

Effects of Body Image on College Students' Attitudes Toward Diet/Fitness Apps on Smartphones

Jaehee Cho, PhD,¹ H. Erin Lee, PhD,² Sun Jin Kim,¹ and Dongjin Park, PhD³

Abstract

Considering the increasing use of diet/fitness apps, this study aimed to investigate how four factors related to body image—evaluations of and orientations toward both appearance and fitness—impact college students' perception of the usefulness of such apps. Based on the Technology Acceptance Model, this study tested a path model examining the relationships among the four body-image-oriented factors, perceived usefulness (PU) of diet/fitness apps, and behavioral intention to use such apps. Results from a path analysis revealed that while college students' evaluation of appearance and fitness decreased the PU of diet/fitness apps, their orientation toward fitness increased the same outcome variable.

Introduction

OUR LIVES TODAY ARE HEAVILY DEPENDENT on various information communication technologies. The rapid increase of smartphone ownership^{1,2} is particularly noteworthy. According to the Pew Research Center, in 2013, 56% of U.S. mobile phone users owned a smartphone. Moreover, according to Pew, there was an increase in the use of smartphone apps, and 19% of smartphone owners used health-related apps on their phones.³ Two main purposes of using smartphone apps were diet/calorie counting (31%) and exercise/fitness (38%).

Although previous research has reported on the general patterns of using diet/fitness apps³ and the technical characteristics of such apps,^{4,5} little is known about the motivational factors in adopting diet/fitness apps. Therefore, this study aimed to explore the potential motivators that trigger the adoption of diet/fitness apps, especially among young populations who heavily use smart devices.² Focusing on young populations' desires for better body images, this study examined how factors related to body image motivated college students to adopt diet/fitness apps.

Moreover, in South Korea, the penetration of smartphones is notable. Google Korea reported that smartphone ownership reached 73% among Korean adults. In view of this high ownership of smartphones, this study analyzed data from Korean college students. To explain the process of new technology adoption, the study applied the Technology Acceptance Model (TAM) as its theoretical background.

Review of Literature

Perceived usefulness of diet/fitness apps

Regarding the adoption of new technologies, previous studies have often used the TAM as their theoretical background.⁶⁻⁹ This model has been recognized as a persuasive tool for examining the power of perceptual motivators that lead people to adopt new technologies. The main components of the original TAM are perceived usefulness (PU) and perceived ease of use (PEOU) of new technologies. PU can be defined as the extent to which a person perceives the usefulness of a new technology for completing a given task.⁸ PEOU is determined by the ease of using a new technology.

Although PU and PEOU, overall, positively affect one's intention to use new technologies, PEOU's effect has often been found to be negligible. Particularly, when a new technology is an adaptive form of an original technology or when a new technology is fundamentally easy to use, PEOU's effect can be insignificant. Because young generations, known as digital natives, are already quite familiar with using various apps, the PEOU of a new type of smartphone app can be generally high among them. This means that PEOU is not necessarily a determining factor in adopting this particular technology. Regarding PEOU's diminished role, previous research has found that the PEOU of health apps does not directly predict the behavioral intention to use those new apps.¹⁰ Therefore, this study mainly focused on the role of the PU of diet/fitness apps in influencing one's intention to use them.

¹School of Media and Communication, Chung-Ang University, Seoul, South Korea.

²Media Communication Division, Hankuk University of Foreign Studies, Seoul, South Korea.

³School of Communication, Hallym University, Chuncheon, South Korea.

Body image as predictors of the PU of diet/fitness apps

Previous research has addressed the necessity of examining the effects of potential predictors on the PU of new technologies.^{8,11} That is, to develop a more thorough theoretical model of technology adoption, it is necessary to understand the factors that will influence the PU of new technologies. For example, the technological characteristics of a new technology can increase the PU of that technology.^{12,13}

Therefore, this study investigated how college students' body image impacts their perceptions of diet/fitness apps as well as intentions to use them. Body image is multidimensional and is composed of attitudinal, cognitive, and behavioral dimensions.¹⁴ Particularly, body image is explained through three aspects: appearance, fitness, and health.¹⁴ This study focused on two aspects of body image—appearance and fitness—among college students. Considering the relative healthiness of college students, health, the remaining aspect of body image, was not included in this present study. In regards to appearance, people evaluate the present state of their own appearance (appearance evaluation) and develop desires to keep or improve their appearance (appearance orientation). Likewise, individuals evaluate their physical abilities and state of fitness (fitness evaluation) and make efforts to increase their physical health as well as to improve their levels of body fit (fitness orientation). These four factors were considered as the predictors of the PU of diet/fitness apps.

