the perceived cognitive effort required to make a healthy choice. She believed that the app '*does [help] because if you were…starting off…the app is very…good…[to] give you a guideline to what stuff you should get rather than stuff you shouldn't get*'. The inclusion of features that built nutrition knowledge prompted an in-depth processing of nutrition content as she aimed to address those gaps in her personal resources, which she perceived enhanced her capacity to change.

There was a recognition amongst participants that increasing nutrition knowledge alone was not sufficient to change behaviour. Consequently, the integration of features that supported self-regulation was valued, such as goal-setting, self-monitoring, and behaviour prompts. Carol, who had an average nutrition knowledge score, found the integration of a self-

monitoring feature as particularly valuable. Drawing on her personal information and health goals, Carol invested time and effort to set a daily calorie goal and used the app to actively monitor her daily food intake in relation to this calorie goal. Investing time and effort in app use allowed for the provision of feedback on behaviour change progression and the remaining changes needed to achieve personal goals. This feedback encouraged further cognitive processing of app content to inform her process of behaviour change. Carol was able to modify her food behaviour in a timely manner to ensure progression towards her behaviour change goal: '*I'd finished everything so it was at the end of the evening and I was like, "Oh my God, I'm minus a thousand calories"…I actually was better the second day…I wouldn't have eaten as much, I was more conscious of what I was doing with it*'. Thus, behavioural engagement appeared to prompt cognitive engagement, and was subsequently experienced as a perceived increased capacity to change.

The process of engagement was not always expressed in positive terms and the needs for higher cognitive or behavioural engagement to achieve personal goals was a source of discontent for some. For example, Carol, who works full-time in an administration role, saw the time and cognitive effort required as onerous: '*for meals that you'd make yourself it was hard to decide which [food to input],… I just wasn't sure which one…[and] like, I had cucumber, tomato, lettuce, you've to put in cucumber, tomato, lettuce, so it just takes too long*'. This led to feelings of frustration as work, family, and social commitments may restrict the time and cognitive space available for the necessary level of engagement. This negatively valenced emotional engagement may influence the extent to which Carol experienced a perceived increased capacity to change as it was evaluated against the time and cognitive effort invested.

The integration of prompts was viewed as valuable. These worked by disrupting the routine and habitual elements of existing behaviour. This encouraged more deliberative decision-making where behaviour was driven by new goals rather than habitual performance of the

undesired behaviour. This view was expressed by Angela, who works full-time in a local community centre, as she discussed her previous experiences of behaviour change. Angela had previously attended a weight-management service where she would attend on a weekly basis to monitor her weight and get advice on healthy eating. However, a lack of interaction with the service between meetings often led to periods of lower motivation to change which resulted in unhealthier food behaviours driven by routine and habit. She used one of the apps to set daily reminders which encouraged a more regular interaction with the app. This interaction positively influenced her perceived capacity to change and she was now consuming healthier snack options, such as fruit and yoghurts, instead of biscuits. Similarly, Patricia, a married mother of one with a higher than average nutrition knowledge, expressed her satisfaction at the integration of prompts as '*every morning it reminds me why I want to do this*'. Such prompts encouraged a greater use of the app and a subsequent assessment of relevant content to inform her behaviour change journey.

App as a Confidential and Empathetic Ally

Engagement with the app led the user to view the app as a confidential and empathetic ally working with them towards a behaviour change goal. The language used in the app, both tone and content, was a crucial influence on this experience. Personalised messages placed the user at the centre of information delivery enhancing message salience. The use of an informal and supportive tone, such as 'Don't forget to bring your healthy snacks to work', was important as it '*made it feel more personal, approach wise',* as outlined by Marie, a mother of two children who works as a full-time administrator for a local community group. This resulted in a positive affective interaction that established the basis of a trusted alliance and influenced subsequent interactions. Marie initially had concerns about the security of personal information inputted into an app. However, making a positive emotional connection with one app prompted Marie to input such information and continue investing time and energy in its use. In contrast, the use

of language that she perceived as more formal meant that messages were considered directive rather than supportive. For example, the other app used by Marie spoke about research findings and used language that she associated with health professionals but was not part of her everyday vernacular. Consequently, Marie felt that this alternative app had *'a very clinical kind of feel to it'* and viewed it as an unsympathetic entity delivering generic information of limited relevance to her. Consequently, she terminated its use, illustrating the influence of the emotional response on the user's experience.

