

**A survey on the behavior of Indonesian football players using smartwatch****Tri Lathif Mardi Suryanto<sup>a\*</sup>, Nur Cahyo Wibowo<sup>a</sup>, Asif Faroqi<sup>a</sup> and Achmad Afandi<sup>b</sup>**<sup>a</sup>*Department of Information System, University of Pembangunan Nasional Veteran Jawa Timur, Surabaya, Indonesia*<sup>b</sup>*Department of Exact Sciences and Sport Education, IKIP Budi Utomo Malang, Malang, Indonesia***CHRONICLE****ABSTRACT***Article history:*

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The development of wearable technology opens the potential for its use in various sectors, one of which is the use of smartwatches in the sports sector. This paper examines soccer players' behavior's impact on using smartwatches as a training monitoring tool. This study uses a quantitative approach involving as many as 128 soccer players to complete a research questionnaire with face to face (offline). SEM-PLS is used as an analytical method to test the proposed inferential model. As a result, research shows that social influences, relative advantages, and enjoyment impact the use of smartwatches during training and daily use by soccer players.

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**1. Introduction**

Although it is still not as attractive as smartphones, smartwatches are now one of the rapidly developing technologies. For example, in Indonesia, the smartwatch market is growing 24 percent from year to year (Maulida, 2022). Elsewhere, the market size of smartwatches in North America continues to increase (Sights, 2022). It is triggered by increasing public awareness of healthy living. Smartwatch is an internet of things device worn on the hand, has computing features that can record personal data through its sensors and can be connected to other devices via wireless connectivity. This smartwatch's ability can be used in various sectors, especially in the health sector. Several studies in the health sector include the use of smartwatches to measure heart rate in elderly users (Alfeo et al., 2017) and usability measurements of smartwatches in elderly users with atrial fibrillation problems (Ding et al., 2022). The ECG feature on certain smartwatches is also used in the medical environment to detect atrial fibrillation (Isakadze & Martin 2020). In sports, smartwatches are used to measure physical activity, for example, used by coaches to monitor the results of high-intensity interval training. The trainer can use the training data to determine the proper exercise (Sivakumar et al., 2021). Using a smartwatch to measure physical activity is a new approach compared to the old approach, which has to choose an exercise first and press the start or stop button (Shen et al., 2018). In football, sensor-based internet of things devices has been widely used. Among them is the use of video tracking and GPS to monitor the distance covered by soccer players (Pons et al. 2021). In addition, some researchers have developed a device to store, analyze and visualize routes on mobile users, and trainers can also use this device to monitor distance cover (Doulamis et al., 2012). In general, an important point used by coaches to monitor players' fitness performance is the heart rate value (Póvoas et al., 2019; Xiao et al., 2020). With the increasing use of smartwatches in various fields, smartwatches have become an important area to be researched, both by academics and by industry. The industry needs input from the use of smartwatches to further refine it, both in terms of features and from hardware constraints. Several previous studies have confirmed that the development of smartwatch trends is related to technical matters and humans (Wu et al., 2016).

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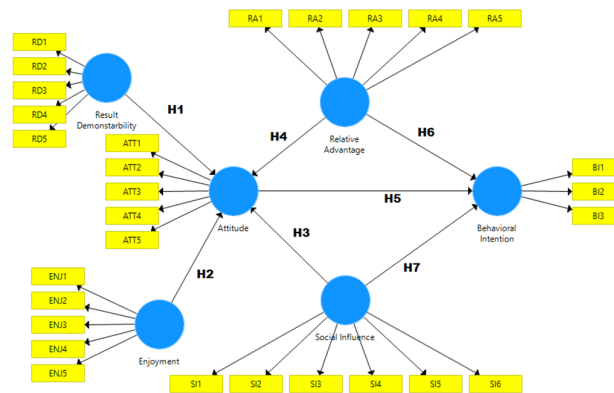
Previous research has revealed the factors that influence user acceptance of smartwatches. Some of these factors include perceived relative advantage, perceived result demonstrability, perceived enjoyment, social influence, and attitude (Wu et al., 2016). More specifically, in the medical field, research on smartwatch acceptance is also being conducted (Elnagar et al., 2022). It is crucial to analyze technology acceptance so that the benefits of smartwatches can be optimized. No matter how sophisticated technology is, if it is not used, the benefits of the technology cannot be felt (Faroqi et al., 2020a). By knowing the factors that affect the acceptance of smartwatches by users, the industry can continue to innovate on its smartwatch products.

