Gamification's role in fostering user engagement with healthy food-based digital content

ABSTRACT

Though digital platforms (e.g., social media) are often used to promote unhealthy, calorie-dense foods, the dynamics characterizing consumers' engagement with healthy nutrition-based content (e.g., as stimulated trough gamification) on these platforms remains tenuous, warranting further exploration. Addressing this gap, we deploy a qualitative field study and two experiments to show that *challenge*, a gamification mechanic that relies on rewarding incremental behavioral (e.g., food choice) improvements, shapes consumers' enjoyment of, and engagement with, digital healthy food-based content. Study 1 (n=95) shows that challenge induces consumer enjoyment, boosting their engagement with healthy food-related digital content. Study 2 (n=94) corroborates these findings by revealing a serial mediation effect of gamification-based challenge on consumers' enjoyment of, and engagement with, healthy food-based content. Extending Study 1, we also identify engagement's positive effect on consumers' app reuse intent. Moreover, we identify a moderating role of consumers' stage of change-based action (i.e., readiness to act on their health), which strengthens the association of gamification-based challenge/enjoyment. Overall, the findings substantiate gamification's role in boosting consumers' engagement with digital healthy food-based content. We conclude by deriving pertinent implications from our analyses.

Keywords: Mobile apps; Gamification; Healthy food; Engagement; Challenge; Experience; State of change.

Paper type: Empirical research.

1. Introduction

Though digital (e.g., social media) platforms proliferated before COVID-19, the pandemic has sparked their surging use (Pennington, 2021). For example, while over 70% of consumers checked other Facebook users' comments before making restaurant decisions before the pandemic (Reviewtrackers, 2019), digital platforms became the key source of meal inspiration, or recipe, ideas after (Trifonova, 2022). Digital platforms, therefore, impact people's relationship with food. Unfortunately, this influence is not necessarily positive, as people, reportedly, are more inclined to like, share, or comment on (i.e., engage with) unhealthy, calorie-dense (vs. healthy, calorie-light) food-based content on these platforms (Pancer et al., 2021), generating several consequences.

First, engaged users tend to be motivated to interact with, and expose themselves to, specific contents (Harmeling et al., 2017), leading digital platform (e.g., social media) algorithms to suggest similar future content to them (e.g., in their newsfeed; Gillespie, 2016), reinforcing their exposure to, and engagement with, such content, including for unhealthy/calorie-dense food (Pancer et al., 2022). As repeated exposure, typically, enhances individuals' object evaluations (Fang et al., 2007), their recurrent exposure to unhealthy foods is likely to see their rising engagement with content promoting such foods, impacting their food choices (Pancer et al., 2022). In other words, engaging with unhealthy food-based digital content may jeopardize people's efforts to maintain a balanced diet, potentially heightening their obesity risk (W.H.O., 2022). This issue, therefore, represents important societal lifestyle, and weight management, challenges (Hill & Peters, 1998).

Fortunately, research addressing effective digital platform interventions that may stimulate consumers to make healthier food choices is advancing (De Bauw et al., 2022; Van der Laan & Orcholska, 2022). However, *how* to foster consumers' engagement with content promoting healthy, calorie-light (vs. unhealthy) food remains nebulous (Partridge & Redfern, 2018),

exposing an important literature-based gap. In particular, while unhealthy foods are, typically, associated with benefits, like feeling good (Pancer et al., 2022; Raghunathan et al., 2006), healthy foods tend to be associated with giving up on one's preferences, hence generally, negative affects (Hilger et al. 2017; Pinho et al., 2018), yielding consumers' less positive engagement with these (vs. unhealthy foods; Pancer et al., 2022). Consequently, marketers face the challenge of stimulating consumers' positive engagement with healthy, calorie-light foods (Pancer et al., 2022), as explored further in this research.

We posit that *gamification*, the use of game mechanisms in non-game contexts (Deterding et al., 2011), offers a strategic tool to stimulate consumers' engagement with healthy foods. Prior research corroborates gamification's capacity to engage users with brands, or brand-related content (Leclercq et al., 2018), which we expect to also hold for the healthy nutrition context (Hilger et al. 2017; Pinho et al., 2018). Here, gamification-based *challenge*, or the "mechanics linked to [users' task] accomplishment …[in] gamified design[s]" (Poncin et al., 2017, p. 322), is of particular relevance to engage users (e.g., by appealing to their desire to master relevant tasks; Leclercq et al., 2020).

However, despite its importance, the role of gamification-based challenge in driving engagement remains tenuous, particularly in negative (vs. positive) affect-eliciting contexts, like healthy food (Leclercq et al. 2019). Moreover, the effects of users' personal characteristics on this association are poorly understood, as, therefore, explored further in this research. We argue that to incite consumers' positive engagement with healthy food-related digital content, their readiness to change their behavior (i.e., to consume healthy (vs. unhealthy) foods) needs to be considered (Nakabayashi et al. 2020). Addressing this issue, we explore the effect of consumers' stage of change-based readiness to act on their health objectives (Prochaska & DiClemente, 1983), as a moderator on the association of their digital healthy food-related

content-based enjoyment and engagement. Specifically, we posit that those exhibiting higher (vs. lower) readiness to change will see a stronger association of these variables.

This paper makes two contributions to the healthy nutrition, gamification, and engagement literature. First, extending the work of authors, including Flaherty et al. (2019) and Pancer et al. (2022), we conduct a qualitative field study and two experiments, which reveal that gamified, challenge-based healthy food-based content on social media can, indeed, stimulate engagement with such content, fostering consumers' healthier food choices. Our studies show that consumers' experience with gamified content promoting healthy foods drives their content-related enjoyment, in turn boosting their content engagement, exposing enjoyment's mediating role. Our analyses suggest that gamified healthy food-based content can be used to shift, traditionally, negative, to more positive content engagement (Hollebeek & Chen, 2014), unlocking important new insight.

Second, we extend these findings by identifying a moderating role of individuals' stage of change-based action (i.e., readiness to act to benefit their health; Prochaska & DiClemente, 1983; Nakabayashi et al., 2020) in the association of their enjoyment of, and engagement with, digital healthy food-based content. These analyses matter, given the limited recognition of consumers' mental readiness, or preparedness, to change their food choices in fostering healthier food choices to-date. By understanding the role of this variable, digital content marketers will be able to target their healthy food-based content at those displaying higher (vs. lower) readiness to act, given their greater expected receptivity to, and engagement with, this content, yielding an improved return-on-marketing-investment.

We review key literature addressing consumer engagement, healthy food content and social media, followed by an overview of the studies and their results. We conclude by discussing the findings and their implications.

2. Theoretical Background

2.1 Engaging consumers with healthy food-based digital content

Engaging consumers in healthy, calorie-light food content on digital platforms represents a key societal issue (Pancer et al., 2022; Flaherty et al., 2019) and a marketing performance indicator (Flaherty et al., 2019). Given the delayed (vs. instant) gratification characterizing healthy food consumption, it is of particular importance to foster consumers' sustained, repeated positive engagement with such digital content (Conner & Norman, 2017).

Debate surrounds consumer engagement's definition (Hollebeek et al., 2018). For example, Brodie et al. (2011, p. 252) define the concept as a psychological state that "occurs by virtue of interactive [consumer] experience with a focal agent/object." However, Hollebeek et al. (2019, p. 166) view the concept as a consumer's (e.g., cognitive, emotional, and/or behavioral) resource investment in his/her brand interactions (Alexander et al., 2018), revealing its multidimensional nature. Engagement is, commonly, driven by individuals' functional, and/or hedonic, motives that may inspire them to act (Hollebeek & Macky, 2019).