The provision of localised privacy also had an influence of the individual experience. Localised privacy relates to the existence of a private interaction where personal information and change progression were not shared with the user's social network. This did not mean that participants were unwilling to input personal information but there was concern as to who would be able to access such information and user anonymity was of utmost importance. Personal information could be shared anonymously with the development team or other users but not amongst the user's social network, such as personal social media. The provision of localised privacy allowed the user to retain control of their personal information and encouraged app engagement without the fear of social disclosure. Consequently, the app was seen as an alternative to public weight-management programmes which were viewed by some as stigma-laden and incongruent with personal privacy goals. Carol had attended weight-management programmes in the past and disliked the public nature of such programmes as '*you don't know who you're going to see there*' and '*you don't really want the whole world to know that you've gone down a pound or up a pound really*'. A 'private' app offered an alternative approach where expert empathetic advice could be sought without compromising on personal goals. Such engagement contributed to the perception that the app was an ally aiding the user's behaviour change journey.

Gamification, the integration of game-like features in an app, introduced a hedonic element to app use. For some users, this facilitated the perception that the app offered a friendly empathetic environment thereby prompting a positive emotional response. It also encouraged a more regular interaction with the app and prompted the user to cognitively process content in relation to individual behaviour change. However, the influence of gamification on engagement differed depending on the degree to which it was congruent with the user's self-concept and future orientation. In one of the apps, users were encouraged to set behaviour challenges and points were awarded upon successful completion of these challenges, which resulted in feelings of competence and satisfaction. These points could then be used to procure virtual clothes for a user's avatar. Patricia, in her twenties and mother to one son, enthusiastically spoke of these gamification features: '*with the challenges…you get…virtual clothes and you have to dress yourself…every time you go up a level, you get new stuff, and that's really cool… I think it's a fun approach to weight-loss*'. Patricia appreciated this focus on short-term, objective behaviour goals as they offered an alternative from her previous behaviour change attempts that had required a sustained effort to attain reward. Thus, gamification elicited a positive emotional response which underpinned her experiencing the app as a perceived ally.

A different experience was expressed by Gillian, who similarly is in her twenties and lives in a house-share. She expressed disappointment in these game-like features: '*it gave you points and…then every so often it'd be like, "Oh you've unlocked this" and I'd go into it and it was like, "Oh you've unlocked a new outfit for your avatar" and I was like "wow, great…I don't know what I'm going to do with this"…there's no motivation factor I suppose in it'*. Through discussion with Gillian, it appeared that she was more future oriented and placed a higher value on longer-term health goals which may render such short-term game-like rewards as personally irrelevant. The integration of gamification had encouraged a greater investment of time in using the app but the incongruency of subsequent rewards with her self-concept led to feelings of

frustration. She considered herself a serious individual but the integration of gamified features was deemed childish. This diminished the credibility of the app for Gillian as it did not appear to understand her behaviour change needs which led to termination of its use. Thus, gamification may or may not prompt engagement as personal characteristics and the congruency of such features with the individual's self-concept appear to be important.