Hypotheses building

The theory of reasoned action (TRA) emphasizes that individuals' behaviors are triggered when they have reasonable desires to achieve specific goals.¹⁵ Therefore, when a person highly evaluates his/her own appearance, s/he may feel it less necessary to use a new tool to enhance their appearance. To such a person, who is confident in his/her attractiveness, a new tool for managing appearance would be superfluous. This implies a negative effect of appearance evaluation on the PU of diet/fitness apps on smartphones. Accordingly, the following hypothesis was established:

H1: Appearance evaluation will negatively predict the PU of diet/fitness apps.

Next, fitness evaluation can be conceptualized as the extent to which a person is confident in his/her abilities to accumulate physical skills and play sports.¹⁴ Thus, it is plausible that people with high fitness evaluation already monitor their fitness levels through habitual use of fitness tools (e.g., journal for exercise history). Here, a habit can be defined as "a process that, once started, runs by itself and does not need conscious guidance."^{16(p197)} The concept of habits emphasizes cognitive and behavioral automaticity. That is, people tend to keep engaging in the same behaviors without any cognitive effort while expecting certain outcomes from those behaviors. Therefore, it becomes hard to break old habits due to automatic repetition. Considering the habitual uses of fitness tools, people with high fitness evaluation would maintain their own fitness habits, saving time needed for testing out new fitness tools. Therefore, this study established the following hypothesis:

H2: Fitness evaluation will negatively predict the PU of diet/fitness apps.

Lastly, while evaluation in terms of appearance and fitness is focused on an individual's evaluation of his/her own current conditions, appearance and fitness orientation are related to one's desires to enhance one's appearance as well as physical condition.¹⁴ This implies that no matter how highly people evaluate their own appearance and fitness, their desires to improve appearance and fitness may encourage them to actively adopt and use new tools. Consequently, unlike the negative effects of appearance and fitness evaluation on the PU of diet/fitness apps, orientations toward appearance and fitness will positively impact the PU of such apps. Moreover, according to previous research depending on the TAM, the PU of new technologies positively predicts one's behavioral intention to use those technologies.^{6,17–19} Accordingly, the following hypotheses were established and tested:

H3: Appearance orientation will positively predict the PU of diet/fitness apps.

H4: Fitness orientation will positively predict the PU of diet/fitness apps.

H5: The PU of diet/fitness apps will positively predict behavioral intention to use those apps.

Method

Participants and procedure

To test the proposed hypotheses, data were collected through an online survey. The primary investigator contacted five professors in three Korean universities. An invitation e-mail was distributed to students who were enrolled in their classes. In total, 294 students completed the online survey. The response rate was approximately 71%. The majority of students were female (67%). The average age was 23.2 years. The median of annual household income was \$30,000–40,000, and the median of monthly expenses was \$300–400.

To help participants understand the appearance and functions of diet/fitness apps, they were provided with 12 screenshots taken from four diet/fitness apps. These four apps were selected based on Korean app ratings from App Annie (www.appannie.com/kr/). After reviewing the screenshots, participants completed the main survey questions. For the attention check, four questions were asked about their understanding of the information given in the screenshots, for example "Users can set up their own daily diet habits through *Diet Only for a Week*." The majority of participants provided the correct answers for all questions (83.2–87.6%). Therefore, it was concluded that the survey participants paid attention to the screenshots.

Instruments

This study used 5-point Likert scales (1 = "strongly disagree"; 5 = "strongly agree") to measure the six main variables. All instruments were high in reliability (see Table 1).

