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# Association between fitness technology use and physical activity mediated by communication behaviors on social media

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## Abstract

**Objective:** Fitness technologies, such as smartphone applications and wearable tracking devices, have gained widespread popularity. This study had two main objectives: 1) to examine whether fitness technology use is associated with increased physical activity (PA) levels and 2) to investigate whether communication behaviors on social media mediated the association between fitness technology use and PA.

**Methods:** Data were from the U.S. Health Information National Trends Survey 2022 ($N = 6{,}252$, weighted $N = 258{,}418{,}467$). Weighted linear regressions were conducted to examine the associations between fitness technology usage, physical activities, and communication behaviors on social media. Mediations were tested using PROCESS macro, a path-analysis based tool.

**Results:** Controlling for demographic and other known influences on PA, the findings revealed that users of fitness technology reported higher levels of both moderate PA ($\beta = .41$, $p < 0.001$) and strength training ($\beta = .29$, $p < 0.001$). Additionally, communication behaviors (i.e., sharing personal health information on social media and watching health-related videos on social media) mediated the relationship between fitness technology use and frequencies of strength training.

**Conclusion:** The results underscored the potential of fitness technologies in enhancing PA levels through promoting communication behaviors on social media.

## Keywords

Fitness technology, health information technology, PA, apps, wearable tracking devices, communication mediation, social media

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## Introduction

Among many health behaviors, physical activity (PA) stands out as a crucial factor in safeguarding against major diseases, including cardiovascular disease, diabetes, and cancer.[1] Furthermore, emerging evidence shows that engaging in PA is linked to a range of mental health benefits, such as improved mood, increased self-esteem, enhanced cognitive functioning, and reduced levels of depression.[2,3] The surge in popularity of fitness technology has generated optimism about its potential to encourage PA.[4–6] Despite the widespread adoption of fitness technology, important questions remain unanswered regarding its effectiveness in promoting PA.[7–10] Specifically, how is fitness technology use associated with increased PA? Within an emerging health support system that enables rapid exchange of individualized health information on social media,[11,12] does communication behaviors on social media impact the relationship between fitness

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technology usage and PA? Drawing from the cognitive mediation model[13] and communication mediation model,[14] this study seeks to answer those questions by using a nationally representative sample.

## Literature review

### *Fitness technology and PA*

Fitness technology, such as smartphone applications (apps) and wearable tracking devices, has become increasingly popular. Owners can use standalone wearable trackers, a tracker paired with a companion fitness app, or an app on a smartphone or tablet without separable trackers.[5] National data for the United States shows that nearly half of smartphone and tablet owners had a fitness/health app on one of their devices.[15] According to a 2019 survey by the Pew Research Center, 21% of U.S. adults owned wearable tracking devices.[16] This trend of increasing adoption of fitness technology is not unique to the United States; similar patterns have also been observed in other countries.[17–20]

Both manufacturers and users acknowledge fitness technology's potentials in encouraging PA. Fitness technology affords planning, goal setting, feedback, monitoring, and incentives, all of which are designed to sustain behavioral changes.[5,21] Over 30% of all health-related apps are designed specifically to promote PA.[22] Owners of fitness technologies exhibited a greater intention to create active lifestyles.[10,23] Users are driven by gaining mental benefits resulted from PA.[24] They also believe that fitness technologies can help them become more active and achieve their exercise goals.[25] This is great news given that 23% of adults and a staggering 81% of adolescents worldwide fail to meet the World Health Organization's recommendations for PA for health.[26]

Both moderate, everyday PA and more vigorous, exercises aimed to enhance musculoskeletal fitness have been shown to enhance quality of life. A substantial body of evidence indicates that engaging in regular PA reduces the relative risk of mortality and the development of leading diseases.[1,27] Additionally, PA offers numerous mental health benefits.[2,3] Moderate PA such as walking, cycling, and active recreation can thus contribute to achieving multiple interrelated sustainable development goals outlined by WHO.[26] Besides these everyday activities, there has been a growing recognition of the importance of more vigorous activities designed to enhance musculoskeletal in promoting overall well-being.[1] For example, improved musculoskeletal fitness is associated with reduced risks of dependence, disability, and chronic diseases.[28] Musculoskeletal fitness is particularly important for the elderly population as it helps maintain functional independence and enhances their quality of life.[28] Consequently, many guidelines recommend regular exercises that tax and improve the musculoskeletal system, such as strength training.[29–32]