Alternative Outcomes

It was apparent that a number of elements influence the engagement process. Positively valenced engagement may lead to a continued interaction with the app that is founded upon trust and satisfaction. If this interaction continues to fulfil the needs of the user, app use is likely to continue and lead to relationship formation. However, it was also possible that states of dormancy or disengagement would be experienced. If engagement with the app did not fulfil expectations, both in relation to anticipated effort and value gained, there was a risk of disengagement. Gillian, who works full-time, intended to '*keep [the app] for a couple of weeks, see how I get on and if it just becomes second nature then I'd easily stick at it*'. She viewed the app as valuable for the effort invested but expected that this effort would reduce over time as she became more familiar with the app. However, if this is not achieved Gillian is likely to terminate its use due to a perceived imbalance between expectation and experience.

A dormant state was experienced by those who viewed the app as valuable but were likely to only draw on its use in particular contexts and address particular goals. Jane, a mother of four children who works part-time in the evenings, viewed the apps as self-regulation facilitators that could be called upon when such support was desired. After the birth of her last child, she embarked on a period of behaviour change to lose weight that she had gained over her pregnancies. She acknowledged the dynamic nature of behaviour change where lapses in healthy behaviour occurred at times. While she did not believe that she would use either of the

apps continually, she did view them as relevant during such lapses: '*If I ever put up the bit of weight again I would use it [because] I definitely found that helpful with the snacks and everything'.* Thus, the apps would remain on Jane's phone with minimal engagement until such time that active engagement was required. Consequently, a state of dormancy represented an enduring relationship state that was activated when necessary. Such examples illustrate that relationship formation was possible but a continuous evaluation of salient elements would take place with disengagement as a potential alternative outcome.

Discussion

The purpose of this study was to explore the lived experience of using a health app by those consumers wishing to change towards healthier food purchasing behaviour. By investigating this lived experience, the importance of consumer engagement became apparent and highlighted a number of interesting aspects that add to the extant literature. The findings suggest that engagement dimensions may influence, mediate, and moderate one another. This may lead to varying configurations of engagement as contextual influences shape dimension saliency and direction. It is these particular configurations that are experienced at an intrinsic level and expressed by the individual. Such findings emphasise the influence of the engagement context and the importance of capturing and understanding this context. Anticipated effort appeared to drive the engagement process and may be a valuable consideration in additional contexts. Experiencing consistency and congruency with existing goals and self-concept had a positive influence on engagement and supported relationship formation. These findings, and their proposed contribution, will now be discussed in the context of the extant literature.

The present research contributes to the extant literature in three ways. Firstly, the link between engagement dimensions suggests that they may not exist in isolation. Instead, they may draw on and influence one another, an interplay that collectively contributes to overall engagement and the subsequent individual experience. This re-emphasises the dynamic, iterative nature of engagement (Brodie, et al., 2011) where consumers are active partners in the interaction rather than passive recipients (Hollebeek, 2011a). This interplay further reflects the user's process of integrating both positive and negative elements of engagement to find balance in the individual experience. A holistic evaluation of engagement was undertaken as users aimed to find an optimal level sufficient for their needs and the specific context. Acceptable individual levels needed to be met for engagement to continue and to foster relationship formation. This echoes the '*calculative commitment*' element of engagement, illustrated by Bowden (2009), where consumers cognitively assess the value of the interaction, and engagement is continued as long as value is perceived.

The present findings illustrate the importance of the individual context and its influence on how engagement is expressed. Findings suggest the need to examine if engagement dimensions influence one another in different contexts and the impact that this may have on the individual experience. It is possible that different contexts may lead to different configurations as particular dimensions of engagement are intensified. Furthermore, much of the existing consumer engagement literature focuses on outcomes in the form of brand relationships, while the present research draws attention to the intrinsic expression of engagement at an individual level. This intrinsic expression represents a potential interim space between engagement and possible outcomes which offers another means of examining the engagement process. Such findings may have important implications for the measurement of engagement and suggests the need to explore how best to capture the dynamic nature of engagement in varying contexts. Supporting Calder et al. (2016a), our findings re-emphasise the need to move beyond generic

measurement approaches towards an understanding of how best context, and its influence on engagement, can be examined. Qualitative methods offer a valuable approach for exploring contextual influences. There is potential for a greater use of such methods in engagement research which may offer a different insight into the engagement process and how it may be progressed in both theoretical and managerial terms.