The use of smartwatches, especially in football, are still not widely used, both for measuring fitness performance and monitoring the distance coverage of players. Some existing tools tend to be less flexible than smartwatches that only need to be worn in hand. Based on literature studies, research on smartwatches for athletes, especially football players, is still about their functionality, while from the user's point of view, it is still rarely studied. This study examines the factors that influence football players using smartwatches. It is hoped that from the results of this study, a practical and efficient solution will be identified to measure the fitness performance of football players.

**2. Literature review**

The use of smartwatches in sports has not been widely discussed. Smartwatch research is widely found in the medical field, especially to measure heart problems (Ding et al., 2022; Alfeo et al., 2017). In particular, previous research has also measured the usefulness of the ECG feature on smartwatches (Isakadze and Martin 2020). The use of smartwatches in the sports sector is still relatively new. Some sports instructors still use other equipment to monitor the players' physical condition (Póvoas et al., 2019). The use of equipment similar to that used by players in the form of bracelets but not explicitly mentioned as smartwatches (Xiao et al., 2020), several studies related to smartwatches were also found to be testing prototypes (Árvai, 2021; Kurdi et al., 2020). Meanwhile, the use of smartwatches in soccer has not been widely studied. Most of the use of smartwatches in the sports field is seen from the point of view of features and technology. While research from the player's point of view is still not widely found.

The various advantages of using a smartwatch can only be enjoyed if the user is willing to use it. Therefore, it is necessary to know and research the factors that influence users to want to use technology. In addition, by knowing these acceptance factors, service providers or technology producers can evaluate their services or products. Several studies related to technology acceptance include research on factors that influence a person to use e-marketplaces (Faroqi et al., 2020b), and factors that influence users to choose instant messaging (Lu et al., 2009). User factors to accept newly developed apps (Minnaar et al., 2020; Lisana & Suciadi 2021). In the government sector, research on e-government acceptance has also been widely carried out, some of which are (Jacob & Darmawan 2019; Mensah, 2019; Faroqi et al., 2020a). From several studies related to technology acceptance, several influencing factors include perceived benefits (Venkatesh et al., 2003; Davis et al., 1992), perceived enjoyment, and social influence (Venkatesh et al., 2012), and attitude (Cahyono & Susanto 2019). In research on the acceptance of smartwatches by users, the perceived usefulness factor is termed relative advantage and result demonstrability (Wu et al., 2016). Based on previous research, several hypotheses are proposed in this study.



**Fig. 1. Conceptual Research Model**

Fig. 1 describes the model proposal variables used for the needs of this study, and this measurement model provides an overview of the hypothetical relationship between latent factors. There are seven (7) hypotheses whose influence is a positive statement.

**3. Research model and hypotheses**

The object of the case study in this research is amateur and semi-professional soccer players in East Java, Indonesia. This study used a quantitative approach. Primary data was obtained from questionnaire data. Questionnaire items were measured using a

5-point Likert scale, whose scores ranged from strongly disagree to agree strongly. Questionnaire items were obtained from previous research (Wu et al., 2016).

**Table 1**

Personal characteristics of the participants

Respondent	Criteria	Total	%
Gender	Man	101	78%
	Woman	27	22%
Age	less 16 years	7	6%
	17-25 years	50	39%
	26-35 years	45	35%
	more 36 years	20	16%
Smartwatch user	Yes	55	43%
	Plan to use	73	57%
Smartwatch used or what you want to use	Apple Smartwatch	26	21%
	Garmin Smartwatch	5	4%
	Huawei Smartwatch	7	5%
	Oppo Smartwatch	22	17%
	Samsung Smartwatch	22	17%
	Suunto Smartwatch	2	2%
	Xiaomi Smartwatch	44	34%

A total of 128 football players have filled out the questionnaire. The sampling technique used is purposive sampling. Football players who were respondents in this study must have or have used a smartwatch or who plan to use a smartwatch for training needs. The data obtained will be processed using a Structural Equation Model (SEM-PLS), as has been done by previous researchers (Kurdi et al. 2020). Table 1 summarizes the respondent's data. The majority of respondents are male. The total respondents, 43% have used a smartwatch, and the rest plan to use it. In comparison, the smartwatch brand that respondents most choose is Xiaomi.