Does the use of fitness technology correlate with increased PA, including moderate and musculoskeletal-focused (strength training hereafter) PA. Several studies have suggested a positive association between fitness technology usage and higher levels of PA.[33] For example, college students who used fitness apps engaged in more moderate and vigorous-intensity PA.[34] Additionally, during the COVID-19 lockdown, individuals who used fitness apps engaged in more moderate and vigorous-intensity PA.[6] However, there is also contrasting evidence on the link between fitness technology use and PA. National data collected in 2014 showed that, despite having stronger intentions for exercises, owners of fitness apps did not significantly differ from nonowners in their self-reported exercise levels.[10] Similarly, one study using national data collected in 2017 found no association between the use of fitness technologies, including fitness app and tracking devices, and PA.[8] Recent meta-analyses have also reported limited strong evidence for the connection between PA and the use of fitness technologies.[35,36] Together, this study asks:

**RQ**: Whether use of fitness technology is associated with 1) moderate PA and 2) strength training?

### *Mediating roles of communication behaviors on social media*

Although previous research has provided inconclusive evidence regarding the connection between PA and fitness technology usage, it has underscored the need to delve deeper into the mechanisms underlying the association mentioned above. Specifically, it is crucial to consider the features of fitness technology and how owners actually engage with these technologies in order to better understand these mechanisms.[7,9,37] For example, studies have shown that gamification can boost the effectiveness of fitness application in promoting PA.[38] Furthermore, gaining followers within fitness apps were associated with increased engagement in workouts and strength training.[9] Additionally, elaboration resulted from using fitness apps was associated with knowledge about PA, an important precursor to behavior change.[7]

Communication behaviors on social media can serve as a mechanism that connects fitness technology usage to PA. Specifically, affording personalized data and social network connectivity, among others, are core features of fitness technology.[12,39–42] Users have been found to share their personal health information on social media as a means to maintain connections and bolster their exercise motivations.[40,43,44] Sharing personal health information allows their social media friends to comment, react, and bear witness to their endeavors. Consequently, this heightened sense of connectivity and accountability may contribute to sustained use of the fitness technology and increased levels of PA.[12,45,46] Therefore, this study hypothesizes:

*H1:* Use of fitness technology is positively associated with sharing personalized health information on social media.
*H2:* Sharing personalized health information on social media is positively associated with PA.

Furthermore, using fitness technology may motivate users to seek out additional information and engage in further elaboration. Previous research has shown that communication tends to stimulate more communication.[47] For example, individuals who consumed more TV news often engage in additional forms of communications, such as reading newspaper, face-to-face discussions, and information seeking online.[14,45,48] This pattern of concurrent communication is primarily driven by people's needs for complementary information and the opportunity for elaboration.[14,48] In light of this body of literature, users of fitness technology will actively seek out related information to enhance their knowledge about fitness. This tendency is particularly relevant in today's media landscape, where social media platforms have become increasingly important channels for accessing information related to physical exercise and physical literacy.[49,50] Moreover, when individuals feel accountable for explaining personal information and demonstrating expertise, they are more likely to be motivated to acquire and elaborate on health and fitness-related information,[7] all of which can drive behavioral change.[51] In light of these considerations, this study proposes the following hypotheses:

*H3:* Use of fitness technology is positively associated with acquiring more related fitness/health information on social media.
*H4:* Acquiring fitness/health information on social media is positively associated with PA.

Based on the rationales outlined above, communication behaviors on social media can be expected to mediate the relationship between fitness technology usage and PA. This prediction is in line with existing theorizing and evidence. The cognitive mediation model[52] and its extensions (e.g., communication mediation model[14]) posit that media use predicts further communicative behaviors which, in turn, predict relevant behaviors. In other words, communicative behaviors mediate the relationship between media use and health behaviors.[53–55] This is because communication behaviors serve to enhance elaboration, facilitate knowledge acquisition, and reinforce social norms, all of which can lead to attitudinal and behavioral change.[14] For example, Li et al.[45] found that exposure to health-related media content led to cancer screening behaviors indirectly through increased health information seeking online.