Body-Self Relations Questionnaire. Four factors related to body image were measured through the Body-Self Relations Questionnaire (BSRQ).²⁰ First, appearance evaluation refers to one's perception of attractiveness regarding one's

TABLE 1. SURVEY ITEMS FOR MAIN MEASUREMENT

Factor	Items
Appearance evaluation ($M=2.73$, $SD=0.74$, $\alpha=0.90$)	My body is sexually appealing I like my looks just the way they are Most people would consider me good-looking I like the way I look without my clothes on I like the way my clothes fit me I like my physique I am physically attractive
Fitness evaluation ($M=3.08$, $SD=0.91$, $\alpha=0.82$)	I am good at playing physical sports or games I easily learn physical skills My physical endurance is good
Appearance orientation ($M=3.74$, $SD=0.55$, $\alpha=0.87$)	Before going out in public, I always notice how I look I am careful to buy clothes that will make me look my best I check my appearance in a mirror whenever I can Before going out, I usually spend a lot of time getting ready It is important that I always look good I am self-conscious if my grooming isn't right I take special care with my hair grooming I am always trying to improve my physical appearance
Fitness orientation ($M=3.23$, $SD=0.45$, $\alpha=0.88$)	I take much effort to keep a good level of fitness Being physically fit is a priority in my life I actively do things to keep physically fit It is valuable to have a fit body I would pass most physical fitness tests It is important that I have superior physical strength I do things to increase my physical strength It is important for me to improve my physical stamina I try to be physically active I play a sport regularly throughout the year Regularly participating in sports is important to me I care about improving my ability in physical activities
Perceived usefulness ($M=3.35$, $SD=0.76$, $\alpha=0.92$)	Diet/fitness apps will be useful for managing my health Diet/fitness apps will be useful It is valuable to use diet/fitness apps to manage my health
Intention to use diet/fitness apps ($M=2.69$, $SD=0.91$, $\alpha=0.96$)	I want to use diet/fitness apps I expect that I will use diet/fitness apps I am planning to use diet/health apps

present appearance. This variable was measured through seven items from the BSRQ.²⁰ Second, fitness evaluation is the extent to which an individual evaluates his/her present state of physical abilities and body fit. Three items from the BSRQ were used to measure this.²⁰ Third, while appearance evaluation is related to one's perceived attractiveness of one's present appearance, appearance orientation has to do with one's desire to invest in this appearance. Eight items

from the BSRQ²⁰ were used to measure appearance orientation. Lastly, like appearance orientation, fitness orientation refers to one's desire to improve one's physical abilities and fitness. This study used 12 items from the BSRQ²⁰ to measure this variable.

Two components of the TAM. First, to measure perceived usefulness, four items from Davis et al.'s⁶ scale were

TABLE 2. CORRELATIONS FOR KEY STUDY VARIABLES

	1	2	3	4	5
1 Appearance evaluation					
2 Fitness evaluation	0.203**				
3 Appearance orientation	0.082	0.025			
4 Fitness orientation	0.198**	0.490**	0.171*		
5 Perceived usefulness	-0.250**	-0.061	0.083	0.130*	
6 Intention to use	-0.214**	-0.098	0.014	0.119*	0.615**

$N=288$.

* $p < 0.01$; ** $p < 0.001$.

TABLE 3. STATISTICS OF DISCRIMINANT VALIDITY

Factor 1	Factor 2	Statistics of discriminant validity
Appearance evaluation	Appearance orientation	0.14
Appearance evaluation	Fitness evaluation	0.23
Appearance evaluation	Fitness orientation	0.21
Fitness evaluation	Appearance orientation	0.11
Fitness evaluation	Fitness orientation	0.59
Appearance orientation	Fitness orientation	0.25
Perceived usefulness	Perceived usefulness	0.65

reworded and used to reflect the use of diet/fitness apps. Next, intention to use diet/fitness apps was measured through three items from Davis et al.'s scale.⁶

This study tested the convergent and discriminant validity of the six measures. First, as shown in Table 2, there were significant positive correlations between the two evaluation-related measures, between the two orientation-related measures, and between the PU of diet/fitness apps and the behavioral intention to use them. These significant correlations support the convergent validity of the measures. Next, in order to test for discriminant validity, Campbell and Fiske's guidelines were considered.²¹ In total, seven pairs of the six measures were created, and the correlations among all items measuring each pair of two variables were calculated. Finally, the statistic for discriminant validity for each pair was calculated and evaluated. When the statistic is <0.80 , it is reasonable to argue that the two factors under check need to be differentiated, indicating acceptable discriminant validity. As shown in Table 3, the results supported the discriminant validity for all six measures.

Results

Hypotheses tests

To test the proposed hypotheses, this study conducted a path analysis with AMOS 21 (IBM Corp., Armonk, NY). Based on Hu and Bentler's guidelines,²² multiple model fit indices were evaluated: comparative fit index (CFI), infinite fit index (IFI), and root mean square error of approximation (RMSEA). The proposed model obtained acceptable model fits: $\chi^2(df=4)=8.92$, $p=0.06$, CFI=0.98, IFI=0.98, RMSEA=0.07.