#### 4. Results and discussion

The collected data is then processed using a structural equation model analysis consisting of measurement and structural models. The results of the validation variation test through external loading can be seen in Table 2 as follows.

**Table 2**

Outer Loadings

Var.	Item	Score
ATT	When carrying out exercises, using a Smartwatch will be a favorable decision.	0.839
	When carrying out activities, using a Smartwatch will be a smart decision.	0.880
	I have a positive impression of using the Smartwatch for training.	0.911
	I would be interested in buying a Smartwatch to support my workout program.	0.916
	I would love to use a Smartwatch during training.	0.876
BI	I am willing to use a Smartwatch during training.	0.872
	I am willing to use a Smartwatch while doing exercises if I have one.	0.935
	I am willing Smartwatch to help me do various types of recording of the results of the exercise.	0.921
ENJ	The process of interacting with the Smartwatch will make me feel happy.	0.835
	Using a Smartwatch will make me enjoy its sophistication.	0.830
	Using a Smartwatch will be very entertaining.	0.828
	Using Smartwatch will be entertaining.	0.866
	Using a Smartwatch will make me feel relaxed.	0.725
RA	Smartwatches increase comfort when I do exercise.	0.779
	A smartwatch will make the exercises I do more effective.	0.821
	The smartwatch will be a useful device for me when doing exercises.	0.887
	Using a Smartwatch during training will have more advantages than disadvantages.	0.851
RD	Using a Smartwatch during training will be more profitable than a regular watch.	0.829
	After completing the exercise, when observing the condition of the body, it will be easier to use a Smartwatch.	0.812
	After completing the exercise, expressing the training results to others will be easy if you use a Smartwatch.	0.763
	Completing the exercise and discussing the training results with others will be easy if you use a Smartwatch.	0.864
	When using a smartwatch, I will gladly reveal how easy it is to share training results information with other people	0.838
SI	I am happy to share the importance of using a Smartwatch during training sessions with others.	0.849
	Using a Smartwatch will help me improve my social status.	0.733
	Anyone who uses a Smartwatch will have a higher social status in TIM.	0.771
	My manager/Coach influences my smartwatch usage, and it's important to influence my behavior toward using a smartwatch.	0.889
	My family, friends, and people around me influence the use of Smartwatches, and it is important for me to use Smartwatches.	0.915
	People around me are used to seeing and/or using Smartwatches.	0.766
	Using a Smartwatch in practicing soccer (sports) is a natural thing.	0.739

The measurement model ensures that the respondent's data is valid and reliable. In this study, using a previous research approach to create question items and the results of the variable validation test are presented in table 2. The outer loading value on the data has met the statistical requirements where the outer loading value is greater than 0.7. At the same time, the structural model is used to analyze the relationship between variables.

**Table 3**  
Results of validity test

	Attitude	Behavioral Intention	Enjoyment	Relative Advantage	Result Demonstrability	Social Influence
<b>A</b>	<b>0.885</b>					
<b>BI</b>	0.713	<b>0.910</b>				
<b>E</b>	0.732	0.555	<b>0.818</b>			
<b>RA</b>	0.557	0.446	0.513	<b>0.757</b>		
<b>RD</b>	0.680	0.542	0.745	0.565	<b>0.826</b>	
<b>SI</b>	0.783	0.586	0.660	0.385	0.577	<b>0.806</b>

Table 3 shows that the validity test results have been met, which is indicated by the lower cross-loading indicator value than the construct. Meanwhile, reliability testing results have also been achieved with a high composite reliability value. The results of the reliability test are shown in Table 4.

