Let's start tomorrow - bridging the intention behavior gap using fitness apps

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Abstract. The intention-behavior gap is a well-known phenomenon in health behavior research. Individuals often intend to engage in healthy behaviors but fail to act. Fitness apps have emerged as a promising tool to bridge this gap and promote physical activity. This study aimed to understand the acceptance factors relevant to intending to use fitness apps (UTAUT2) and factors that prevent people from using fitness apps. By shedding light on behavioral-related factors such as organizational and motivational challenges, social inclusion, and volitional factors, this study contributes to explaining and bridging the intention-behavior gap. An online survey was conducted with a sample size of n = 100. Participants were asked about their fitness app usage, motivation for using fitness apps, and barriers preventing them from using them. The results showed that while hedonic motivation and habit influence users' intention to use fitness apps, performance expectancy influences the intention to use a fitness app for non-users. Further, the results showed no influence of behavioral-related factors on the intention to use fitness apps but on sport behavior. The study's findings offer implications for research and actionable guidelines for promoting physical activity and overcoming the intention-behavior gap.

Keywords: Fitness Apps · Acceptance · Intention Behaviour Gap · Volition.

1 Introduction

"Let's start tomorrow" refers to people's tendency to delay taking action on their intentions, such as using a fitness app. Even though the desire to lead a healthy life is familiar to many. In addition to a genetic predisposition, general lifestyle significantly impacts health. Diet, exercise, relaxation, and sleep are four pillars that positively influence life [7]. Regular physical activity is crucial for maintaining good health and well-being. Despite the well-known benefits of exercise, many people struggle to engage in physical activity consistently. Based on the most recent study results of the WHO 40 % of the German population lacks exercise. This results in dramatic health consequences such as back problems, cardiac disease, obesity, diabetes, depression, and dementia, among other

diseases [20]. The rising number of diseases, demographic change, and the shortage of skilled healthcare professionals represent an enormous challenge for the healthcare system [19].

Fortunately, the rise of digitization has brought new opportunities to promote physical activity. Fitness apps are popular digital tools that people can use to track their exercise and monitor their progress toward their fitness goals. These apps can motivate individuals to engage in physical activity and improve their health and well-being. Tracking and analyzing personal data using fitness apps has increased in the last decade. The so-called *quantified-self movement* is one of the factors driving people's interest in using fitness health apps [18]. In addition, people, in general, are increasingly interested in taking an active role in their own healthcare [23].

However, the usage of fitness apps is still evolving, and usage is relatively low. Moreover, even intending to do sports with the help of a fitness app does not automatically lead to taking actual action to change behavior [28]. People may encounter various obstacles that prevent them from acting on that intention to do sports. For example, they may lack motivation, feel overwhelmed, or encounter technical difficulties with the app.

Therefore, this study was examined to understand the acceptance-relevant factors of intending to use fitness apps and factors that prevent people from using fitness apps. By shedding light on behavioral-related factors such as organizational and motivational challenges, social inclusion as well as volitional factors, this study contributes to explaining and thus bridging the intention-behavior gap. The study's findings offer implications for research as well as actionable guidelines on promoting physical activity and overcoming the intention-behavior gap.

2 Related Work

In the following the value of fitness apps, the empirical approach to measure acceptance as well as behavioral related factors that might be seen as obstacles to using fitness apps is described.

2.1 Value of Fitness-Apps

Fitness apps, belonging to the broader category of eHealth and known as mobile health apps (mHealth app), are software applications designed to help individuals track and manage their physical fitness and well-being through digital devices such as smartphones, tablets, or wearable devices [36]. These apps typically include features such as tracking physical activity, monitoring food intake, providing customized exercise plans, and offering community support.

Fitness apps have taken on new meaning and importance during the COVID-19 pandemic. With gyms and fitness studios closed or operating at reduced capacity in many areas, people have had to find alternative ways to stay active and maintain their fitness routines. Fitness apps have provided a convenient and

accessible option for individuals to exercise at home or outdoors while following social distancing guidelines [29].

Moreover, fitness apps can contribute to the achievement of the third Sustainable Development Goal to ensure health and well-being for all by promoting physical activity, healthy behaviors, and providing education and resources for good health [29]. Thus, the value of fitness apps is high, especially regarding the convenient fact that they are accessible for free or at a low cost for everyone who owns a smartphone.

Even though the advantages of fitness apps are outstanding, there is often an intention-behavior gap which means that people fail to translate their positive intentions to use a fitness app into action [12]. For this reason, this study aims to reveal the factors that prevent people from doing physical exercise with fitness apps.