We contend that the mediating role of communication behaviors also applies to the context of fitness technology use. In light of the cognitive and communication mediation models, fitness technology use may prompt users to engage in communication behaviors on social media which, in turn, are associated with more PA. The communication behaviors can involve sharing personal health information and seeking more health-related information on social media. Therefore, this study proposes the following hypothesis:

*H5:* Communication behaviors on social media mediate the relationship between fitness technology usage and PA.

## Methods

### Data and study sample

Data were from the 2022 Health Information National Trends Survey (HINTS 6) conducted by the by the National Cancer Institute. Health Information National Trends Survey is a nationally representative cross-sectional survey among all adults (18 years old or older) in the civilian noninstitutionalized population of the United States. Health Information National Trends Survey data are publicly available. Health Information National Trends Survey 6 were collected from March 7, 2022, to November 8, 2022, with a response rate of 28.1% (National Cancer Institute, 2023). Participants were offered the choice to response to the survey, in either English or Spanish, online or on paper. Sampling weights were applied in data analysis for nationally generalizable estimates. The current study has a sample size of 6252 (weighted $N =$ 258,418,467). The HINTS 6 was designated "exempt research" under 45 CFR 46.104 and approved by the Westat IRB (Project # 6632.03.51). Health Information National Trends Survey 6 received a "Not Human Subjects Research" determination from the NIH Office of IRB Operations on August 16, 2021 (iRIS reference number: 562715). Participants were provided with written informed consent.

### Measures

*Outcome variable.* This study focuses on two outcome variables: moderate PA and strength training. To measure moderate PA, respondents were asked "in a typical week, how many days do you do any PA or exercise of at least moderate intensity, such as brisk walking, bicycling at a regular pace, and swimming at a regular pace (do not include weightlifting)." To measure strength training, respondents were asked "in a typical week, outside of your job or work around the house, how many days do you do leisure-time PA specifically designed to strengthen your muscles, such as lifting weights or circuit training (do not include cardio exercise such as walking, biking, or swimming)." The scales for both of the items ranged from 0 ("none") to 7 ("seven days per week").

*Main predictor.* Fitness technology use was measured using two items. The first question asked: "in the past 12 months, have you used a health or wellness app on your tablet or smartphone?" Participants answered "yes (coded as 1)" or "no (coded as 0)." Those who answered, "I do not have any health apps on my tablet or smartphone" were coded as "no." The second question asked: "In the past 12 months, have you used an electronic wearable device to monitor or track your health or activity? For example, a Fitbit, Apple Watch, or Garmin Vivofit." Similarly, participants answered "yes (coded as 1)" or "no (coded as 0)." Participants' answers to the two items were summed to create an additive measure of fitness technology use such that higher scores indicate greater use of fitness technology.

*Mediators.* Two communication behaviors on social media including sharing personal health information and information acquisition were tested in this study. Communication behaviors on social media were measured by asking participants' frequencies of sharing personal health information ("In the past 12 months, how often did you share personal health information on social media?") and information acquisition on social media ("In the past 12 months, how often did you watch health-related video on social media?"). Both of the two items ranged from 0 "never" to 4 "almost every day."

*Covariates.* This study controlled for sociodemographic variables including gender at birth (male/female), age (ranged from 18 to 99), race/ethnicity (non-Hispanic White, non-Hispanic Black, Hispanic, non-Hispanic Asian, or non-Hispanic other), education levels (less than 8 years, 8 through 11 years, 12 years or completed high school, post high school training, some college, college graduate, postgraduate), and family income ranges ($0–$9,999, $10,000–$14,999, $15,000–$19,999, $20,000–$34,999, $35,000–$49,999, $50,000–$74,999, $75,000–$99,999, $100,000–$199,999, $200,000, or more). Body mass index (BMI) was also controlled due to its relevance to PA.[56] All of the control variables are categorical variables except for age and BMI.

