MASTERARBEIT | MASTER'S THESIS

Titel | Title

The anticipated acceptance of virtual reality for physical activity with special consideration of a self-built low-cost setup.

verfasst von | submitted by

Michael Weißensteiner BSc BEd MSc

angestrebter akademischer Grad | in partial fulfilment of the requirements for the degree of

Master of Education (MEd)

Wien | Vienna, 2025

Studienkennzahl lt. Studienblatt | Degree programme code as it appears on the student record sheet:	UA 199 500 505 02
Studienrichtung lt. Studienblatt | Degree programme as it appears on the student record sheet:	Masterstudium Lehramt Sek (AB) Unterrichtsfach Bewegung und Sport Unterrichtsfach Darstellende Geometrie
Betreut von | Supervisor:	Univ.-Prof. Dipl.-Ing. Dr. Arnold Baca
Mitbetreut von | Co-Supervisor:	Dr. Juliana Exel Santana B.Sc. MSc.

Abstract

Physical activity is declining, particular in developed countries, due to factors like digitalisation and time constraints. This leads to increased non-transferable diseases, burdening healthcare systems. To address this, combining virtual reality with physical activity is being explored due to promising results regarding adherence, motivation, enjoyment, mood and perceived exertion. However, it is currently unclear whether individuals would accept and implement virtual reality in combination with physical activity. Therefore, the objective of the study was to assess the anticipated acceptance of virtual reality for physical activity with special consideration of a self-built low-cost setup and to examine the differences in acceptance between general virtual reality and the self-built low-cost setup. The study sample comprised 315 individuals (138 women, 177 men; mean age = 35.4 ± 20.6 years; mean height = 173.5 ± 10.1 cm; mean weight = 73.3 ± 17.2 kg) who voluntarily participated in an online survey with a five-point Likert-scale (1 = strongly disagree; 5 = strongly agree) and independent inputs. The measured constructs were analysed and embedded in two structural equation models to gain insights regarding the acceptance factors. The statistical analysis indicated that the acceptable model fits (general acceptance model: SRMR = 0.072; CFI = 0.911; $\chi 2$ = 1571.335; $\chi 2$/df = 2.459; RMSEA = 0.068; TLI = 0.902; df = 639; self-build low-cost acceptance model: SRMR = 0.077; CFI = 0.923; $\chi 2$ = 1627.188; $\chi 2$/df = 2.676; RMSEA = 0.073; TLI = 0.916; df = 608) as well as the differences obtained pose a difficulty in gaining many insights in terms of anticipated acceptance. Nevertheless, it became evident that external factors (age, past experience, curiosity, and the price respondents are willing to pay) exert a lesser influence than anticipated. Instead, the perceived ease of use, perceived enjoyment and perceived usefulness emerged as determining factors in the acceptance of virtual reality in the context of physical activity.

However, means of selected variables of both models indicate (intention to use virtual reality (2.23 ± 1.18); intention to purchase virtual reality (1.94 ± 1.18); intention to use self-build low-cost virtual reality (2.33 ± 1.26); intention to build self-build low-cost virtual reality (2.11 ± 1.21)) that the acceptance of virtual reality as an intervention against physical inactivity may be too less to be regarded as a key intervention against physical inactivity.

Although the level of acceptance is below neutral, it can be inferred that external factors do not exert a significant influence. However, it is crucial to prioritise the user-friendliness, ease of use, and enjoyment of the devices in future design processes to potentially enhance acceptance and contribute to the effort to combat inactivity.

Zusammenfassung

Der Rückgang der körperlichen Aktivität ist weiter fortschreitend, vor allem in Regionen in Europa oder Nordamerika. Die Gründe dafür sind vielfältig und reichen von der Digitalisierung bis hin zum Zeitmangel. Infolgedessen belastet das erhöhte Risiko von nicht übertragbaren Krankheiten die Gesundheitsbehörden hinsichtlich der Anzahl der Patienten und der verursachten Kosten. Zu den vorgeschlagenen Lösungen gehört die Kombination von virtueller Realität und körperlicher Aktivität. Der Grund dafür ist, dass der Einsatz von virtueller Realität zur Förderung körperlicher Aktivität vielversprechende Ergebnisse in Bezug auf Adhärenz, Motivation, Spaß, Stimmung und wahrgenommene Anstrengung gezeigt hat.