2.2 Measuring Acceptance of Fitness Apps

Acceptance of fitness apps can be defined as the degree to which a person is willing to use and engage with the app. There have been several models developed to understand the factors that influence acceptance. Most of these models are based on the Theory of Reasoned Action (TRA) proposed by Fishbein and Ajzen in 1977 [13]. The TRA has been the foundation for subsequent acceptance models and suggests that actual behavior is the immediate predictor of technology use based on behavioral or usage intention. This intention is determined by attitude towards the behavior and social norms.

The Unified Theory of Acceptance and Use of Technology (UTAUT) was developed as a successor to the Technology Acceptance Model (TAM) models, with a focus on predicting adoption in the work context [32]. However, with the increased use of technology outside the work context, UTAUT and its extension UTAUT2, have provided a model for investigating acceptance in commercial and other contexts, such as the digital health sector. The model includes seven constructs: performance expectancy, effort expectancy, social influence, facilitating conditions, hedonic motivation, price value, and habit.

Performance expectancy refers to the degree to which users believe that using the technology will improve their performance. Effort expectancy refers to the ease of use of the technology. Social influence refers to the degree to which users perceive that others expect them to use the technology. Facilitating conditions refer to the availability of resources to support the use of technology. Hedonic motivation refers to the pleasure and enjoyment users derive from using technology. Price value refers to the perceived value of the technology in relation to its cost. Finally, habit refers to the automatic and repetitive use of technology.

Several studies have used the UTAUT2 model to measure the acceptance of fitness apps. Performance expectancy, effort expectancy, social influence, and hedonic motivation were significant predictors of users' intentions to use fitness apps [3], [17].

Since UTAUT2 provides a useful framework for understanding the factors that influence the acceptance and use of fitness apps, it was chosen as a basic model in this study.

2.3 Approaching the Intention Behavior Gap

The intention-behavior gap refers to the discrepancy between an individual's intentions to engage in a behavior, and their actual behavior [27]. In other words, it is failing to act on one's intentions.

There are several theoretical approaches to understanding the intention-behavior gap, including the Theory of Planned Behavior [1] and the Health Action Process Approach [26]. Both models propose that behavior is the result of a combination of intention, which is influenced by attitudes, subjective norms, and perceived behavioral control, and actual behavior, which is influenced by environmental and personal factors.

In addition, several empirical studies have identified various factors that contribute to the intention-behavior gap in the context of health-related behaviors.

One major factor is usability. If the app is difficult to use or does not provide a clear and easy-to-understand interface, users may abandon the app or not use it as frequently as intended.

Furthermore, organizational factors such as workplace policies and social support have been shown to influence individuals' ability to act on their intentions [22]. Motivational challenges, such as low self-efficacy and lack of intrinsic motivation, have also been identified as significant barriers to behavior change [30].

Social inclusion, or the degree to which an individual feels connected to a social group, has been found to impact the intention-behavior gap in various ways. For example, individuals who feel socially excluded may be less motivated to engage in healthy behaviors [16].

Finally, volition, or an individual's ability to self-regulate their behavior, has been identified as a critical factor in the intention-behavior gap. For example, individuals who lack self-control may struggle to follow through on their intentions to engage in healthy behaviors [25].

Overall, the intention-behavior gap is a complex phenomenon that is influenced by a variety of factors. This study intends to bridge the intention behavior gap by examining behavior-related factors such as organizational and motivational challenges, social inclusion, and volitional factors.

3 Empirical Approach and Logic of Procedure

To get insights into the factors that are acceptance relevant and, moreover, to understand the intention-behavior gap by shedding light on behavioral-related factors, we conducted an online survey as part of a bachelor thesis at RWTH Aachen University in the summer of 2021. The participants took part voluntarily and were not compensated. The sample, procedure, and results are briefly outlined below. The following research questions guided the study:

1. What are acceptance-relevant factors that describe the intention to use a fitness app?
2. In how far do these acceptance relevant factors differ regarding users and non-users of fitness apps?
3. To what extent do behavioral-related factors (organizational, motivational challenges, social inclusion, and volitional factors) coupled with the acceptance-related factors (UTAUT2) contribute to the intention to use a fitness app?
4. Do behavioral-related factors (organizational, motivational challenges, social inclusion, volitional factors) differ between fitness app users and non-users?

Figure 1 overviews the proposed research model underlying this study.