Engagement's most directly observable *behavioral* dimension reflects the consumer's investment of time, energy, and effort in his/her interactions with a brand/brand-related object (e.g., content; Hollebeek et al., 2014). Online, these behavioral investments may manifest through users' commenting, sharing, and/or liking of specific content (Pancer et al., 2022). Through its interactivity, engagement induces consumers' repeated exposure to specific objects, in turn, enhancing their evaluation of these (Winkielman & Cacioppo, 2001).

2.2 Role of gamified experience in boosting engagement

Gamification offers a powerful tool to stimulate consumers' desired actions (e.g., purchase), boosting their resource investments (i.e., engagement) in their gamified content interactions (Johnson et al., 2016; Leclercq et al., 2017), including in the health context (Hamari & Koivisto, 2015).

Gamification comprises several mechanics to engage individuals (Poncin et al., 2017), of which *challenge*, the "mechanics linked to the accomplishment of a task within the gamified design" (e.g., reaching objectives/participating in a contest; Poncin et al., 2017, p. 322), is particularly noteworthy. Challenge requires participants to complete tasks by overcoming relevant obstacles, allowing users to attain (e.g., points) scores for their performance (Van der Kooij et al., 2019). By tapping into their competence and/or accomplishment needs, challenge is, thus, expected to lift consumers' game-play motivation (Seaborn & Fels, 2015), stimulating them to take on new challenges, which become increasingly attainable (Zichermann & Cunningham, 2011). In line with the consistency principle, which posits that people wish to be seen as consistent with their past behavior (Cialdini, 1993; Festinger, 1957), challenge is expected to boost consumers' (e.g., behavioral) engagement, in turn impacting their object-related attitudes (Guadagno & Cialdini, 2010).

To complete a challenge, individuals may break their goals down into smaller ones (Dahl & Moreau, 2007), which is particularly suitable in the healthy nutrition/diet context that is characterized by delayed (vs. instant) gratification (Lee & Kotler, 2015). Individuals, thus, tend to perceive small steps (e.g., consuming meat once less weekly) as less overwhelming (vs. going vegetarian *cold turkey*), while also offering them more regular (e.g., weekly) engagement opportunities. Overall, challenges that decompose the overall goal (e.g., consuming a more balanced diet) into relevant sub-goals (e.g., preparing calorie-light dishes) is expected to be particularly suitable to engage consumers with digital healthy food-based content.

2.3 Gamification-based challenges deployed on digital platforms

Gamification may be implemented on different (e.g., social media/mobile app-based) platforms (Leclercq et al., 2020), which can be used to facilitate personalized interactions (Tong et al., 2020). While consumers' app usage is growing steadily (König et al., 2021; Kunkel et al., 2020), not all the 200 billion apps downloaded in 2020 (Statista, 2021) are used regularly.

Specifically, after an initial phase of interest, most apps tend to be used only sporadically, seeing users' plummeting engagement with these (Viswanathan et al., 2017). This issue is particularly detrimental in the health context, given its delayed gratification and the need for repeated pro-health behaviors, to achieve, or maintain, excellent health, as noted. In other words, unused health-related apps are likely to limit consumers' attainment of their health (e.g., nutrition/weight management) objectives (König et al., 2021). However, *gamified* health-related (e.g., nutrition) apps are, still, predicted to foster users' engagement (e.g., by motivating them to interact with proposed calorie-light food content), boosting their evaluation of healthy food-related content (Fang et al., 2007).

2.4 Mediating role of enjoyment

Playing games typically elicits users' positive experiences (e.g., by unlocking their enjoyment; Poncin et al., 2017; Eppman et al., 2018). *Enjoyment*, a user's level of pleasure and his/her positive affective response during the gameplay, represents a critical determinant of their game-related engagement (Abbasi et al., 2021). To nurture users' game-related enjoyment and competence, challenges may be used (Van der Kooij et al., 2019). However, despite this intuitive association, the role, and effectiveness, of game-related challenges in raising users' healthy food content/app-related enjoyment remains tenuous, as, therefore, explored in this research.

As transient affective states (e.g., mood) may also impact consumers' food choices (e.g., people in a bad mood are more likely to make unhealthy (vs. healthy) food choices; Gardner et al., 2014), it is important to neutralize, or reverse, consumers' negative affective states as much as possible (e.g., by boosting their enjoyment of healthy food-related digital content) to engage them. Specifically, consumers' positive affect attained from their exposure to stimuli (e.g., healthy food-based content) may transfer, or spillover, to the promoted brand (Derbaix, 1995; Poncin & Derbaix, 2009; Hollebeek et al., 2023). Thus, if consumers enjoy engaging with

gamification-based challenges in the context of healthy food-based digital content, we expect their positive content-related emotions to transfer to the content's object (i.e., the healthy food), yielding their more positive engagement with the latter.

2.5 Moderating role of induced mood

To further substantiate enjoyment's mediating role in the association of gamification-based challenge (vs. no challenge) and engagement, we consider the potentially moderating role of consumer mood (see Figure 1). Prior research shows that positive/negative moods affect users' (e.g., gamification-related) enjoyment (Swinyard, 1993; Puccinelli et al., 2009). If enjoyment is a prerequisite for engagement (Leclercq et al. 2018), it is reasonable to also expect the inverse dynamic (i.e., where a consumer's negative mood may impair his/her enjoyment, in turn limiting his/her engagement). We hypothesize:

> **H1a.** *Gamified challenge (vs. non-challenge)-based mobile apps positively impact consumers' gamification-related enjoyment.*
> **H1b.** *Gamified challenge (vs. non-challenge)-based mobile apps positively impact consumers' engagement with healthy food-based digital content.*
> **H2.** *Consumers' enjoyment of healthy food-based digital content mediates the relationship of their perceived challenge and their engagement with healthy food-based digital content.*
> **H3.** *Consumers' mood moderates the mediated association of their enjoyment of gamification's main effect (challenge vs. non-challenge-based mobile apps) and their engagement.*

Insert Figure 1

3. Experimental Studies

We next introduce the experimental studies (Studies 1-2) conducted to test our objectives, as discussed further below.

3.1 Study 1

3.1.1 Design and procedure

To test the hypotheses, we designed a scenario-based online experiment. Scenario-based approaches have been successfully used across contexts ranging from services marketing

(Albrecht et al., 2017), advertising (Fox et al., 2019), or corporate social (ir)responsibility (Antonetti et al., 2020), to m-health studies (Chen & Pu, 2014). Offering similar outcomes to those of field experiments, this approach allows for the creation of specific experimental conditions by manipulating/controlling relevant variables (Kim & Jang, 2014). Recent research also demonstrates the relevance of using experiments to study engagement in health behaviors (Ghose et al., 2021).

In line with our objectives, scenarios were created that immerse the participants in a relevant app-based context. To test H1-2, the scenarios either proposed a challenge (i.e., challenge condition) or lacked a challenge (i.e., control condition). We asked participants to imagine a situation in which they used the 'Healthood' app to improve their food choices/diet by using the healthy, easy-to-prepare recipes regularly proposed by the app. Healthood's design was based on two popular health apps, Yazio and Lifesum (see Appendix A). To deepen respondents' immersion, the scenarios were supported by a brief video showing the app's main features.

In both conditions, participants were informed that they had already prepared a recipe proposed by the app before and felt good about doing so. In the challenge condition, they were also briefed as follows: "You started the *Chicken Challenge* proposed by the app, which consists of cooking 3 chicken-based recipes this week. You have already prepared two chicken recipes. Prepare one more, and the challenge will be complete!" Participants were, thus, informed they were about to complete a recipe-based challenge for which they had already achieved a level of success. We intentionally used a scenario in which respondents had already completed related challenges, while also specifying the level of achievement, to raise each participant's realism and immersion. To further substantiate the mediating role of enjoyment (H2), while also showing the moderating role of induced mood in this mediation (H3), we focused on inducing variance in participants' overall affective state. As it is not possible to

control participants initial mood (i.e., their mood at the start of the experiment), this approach was deemed most effective.