Allerdings ist derzeit unklar, ob die Menschen virtuelle Realität in Kombination mit körperlicher Aktivität akzeptieren und einsetzen würden. Ziel der Studie war es daher, die zu erwartende Akzeptanz von Virtual Reality für körperliche Aktivität unter besonderer Berücksichtigung eines selbstgebauten, kostengünstigen Setups zu bewerten und die Unterschiede hinsichtlich Akzeptanz zwischen allgemeiner Virtual Reality und dem selbstgebauten, kostengünstigen Setup zu untersuchen.

Die Untersuchungsstichprobe umfasste 315 Personen (138 Frauen, 177 Männer; mittleres Alter = 35,4 ± 20,6 Jahre; mittlere Größe = 173,5 ± 10,1 cm; mittleres Gewicht = 73,3 ± 17,2 kg), die freiwillig an einer Online-Befragung mit einer fünfstufigen Likert-Skala (1 = stimme gar nicht zu; 5 = stimme voll zu) und unabhängigen Eingaben teilnahmen. Die gemessenen Variablen wurden analysiert und in zwei Strukturgleichungsmodelle eingebettet, um Erkenntnisse über die Akzeptanzfaktoren zu gewinnen.

Die statistische Analyse ergab, dass ein akzeptables passendes Modell (allgemeines Akzeptanzmodell: SRMR = 0,072; CFI = 0,911; $\chi2$ = 1571,335; $\chi2$/df = 2,459; RMSEA = 0,068; TLI = 0,902; df = 639; selbstbau-kostengünstigen-Akzeptanzmodell: SRMR = 0,077; CFI = 0,923; $\chi2$ = 1627,188; $\chi2$/df = 2,676; RMSEA = 0,073; TLI = 0,916; df = 608) sowie die erzielten Unterschiede es erschweren, viele Erkenntnisse über die erwartete Akzeptanz zu gewinnen. Die Ergebnisse der Untersuchung legen jedoch nahe, dass externe Faktoren (Alter, vorheriger Nutzen, Neugier und Preis des Produktes) einen geringeren Einfluss haben als angenommen. Stattdessen erwiesen sich die wahrgenommene Benutzerfreundlichkeit, der wahrgenommene Spaß und den wahrgenommenen Nutzen als entscheidende Faktoren für die Akzeptanz der virtuellen Realität im Zusammenhang mit körperlicher Aktivität.

Die Mittelwerte ausgewählter Variablen beider Modelle (Absicht, die virtuelle Realität zu nutzen (2,23 ± 1,18); Absicht, die virtuelle Realität zu kaufen (1,94 ± 1,18); Absicht, die virtuelle Realität kostengünstig selbst zu nutzen (2,33 ± 1,26); Absicht, die virtuelle Realität kostengünstig selbst zu bauen (2,11 ± 1,21)) deuten jedoch darauf hin, dass die Akzeptanz der virtuellen Realität als Intervention gegen körperliche Inaktivität möglicherweise zu gering ist, um als Schlüsselintervention gegen körperliche Inaktivität angesehen zu werden. Obwohl das Akzeptanzniveau unter dem neutralen Wert liegt, lässt sich daraus schließen, dass externe Faktoren keinen signifikanten Einfluss ausüben. Es ist jedoch von entscheidender Bedeutung, die Benutzerfreundlichkeit, den wahrgenommenen Nutzen und den Spaß an den Geräten in künftigen Entwicklungsprozessen im Vordergrund zu stellen, um die Akzeptanz zu erhöhen und einen Beitrag zur Bekämpfung der Inaktivität zu leisten.