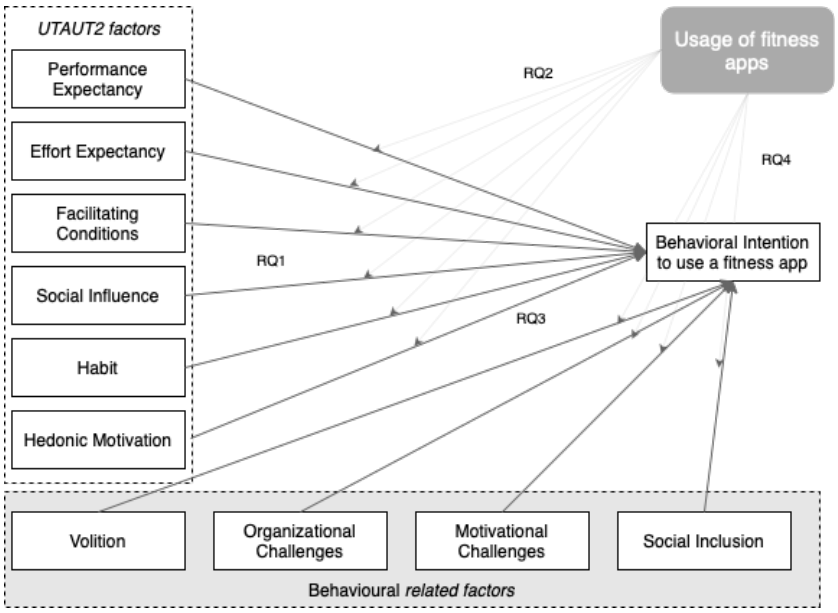

Fig. 1. Proposed research model: RQ: research question; UTAUT2: unified theory of acceptance and use of technology 2.

3.1 Evaluation Measures

The online survey consisted of four parts. The constructs used in the survey with their respective sources can be seen in table 1.

Demographic data. In the first part, demographic data such as age, gender, marital status, school qualifications, occupation and whether children lived in the household were queried.

Table 1. Constructs used in the questionnaire with their respective sources.

Constructs	Subconstructs	Source upon which the construct was based
UTAUT2[a] constructs	Performance expectancy Effort expectancy Social Influence Facilitating Conditions Hedonic motivation Habit Behavioral intention	Venkatesh et al. [4]
Organizational Challenges	N/A[b]	Brown et al., 1999 [6]
Motivational Challenges	N/A[b]	Brown et al., 1999 [6]
Social inclusion	N/A[b]	Brown et al., 1999 [6]
Volition[c]	N/A[b]	Elsborg et al., 2017 [10]

[a] UTAUT2: unified theory of acceptance and use of technology 2.

[b] N/A: not applicable; the construct did not have any subconstructs.

[c]: German validation by Pfeffer et al. [21]

Sport Behavior, App Usage and Hurdles. The second part comprises the actual sport behavior which was explored retrospectively with three foci: the commitment to planned sports (*Have you exercised every time you set out to do so in the last three weeks?*) and the quality (*Are you satisfied with the amount of exercise you have done in the last three weeks?*) which could be indicated on a five-point Likert scale and quantity (*How often have you exercised on average in the last three weeks?* could be answered from *once a week* to *daily* seven gradations in the possible answers.

Respondents were also asked whether they owned a smartphone, tablet, or wearable device, whether they had installed a fitness app, whether and how long they had been using fitness apps, and - in case they had installed one - which app they use.

They were also asked what they use an app for or can imagine using it for *to create workout plans*, *regular reminders to exercise*, *monitoring of vital signs (heartbeat, sleep...)*, *competition with friends and other people*, *tracking and sharing distances run*, *progress monitoring/statistics*, *calorie tracking*, *social exchange with other athletes* or other functions that could be typed in as free text. Furthermore, experienced hurdles were asked which have prevented one from doing sports in the past few weeks (*retrospective barriers*), such as: *too many work and university appointments*, *too many leisure dates*, *health problems*, f*finding people with whom to train together*, *motivational issues* or other hurdles that could be entered as free text. All items were examined on a five-point Likert scale between "do not agree at all" to "agree completely".

Theory of Planned Behavior and UTAUT2 Factors. The third part comprised the intention to do sport based on the Theory of Planned Behavior. For this purpose, as suggested by Ajzen [2], the instrumental and experimental

aspects, the subjective norm, the perceived behavioral control and the intention were presented on five-point Likert scales. For the instrumental and experiential aspects, it should be indicated whether more physical activity would be rather bad or good and rather pleasant or unpleasant. The subjective norm was indicated by *Most of the people I care about like it when I exercise*. Perceived behavioral control was queried with the statements *I am confident that I can do sport* and *Doing sport is my decision*. For intention, respondents were asked whether it was more likely or less likely that they would plan to do sport.