To induce variance, we followed Westerman et al.'s (1996) mood induction procedures by combining *Imagination* and *Film/Story*. Specifically, we asked participants to recall, and attempt to re-experience, their original perceptions of, and affective responses to, a positive (for half our participants), or negative, childhood memory (for the other half). To help participants reconnect to their affective childhood state (i.e., inducing of good/bad mood), we showed a representation of a child's face experiencing this emotion.

Our experimental design represents an orthogonal 2 (challenge vs. control) x 2 (good vs bad mood) between-subjects design comprising 4 conditions. We expected that the negative affective state (i.e., induced bad mood) would reduce participants' ability to enjoy themselves while completing the challenge. If the latter is true, the impact of the challenge on their engagement should also be reduced, proving enjoyment's crucial role and demonstrating induced mood's moderating role. Participants, then, answered questions related to our objective, as detailed below. We recruited 175 participants by using Prolific, an online panel that enabled us to select the participants and randomly assign them to one of the four experimental conditions.

3.1.2 Manipulation check and group equivalence

The manipulation addressing the presence of a challenge was validated for those respondents, who answered *yes* to the following question: "*Would you say that, using the app, you started a challenge called Chicken Adept*?" We deleted three participants, who incorrectly indicated they had started a challenge when they had not. To validate the manipulation for induced mood, we measured respondents' affective state (induced mood) using the following seven-point semantic differential item: "*I feel in a bad (vs. good) state of mind*."

To retain only those participants who were in either a good, or a bad, mood, we supressed those, who reported a mood of 5 (n= 46), corresponding to the sample mean. We also deleted those who were below 5 while in the "good mood" condition (n=11) and those above 5 while in the "bad mood" condition (n=20). We deleted these 77 participants to be able to prove the role of positive (vs. negative) mood, as those experiencing a *medium mood* were of no interest, as they reduce the difference in variance between the two groups. This approach also enabled us to keep an equivalent number of participants in both conditions. Our final sample of 95 participants was allocated to one of the four experimental conditions (Group 1: Bad mood – Control/no challenge (n=24); Group 2: Bad mood – Challenge (n= 22); Group 3: Positive Mood – Control/no challenge (n=24); or Group 4: Positive Mood – Challenge, n=25). There were 47 participants in the challenge condition (n=47), and 48 in the control condition (n=48). The mean age was 34 years (50% men). Overall, the groups were equivalent in terms of gender and age.

The app's realism was measured with the following question: "*Do you perceive Healthood to be realistic compared to other health apps*?" (0: Not realistic at all, through to 10: Highly realistic). The groups were equivalent in terms of the Healthood app's perceived realism (M_{group1} = 7.08, M_{group2} = 7.32, M_{group3} = 7.68, M_{group4} = 7.67, F (1,93) =0.702, n.s.).

3.1.3 Measures

To measure enjoyment, we adapted Ahn et al.'s (2007) scale by focusing on six items gauging enjoyment ("*Using the application* '*gives me fun in the task I have to do*," "*Brings me enjoyment in the task I have to do*," "*Makes me happy in the task I have to do*," "*I enjoy using the app very much*," "*My user experience is nice*," "*I think using the app is very entertaining*"; α = 0.916). To measure users' engagement with the app's healthy food-based content, we adapted Vivek et al.'s (2014) behavioral engagement (i.e., enthused participation) sub-scale (i.e., four items: "*I spend a lot of my discretionary time on the app's content*," "*I am heavily into the app's content*,"

"*I am passionate about the app's content*," "*My days would not be the same without the app's content*;" α = 0.868). All multiple-item variables were measured by using seven-point Likert scales ranging from *strongly disagree* (1) to *strongly agree* (7). Measures, and reliability statistics, are provided in Appendices B-C.

3.1.4 Results

To test H1a-H1b, we analyzed the impact of perceived challenge on users' enjoyment, and engagement, with the app's healthy food-based content by using GLM (see Table 1). First, we present the main effect of challenge on enjoyment ($M_{control}$ = 4.656 - $M_{challenge}$ = 5.284 , $F_{1;91}$ = 7.004 $p < .05$; partial eta square/size effect (Cohen, 1988 = .071; power = 0.745), and on engagement ($M_{control}$ = 3.351 - $M_{challenge}$ = 3.667 , $F_{1;91}$ = 1.924; n.s.; partial eta square/size effect Cohen, 1988 = .021, power = 0.279), as well as induced mood's direct effect on enjoyment ($M_{BadMood}$ = 4.526 – $M_{PositiveMoood}$ = 5.394 , $F_{1;91}$ = 12.806; $p < .001$; partial eta square/size effect (Cohen, 1988 = .123; power = 0.943), and on engagement ($M_{BadMood}$ = 3.027 – $M_{PositiveMoood}$ = 3.964, $F_{1;91}$ = 15.250; $p < .001$; partial eta square/size effect (Cohen, 1988 = 0.144, power = 0.972). Based on these analyses, H1a-H1b are supported.

To test H2, we used Hayes's (2013) mediation model (Model 4, bootstrapped samples = 5000; see Appendix D). Here, gamification (0=control, 1=challenge) was the independent variable (X), user engagement with healthy food-based content was deployed as the dependent variable (Y), and user enjoyment served as the mediator. As per H2, the indirect effect of challenge on user engagement, through enjoyment, is significant (β = 0.37; 95% *CI* = [.066 - 0.675]), confirming enjoyment's full mediation effect and supporting H2.

To test H3, we used Hayes's (2013) moderated mediation model (Model 7; bootstrapped samples = 5000). Gamification (0=control, 1=challenge) was deployed as the independent

variable (X), user engagement with healthy food-based content represented the dependent variable (Y), user enjoyment served as the mediator, and induced mood as the moderator.

Table 1 : Study 1 – Cross-condition results

<table>
<tr><th colspan="2"></th><th colspan="3">Enjoyment (mean scores/SD)</th><th colspan="3">Engagement (mean scores/SD)</th></tr>
<tr><td>Group 1 (n = 24) (BM/Ctr)</td><td rowspan="2">Bad Mood (n = 46)</td><td>4.159 (1.36)</td><td rowspan="2">4.526 (1.40)</td><td rowspan="4">F(1,91)= 12.806 p=0.000***</td><td>3.023 (1.05)</td><td rowspan="2">3.027 (1.10)</td><td rowspan="4">F(1,91)= 15.250 p=0.000***</td></tr>
<tr><td>Group 2 (n = 22) (BM/C)</td><td>4.862 (1.39)</td><td>3.031 (1.17)</td></tr>
<tr><td>Group 3 (n = 24) (GM/Ctr)</td><td rowspan="2">Good Mood (n = 49)</td><td>5.093 (1.19)</td><td rowspan="2">5.394 (1.07)</td><td>3.640 (1.33)</td><td rowspan="2">3.964 (1.26)</td></tr>
<tr><td>Group 4 (n = 25) (GM/C)</td><td>5.708 (0.84)</td><td>4.302 (1.12)</td></tr>
<tr><td colspan="2">Control (n = 48)</td><td>4.656 (1.34)</td><td colspan="2">F(1,91)= 7.004 p=0.010**</td><td>3.351 (1.23)</td><td colspan="2">F(1,91)= 1.924 p=0.169</td></tr>
<tr><td colspan="2">Challenge (n = 47)</td><td>5.284 (1.21)</td><td colspan="2"></td><td>3.667 (1.30)</td><td colspan="2"></td></tr>
</table>

The results show that challenge influences users' engagement with healthy food-based content through enjoyment, but only for an induced good mood (i.e., levels 6-7). However, as expected, this effect is non-significant for a low (bad) induced mood (level 2). This effect also produced an overall positive, indirect effect of enjoyment on engagement (induced mood=6; β = 0.41; 95% *CI* = [.106 - 0.734]; induced mood=7; β = 0.47; 95% *CI* = [.068 - 0.916]).). Overall, the results support H2-H3: User enjoyment fully mediates the relationship between challenge and their engagement with healthy food-based content for the highest level of induced mood (see Appendix D).