Table of Contents

1. Introduction

The decline in physical activity is ongoing and with this, sedentary behaviour increases especially in developed countries (World Health Organization, 2020; Gomes et al., 2017; Knight, 2012; Anderson & Durstine, 2019). As a result of that the likelihood of non-transferable diseases (i.e. cardio metabolic diseases, cancer and type 2 diabetes) rises, increasing the number of patients and the costs of treatment in public health systems (Lee et al., 2012; Ding et al., 2016).

Researchers are dedicated to find options to overcome physical inactivity and virtual reality seems to be a feasible one. Virtual reality uses head-mounted displays and sensors to play images into the user's field of vision. These images change according to the movements of the head. While showing a recorded or computer-generated virtual world an effort is made to block external stimuli from the physical world (Neumann et al., 2018). Virtual reality in combination with physical activity has shown positive effects regarding adherence, motivation, mood, enjoyment and perceived exertion. When individuals engage in physical activity within a virtual environment, there is a noticeable increase in adherence levels, indicating elevated motivation for exercise. Subsequent to engaging in physical activity with virtual reality, individuals experience improved mood states and report higher enjoyment, while perceiving the activity as less exerting (Murray et al., 2016; Liu et al., 2019; Ulas & Semin, 2021; Ng et al., 2019; Plante et al., 2003; McClure & Schofield, 2019; Weißensteiner, 2023).

With these findings, virtual reality has the potential to contribute to reducing physical inactivity. However, the cost and complexity of virtual reality devices currently may limit their accessibility. In response to this challenge, Weißensteiner (2023) proposed a low-cost, self-buildable system that could address the affordability and availability concerns.

However, it is not known whether the masses would accept and implement virtual reality in combination with physical activity and whether the cost of a device plays a role in the intended acceptance for the use. Unfortunately, literature has not, to the knowledge of the author, addressed the issue of the acceptance of virtual reality in combination with sport/exercise for an increase in physical activity with the factor costs and availability. Therefore, the aim of the thesis is to extend and adapt a Technology Acceptance Model in order to gain insights into the factors influencing respondents' anticipated use of virtual reality for physical activity and the use of the self-built low-cost setup for physical activity. This will be done by exploring (1) the influence of age, past use, curiosity and price willing to pay as contributing factors, (2) respondents' perceptions about ease of use, usefulness, enjoyment and attitudes towards the utilisation and purchase/build of virtual reality, (3) the probability of future utilisation and future purchase/build intention of virtual reality.

2. Aim

The main goal of the present thesis is to investigate the differences between anticipated acceptance of virtual reality for physical activity with the anticipated acceptance of virtual reality for physical activity with self-built low-cost setup.

The present work extends and adapts the original Technology Acceptance Model in order to gain insights into the factors influencing respondents' anticipated use of virtual reality for physical activity and the use of the self-built low-cost setup for physical activity. This will be performed by investigating (1) the influence of age, past use, curiosity and price willing to pay as contributing factors, (2) respondents' perceptions about ease of use, usefulness, enjoyment and attitudes towards the utilisation and purchase/build of virtual reality, (3) the probability of future utilisation and future purchase/build intention of virtual reality.

The hypotheses of this study are linked to the Technology Acceptance Model, as follows:

H1: Perceived ease of use is positively associated with perceived usefulness.

H2: Perceived enjoyment is positively associated with perceived usefulness.

H3: Past use is positively associated with perceived usefulness.

H4: Price willing to pay is positively associated with perceived usefulness.

H5: Age is negatively associated with perceived usefulness.

H6: Curiosity is positively associated with perceived ease of use.

H7: Past use is positively associated with perceived ease of use.

H8: Price willing to pay is positively associated with perceived ease of use.

H9: Age is negatively associated with perceived ease of use.

H10: Perceived ease of use is positively associated with perceived enjoyment.

H11: Price willing to pay is positively associated with perceived enjoyment.

H12: Perceived ease of use is positively associated with attitude towards using virtual reality.