The general attitude towards fitness apps was asked by scales adopted by Vervier [35] based on Venkatesh's UTAUT2 model [32]. The Performance Expectancy indicates whether a fitness app brings a personal benefit. Here, for example, the question was asked to what extent the statement that a fitness app is useful in everyday life was agreed upon. The effort expectancy asks how difficult it is for the user to use a fitness app, i.e. the ease of use, indicating, for example, whether the handling of such apps is clear and understandable. Social influence measures whether significant others have an influence on the willingness to use fitness apps through questions like to what extent people whose opinion is valued think that one should use those. The facilitating conditions show whether the necessary prerequisites and knowledge are available to use fitness apps. This means, among other things, whether you have a smartphone or tablet that runs such an app or whether you have the necessary knowledge to use an app. The hedonic motivation in the use of fitness apps measures whether the use of an app is perceived as pleasant and entertaining. Regarding the habit of using fitness apps, respondents were asked whether the use had already become a habit, whether one could still do without such an app, and whether one needed this app. Price Value was not included in the study. Behavioral Intention measures whether the intention is to continue using a fitness app or whether it is intended to be integrated into everyday life.

Behavioral Related Factors. The fourth part consists of social, organizational, and motivational challenges as well as volitional factors which are anticipated to explain overcoming hurdles to use a fitness app. All items are shown in table 2.

Items referring to the volitional factors were taken over completely from [21], but the proposed four-point Likert scale was transformed to a five-point Likert scale in order to have coherent five-point scales with the same classification in all questionnaire items. Table 1 gives an overview of the constructs used in the questionnaire with their respective sources.

In the following, the methodological approach is outlined.

3.2 Structural equation modeling (SEM)

Structural equation modeling (SEM) is used to understand cause-and-effect relationships in empirical data. SEMs can be used to confirm theories, for which covariance-based SEMs are used, while variance-based partial least squares SEMs

Table 2. Behavioral related constructs with corresponding items and respective sources.

N.	Scale item: I can imagine, that a fitness app can help me...	from N.[a] [6]
	social inclusion	
1	...exercise on my own.	o.c.[b]
2	...to adapt my behavior to that of my friends.	9.
3	...ask others for help when I need it.	60.
4	...to be like the people around me.	44.
5	...motivate myself to exercise by sharing with my friends.	o.c.[b]
6	...find a group to do sports together.	o.c.[b]
	organizational challenges	
1	...set aside time in my schedule for exercise.	o.c.[b]
2	...be less easily distracted from my plans.	6.
3	...find a routine.	24.
4	...stick to a plan that works well.	27.
5	...make plans to help me reach my goals.	40.
6	...set goals and monitor my progress.	42.
	Motivational challenges	
1	...reward myself for progress on my goals.	7.
2	...follow through with things once I set my mind to do them.	20.
3	...look for possible solutions as soon as I see a problem or challenge.	32.
4	...strengthen my willpower.	34.
5	...resist temptations.	41.
6	...stick to rules no matter what.	48.

[a] N.: Number

[b] o.c.: own consideration

are used for exploratory purposes [8]. Using both techniques, two kinds of effects can be investigated: The measurement model considers the relationships between observed and latent variables and the structural model considers the relationships between the latent variables.

In the first step (measurement model), the latent factors are calculated from the manifest, observed variables. These calculated latent factors give the analyzed variance of the manifest indicators adjusted for measurement errors. In the second step (structural model), it can be considered how the latent independent variables (or exogenous variables) influence the latent dependent variables (or endogenous variables). As input variables, the exogenous variables are at the beginning of the model, they are not influenced by other variables. In contrast, the endogenous variables are influenced by other variables in the model. It is possible that some variables within structural equation modeling are simultaneously dependent and independent. By using structural equation modeling, it is possible to investigate whether one variable directly influences another variable

or whether the relationship between the two variables is mediated by another variable [15, 8].

3.3 Assessment of quality

We followed the guideline by Hair et al [14] to check for the quality of the measurement model.