3.1.5 Discussion

The results of Study 1 show that the use of gamification-based challenge unlocks users' enjoyment of, and engagement with, gamified healthy food-based digital content. The findings also reveal a mediating effect of challenge on engagement through enjoyment. However, this finding only applies to the highest level of induced mood, suggesting that when people do not enjoy healthy food-based digital content, they do not engage. These results, thus, offer novel insight into the key prerequisite role of user enjoyment in unlocking their engagement, while also showing that enjoyment may be fostered in the context of healthy food-based content. We next introduce our exploratory field study.

3.2 Exploratory field study

3.2.1 Overview and objectives

To extend scholarly acumen of challenge as an intervention tool to engage consumers, and to improve their long-term dietary choices, we conducted an exploratory field study featuring two objectives. First, based on the health intervention literature, we explored the role of individuals' *stage of change* (Prochaska & DiClemente, 1983), as discussed further below, to strengthen (e.g., gamified healthy food-based digital content) intervention effectiveness (Nakabayashi et al., 2020; Schüz et al., 2007). The stage of change perspective is relevant, given its ability to strengthen the effectiveness of interventions. Second, as apps are designed for sustained use (Viswanathan et al., 2017), we explore the extent to which challenge may influence consumers' intent to reuse the app (Hamari & Koivisto, 2015).

3.2.2 Moderating role of stage of change

While individual differences influence people's motivation to adopt healthier behaviors, a need also exists to tailor interventions on digital platforms (Keeling et al., 2022; Rhaisa do Amaral e Melo et al., 2017). In this vein, Prochaska & DiClemente (1983) argue that effective interventions consider individuals' *stage of change*, or their readiness to act by making positive

(e.g., health-benefiting) changes to their lives. Behavioral change is a dynamic process that, typically, transpires through multiple stages. As people tend to sequentially progress through these stages, change tends to be a gradual process that is contingent on individuals' readiness for change (Prochaska & DiClemente, 1983). For example, consumers in the first (precontemplation) stage are characterized by a low intent to change their behavior, rendering the importance of interventions designed to inform (raise awareness of) the need for change. However, individuals in the fourth (action) stage tend to exhibit behavioral processes, like self-monitoring or action control (Schüz et al., 2007).

In the health (communications) context, the stage of change has been considered a relevant conceptual foundation (Whitelaw et al., 2000), with prior studies suggesting that matching interventions (e.g., healthy food-based digital content) to individuals' stage of change will, typically, raise intervention effectiveness (Schüz et al., 2007). In the context of gamification-based challenge, it is appropriate to focus on consumers in the action stage. According to Prochaska and DiClemente (1983), individuals in the action stage act to cultivate, or boost, their health and engage in behavior to fulfil this objective (e.g., by accepting goal-fulfilling challenges). Given the dynamic nature of the stage of change process, we argue that the more advanced individuals are in terms of their readiness to change, the more effective specific interventions that are adapted (e.g., personalized) to match their stage of change will be. We expect (e.g., gamified) challenge to be particularly effective for individuals in the action stage, given their, typically, elevated readiness to transition from action to maintenance of the newly acquired behavior (Prochaska & DiClemente,1983).

3.2.3 Analysis

To better understand the field context of health/healthy food-related apps, we studied the case of a healthcare operator's app that failed to engage its users, boosting the external validity of our research. We collaborated with the healthcare operator, who developed the app in 2019, but

removed it from app stores a couple of years later. Despite high download rates after each app promotion/communication wave, the operator never succeeded at engaging it users longer-term (in terms of fostering their sustained app use) and, thus, decided to discontinue the app (Hamari & Koivisto, 2015; Hollebeek & Macky, 2019).

To better understand the reasons for the app's failure to engage its users, we conducted a qualitative study among health app users (12 individual interviews) in partnership with the healthcare operator. Half the convenience sample (n=6) had used the app for at least one month and the other half were six users of another health app (see Appendix E). The interviews lasted 30-45 minutes. After transcribing the interviews, the data comprised 115 pages (50,912 words).

Content analysis revealed the importance of users' enjoyment induced by the app's performance (i.e., easy to use/functions well). As one interviewee said, "*When the mobile app is constantly bugging, it's hard to have a pleasant experience and to be willing to engage with the application further*" (R3, female, 27). The analysis also highlighted gamification's relevance to engage users. Three respondents stated that engaging health apps should be playful and present the workouts as a game. For example, one interviewee said, "*There would have to be really something that would make me really hooked. This feedback that we were saying earlier and then a kind of small addiction too because it's easier to have a form of addiction with games than with a healthcare application*" (R10, Female, 40).

To further strengthen the notion that individual characteristics may explain users' lacking engagement and, thus, their failure to use the app, we considered individuals' stage of change, as noted. Our analyses reveal a critical role of consumers' stage of change in the context of their adoption, and continued use, of health-related apps: Most users (i.e., 5/6) exposed a limited readiness to act, as they were still in the earlier stages of the process (e.g., (pre)contemplation; Prochaska & DiClemente, 1983). As one interviewee stated, "*I know I should be trying harder to eat better but it's so hard to actually… change*" (R6, male, 58). This

individual variable, thus, helped us understand users' motivation/readiness to change their behavior, confirming our conjecture that it will moderate the effect of challenge on induced enjoyment and, in turn, impacting engagement. We hypothesize:

> **H4:** *The impact of challenge on users' intention to reuse the app is serially mediated by their enjoyment of, and engagement with, healthy food-based content*.
>
> **H5:** *In the action stage of change, users' action level moderates the serial relationship between challenge, user enjoyment, engagement and intention to reuse the app, such that users' enjoyment of healthy food-based content is higher for individuals exhibiting higher (vs. lower) readiness to act*.

Figure 2 summarizes the hypotheses in study 2.

Insert Figure 2

3.3 Study 2

3.3.1 Overview and objectives

With our hypotheses being further strengthened by the field study, we designed a second experiment, as reported below. Study 2 was designed to meet four main objectives. First, it purports to confirm the effectiveness of gamified challenge (vs. the absence of challenge) on users' engagement with app-based healthy food content, and to demonstrate its impact on their app reuse intent. Second, based on Study 1's results, we added user enjoyment as an additional mediator in the process to further substantiate enjoyment's role in fostering engagement with healthy food content. Third, we seek to confirm that users' engagement with healthy food-based content mediates the impact of gamified challenge on their app reuse intent. Fourth, to further demonstrate the need to tailor interventions to consumers' personal characteristics, we explore the potentially moderating role of stage of change-based readiness to act in the relationship of perceived challenge/enjoyment.

3.3.2 Design and procedure

To test the hypotheses, we designed a scenario-based online experiment comprising two conditions, as in Study 1. The two conditions (challenge vs. absence of challenge [control]) were the same as those used in Study 1. Participants answered questions about their enjoyment

of, and engagement with, specific app-based healthy food content, their intent to reuse the app, and their level of stage of change-based readiness to act. As in Study 1, we controlled for the immersive capability/quality of the experiment by requesting users' impression of the app's realism, while concluding with sociodemographic questions. The questionnaire was sent to professional consumer panel (Panelabs), who were familiar with apps.