H13: Perceived enjoyment is positively associated with attitude towards using virtual reality.

H14: Perceived usefulness is positively associated with attitude towards using virtual reality.

H15: Perceived ease of use is positively associated with attitude towards purchasing virtual reality.

H16: Perceived enjoyment is positively associated with attitude towards purchasing virtual reality

H17: Perceived usefulness is positively associated with attitude towards purchasing virtual reality.

H18: Past use is positively associated with intention to use virtual reality

H19: Attitude towards using virtual reality is positively associated with intention to use virtual reality.

H20: Attitude towards purchasing virtual reality is positively associated with intention to purchase virtual reality.

H21: Perceived enjoyment is positively associated with intention to purchase virtual reality

H22: Perceived usefulness is positively associated with intention to purchase virtual reality.

Following hypotheses are formulated regarding the self-built low-cost setup (sblcs). The abbreviation *sblcs* indicates that the construct is associated with the Technology Acceptance Model of the self-built low-cost setup, with the intention to distinguish the constructs form the Technology Acceptance Model for general acceptance and therefore to prevent confusion as well as to be able to draw comparisons.

H23: Perceived ease of use (sblcs) is positively associated with perceived usefulness (sblcs).

H24: Perceived enjoyment (sblcs) is positively associated with perceived usefulness (sblcs).

H25: Past use (sblcs) is positively associated with perceived usefulness (sblcs).

H26: Age is negatively associated with perceived usefulness (sblcs).

H27: Curiosity is positively associated with perceived ease of use (sblcs).

H28: Past use (sblcs) is positively associated with perceived ease of use (sblcs).

H29: Age is negatively associated with perceived ease of use (sblcs).

H30: Perceived ease of use (sblcs) is positively associated with perceived enjoyment (sblcs).

H31: Perceived ease of use (sblcs) is positively associated with attitude towards using virtual reality (sblcs).

H32: Perceived enjoyment (sblcs) is positively associated with attitude towards using virtual reality (sblcs).

H33: Perceived usefulness (sblcs) is positively associated with attitude towards using virtual reality (sblcs).

H34: Perceived ease of use (sblcs) is positively associated with attitude towards building virtual reality (sblcs).

H35: Perceived enjoyment (sblcs) is positively associated with attitude towards building virtual reality (sblcs).

H36: Perceived usefulness (sblcs) is positively associated with attitude towards building virtual reality (sblcs).

H37: Past use (sblcs) is positively associated with intention to use virtual reality (sblcs).

H38: Attitude towards using virtual reality (sblcs) is positively associated with intention to use virtual reality (sblcs).

H39: Attitude towards building virtual reality (sblcs) is positively associated with intention to build virtual reality (sblcs).

H40: Perceived enjoyment (sblcs) is positively associated with intention to build virtual reality (sblcs).

H41: Perceived usefulness (sblcs) is positively associated with intention to build virtual reality (sblcs).

3. Organisation of Thesis

This thesis is structured according to the IMRaD format, which stands for Introduction, Methods, Results, and Discussion. The **Introduction** outlines the critical issue of physical inactivity and its adverse health effects, while exploring the potential of virtual reality as a solution. It also frames the research questions and presents the hypotheses guiding this study. The **Methods** section then describes in detail the two modified models of the Technology Acceptance Model (TAM) that have been adapted to address the research questions and test the proposed hypotheses. The **Results** section will follow, presenting the data collected and key findings, which will be critically examined in the **Discussion** section. Finally, the **Conclusion** will summarise the study by revisiting the initial research questions, evaluating whether the hypotheses were supported, and highlighting the broader implications of the findings.