Table 3. Dispersion and reliability of *UTAUT2* constructs and *behavioral related* factors

	Mean	**SD**	**Reliablity (Cronbachs α)**	**Quantity items**
Performance Expectancy	3.09	0.92	$\alpha = .884$	6
Effort Expectancy	4.05	0.77	$\alpha = .899$	4
Facilitating Conditions	4.65	0.55	$\alpha = .698$	2
Social Influence	2.30	0.90	$\alpha = .912$	3
Habit	2.27	0.98	$\alpha = .827$	3
Hedonic Motivation	3.25	0.83	$\alpha = .912$	2
Behavioral Intention	2.86	1.19	$\alpha = .927$	3
Organizational Challenges	3.60	0.79	$\alpha = .889$	6
Motivational Challenges	2.76	0.81	$\alpha = .834$	6
Social Inclusion	2.64	0.87	$\alpha = .843$	6
Volitional Factors	3.36	1.11	$\alpha = .934$	18
Intention to exercise (tpb)	1.95	0.57	$\alpha = .781$	3

SD: standard deviation

4 Results

After a short introduction of our sample, we present the actual results of our study answering the four research questions.

4.1 Sample

Table 4 shows the demographic characteristics of the sample separately for users and non-users of fitness apps. In total 100 surveys were fully completed consisting of 64 % female and 34 % male participants (2 %diverse) between 17 and 77 ($mean$ = 28.35, SD = 13.96) years. Overall, the sample is well-educated. 37% have high school diploma, 29 % a university degree and 7% intermediate maturity.

Participants' sports behavior/ intention to do sports. In the last three weeks, most participants exercised once a week (47%). Also, many participants

exercised two (20%) or three times (21%) a week and only a few participants (11%) exercised more often (4-6x) or daily (1%).

Fitness app users ($N = 55$) exercised more often in the last three weeks ($MW = 3.45$, $SD = 1.27$) than non-users ($N = 45$, $MW = 2.73$, $SD = 1.28$) and are more satisfied (users: $MW = 2.89$, $SD = 1.34$, non-users: $MW = 2.20$, $SD = 1.16$) with how frequently they did sports.

Table 4. Demographic characteristics of the sample comparing users and non-user of fitness apps (n=100).

Characteristic	Users ($n = 55$)	Non-users ($n = 45$)
Age (years), mean(SD)	28.24 (12.72)	28.49 (13.40)
Gender,n(%)		
Women	31	31
Men	20	16
Diverse	2	0
Education level		
intermediate maturity	7	3
high school diploma	32	32
university degree	19	10

*S*D: standard deviation

Attitude towards app usage. 52% of the participants use a fitness app such as Fitbit, Samsung Health, and Komoot. Respondents currently use fitness apps most for *progress monitoring or statistics* (56%), or can imagine using a fitness app for this purpose. Also, many respondents use an app for *regular reminders to exercise* (48%) and for *tracking and sharing distances run* (47%). 37% use fitness apps *to create workout plans*. 36% *monitor vital signs* (such as heartbeat, sleep, etc.). 24% stated to use the app for *a competition with friends and other people*, 21% *to track calories* and 6% for *social exchange with other athletes*.

Hurdles experienced. For the participants, *motivation issues* were the biggest barrier to exercising in the last three weeks ($M = 3.66$, $SD = 1.32$). In addition, *too many work and university appointments* prevented the participants from exercising ($M = 3.39$, $SD = 1.35$). In comparison *leisure dates* ($M = 2.75$, $SD = 1.20$), *health problems* ($M = 2.84$, $SD = 1.43$) and *finding people with whom to train together* ($M = 2.56$, $SD = 1.43$) represented lower barriers for participants to exercise.

4.2 Acceptance relevant factors

Regarding the first question about what are acceptance-relevant factors that describe the intention to use a fitness app the following results were found: a structural-equation model analyzing the influence of the *UTAUT2* factors on *behavioral intention to use fitness apps* explained 58% of the variance of *app usage* ($R^2 : 0.583$). *Enjoyment when using the app* (0.407, $p < .001$) leads participants

most strongly to indicate app use in the future. Besides, *performance expectancy* (0.282, $p = .001$) and *habit* (0.208, $p = .004$) result in a higher *behavioral intention to use fitness apps*. In contrast, *facilitating conditions* (0.130, $p = .134$), *effort expectancy* (0.013, $p = .870$), and *social influence* (0.049, $p = .533$) do not influence *fitness app use* in our sample.

The f^2 test for *app use fun* was 0.203. Cronbach's alpha, rhoA, composite reliability, and mean extracted variance were all sufficiently good.

4.3 Acceptance relevant factors of users and non-users

In a second structural-equation model, we compared users and non-users of fitness apps (see Figure 2) considering the influence of the *UTAUT2* factors on the *behavioral intention to use a fitness app*. The construct *habit* drops out for the non-users since they do not have it yet. The model explains about 43% variance for non-users and about 73% variance of users of fitness apps.