**Table 4**  
Results of Construct Reliability

	Composite Reliability	AVE
<b>Attitude (A)</b>	0.947	0.783
<b>Behavioral Intention (BI)</b>	0.935	0.828
<b>Enjoyment (E)</b>	0.910	0.670
<b>Relative Advantage (RA)</b>	0.901	0.573
<b>Result Demonstrability (RD)</b>	0.915	0.682
<b>Social Influence (SI)</b>	0.917	0.649

Thus, the data used for this study can be declared reliable so that it can be continued with other tests. Next, structural models are used to test the proposed hypotheses. Table 5 summarizes the results of hypothesis testing.

**Table 5**  
Results of hypotheses test

	Hypothesis	Original Sample	Sample Mean	Standard Deviation	P Values
<b>H1</b>	RD → A	0.131	0.115	0.093	0.157
<b>H2</b>	E → A	0.214	0.204	0.104	<b>0.041*</b>
<b>H3</b>	SI → A	0.496	0.495	0.074	<b>0.000*</b>
<b>H4</b>	RA → A	0.182	0.208	0.085	<b>0.033*</b>
<b>H5</b>	A → BI	0.607	0.587	0.137	<b>0.000*</b>
<b>H6</b>	RA → BI	0.077	0.097	0.116	0.508
<b>H7</b>	SI → BI	0.081	0.084	0.119	0.499

The four accepted hypotheses are H2, H3, H4, and H5, indicated by a p-value less than 0.05. From these results, it can be seen that the intention of football players to use smartwatches is influenced by attitude. *Attitude* is defined as an individual's overall evaluation that shapes behavior. The attitude is influenced by enjoyment, social influence, and relative advantage variables.

Practically, the study's results tell us that enjoyment, social influence, and relative advantage are essential things to pay attention to so that soccer players want to use smartwatches. *Enjoyment* is the feeling of pleasure users feel when using technology. This factor is found to be a factor that significantly affects technology acceptance, especially technology that contains hedonic elements (Lu et al., 2009; Faroqi et al., 2020b). Smartwatch manufacturers need to make their products have hedonic elements, such as attractive icons or display themes that can be changed to be more personal. Nowadays, smartwatches are used in conjunction with apps.

The data obtained from the smartwatch is displayed in the application on the smartphone. Like enjoyment, social influence is also a factor that affects technology acceptance. The practical implication is that smartwatch manufacturers can add features to share their practice experiences using smartwatches on social media. Relative advantage has a definition that is almost the same as the performance expectancy variable in UTAUT (Venkatesh et al. 2003) and the perceived usefulness variable in TAM (Davis et al., 1992).

For football players to want to use smartwatches, it is necessary to explain to them the various benefits obtained when using a smartwatch during training or competition, both for personal benefits for soccer players and the team. For example, player fitness data can be directly observed by coaches through applications on smartphones. The implication is that this information can be used by coaches to replace players during matches or to determine the appropriate portion of training when training.

**Table 6**  
The results of R-Square

	R Square	Adjusted R Square
<b>Attitude</b>	0,736	0,728
<b>Behavioral Intention</b>	0,515	0,503

The value of R-Square is shown in table 6. R-square shows what percentage of the variance of a construct can be explained by the construct that is hypothesized to affect it. The higher the R-square indicates a good model. The test results show that the R-square of the attitude construct is 0.728, meaning that the attitude variance can be explained by 72.8% by the variance of the constructs that are hypothesized to affect it. Likewise, for behavioral intention, an R-square of 0.503 indicates that the variance of behavioral intention can be explained by 50.3% by the construct that is expected to influence it.

## 5. Conclusion

This study examines intentions to use smartwatches from the perspective of football players. We contribute to technology adoption research, examining the factors that influence football players to want to use smartwatches. The results show that enjoyment, relative advantage, and social influence affect attitude, where attitude affects football players' intention to use smartwatches. In addition to academic contributions, the results of this study are helpful for the industry to evaluate its product design and marketing practices. The results indicate that users also pay attention to the enjoyment factor. Further research can explore other variables such as price and brand value; for example, users are reluctant to use smartwatches if the price is too high. In addition, research respondents can involve coaches or team managers because team investments and finances, including investments in smartwatch procurement, are the responsibility of management.

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