3.3.3 Measures

The measures were identical to those in Study 1. Enjoyment was adapted from Ahn et al. (2007) (α=0.806), and users' app-based healthy food content engagement focused on behavioral engagement (i.e., enthused participation; Vivek et al., 2014; α=0.88). We also measured users' app reuse intent by adapting Bhattacherjee's (2001) scale: "*I plan to use the app at least as much as I did before*,' '*I predict to use it more often rather than less often*," "*I will carry out the activities proposed by the app more regularly*" (α=0.88).

We, then, measured users' stage of change-based readiness to act using the URICA-based action sub-scale scale (McConnaughy et al., 1983): "*I am doing some work to improve my diet/to feel better*," "*At times, improving my diet/feeling better is difficult, but I am working on it*," "*Even though I am not always successful in changing, I am at least working on improving my diet/my well-being*" (α=0.91). All variables were measured with seven-point Likert scales ranging from *strongly disagree* (1) to *strongly agree* (7). The app's realism was measured by using the following question: "*Do you perceive Healthood to be realistic compared to other health apps*?" (0: Not at all realistic, through to 10: Highly realistic). The measures, and reliability statistics, are provided in Appendices B and F, respectively.

3.3.4 Manipulation check

To validate the manipulations in the presence of perceived challenge, we asked participants the following question: "*Remember when you were described your use of Healthood. In the scenario, did you start a chicken-based challenge*?" The final sample (n=94) was allocated to

either the challenge condition (n=43) or the control condition (n=51). The mean age was 32 years (75% female). Overall, the groups were equivalent in terms of gender/age. Participants indicated that Healthood was realistic (mean 7/10), and there was no difference between the two conditions ($M_{challenge}$ = 7.2; $M_{control}$ = 6.9; $F_{1;92}$ = .67; p = .44).

3.3.5 Results

To test H1a-H1b, we adopted a mean-comparing t-test to analyze the impact of perceived challenge on enjoyment of, and engagement with, the app's healthy food content, and their app reuse intent. The results show a significant difference of challenge on users' mean enjoyment ($M_{challenge}$ = 4.51; $M_{control}$ = 4.16; t-test = 1.76; one-tailed p < .05). Moreover, as expected, the impact of challenge on engagement with healthy food-based content was also significant ($M_{challenge}$ = 3.94; $M_{control}$ = 3.08; t-test = 3.49; one-tailed p < .001). Therefore, these results support H1a-H1b.

To test H4, we used Hayes's (2013) serial mediation model (Model 6; bootstrapped samples = 5000). For the analysis, gamification (0=control, 1=challenge) was the independent variable (X), app reuse intent was the dependent variable (Y), enjoyment was mediator 1 (M1), and engagement with healthy food-based content was mediator 2 (M2). The results show that challenge has a positive effect on app reuse intent via users' enjoyment of, and their engagement with, the healthy food-based content (vs. the no challenge condition).

Perceived challenge exerted a significant, positive effect on user enjoyment (β = 0.35; t = 1.76, one-tailed p < .05), boosting their engagement with the healthy food content (β = 0.80; t = 7.99; p < .001). Likewise, engagement had positively impacted app reuse intent (β = 0.39; t = 4.23; p < .001). However, the direct effect of perceived challenge on app reuse intent was not significant (β = -0.26, t = -1,49, n.s.). This effect produced a full mediation effect of challenge on app reuse intent (β = 0.48; 95% CI = [.143 - .831]). Overall, the results support H4: Users'

enjoyment of, and their subsequent engagement with, healthy food-based content mediates the relationship of challenge and app reuse intent.

To test H5, we used Hayes' (2013) moderated mediation model (Model 7; bootstrapped samples = 5000). Here, gamification (0=control, 1=challenge) was the independent variable (X), app reuse intent was the dependent variable (Y), enjoyment was the mediator (M), and stage of change-based action served as the moderator (W). The results show a significant interaction effect (β=0.39; t = 2.64; p < .001). For those users exhibiting action levels exceeding 5.71 (β=0.76; se = 0.26, t = 2.97; p < .05), the effect of gamification was significant and positive. These users, thus, experienced more enjoyment when using a challenge (vs. non-challenge)-based app. However, this effect was non-significant for users displaying a readiness to act of under 5.71. Moreover, the effect of users' enjoyment on their app reuse intent was significant and positive (β = 0.42; t = 3.75; p < 0.001). The direct effect of challenge on app reuse intent was non-significant. Finally, the indirect effect of challenge on app reuse intent through users' enjoyment was significant and positive (β = 0.32; 95% CI = [0.1079 - 0.5798]). Overall, the results support moderated mediation (Index = 0.1635; 95% CI = [.0371 - 0.3234]), and support H5 (see Appendix G).

3.3.6 Discussion

The Study 2 results show that using perceived gamification-based challenge boosts users' enjoyment of, and engagement with, digital healthy food-based content. We also expose a serial mediation effect through users' enjoyment of, and engagement with, healthy food-based content in the relationship of perceived challenge and app reuse intent, further substantiating enjoyment's role in engaging users with healthy food-based content. Finally, we found that users' stage of change-based readiness to act moderates the mediating role of their enjoyment in the relationship of challenge/app reuse intent.

4. General discussion

In a world in which digital platforms, including mobile apps, are changing the way consumers engage with brand-related content (Lowe et al., 2019; Yan & Corino, 2019) and also (un)healthy food (Pancer et al., 2021; 2022) , it is essential to cut through the clutter and boost their engagement (Bozkurt et al., 2021). In the context of digital healthy food-based content, our findings suggest that raising users' engagement is conducive to fostering their sustained healthier food choices, contributing to their more balanced diets and, potentially, lowering surging obesity rates.

However, prior studies addressing the interface of food media/digital engagement highlights the particular challenge in engaging consumers with digital healthy food content, as it, typically, counters individuals' fundamental *feel good* motive (Hilger et al. 2017; Pancer et al., 2021). Positive affect (e.g., enjoyment) has, indeed, been identified as key to fostering engagement (Eppman et al., 2018; Pancer et al., 2022). In this context, we conducted a multi-method set of studies to explore to what extent consumers' enjoyment of gamified digital healthy food-based content may incite their content engagement (see Table 2).

Table 2: Study overview

	Study 1	**Field study**	**Study 2**
Sample size	95	12	94
Sample source	Prolific (oneline panel)	Partner's data-base	Panelabs (e-mails)
Method	Online experiment	Qualitative	Online experiment
Design	2X2	In-depth interviews	2X1
App context	Nutrition	Nutrition and health	Nutrition
Research questions/Hypotheses	H1-H3		H1, H4-H5

First, Study 1 investigated whether consumers' gamified app-based enjoyment renders their more positive healthy nutrition associations. We showed that gamified app-based challenge fosters enjoyment, a prerequisite to their positive engagement with healthy food content. Second, the exploratory field study assessed potential reasons why health apps produce only limited engagement. We found that the absence of a positive emotional state (Orji & Moffatt, 2018), and insufficient readiness to change (Prochaska & DiClemente, 1983), at least partly explain apps' failure to engage. Third, Study 2 explored whether users' stage of change-based readiness to act moderates their gamified challenge-based enjoyment, and subsequent engagement and app reuse intent. We show a moderated serial mediation of challenge on enjoyment of, and engagement with, healthy food-based content, in turn driving the app reuse intent. This finding, thus, responds to calls for additional insight into personalized digital content (Keeling et al., 2022), as investigated here in the context of healthy food-based content.