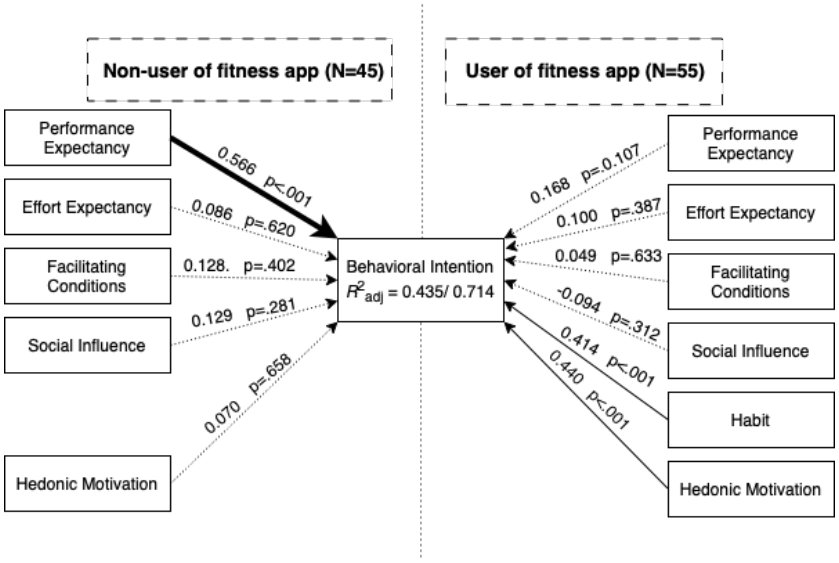

Fig. 2. Influence of *UTAUT2* factors on *behavioral intention to use fitness apps* contrasting users and non-users of fitness apps. (significance based on bootstrapping; n=100). adj: adjusted.

For non-users of fitness apps only *performance expectancy* (0.566, $p < .001$, $f^2 = 0.333$) strongly influences how strong they *intend to use a fitness app*. For users of fitness apps, *hedonic motivation* (0.440, $p < .001$, $f^2 = 0.410$) and *habit* (0.414, $p < .001$, $f^2 = 0.370$) lead to a higher *behavioral intention to use a fitness app*.

4.4 Acceptance explained by UTAUT2 and behavioral related factors

Using another structural-equation model ($n = 100$), we analyzed whether *behavioral related* factors (*volition*, *organizational challenges*, *motivational challenges*, *social inclusion*) influence the *intention to use a fitness app* in addition to the *UTAUT2* factors. The model explained around 60% ($n = 100, R^2_{adj} = 0.605$) of the variance. Next to *performance expectancy*, *hedonic motivation* and *habit*, we found a significant influence of *organizational challenges* ($0.172, p = .041$) on *intention to use a fitness app*, but according to the f^2-test only the effect of *hedonic motivation* was big enough for the sample (0.373, $p < .001$, $f^2 = 0.184$).

Zooming in to the group of users of fitness apps, another structural-equation model explained 70% of the variance of the *intention to use a fitness app* ($n = 55, R^2_{adj} = 0.704$). As could be seen for the overall sample, *hedonic motivation* and *habit* significantly lead to a higher *intention to use fitness apps*, but the model showed no significant influences of the *behavioral related* factors ($p_s > .05$).

Considering the non-users of fitness apps, a structural-equation model explained 47% of the variance of the *intention to use a fitness app* ($n = 45, R^2_{adj} = 0.472$). Again, as could be shown for the overall sample, only the *performance expectancy*, but no *behavioral related* factors influenced the *intention to use a fitness app*($p_s > .05$).

4.5 Bridging the intention behavior gap

Another structural-equation model (see Figure 3) explained 39% ($n = 55, R^2adj = 0.385$) of the variance of *sports behavior in the past*.

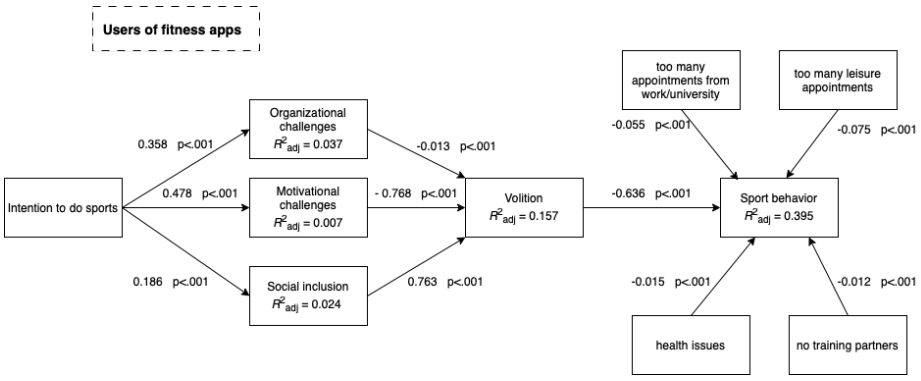

Fig. 3. Structural model from *intention to do sports* to *sport behavior retrospective* (significance based on bootstrapping; n=55). adj: adjusted.