Second, this exploratory research illustrated the role of individual motivation and anticipated effort as preliminary factors that shaped the engagement process. Given the consistent inclusion of involvement as an antecedent in models of engagement (Brodie, et al., 2011; Hollebeek, 2011b), the presence of motivation is not surprising. Motivated consumers typically display a greater interest in objects viewed as relevant to achieving their desired goals (Glanz, Rimer, & Viswanath, 2008, pp 98-102), thus representing a more involved consumer (Zaichkowsky, 1985). However, anticipated effort was also shown to be important in this pre-engagement phase. Anticipated effort levels needed to be within acceptable boundaries, as perceived by the user, for engagement to occur. While some authors have highlighted the potential role of participation and flow as drivers of engagement (Brodie, et al., 2011; Leckie, et al., 2016), none have proposed the inclusion of anticipated effort. It is important to acknowledge that anticipated effort may only be of relevance in our context of health apps, given the context-specific nature of engagement (Brodie, et al., 2011; Hollebeek, 2011b). However, we propose that anticipated effort may drive engagement in additional contexts and further investigation is warranted on its relevance to the engagement process.

Third, findings illustrate that experiencing goal consistency and congruence with the individual self-concept prompts engagement. Self-concept can be defined as the '*cognitive and affective understanding of who and what we are'* (Malär, Krohmer, Hoyer, & Nyffenegger, 2011) representing an individual's persistent hopes and fears that may vary according to the different social contexts in which one resides (Aaker, 1999; Sirgy and Chenting, 2000). In an attempt to

fulfil needs in relation to self-consistency and self-esteem, consumers seek those interactions that verify the actual concept of the self or allow for expression of an idealised self-concept (Sirgy, 1982; Sirgy, et al., 2000). . The present findings demonstrate in an applied context the argument made by Calder et al. (2016b) that '*engagement results from experiencing a brand as related to some higher-order personal life goal or value*' as distinct from the traditional focus on lower-order product goals and negative self-control. This develops the extant knowledge on the psychological process of engagement and offers opportunities to examine how this congruence with higher-order goals, or self-concept, can be achieved.

Confirmation of self-congruence provides the consumer with a sense of satisfaction and positivity (Aaker, 1999; Sirgy, 1982) strengthening the emotional attachment formed and driving subsequent behaviour (Malär, et al., 2011; Sirgy et al., 2000). In contrast, its absence may lead to cognitive dissonance and the perception that the product is unattainable or overly superior, leading to a distancing of the consumer as a means of resisting ego deflation (Collins, 1996; Festinger, 1957). Such dissonance was evidenced in the present findings by the negative influence of inappropriate tone and the irrelevant integration of gamification which led to user disengagement. However, it was also apparent that personal characteristics influenced the extent to which an app was viewed as congruent. Evidence suggests that a focus on the idealised self may be more successful in those with lower levels of self-esteem that are driven by the need for self-enhancement (Grubb and Grathwohl, 1967; Malär, et al., 2011). In contrast, the actual self-concept is of greater importance for consumers with higher levels of motivation and involvement (Malär, et al., 2011). Consequently, a focus on the ideal or actual self is likely to have differing results in terms of effectiveness depending on personal characteristics. It was beyond the scope of this study to explore the influence of personal characteristics but further consideration is warranted given their potential importance.