5. Implications, Limitations, and Further Research

5.1 Theoretical implications

This research contributes to the literature on consumer engagement with gamified digital healthy food-based content, which remains tenuous to date. Specifically, Studies 1-2 show that app users' enjoyment of gamified healthy food-based content nurtures their engagement with such content, yielding pertinent implications for theory development. The results reveal the importance of creating perceived *enjoyable* gamification-based challenges, as consumers are found to only engage with perceived enjoyable content. Sample research questions include: How do app developers/managers create optimally enjoyable (e.g., health food-based) digital content? What shape might the curve depicting the association of perceived content-related enjoyment, and engagement, take (e.g., linear/curvilinear)? For a potential curvilinear association, what is the optimal content-related enjoyment level yielding peak engagement?

Second, we find a serial mediation process to drive consumers' app reuse intent, which, by unlocking their gamified challenge-based enjoyment, stimulates their engagement with such content. The findings, thus, cover the entire process explaining how gamification-based challenge affects users' engagement with healthy food-based content by enhancing their enjoyment of health apps. Both Studies 1-2 confirm the key role of enjoyment, offering a level of robustness. The enjoyment triggered by challenge is, then, associated with the healthy food-based content. We posit that this enjoyment nurtures consumers' (more) positive engagement with healthy food-based digital content, offering a unique theoretical contribution. That is, the consumer's enjoyment triggered by specific healthy food content is transferred to the content's subject (i.e., the healthy food), exposing a spillover effect (e.g., Derbaix, 1995; Poncin & Derbaix, 2009; Hollebeek et al., 2023). This finding, likewise, raises pertinent implications. For example, do any perceived challenge levels serve to lower, or generate more negative engagement? How might other gamification be used to facilitate positive spillover effects?

Third, the findings support the theoretical foundations of stage of change-based readiness to act (Prochaska & DiClemente, 1983), corroborating its relevance in digital environments. Our analyses demonstrate the moderating role of users' readiness to act on their engagement with gamified healthy food-based content, thus adding to the prior stage of change literature. Overall, the results indicate that to boost users' engagement with gamification-related challenges associated with app-based healthy food content, those users exhibiting high (vs. low) readiness are more likely to engage with such content. In turn, as users grow more ready to change, their enjoyment rises in parallel, subsequently boosting their engagement. The findings, thus, suggest a need to personalize digital healthy food-based content (Keeling et al., 2022; Rhaisa do Amaral e Melo et al., 2017), raising important implications. For example, what type/level of content personalization will optimize user enjoyment of, and engagement with,

particular content? To what extent is user-based readiness to act intrinsic (vs. extrinsic, i.e., to what degree can it be shaped by external (e.g., content) forces)?

5.2 Managerial implications

This research also provides pertinent managerial implications. First, based on the findings, we recommend integrating gamified challenges in health apps, given their capacity to trigger user enjoyment of, and engagement with, specific content. Users' enjoyment of the healthy food content, as induced by gamification-based challenge, is expected to spillover (transfer) to the healthy food, thus breaking the traditional cycle of users' negative healthy food-related affect. Challenges, therefore, facilitate the association of healthy food-based content, and healthy food, with enjoyable experiences, improving individuals' mental association, and relationship, with healthy food. As engagement was found to boost app reuse, the findings also safeguard continued app usage, beyond mere download. Specifically, we show that perceived enjoyable apps are likely to boost users' engagement with their content, helping them reach their long-term health (e.g., weight loss) goals.

Second, we recommend app developers to ensure that an app's objectives are aligned with its users' stage of change-based readiness to act on their health objectives. In this vein, apps have the advantage of being able to easily incorporate personalized aspects, boosting their effectiveness (Maslowska et al., 2016). The findings show that tailoring an app to its users' readiness to change will boost its effectiveness, as the more active its users are, the greater their enjoyment of gamified app-related challenges, in turn raising their engagement with healthy food-based content. Conversely, consumers' readiness to act may also explain why the adoption of gamified app-based challenges is less effective for some individuals. If people aren't ready to act to benefit their health, they may also lack the readiness to master other health-related challenges, impeding the commencement of the identified virtuous enjoyment/engagement cycle. Overlooking this personal characteristic when evaluating app effectiveness may, thus,

mislead app managers, who might consider the app as ineffective when it is, in fact, inadequately targeted. For instance, if the audience is not sufficiently ready to act, the app would not engage it users (and vice versa for audiences displaying an elevated readiness to act).

5.3 Limitations and further research

This study is subject to several limitations, which offer additional research avenues. First, we focused on the gamification-based challenge (Johnson et al., 2016). Challenges are particularly suited to trigger enjoyment and as such, served our research purpose. However, scholars may wish to investigate other gamification mechanics (e.g., badging/competition) or specific combinations of such mechanics. It would also be valuable to assess cooperative challenges involving community members collaborating toward specific collective/individual objectives. Many health apps rely on community-based (e.g., social) features to stimulate user engagement. Understanding the role of specific gamification mechanics, and their potential interactions, thus, offers an important area for further exploration, whether in- or outside of the health context.

Second, while we found that healthy food-based digital content can trigger users' enjoyment (positive affect), hence engagement, we cannot rule out the possibility that negative affective reactions may also exist. Fortunately, the results show that while these would not impair the engagement process, they suggest that elevated enjoyment is a necessary precondition for engagement. In other words, high enjoyment would override the negative affect usually associated with healthy food content. Nevertheless, it would be interesting to confirm the potential co-existence of positive/negative content-related affect in shaping users' content enjoyment and engagement, or to better understand how individuals manage/regulate their affective states in this regard.

Third, our scenarios assumed that participants had previously accepted related challenges, which were (nearly) completed, which may have impacted users' engagement (e.g., through heightened perceived task-related self-efficacy). Future researchers may, therefore, explore the effect of challenges that offer no information on the level of completion.

Fourth, our analyses provide a better understanding of the process by which users engage with healthy food-based apps, and we show the importance of user enjoyment in stimulating their content engagement. We also took a longer-term perspective (i.e., by adopting users' app reuse intent). Though this proxy is relevant in this research, we acknowledge its imperfect nature, which can only be confirmed through longitudinal study. Future longitudinal research would also permit the investigation of engagement's dynamic, iterative nature (Brodie et al., 2011; Viswanathan et al., 2017), in the context of users' ongoing health-related behavior.

Finally, we show that stage of change-based readiness to act impacts users' app content-related enjoyment. Our analysis did, therefore, not consider other stage of change-based phases, and their respective characteristics, yielding further research opportunities. For example, we recommend investigating how specific gamification mechanics can help users move from one stage of change to the next, boosting their readiness for change (e.g., by drawing on field data).

Overall, this research suggests that app users' enjoyment with digital healthy food-based content can be leveraged to boost their engagement not only with such content, but also with the healthy food, thus reducing, or overcoming, consumers' traditionally negative engagement with such content. Specifically, by using gamification-based challenge, consumers' negative association with healthy food-based content can be turned around to more positive associations, facilitated by their content enjoyment. Their enjoyment will, in tun, contribute to their more positive content engagement, and with the healthy foods featured in such content, generating improved understanding of the engagement processes in content-related interventions contributing to healthier lifestyles.

References

Abbasi, A., Asif, M., Hollebeek, L., Islam, J., Hooi, T., & Rehman, U. (2021). The effect of consumer esports videogame engagement on consumption behaviors. *Journal of Product & Brand Management*, *30*(8), 1194-1211.

Ahn, T., Ryu, S., & Han, I. (2007). The impact of Web quality and playfulness on user acceptance of online retailing. *Information & Management*, *44*(3), 263-275.

Albrecht, A., Walsh, G., and Beatty, S. (2017). Perceptions of group versus individual service failures and their effects on customer outcomes: The role of attributions and customer entitlement. *Journal of Service Research, 20*(2), 188-203.