### *Statistical analysis*

For descriptive statistics, we computed the means and standard deviations for continuous variables, and the percentages and frequencies for categorical variables. Multivariate linear regressions were used to test hypotheses 1–4. All analyses were weighted based on the HINTS survey weights. Stepwise deletion was implemented for missing values. H5 was tested using PROCESS macro, a path-analysis based tool, Model 4 (simple mediation process[57]). The two communication behaviors described above were included in the same mediation model, acting as parallel mediators. In the mediation model, 5000 bootstrap samples and 95% bias-corrected confidence intervals were used to test the indirect relationships between fitness technology use and PA through communication behaviors on social media. The bootstrapping technique is a more appropriate and accurate way of inferring the indirect effect (i.e., mediation) compared with methods that assume normal distribution of the indirect effects, because the sampling distribution of the indirect effect is rarely normal.[57]

Figure 1 depicts the proposed mediation model. Paths *a*, *b*, *c*, and *d* together represent the mediating process through communication behaviors on social media (i.e., share personal health information on social media, acquire further health information on social media) between fitness technology use and PA. Path *e* represents the direct relationship between fitness technology usage and PA. Two separate mediation analyses, with moderate PA and musculoskeletal-focused PA (i.e., strength training) as the outcome variable, respectively, were performed. All data analyses were conducted using STATA 17.

## Results

Table 1 presents the descriptive statistics of the sample. The average age of the participants was 48.74 years old. 50.76%

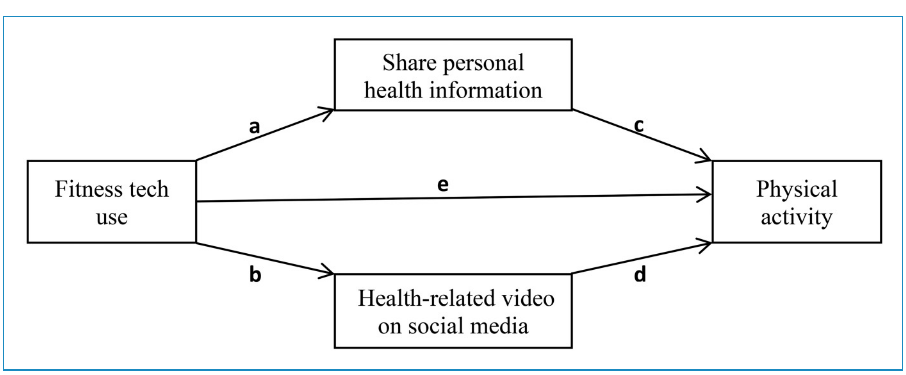


**Figure 1.** The concept model of the proposed mediation model.
*Alt Text:* A conceptual model outlining the mediating paths: independent variable, fitness technology use, is linked to two mediators: share personal health information and watch health-related video on social media, and those two mediators are then linked to the outcome variable, PA.

respondents were female and 61.21% were non-Hispanic white. 30.04% of the respondents had some college education and 18.89% were college graduate. The average annual family income was 5.92 on a scale ranging from 1 ($0–$9999) to 9 ($200,000 or more). About 29% respondents used both health/fitness application and wearable tracking devices. Participants shared their personal health information on social media with an average frequency of 0.27 ($SE = .02$) on a scale ranging from 0 (never) to 4 (almost every day). They watched health-related video on social media with an average frequency 1.03 ($SE = .02$) on a scale ranging from 0 (never) to 4 (almost every day). Participants engaged in moderate PA on average 2.89 ($SE = .04$) days a week and musculoskeletal-focused PA (i.e., strength training) on average 1.42 ($SE = .04$) days a week.

Table 2 includes the results of multivariate regressions examined hypotheses 1–4. H1 predicted that use of fitness technology would be positively associated with sharing personalized health information on social media. As shown in Table 2, fitness technology use was positively associated with sharing personal health information on social media ($b = .11$, $SE = .02$, $p < 0.001$). H1 was supported.

H2 predicted that sharing personal health information on social media would be positively associated with PA. The results showed that sharing personal health information on social media was positively associated with strength training (i.e., musculoskeletal-focused PA, $b = .27$, $SE = .10$, $p = 0.009$) and was not associated with moderate PA ($b = .09$, $SE = .11$, $p = 0.43$). H2 received partial support.

H3 predicted that use of fitness technology would be positively associated with watching health-related video on social media. The results showed that fitness technology use was positively associated with watching health-related video on social media ($b = .29$, $SE = .04$, $p < 0.001$). H3 was supported.