Research Limitations

The majority of participants were mothers aged between 31 to 40 years with a good standard of nutrition knowledge. Consequently, this sample may reflect a more motivated set of consumers within this socioeconomic group which may limit the transferability of findings. However, it is also likely that this sample represents those women most likely to avail of a healthy eating app in a real-life dietary intervention setting. Thus, it is proposed that findings do represent the true experience of using a healthy eating app in this cohort. Challenges were faced in the recruitment of women aged under 30 years despite purposive sampling of community groups working with young adults. This was surprising given the literature demonstrating the high use of health apps in this age group (Bhuyan, et al., 2016; Deloitte, 2014; Shen et al., 2017). Feedback from community workers highlighted that this may be due to a lack of sufficient motivation to change healthy eating behaviour in this age group and restricted app access due to budget and wireless internet access constraints. Given such constraints, it may be that apps are not considered an acceptable means of changing behaviour by younger adults from a lower socioeconomic group but this requires further exploration.

A small number of participants commented that the study duration was too short and acknowledged that they may not have examined the apps adequately. The two-week period was chosen to minimise participant burden and to reflect an initial utilisation phase. It is possible that particular factors were not identified which may influence the user experience. However, some participants had already stopped using one of the apps by study completion as they were not viewed as valuable. This suggests that the study duration did offer sufficient time to gain an insight into user engagement and influential factors. As this study aimed to explore the initial utilisation phase, it is proposed that the two-week period was sufficient for our purposes. Future research should consider the time allocated for review and ensure it is sufficient for research purposes.

The order in which apps were presented to participants may have introduced bias despite randomisation to minimise such bias. The experience gained during use of the first app may have influenced use of the second app. It has been suggested that such bias may be reduced by incorporating an additional interview prior to participants downloading the second app. However, this approach would have revealed the specific focus of the interview which may also have influenced their use of the second app. Furthermore, the participant sample was from a lower socioeconomic background which are typically harder to recruit and retain in research studies (Bonevski et al., 2014; Pescud, Pettigrew, Wood, & Henley, 2015). Consequently, a balance between participant burden and data collection needed to be achieved. The authors accept that a certain level of bias may have been present due to the study design despite attempts otherwise. However, it is not envisaged that this had a substantial impact on the findings and that they do provide a useful insight into user engagement.

Theoretical Implications

One theoretical implication of our findings is the potential need to move beyond the use of generic measures of engagement that are typically quantitative in nature (Calder, Isaac, & Malthouse, 2016a). Our findings suggest a potential interaction between engagement dimensions, where they may influence the expression of another in different contexts, which may result in varying individual experiences. Such insight was facilitated by the use of qualitative exploration of the user experience which revealed the nuances present in the engagement process. The multifaceted ways in which engagement intrinsically expresses itself and the importance of context is highlighted by Calder et al. (2016a) who encourage an examination of context-specific means of measurement to capture relevant elements of the engagement process. Such an approach will progress our understanding of the psychological

process of engagement while providing practical insights for managers. A greater use of qualitative methods may be beneficial to capture those contextual influences of importance. A flexible, mixed-method approach to engagement measurement has also been proposed (Calder, et al., 2016a). However, the resources required for its implementation may not be available to all which is an important consideration in its use. Exploration of alternative approaches is warranted to ensure those context-specific influences are captured and to gain such rich insight into the dynamic engagement process. Furthermore, mobile technology offers a valuable opportunity to examine the engagement process given the significant role it plays in consumers' everyday lives. Mobile technology could be drawn upon to a greater extent in future research and may allow for further insight into engagement.

The present research also illustrated the role of anticipated effort as a potential preliminary driver of engagement which questions the existing evidence in relation to engagement antecedents. This finding suggests that antecedents may exist beyond those already cited in the extant literature, such as participation, flow, and involvement (Brodie, et al., 2011; Hollebeek, 2011b; Leckie, et al., 2016). Given that engagement is a context-specific state, it is likely that different factors will act as antecedents in different contexts. Thus, further consideration must be given to alternative constructs to progress our understanding of engagement and those factors necessary for driving engagement in given contexts. Identification of anticipated effort as a potential driver was possible through the employment of a qualitative, exploratory study design. This re-affirms our previous call for a greater integration of qualitative research methods in the examination of engagement. This may allow for capture of potential contextual differences and move forward the existing understanding of the broader engagement process.