The results showed that, first, appearance evaluation significantly and negatively predicted the PU of diet/fitness apps ($\beta=-0.28$, $p<0.001$) (see Fig. 1). Next, fitness evaluation also negatively influenced the PU of diet/fitness apps ($\beta=-0.10$, $p=0.06$). These results supported H1 and H2. Third, while appearance orientation did not significantly predict the PU of diet/fitness apps ($\beta=0.10$, $p=0.21$), fitness orientation positively and significantly predicted it ($\beta=0.39$, $p<0.001$). These results caused H3 to be rejected and H4 supported. The addition of these four variables into the re-

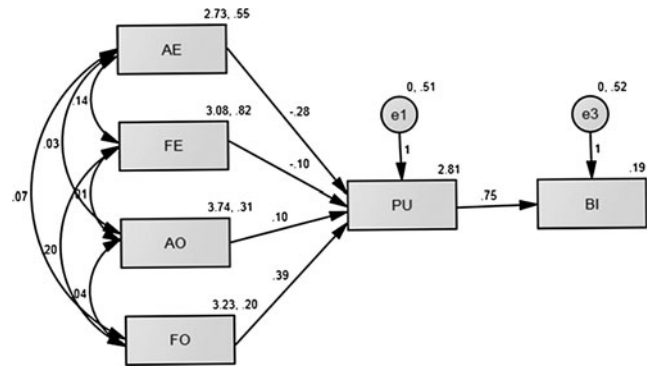


FIG. 1. Path model of main variables. AE, appearance evaluation; FE, fitness evaluation; AO, appearance orientation; FO, fitness orientation; PU, perceived usefulness; BI, behavioral intention to use.

gression model explained 11% of the variance of the PU of diet/fitness apps. Lastly, the PU of diet/fitness apps significantly predicted behavioral intention to use diet/fitness apps ($\beta=0.75$, $p<0.001$), fully supporting H5. The addition of PU of diet/fitness apps into the regression model explained 38% of the variance of behavioral intention to use diet/fitness apps.

Post hoc test. Considering the disproportionate gender composition, a multigroup SEM was conducted in order to check for gender differences in each path. The regression coefficients of each path were compared between male and female groups by calculating Fisher's Z-statistics. However, there was no statistically significant gender difference in any of the paths ($Z=-0.06$ to -1.70).

Discussion

This present study examined the potential effects of four factors related to body image on college students' perceptions of the usefulness of diet/fitness apps. The results from a path analysis indicated that, except for appearance orientation, the other three factors significantly predicted the PU of diet/fitness apps. This path model proposing the micromechanisms that determine the young generations' perceptions of diet/fitness apps contributes to guiding future research efforts to scrutinize the adoption of such new technologies more thoroughly.

The findings from the present study have some practical implications for app developers. This study found that while evaluations of appearance and fitness *negatively* affected the PU of diet/fitness apps, orientation of fitness *positively* predicted the same outcome variable. These findings suggest that developers of diet/fitness apps need to use adaptive strategies when choosing target audiences. To increase the marketability of their apps, it is recommended that developers implement marketing strategies that attract individuals who lack confidence in their appearance and possess less physical abilities, rather than target the general audience. Furthermore, it may save marketing costs to target individuals who have stronger desires to enhance their physical skills.

Limitations and future directions

Despite the theoretical and practical implications of this study, the following points need to be addressed in future

research. First, this study did not examine actual adoption of diet/fitness apps but the behavioral intention to use those apps. Therefore, it is recommended that future research conduct longitudinal studies to examine individuals' actual adoption and use behaviors regarding such apps. Next, although the present study intentionally focused on young populations known as digital natives, the study of only younger users is not sufficient for fully and accurately understanding the use behaviors among other generations. Thus, it is necessary to explore diet/fitness app usage further, particularly among older generations. Moreover, future research will benefit from considering the influence of various demographic factors on people's adoption of diet/fitness apps.

Conclusions

This study pursued an exploration of how four factors related to body image impacted college students' attitudes toward diet/fitness apps. Based on the TAM, this study tested a path model examining the relationships among the four predictors, PU, and behavioral intention to use diet/fitness apps. Results revealed that while college students' evaluations of appearance and fitness decreased the PU of diet/fitness apps, their orientation toward fitness increased the same outcome variable. These findings will serve as empirical guidance for future research concerning the adoption of diet/fitness apps and will provide app developers with more efficient marketing insight.