The results revealed that *intention to do sport* significantly influences *motivational challenges* (0.478, $p < .001$, $f^2 = 0.297$). In turn, *motivational challenges* (-0.768, $p < .001$, $f^2 = 0.185$) and *social inclusion* (-0.763, $p < .001$,

$f^2 = 0.263$) significantly influence *volition*. *organizational challenges* also showed an significant influence on *volition*, but the f^2 was too low for the sample (0.013, $p < .001$, $f^2 = 0.006$). *Volition* in turn, significantly influences *sport behavior* (-0.636, $p < .001$, $f^2 = 0.612$). The *external barriers* showed a significant influence on the *sport behavior*, but the f^2-values were too low for the sample ($f^2 s < 0.009$).

We also calculated a structural-equation model from the *intention to do sports* to *sport behavior* for the non-users of fitness apps (see Figure 4).

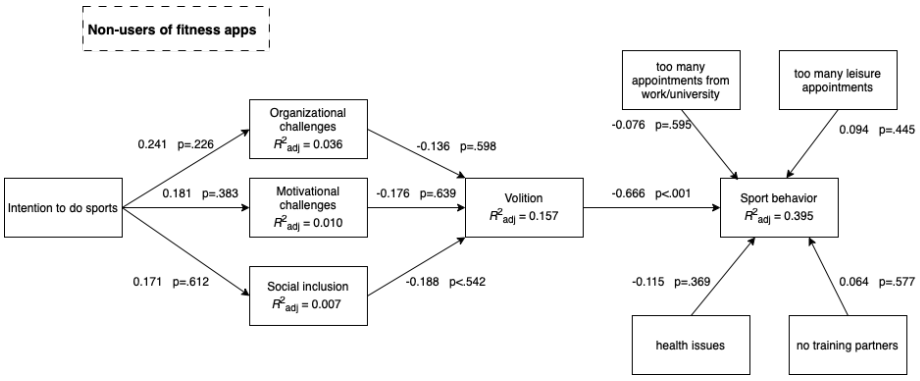

Fig. 4. Structural model from *intention to do sports* to *sport behavior retrospective* (significance based on bootstrapping; n=45). adj: adjusted.

The model explains 40% of the variance of *sport behavior*. In this model, only *volition* significantly influences *sport behavior* (-0.666, $p < .001$, $f^2 = 0.728$)

5 Discussion and guidelines

Acceptance relevant factors of using a fitness app We designed this study aiming to better understand which acceptance factors motivate or prevent users and non-users of fitness apps from doing sports using an app. A further aim of this study was to investigate whether individuals behave according to an intention-behavior gap and if so, how this can be overcome. The intention-behavior gap exists, when individuals indicate that they want to exercise (more), but then fail to put this into practice.

As a base to understand what motivates individuals (users and non-users) to use fitness apps, we applied the established technology acceptance model UTAUT2 [4] and added behavioral related factors (organizational challenges, motivational challenges, social inclusion, volitional factors) to the model.

In our study, the UTAUT2 model could explain 58% of the variance in the intention to use fitness apps. From the original validated UTAUT2 model, we identified only three constructs that influence the intention to use fitness apps.

Without distinguishing between user groups, enjoyment when using a fitness app predicts the use of fitness apps most strongly. Besides, performance expectancy and habit (only users) contribute to the intention to use fitness apps. The construct effort expectancy is modeled as a main aspect in other established acceptance models (for example [11], [31]), but showed no significant influence on acceptance in our study.

Considering the user groups, our results show, that different factors motivate non-users and users of fitness apps to start using/ continue using a fitness app. Individuals, that are users of fitness apps, are already one step ahead of non-users in that they have at least some experience in using the app. If they have fun while using a fitness app, it motivates them to use the app (further). In addition, the use of the app also becomes a habit for some users reinforcing its further usage. In contrast, non-users would most likely start using a fitness app if they expect it to be useful. Exemplary, an app can help people in taking care of their health in daily life.