Managerial Implications

The present research outlines those features of importance in the design of health apps which may support healthier food purchasing behaviour. Ensuring app content is founded upon appropriate behaviour change theory is important, but so too is ensuring that sufficient user engagement is sustained. Findings suggest that engagement may be maintained by supporting a sense of personal autonomy, facilitating perceived increased capacity to change behaviour, and creating a sense of a confidential and empathetic ally. Integrating those features that facilitate such intrinsic experiences should provide the foundation for app design. While the focus of the present research was healthy food purchasing behaviour, such intrinsic experiences may be of relevance to other health behaviours, and subsequently to the design of a broader range of health apps. Furthermore, anticipated effort was proposed as a driver of engagement which may illustrate the need to design apps which are viewed as minimally effortful. However, the time and effort associated with app use continued to be important throughout the engagement process with acceptable, optimal levels set by the individual. Beyond this acceptable level, the app was likely to be viewed as overly effortful and its use risked being terminated. Thus, higher engagement is not always advantageous but may lead to user fatigue (Hollebeek, 2011b; Leckie, et al., 2016). As acceptable effort levels are set at the individual level, it may be beneficial to understand those personal characteristics and app features which contribute to this perceived level of effort (Hollebeek, 2011b). This will allow for an improved marketing of health apps and support optimal engagement.

'Engagement flourishes when consumers perceive the value…to exceed the perceived level of effort exerted' (Brodie et al., 2013). This suggests the need for health apps to be viewed as highly valuable to support their continued engagement. Self-congruent apps may be viewed as more valuable by users as they may best meet individual needs. It is clear that a focus on lower-order product goals is not sufficient to support engagement and future development could explore how best it can ensure congruence with the user's self-concept. In the context of apps,

tailoring offers an important approach which allows alignment of goals and ensures that they are reflective of the self. However, tailoring may also come at a price. It often requires time and effort on behalf of the user (Blecker and Abdelkaf, 2006; Chang and Chen, 2009; Piller, Schubert, Koch, & Möslein, 2005) which was only viewed as acceptable within certain limits by participants in this study. This suggests the need to identify how best to integrate tailored features such that they support self-congruence while minimising the burden experienced by the user. It is possible that a staged-approach to tailoring may be beneficial (Sigala, 2006) although further research should explore how best this may be achieved.

The integration of diverse features that built capacity to change and could be tailored to the needs of the user was key, as was the use of informal and friendly language in a private forum free from judgement. The integration of these features should support engagement and aid the formation of a positive user relationship. However, it was evident that the effectiveness of specific features was influenced by particular personal characteristics. The role of such characteristics could be explored further to ensure apps can be tailored appropriately to address user needs while also allowing the improved marketing of different apps to consumers. Furthermore, sufficient motivation to change behaviour was an important factor that steered engagement. As behaviour change and behaviour change maintenance are theoretically distinct (Kwasnicka, Dombrowski, White, & Sniehotta, 2016; Rothman, 2000), the integration of techniques specifically related to behaviour change maintenance may improve their uptake by those in later stages of change. Kwasnicka et al. (2016) outline a number of theoretical approaches of relevance to behaviour change maintenance. This framework could provide the basis for future app development to support this potential gap.

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Table 1. Participant Characteristics (n=12)