Acknowledgments

This study was supported by the National Research Foundation of Korea Grant funded by the Korean Government (NRF-2012S1A3A2033480).

Author Disclosure Statement

No competing financial interests exist.

References

- Rainie L. (2013) Cell phone ownership hits 91% of adults. Pew Research Center. www.pewresearch.org/fact-tank/2013/06/06/cell-phone-ownership-hits-91-of-adults/ (accessed Jul. 7, 2014).
- Smith A. (2013) Smartphone ownership—2013 update. Pew Research Center. www.pewinternet.org/2013/06/05/smartphone-ownership-2013/ (accessed Jul. 7, 2014).
- Fox S, Duggan M. (2012) Mobile health 2012. Pew Research Center. www.pewinternet.org/2012/11/08/mobile-health-2012/ (accessed Jul. 7, 2014).
- Breton ER, Fuemmeler BF, Abrams L. Weight loss—there is an app for that! But does it adhere to evidence-informed practices? *Translational Behavioral Medicine* 2011; 1:523–529.
- West JH, Hall PC, Arredondo V, et al. Health behavior theories in diet apps. *Journal of Consumer Health on the Internet* 2013; 17:10–24.
- Davis FD, Bagozzi RP, Warshaw PR. User acceptance of computer technology: a comparison of two theoretical models. *Management Science* 1989; 35:982–1003.
- Egea JMO, Gonzalez MVR. Explaining physicians' acceptance of EHR systems: an extension of TAM with trust and risk factors. *Computers in Human Behavior* 2011; 27:319–332.
- Venkatesh V, Davis FD. A theoretical extension of the technology acceptance model: four longitudinal field studies. *Management Science* 2000; 46:186–204.
- Yarbrough AK, Smith TB. Technology acceptance among physicians: a new take on TAM. *Medical Care Research Review* 2007; 64:650–672.
- Cho J, Quinlan MM, Park D. Determinants of adoption of smartphone health apps among college students. *American Journal of Health Behavior* 2014; 38:860–870.
- Venkatesh V, Morris MG, Davis GB, et al. User acceptance of information technology: toward a unified view. *MIS Quarterly* 2003; 27:425–478.
- An JY, Hayman LL, Panniers T, et al. Theory development in nursing and healthcare informatics: a model explaining and predicting information and communication technology acceptance by healthcare consumers. *Advances in Nursing* 2007; 30:E37–E49.
- Wu JH, Wang SC, Lin LM. Mobile computing acceptance factors in the healthcare industry: a structural equation model. *International Journal of Medical Informatics* 2007; 76:66–77.
- Keeton WP, Cash TF, Brown TA. Body image or body images? Comparative, multidimensional assessment among college students. *Journal of Personality Assessment* 1990; 54:213–230.
- Fishbein M, Ajzen I. (1975) *Belief, attitude, intention, and behavior: an introduction to theory and research*. Reading, MA: Addison-Wesley.
- LaRose R. The problem of media habits. *Communication Theory* 2010; 20:194–222.
- Gefen D, Karahanna E, Straub DW. Trust and TAM in online shopping: an integrated model. *MIS Quarterly* 2003; 27:51–90.
- Lee Y, Kozar KA, Larsen KR. The technology acceptance model: past, present, and future. *Communications of the Association for Information Systems* 2003; 12:752–780.
- Wu IL, Chen JL. An extension of trust and TAM with TPB in the initial adoption of online tax: an empirical study. *International Journal of Human-Computer Studies* 2005; 62:784–808.
- Brown TA, Cash TF, Mikulka PJ. Attitudinal body-image assessment: factor analysis of the Body-Self Relations Questionnaire. *Journal of Personality Assessment* 1990; 55:135–144.
- Campbell DT, Fiske DW. Convergent and discriminant validation by the multitrait-multimethod matrix. *Psychological Bulletin* 1959; 56:81–105.
- Hu L, Bentler PM. Cutoff criteria for fit indexes in covariance structure analysis: conventional criteria versus new alternatives. *Structural Equation Modeling* 1999; 6:1–55.

Address correspondence to:

Dr. H. Erin Lee
Media Communication Division
Hankuk University of Foreign Studies
107 Inum-ro, Dongdaemun-gu
Seoul
South Korea

E-mail: helee@hufs.ac.kr