H4 predicted that watching health-related video on social media would be positively associated with PA. The results demonstrated that watching health-related video on social media was positively associated with both moderate PA ($b = .13$, $SE = .06$, $p = 0.03$) and strength training (i.e., musculoskeletal-focused PA, $b = .12$, $SE = .05$, $p = 0.03$). H4 was supported.

H5 predicted that communication behaviors on social media would mediate the link between fitness technology usage and PA. As shown in Tables 3 and 4, communication behaviors on social media did not mediate the relationship between fitness technology use and engagement in moderate PA (point estimate = −.003, 95% CI = [−.0103, .0046] for sharing personal health information and point estimate = .008, 95% CI = [−.0092, .0248] for watching health-related video on social media). In contrast, the mediation paths were significant for strength training (point estimate = .013, 95% CI = [.0054, .0217] for sharing personal health information and point estimate = .022, 95% CI = [.0075, .0371] for watching health-related video on social media). The results suggest that fitness technology use was associated with more communication behaviors on social media which, in turn, was associated with more strength training but not moderate PA. H5 was partially supported.

Lastly, results from the multivariate regressions revealed that using fitness technology was positively associated with both moderate PA ($b = .41$, $SE = .07$, $p < 0.001$) and strength training ($b = .29$, $SE = .06$, $p < 0.001$).

## Discussion

Using nationally representative data collected in 2022, this study set out to examine whether and how the use of fitness technologies, including health/fitness application and wearable tracking devices, was associated with the frequency of PA. Drawing on the cognitive mediation model and its extensions, this research examined the potential mediating roles of social media communication behaviors, specifically sharing personal health information and watching health-related video on social media. The results showed that using fitness technologies was directly associated with PA. Furthermore, fitness technology usage was positively associated with communication behaviors on social media, which, in turn, were positively associated with PA. Further analyses revealed that communication behaviors on social media mediated the link between fitness technology use and strength training (a type of musculoskeletal-focused PA). However, this mediating effect was not observed for moderate PA. The current study enriches the literature on the roles of fitness technologies played in influencing PA by uncovering underlying mediating mechanisms.

A few previous studies have reported that owning and using fitness applications and wearable tracking devices were not significantly associated with self-reported PA.[8,10,35] However, these studies generally relied on data collected before 2019. In light of this, there are two reasons that may explain why a positive association was observed between fitness technology usage and PA, in contrast to some earlier findings. Firstly, it is possible that fitness technologies have reached a mature stage in their product life cycle, resulting in a filtering-out of some consumers who own the product but do not put them into use.[58] For example, research has shown that over 45% of fitness application owners had discontinued their use (Krebs & Duncan, 2015), and the compatibility of these technologies with individuals' lifestyles became an important factor among current users of tracking watches.[59] It is plausible that, after the initial surge of enthusiasm, current users are less swayed by novelty and social influences and are instead driven more by the functionality of fitness technologies. Secondly, it is possible that the COVID-19 pandemic has heightened people's awareness of PA and the potential facilitative power of fitness technologies.[60]

**Table 1.** Descriptive statistics of the study sample.

| Variable | Mean or %[b] | SE or *n*[b] |
|---|---|---|
| Fitness technology usage in past 12 months | | |
| 0 | 40.54% | 2734 |
| 1 | 30.54% | 1918 |
| 2 | 28.92% | 1600 |
| Moderate PA (days in a week)[a] | 2.89 | 0.04 |
| Musculoskeletal-focused PA (days in a week)[a] | 1.42 | 0.04 |
| Share personal health information on social media[a] | 0.27 | 0.02 |
| Watch health related video on social media[a] | 1.03 | 0.02 |
| Gender | | |
| Female | 50.76% | 3535 |
| Male | 49.26% | 2307 |
| Race/ethnicity | | |
| Non-Hispanic White | 61.21% | 3203 |
| Non-Hispanic Black | 10.99% | 889 |
| Hispanic | 17.05% | 1001 |
| Non-Hispanic Asian | 5.72% | 288 |
| Non-Hispanic Other | 5.04% | 184 |
| Age[a] | 48.74 | .20 |
| Education | | |
| Less than 8 years | 1.91% | 116 |
| 8 through 11 years | 4.94% | 271 |
| 12 years or completed high school | 21.62% | 1068 |
| Post high school training other than college | 8.85% | 433 |
| Some college | 30.04% | 1239 |
| College graduate | 18.89% | 1613 |
| Postgraduate | 13.75% | 1108 |