Influence of behavioral related factors We considered whether behavioral-related factors can add value to the UTAUT2 factors in explaining the intention to use a fitness app. The results showed, that the behavioral related factors, that we considered in this study, did not contribute to the explanation of the fitness app use. Thus, further factors adding to the UTAUT2 factors exist, that we did not take into account. Mirroring, that the app-related acceptance factors can strongly lead to a higher intention to use fitness apps and to exercise.

Intention-Behavior-Gap When participants plan to do sports (often) but in reality do no or very little sports, their behavior corresponds to an intention-behavior-gap. Whether an intention-behavior gap exists depends not on the frequency of doing sports but whether humans do sports when they plan to. Therefore, we considered which factors influenced whether participants did sport in the past when they planned to exercise.

We assume that the participants are then dissatisfied with their (sports-) behavior. Considering, whether participants show an intention-behavior-gap, the individuals considered, are rather sportive. Supporting our assumption, fitness app users exercise more often and are more satisfied with the sports they do than non-users. Nevertheless, an intention-behavior gap has been shown, as more than half of the considered individuals did not do sports (always), when they planned to exercise. An individual with a generally higher intention to do sports is also more motivated to use an app to overcome motivational challenges. Also, individuals that can better imagine that the app can help overcome motivational challenges and lead to better social inclusion perceive less volition. This result is in line with results of [16] that being socially excluded demotivates individuals in healthy behaviors. In turn, individuals with a higher volition (users and non-users) did less often sports when they planned to do sports. This result reflects the results of [25] a lack of self-control leads individuals to struggle to follow through on their intentions to engage in healthy behaviors. The volition

of individuals is obviously an important adjusting screw if individuals are to be motivated to do more sport.

Guidelines The findings of our study offer implications for research and actionable guidelines for promoting physical activity and overcoming the intention-behavior gap: In trying to overcome the intention-behavior gap and motivate individuals to exercise more, fitness apps can be of great help. Differences between users and non-users of fitness apps must be taken into account. For example, a fitness app must be designed for users in such a way that users enjoy using it. It should also be easy for them to integrate the app into their everyday lives so that a habit is established that users will ideally want to stick with in the long term. In contrast, non-users must first be motivated to use a fitness app. Here it is important to emphasize the benefits of the app for potential users.

5.1 Limitations and future research

Our study provides interesting insights to understand why individuals use fitness apps and what motivates them to overcome the intention-behavior gap. Nevertheless, with a revised survey in the future, more questions and our questions in more detail can be answered. In further studies, larger samples would allow us to make representative statements for all users and non-users respectively potential users of fitness apps. Besides, in our study, we asked non-users about anticipated attitudes toward fitness apps. In future studies, hands-on experience is needed to evaluate real attitudes and not only anticipated ones. Our study asked how much exercise was done in the last three weeks. Instead, it would be interesting to conduct a long-term study where behavior can be observed. Not only the difference between users and non-users [9] is important when investigating the acceptance of technology, but also different fitness apps can have an influence on the intention to do sports using an app. In addition, our sample is rather young and educated and was acquired via social contacts. Since the health topic is very important for everyone, it is recommendable to include a wide age range in further studies.

Equally, only healthy persons were regarded, but it is important to include sick people as well. Not only do sick people have different challenges when using fitness apps compared to healthy people, but fitness apps also offer them more options. Thus, by using fitness apps, they can try not only to maintain their health status but also to improve it if necessary. Likewise, fitness apps can enable mobility-impaired individuals to perform exercises at home under guidance.

There are factors that were not considered in this study but which do have a major impact on the intention to use a fitness app. One major factor is privacy concern: Users may be hesitant to use fitness apps that require access to personal information or location data, due to concerns about data privacy and security [33], [34]. Furthermore, trust is also an important factor which could be found in several studies [24], [5]. Future studies on the intention behavior gap should therefore consider these factors for a more holistic explanation.

5.2 Conclusion

Fitness apps vary in their ability to overcome different challenges that constitute the intention-behavior gap. People who have trouble finding time in their schedule to exercise, or do not have a plan for how to achieve their athletic goals are most likely to use fitness apps to exercise more. Fitness apps are less suited to address social and motivational challenges. Motivationally experienced challenges have a large impact on volition, which in turn has a large impact on whether one is satisfied with the amount of exercise done. In the future, we will investigate which app features can better assist with social and motivational challenges and are more accepted to influence volition and thus behavior. We will also investigate what other options besides fitness apps exist to overcome individual barriers. Finally, we will investigate how different options can be combined, leading more people to overcome their intention-behavior gap.

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