Alexander, M., Jaakkola, E. & Hollebeek, L. (2018). "Zooming out: actor engagement beyond the dyadic". *Journal of Service Management*, *29*(3), 333-351.

Antonetti, P., Crisafulli, B., & Tuncdogan, A. (2020). "Just look the other way": Job seekers' reactions to the irresponsibility of market-dominant employers. *Journal of Business Ethics*, *174*, 1-20.

Bhattacherjee, A. (2001). Understanding information systems continuance: an expectation confirmation model. *MIS Quarterly*, *25*(3), 351-370.

Borrás-Gené, O., Martínez-Núñez, M., & Martín-Fernández, L. (2019). Enhancing fun through gamification to improve engagement in MOOC. *Informatics*, *6*(3), 28.

Bozkurt, S., Gligor, D., & Hollebeek, L. (2021). Ethnicity's effect on social media-based comment intention: Comparing minority and majority consumers. *Psychology and Marketing*, *38*(11), 1895-1910.

Brodie, R., Hollebeek, L., Juric, B., & Illic, A. (2011). Customer Engagement: Conceptual Domain, Fundamental propositions, and Implications for research. *Journal of Service Research*, *13*(3), 252-271.

Chen, Y., & Pu, P. (2014). Healthy Together: exploring social incentives for mobile fitness applications. *Proceedings of the Second International Symposium of Chinese Chi*, 25-34.

Cialdini, R. (1993). *Influence: Science and practice* (3rd ed.). HarperCollins College Publishers.

Cohen, J. (1988). The effect size. *Statistical power analysis for the behavioral sciences*, 77-83.

Conner, M., & Norman, P. (2017). Health behaviour: Current issues and challenges. *Psychology and Health*, *32*(8), 895-906.

Dahl, D., & Moreau, C. (2007). Thinking inside the box: Why consumers enjoy constrained creative experiences. *Journal of Marketing Research, 44*(3), 357-369.

De Bauw, M, De La Revilla, L., Poppe, V., Matthys, V., & Vranken, L. (2022). Digital nudges to stimulate healthy and pro-environmental food choices in E-groceries. *Appetite*, *172*, 105971, ISSN-0195-6663.

Derbaix, C. (1995). The impact of affective reactions on attitudes toward the advertisement and the brand: A step toward ecological validity. *Journal of Marketing Research*, *32*(4), 470-479.

Deterding, S., Sicart, M., Nacke, L., O'Hara, K., & Dixon, D. (2011). Gamification. using game-design elements in non-gaming contexts. *CHI'11 Extended Abstracts on Human Factors in Computing Systems*, 2425-2428.

Eppmann, R., Bekk, M., & Klein, K. (2018). Gameful experience in gamification: Construction and validation of a gameful experience scale [GAMEX]. *Journal of Interactive Marketing*, *43*, 98-115.

Fang, X., Singh, S., & Ahluwalia R. (2007). An Examination of Different Explanations for the Mere Exposure Effect. *Journal of Consumer Research, 34*(1), 97-103.

Festinger, L. (1957). A theory of cognitive dissonance. Stanford University Press.

Flaherty, S., McCarthy, M., Collins, A, & McAuliffe, F. (2019). A different perspective on consumer engagement: exploring the experience of using health apps to support healthier food purchasing. *Journal of Marketing Management*, *35*(3-4), 310-337.

Fox, A., Nakhata, C., & Deitz, G. (2019). Eat, drink, and create content: A multi-method exploration of visual social media marketing content. *International Journal of Advertising*, *38*(3), 450-470.

Gardner, M., Wansink, B., Kim, J., & Park, S. (2014). Better moods for better eating? How mood influences food choice. *Journal of Consumer Psychology*, *24*(3), 320-335.

Ghose, A., Xitong, G., Beibei, L., & Yuanyuan, D. (2022). Empowering patients using smart mobile health platforms: Evidence from a randomized field experiment. *MIS Quarterly, 46*(1), 151-192.

Gillespie, T. (2016). "#trendingistrending: When algorithms become culture", in Seyfert, R. and Roberge, J. (Eds), *Algorithmic Cultures: Essays on Meaning, Performance and New Technologies*, Routledge, London, 52-75.

Guadagno, R., & Cialdini, R. (2010). Preference for consistency and social influence: A review of current research findings. *Social Influences*, 5(3), 152-163.

Hamari, J., & Koivisto, J. (2015). "Working out for likes": An empirical study on social influence in exercise gamification. *Computers in Human Behavior*, *50*, 333-347.

Harmeling, C., Moffett, J., Arnold, M., & Carlson, B. (2017). Toward a theory of customer engagement marketing. *Journal of the Academy of Marketing Science*, 45(3), 312–335, https://doi.org/10.1007/s11747-016-0509-2.

Hayes, A. (2013). *Introduction to Mediation, Moderation and Conditional Process Analysis: A Regression-based Approach*. Guilford Press, London.

Hill, J., & Peters, J. (1998). Environmental contributions to the obesity epidemic, *Science*, *280*(5368), 1371-1374.

Hilger, J., Loerbroks, A., & Diehl, K. (2017). Eating behaviour of university students in Germany: Dietary intake, barriers to healthy eating and changes in eating behaviour since the time of matriculation. *Appetite, 109*, 100-107.

Hollebeek, L. & Chen, T. (2014). Exploring positively-versus negatively-valenced brand engagement: a conceptual model. *Journal of Product & Brand Management*, *23*(1), 62-74.

Hollebeek, L., Glynn, M., & Brodie, R. (2014). Consumer brand engagement in social media: Conceptualization, scale development and validation. *Journal of Interactive Marketing*, *28*(2), 149-165.

Hollebeek, L., Jaakkola, E., & Alexander, M. (2018). Beyond the dyadic: customer engagement in increasingly networked environments. *Journal of Service Management, 29*(3), 330-332.

Hollebeek, L., Kulikovskaja, V., Hubert, M., & Grunert, K. (2023). Exploring a customer engagement spillover effect on social media: The moderating role of customer conscientiousness. *Internet Research*, .

Hollebeek, L., & Macky, K. (2019). Digital content marketing's role in fostering consumer engagement, trust, and value: Framework, fundamental propositions, and implications. *Journal of Interactive Marketing*, *45*, 27-41.

Hollebeek, L., Srivastava, R.K., & Chen, T. (2019). S-D logic-informed customer engagement: Integrative framework, revised fundamental propositions, and application to CRM. *Journal of the Academy of Marketing Science*, *47*(1), 161-185.