(continued)

**Table 1.** Continued.

| Variable | Mean or %[b] | SE or *n*[b] |
|---|---|---|
| Family income ranges [a, c] | 5.92 | .06 |
| Body mass index (BMI) | 28.68 | .12 |

*Data source:* Health Information National Trends Survey (HINTS 6, 2022).
Unweighted $N = 6,252$, weighted $N = 258,418,467$.
SE = standard error.
[a]Mean and standard error were presented.
[b]Percentage, mean, and SE were weighted; *n*s were unweighted.
[c]Family income ranges were coded as 1: $0–$9,999, 2: $10,000–$14,999, 3: $15,000–$19,999, 4: $20,000–$34,999, 5: $35,000–$49,999, 6: $50,000–$74,999, 7: $75,000–$99,999, 8: $100,000–$199,999, 9: $200,000 or more.

**Table 2.** Regression analysis of the relationship between fitness technology usage, communication behaviors on social media, and PA, unstandardized (S.E.).

| | MPA | MfPA | Information sharing | Watch health video | MPA | MfPA |
|---|---|---|---|---|---|---|
| Age | −003 (.00) | −01 (.00)*** | −01 (.00)** | −01 (.001)*** | −005 (.003) | −01 (.002)** |
| Gender (ref: Male) | −48 (.13)** | −29 (.09)** | −02 (.04) | −002 (.05) | −39 (.14)** | −21 (.09)* |
| Education | .13 (.04)** | 10 (.03)** | −01 (.02) | 06 (.02)** | 16 (.04)*** | 12 (.03)** |
| Income | −005 (.03) | −04 (.03) | −03 (.01)*** | −02 (.01)† | .04 (.03) | 02 (.02) |
| Race (ref: White) | | | | | | |
| Non-Hispanic Black | −11 (.16) | 12 (.13) | 07 (.07) | 33 (.09)*** | −19 (.15) | 07 (.14) |
| Hispanic | −30 (.14)* | 12 (.14) | 09 (.06) | 31 (.09)** | −32 (.15)* | .11 (.13) |
| Non-Hispanic Asian | −78 (.22)** | −41 (.20)* | −.10 (.06) | 22 (.13)† | −79 (.24)** | −35 (.20)† |
| Non-Hispanic Other | −18 (.28) | −21 (.21) | −07 (.06) | 37 (.13)** | −22 (.29) | −22 (.20) |
| BMI | −08 (.01)*** | −04 (.01)*** | .002 (.003) | 001 (.004) | −08 (.01)*** | −04 (.01)*** |
| Fitness technology use | .41 (.07)*** | .29 (.06)*** | 11 (.02)*** | 29 (.04)*** | NA | NA |
| Information sharing | NA | NA | NA | NA | 09 (.11) | 27 (.10)** |
| Watch health video | NA | NA | NA | NA | 13 (.06)* | 12 (.05)* |
| *N* | 5138 | 5126 | 5071 | 5130 | 5039 | 5027 |
| *Adjusted* $R^2$ | 12*** | .07*** | 06*** | .15*** | .10*** | 07*** |

*Note:*† $p < 0.10$; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$; listwise deletion;

Consequently, current owners of fitness technologies might be more likely to use applications and wearable trackers for PA and other lifestyle changes.

The results highlighted the potentials of communication behaviors stemming from fitness technology usage to promote PA. This echoes a body of research emphasizing the importance of technological affordances in driving behavioral changes.[12,41,46] The current study implies that applications and trackers equipped with mechanisms that encourage the sharing of personal health information and the viewing of additional health-related videos are conductive to behavioral changes. Importantly, adding those

**Table 3.** Mediation of the relationship between fitness technology usage (FTU) and moderate PA (MPA) through sharing personal health information on social media (SPHI) and watching health-related video on social media (WHV).

| | | | Bootstrapping | |
|---|---|---|---|---|
| | B | SE | LLCI | ULCI |
| FTU → SPHI → MPA | −0029 | .0038 | −0103 | 0046 |
| FTU → WHV → MPA | 0076 | .0087 | −0092 | 0248 |

*Note:* Bootstrapping results are bias corrected and accelerated; 5000 bootstrap samples; Demographics including age, gender, race, education, family income, and BMI were included into the equations as control variables, but not reported here due to space limitation.