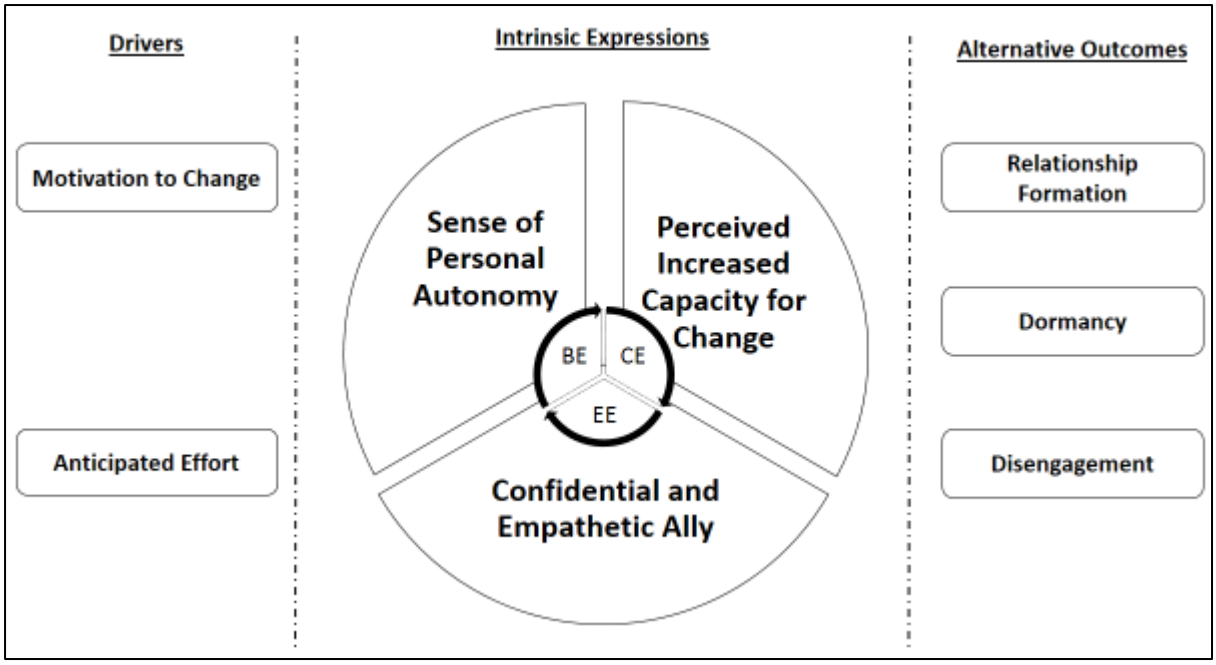
Name	Age Category	Children	Employment Status	Ethnic Category	Nutrition Knowledge Index 0 (Low) – 20 (High)	Mobile Apps Used
Amanda	31-40 years	One Child	Part-time Employment	White European	9	B,A
Andrea	31-40 years	No Children	Full-time Employment (Primary Earner)	White Irish	18	A,C
Angela	41-50 years	Two Children	Full-time Employment	White Irish	16	B,A
Bridget	31-40 years	Four Children	Engaged in the Home	White Irish	15	C, B
Carol	31-40 years	No Children	Full-time Employment (Primary Earner)	White Irish	15	B,A
Catherine	31-40 years	Two Children	Part-time Employment	White European	10	C,A
Gillian	18-30 years	No Children	Full-time Employment (Primary Earner)	White Irish	18	C, B
Jane	41-50 years	Four Children	Part-time Employment	White Irish	19	B,A
Jennifer	41-50 years	Three Children	Part-time Employment	White Irish	19	A,C
Louise	31-40 years	Three Children	Engaged in the Home	White Irish	15	C,A
Marie	31-40 years	Two Children	Full-time Employment (Primary Earner)	White Irish	13	C, B
Patricia	18-30 years	One Child	Part-time Employment	Black African	18	C, B