Johnson, D., Deterding, S., Kuhn, K., Staneva, A., Stoyanov, S., & Hides, L. (2016). Gamification for health and wellbeing: A systematic review of the literature. *Internet Interventions*, *6*, 89-106

Keeling D., de Ruyter, K., & Laing A. (2022). Consumer (dis)engagement coping profiles using online services in health-related stressors. *Psychology and Marketing, 39*(12), 2205-2220.
Kim, J., & Jang, S. (2014). A scenario-based experiment and a field study: A comparative examination for service failure and recovery. *International Journal of Hospitality Management*, *41*, 125-132.
König, L.M., Attig, C., Franke, T., & Renner, B. (2021). Barriers to and Facilitators for Using Nutrition Apps: Systematic Review and Conceptual Framework. *JMIR Mhealth Uhealth*. *19*(6), e20037. https://doi: 10.2196/20037.
Kunkel, T., Lock, D., & Doyle, J. (2021). Gamification via mobile applications: A longitudinal examination of its impact on attitudinal loyalty and behavior toward a core service. *Psychology and Marketing*, *38*(6), 948– 964.
Leclercq, T., Poncin, I., & Hammedi, W. (2017). The engagement process during value co-creation: gamification in new product-development platforms. *International Journal of Electronic Commerce*, *21*(4), 454-488.
Leclercq, T., Hammedi, W., & Poncin, I. (2018). The boundaries of gamification for engaging customers: effects of losing a contest in online co-creation communities. *Journal of Interactive Marketing*, *44*, 82-101
Leclercq, T., Hammedi, W., Poncin, I., Kullak, A., & Hollebeek, L. (2020), When gamification backfires: The impact of perceived justice on online community contributions. *Journal of Marketing Management*, *36*(5-6), 550-577.
Leclercq, T., Poncin, I., & Hammedi, W. (2020). Opening the black box of gameful experience: Implications for gamification process design. *Journal of Retailing and Consumer Services, 52*, 101882.
Lee, N., & Kotler, P. (2015). *Social marketing: Changing behaviors for good*. Sage.
Lowe, B., Dwivedi, Y., & d'Alessandro, S. (2019). Consumers and technology in a changing world. *European Journal of Marketing*, *53*(6), 1038-1050.
Maslowska, E., Smit, E., & van den Putte, B. (2016). It is all in the name: a study of consumers' responses to personalized communication. *Journal of Interactive Advertising*, *16*(1), 74–85.
McConnaughy, E., Prochaska, J., & Velicer, W. (1983). Stages of change in psychotherapy: Measurement and sample profiles. *Psychotherapy: Theory, Research & Practice*, *20*(3), 368.
Nakabayashi, J., Rha-Isa Melo, G., & Toral, N. (2020). Transtheoretical model-based nutritional interventions in adolescents: A systematic review. *BMC Public Health*, 20. https://doi.org/10.1186/s12889-020-09643-z.
Orji, R., & Moffatt, K. (2018). Persuasive technology for health and wellness: State-of-the-art and emerging trends. *Health Informatics Journal, 24*(1), 66-91.
Pancer, E., Philip, M., Poole, M., & Noseworthy, T. (2021). Content Hungry: How the Nutrition of Food Media Influences Social Media Engagement. *Journal of Consumer Psychology*, *32*(2), 336-349.
Pancer, E., Philp, M. & Noseworthy, T. (2022). Boosting engagement with healthy food on social media. *European Journal of Marketing*, *56*(11), 3007-3031.
Partridge, S., & Redfern, J. (2018). Strategies to Engage Adolescents in Digital Health Interventions for Obesity Prevention and Management. *Healthcare, 6*(3), https://doi.org/10.3390/healthcare6030070.
Pennington, N. (2021). Communication outside of the home through social media during COVID-19. *Computers in Human Behavior Reports,* 4 (100118). https://doi.org/10.1016/j.chbr.2021.100118.

Pinho, M. G. M., Mackenbach, J. D., Charreire, H., Oppert, J. M., Bárdos, H., Glonti, K., ... & Lakerveld, J. (2018). Exploring the relationship between perceived barriers to healthy eating and dietary behaviours in European adults. *European Journal of Nutrition*, *57*, 1761–1770.

Poncin, I., & Derbaix, C. (2009). Commercials as context for other commercials. *Journal of Advertising*, *38*(3), 33-50.

Poncin, I., Garnier, M., Ben Mimoun, M., & Leclercq, T. (2017). Smart technologies and shopping experience: Are gamification interfaces effective? The case of the Smartstore. *Technological Forecasting and Social Change*, *124*, 320-331.

Prochaska J. (1995). Why do we behave the way we do? *The Canadian Journal of Cardiology*, *11*, 20A-25A.

Prochaska, J. & DiClemente, C. (1983). Stages and processes of self-change of smoking: toward an integrative model of change. *Journal of Consulting and Clinical Psychology*, *51*(3), 390-395.

Puccinelli, N., Goodstein, R., Grewal, D., Price, R., Raghubir, P., & Stewart, D. (2009). Customer experience management in retailing: understanding the buying process. *Journal of Retailing*, *85*(1), 15-30.

Raghunathan, R., Naylor, R., & Hoyer, W. (2006). The unhealthy = Tasty intuition and its effects on taste inferences, enjoyment, and choice of food products. *Journal of Marketing*, *70*(4), 170–184.

ReviewTrackers, 2019. Media statistics you need to know. https://www.reviewtrackers.com/blog/restaurant-social-media-statistics/.

Rhaisa do Amaral e Melo, G., de Carvalho Silva Vargas, F., Martins dos Santos Chagas, C., & Toral, N. (2017). Nutritional interventions for adolescents using information and communication technologies (ICTs): A systematic review. *PLoS One*, *12*(9), https://doi: 10.1371/journal.pone.0184509.

Seaborn, K., & Fels, D. (2015). Gamification in theory and action: A survey. *International Journal of Human-Computer Studies*, *74*, 14-31.

Statista (2021), Annual number of global mobile app downloads 2016-2020, https://www.statista.com/statistics/271644/worldwide-free-and-paid-mobile-app-store-downloads/.

Schüz, B., Sniehotta, F., & Schwarzer, R. (2007). Stage-specific effects of an action control intervention on dental flossing. *Health Education Research*, *22*(3), 332-341.

Swinyard, W. (1993). The effects of mood, involvement, and quality of store experience on shopping intentions. *Journal of Consumer Research*, *20*(2), 271–80.

Tong, S., Luo, X., & Xu, B. (2020). Personalized mobile marketing strategies. *Journal of the Academy of Marketing Science, 48*, 64–78.

Trifonova, V. (2022). #Foodporn: how to say bon appetit on social media. January, 2022, https://blog.gwi.com/trends/food-trends-on-social-media/.

Van der Kooij, K. van Dijsseldonk, R., van Veen, M., Steenbrink, F, van de Weerd, C., & Overvliet, K. (2019). Gamification as a sustainable source of enjoyment during balance and gait exercises, *Frontiers in Psychology*, *10*.

Van der Laan, L., & Orcholska, O. (2022). Effects of digital Just-In-Time nudges on healthy food choice – A field experiment, *Food Quality and Preference*, 98, https://doi.org/10.1016/j.foodqual.2022.104535.

Viswanathan, V., Hollebeek, L., Malthouse, E., Maslowska, E., Kim, S., & Xie, W. (2017). The dynamics of consumer engagement with mobile technologies. *Service Science*, *9*(1), 36-49.

Vivek, S., Beatty, S., Dalela, V., & Morgan, R. (2014). A generalized multidimensional scale for measuring customer engagement. *Journal of Marketing Theory and Practice*, *22*(4), 401-420.

Westerman, E., Spies, K., Stahl, G., & Hesse, F. (1996). Relative effectiveness and validity of mood induction procedures: a meta-analysis. *European Journal of Social Psychology*, *26*, 557-580.

W.H.O. (2022). Obesity Report 2022. Copenhagen: WHO Regional Office (Europe). CC BY-NC-SA 3.0IGO.

Whitelaw, S., Baldwin, S., Bunton, R., & Flynn, D. (2000). The status of evidence and outcomes in Stages of Change research. *Health Education Research*, *15*(6), 707–718.

Winkielman, P. & Cacioppo J. (2001). Mind at ease puts a smile on the face: psychophysiological evidence that processing facilitation elicits positive affect. *Journal of Personality and Social Psychology*, *81(*6), 989-1000.

Yan, J., & Corino, G. (2019). Digital foraging: How social media is changing our relationship with food and nutrition. *DigitCult - Scientific Journal on Digital Cultures, 4*(3), 39-46.

Zichermann, G., & Cunningham, C. (2011). *Gamification by Design: Implementing Game Mechanics in Web and Mobile Apps*. O'Reilly Media.