**Table 4.** Mediation of the relationship between fitness technology usage (FTU) and strength training (st) through sharing personal health information on social media (SPHI) and watching health-related video on social media (WHV).

| | | | Bootstrapping | |
|---|---|---|---|---|
| | B | SE | LLCI | ULCI |
| FTU → SPHI → ST | .0126 | .0041 | .0054 | .0217 |
| FTU → WHV → ST | .0221 | .0075 | .0075 | .0371 |

*Note:* Bootstrapping results are bias corrected and accelerated; 5000 bootstrap samples; Demographics including age, gender, race, education, family income, and BMI were included into the equations as control variables, but not reported here due to space limitation.

features is low-cost and easy to implement, given the growing integration between fitness technologies and social media. Future studies should delve further into other communication behaviors induced by using fitness technologies and their consequent effects on health behaviors. Doing so will contribute to a more complete understanding of fitness technologies' potentials in promoting changed in health-related behaviors. It is possible that those social media communication behaviors followed from technology usage enhance information elaboration, learning, and social motivations for PA.[7,9] Taken together, more studies on the relationships between communication behaviors, underlying cognitive changes, and health behaviors are warranted.

It is worth noting that the mediating paths were found to be significant only in the linkage between fitness technology usage and strength training, and not in the case of moderate PA. Strength training is, presumably, more cognitive and resource demanding. It is conceivable that individuals with lower levels of physical literacy could engage in moderate PA such as walking and bicycling, but strength training demands a certain level of literacy. This is also evident in the fact that fitness influencers on social media strive to establish expertise by uploading instructional videos.[61,62] In this case, communication behaviors elicited by fitness technologies can play a crucial role in shaping more complex behavioral changes that require a higher degree of physical literacy.

The findings provide valuable practical implications. First, developers can design fitness applications that not only track PA but also facilitate social media integration for users to share their progress, achievements, and challenges. These applications can leverage social reinforcement and support to motivate users to stay active.[11,63] Second, health interventions and campaigns can encourage users to engage in health-related communication behaviors on social media platforms. This might involve providing prompts, challenges, or incentives for users to share their fitness activities or watch health-related content. By doing so, interventions and campaigns can not only expand the reach but also boost engagement among target audience.[64] Third, intervention programs can utilize fitness technologies as a central component to promote PA. By integrating features that facilitate social interaction and support, these interventions can increase adherence to exercise routines and promote sustained behavior change.[65]

The current study has some limitations. First, the cross-sectional nature of the dataset restricted our ability to draw causal inferences. Future research could build on the study to examine longitudinal relationship between fitness technology use, social media communication behaviors, and PA. Doing so would also be helpful to delineate the directionality of influence and the dynamics among variables within the proposed mediation model. Second, as a result of using a secondary dataset, the measures of relevant communication behaviors on social media are quite general in wording and limited in scope. Besides sharing personal health information and watching health-related videos, fitness technologies may encourage various other communication behaviors, such as discussions of fitness-related topics, seeking further fitness-related information from experts, and engaging in in-depth elaboration on fitness-related information, to just name a few. The limitations on the scope and specificity of measurements may have dampened the size of the mediating effects in the proposed model. Therefore, future studies should develop measures of communication behaviors on social media with more diverse behaviors and more precise, context-specific wording. Third, this study used self-report survey which is subject to recall and response biases. To enhance the robustness of the results presented here, alternative measures such as activity tracking and ecological momentary assessment could be used to triangulate the findings.

## Conclusions

Despite those limitations, this research has uncovered a previously overlooked path through which fitness technology may contribute to PA. The results highlighted the roles of communication behaviors on social media in mediating the relationship between fitness technology and PA. The evolving health communication system affords rapid sharing of personal information and access to a vast amount of additional health content. Hence, there exist great potentials for practitioners to harness the influence of communicative behaviors on social media in shaping health behaviors. Future research will benefit from examining more communication-centered mechanisms underlying health behavioral change.

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