Table 2. Overview of the Study Mobile Apps

A	**App Description** The primary goal is weight loss with users able to choose their own goal. Users can choose different weekly meal plans (calorie-controlled) which are aligned with their weight loss goal. A daily menu, including pictures, and a weekly shopping list are provided which can be tailored to user preferences, including taste preferences and frequency of shopping. Recipes are provided for the majority of meals. Users are prompted to monitor their weight-loss goal on a weekly basis. Advice is provided on foods that should be consumed as part of a healthy diet and unhealthier foods that should be avoided or consumed in reduced amounts. Healthier meal options are given for when eating out, including specific options for chain restaurants. All users can access a community forum which is facilitated by a nutritionist. Users can share advice with other users or obtain nutrition advice from the facilitator. Reminders, via push notifications, are sent to the individual relating to meal times and goals and can be tailored by the individual. Examples of prompts include: 'You're doing great! Time for your morning snack'; 'It's snack o'clock. Keep going!'; and 'Today was a great day! Keep it up.'
	Integrated Behaviour Change Techniques Goal setting (outcome) Self-monitoring of outcome(s) of behaviour Behaviour substitution Conserving mental resources Prompts/cues Social support (unspecified)
	User Quality This app was rated as being of good user quality and was on par with app C but of slightly lower quality than app B. It was considered aesthetically appealing with a clear flow between different features that improved its ease of use. It was considered less interactive than the other apps as minimal feedback on user progression was provided and there was reduced prompting of user interaction.
B	**App Description** The primary goal is weight loss with users able to choose their own goal. Users can also choose additional goals from a range of suggested healthy eating and physical activity goals or can input a specific goal of personal relevance. Users can set a daily calorie goal and monitor food consumption and physical activity to align with calorie goal. Goal reminders are sent via push notifications at a time and frequency chosen by the user. Users can add personal photos to act as a goal reminder or to monitor progress over time. Advice is provided on different aspects of healthy eating, including healthy food purchasing behaviour. The user is able to choose particular health tips or add personally relevant health tips which can be set as reminders for a relevant time and frequency. Examples include: 'It's not what you eat, it's what's eating you' or 'Remember you are not depriving yourself, this is your choice'. Users can choose daily health-behaviour challenges, such as create a healthy shopping list, which give point rewards upon completion. These points can be built up over time to procure clothes for the user's virtual avatar. These challenges can be chosen from a range of suggestions or users can input their own personally relevant challenges. Advice is provided on how to use the different features of the app.

	Integrated Behaviour Change Techniques Goal setting (outcome) Self-monitoring of outcome(s) of behaviour Comparative imagining of future outcomes Information about antecedents Behaviour substitution Prompts/cues Distraction Restructuring the physical environment Restructuring the social environment Avoidance/reducing exposure to behaviour cues Social support (unspecified) Information about others' approval Non-specific reward Non-specific incentive
	User Quality This app was rated as having the highest user quality of the three apps. It was aesthetically appealing with an easy to use interface. It was considered an interactive and entertaining app with many features that could be tailored to individual user needs. It was considered a credible app with sufficient quantity of relevant information.
C	**App Description** The primary goal is weight loss with sub-goals related to healthy eating and physical activity subsequently set. Users are given advice on choosing healthy goals. Users can choose the timeframe for their weight-loss goal but restricted options are available for healthy eating and physical activity goals. Users can choose different weekly meal plans (calorie-controlled) aligned with their weight loss goal. A daily menu and a weekly shopping list are provided which can be tailored to user preferences. Recipes are provided for all meal options. Users are prompted to monitor their healthy eating and physical activity goals daily and their weight-loss goal on a weekly basis. All users can access a community forum to share information with other users. Nutritionists were involved in the development of the app. An introduction video provides guidance on using the different features of the app and their relevance to behaviour change, such as self-monitoring. Internet access is required to access the app which limits its use without mobile data or wireless access.
	Integrated Behaviour Change Techniques Goal setting (outcome) Self-monitoring of outcome(s) of behaviour Behaviour substitution Conserving mental resources Social support (unspecified)
	User Quality This app was rated as being of good user quality and was on par with app A but of slightly lower quality than app B. It was considered a credible app with sufficient quantity of relevant information. It was considered less aesthetically appealing and more difficult to use than the other apps due to a difficulty moving between particular sections.

Figure 1. Conceptual model of the engagement process.



BE: Behavioural Engagement; CE: Cognitive Engagement; EE: Emotional Engagement