4. Literature Review

At the beginning the literature review was carried out using the following keywords to search for relevant articles: “acceptance“, “virtual reality“, “physical activity“, “sports“, “exercise“. All keywords were search in the German language as well. The found articles were accessed via U:search (SPONET - Sports Science on the Web, SPOWIS - Sports Science Literature, SPORTDiscus and SURF). In addition, Researchgate and Google Scholar were queried for more articles. From the articles found, preference was given to "peer-reviewed" listings. Therefore, 47 articles were recorded. After the Removal of duplicates, 21 articles were subjected to an abstract analysis. Thus, the number of articles decreases to 14. In the process of the abstract analysis, focus has been set on the acceptance of virtual reality in general, as there are few specific articles on the acceptance of virtual reality in regard to physical activity. So, there are articles included which are not in the field of sports/exercise, but of which helpful conclusions can be drawn regarding the method, model or survey. Furthermore, the acceptance of other technologies (e.g., smartphone) for physical activity have been also part of the articles accepted for the same reasons as mentioned above. For the remaining 14 articles, a full test analysis was performed. After completion, 9 articles were included in this master’s thesis.

Health authorities, as the World Health Organisation and the American Heart Association issued concerns about the current physical activity levels. These are particularly true in developed European and North American countries (American Heart Association, 2024; World Health Organisation, 2020). The reasons for that are manifold, ranging from digitalisation to the lack of time (Klompstra et al., 2014). For instance, the advent of digitalisation has been linked to a rise in sedentary behaviour, resulting in elevated levels of sitting time. This indicates that as countries become more digitally developed, there is a tendency for sedentary behaviour to increase (Moreno-Llamas et al., 2020). One factor contributing to this trend is the growing reliance on digital devices, including smartphones, tablets, and laptops. This reliance has led to a rise in screen time and, consequently, an increase in sedentary behaviour (Mclaughlin et al., 2021). The outcome may lead to a decrease in physical movement and a rise in sedentary behaviour (Deflino et al., 2021; Christofaro et al., 2016; Borle et al., 2021; Moreno-Llamas et al., 2020).

The fact of not being physically active promotes risk factors regarding health issues. In particular, non-transferable deceases, including cancer (10% of breast cancers and 10% of colon cancer), coronary heart diseases (6%) or type 2 diabetes (7%). This is also associated to 9% increase in premature mortality rates (Lee et al., 2012; Mikus et al., 2012). Consequently, health care systems incur costs amounting to approximately $53.8 billion annually (Ding et al., 2016). Lee et al. (2012) proposes that increasing participation in physical activity by 10% could prevent 500.000 deaths annually.

Amongst the strategies suggested by researchers to promote physical activity is the combination of virtual reality with exercise and sport. The virtual reality technology utilises among other approaches head-mounted displays (HMDs) and sensors to project images directly into the user's field of vision, adjusting to the movements of the users's head. In virtual reality scenarios, users are immersed in recorded or computer-generated environments, aiming to block out real-world stimuli for maximum immersion. Immersion refers to the user's perception of the virtual environment as real (Neumann et al., 2018). When users interact with the displayed images, gyroscope sensors detect their movements and adjust the visuals accordingly, creating visual feedback (Ng et al., 2019). In more advanced systems, auditory, tactile, or haptic feedback can also be integrated (Düking et al., 2018; Liu et al., 2019). A crucial aspect is the ability to manipulate and control the virtual reality environment in reproducible ways. This technology can be utilised for performance assessment, feedback acquisition, and skill practice or promote physical activity (Neumann et al., 2018; Murray et al., 2016). Additionally, virtual environments can simulate the presence of another individual (such as a coach, competitor, teammate, or fan), potentially enhancing performance levels (Murray et al., 2016; Neumann et al., 2018).

It should be noted that there are also disadvantages associated with the usage of virtual reality during sport/exercise. When utilising virtual reality through a head-mounted display (HMD), it has been observed that cybersickness, also known as simulator sickness or motion sickness, may occur. This occurrence is attributed to a discrepancy between the visual stimuli presented and the user's sensory perceptions (Koulieris et al., 2017; Kennedy et al., 1993). The likelihood of experiencing motion sickness is higher when viewing omnidirectional (360° degree) videos compared to unidirectional videos on a traditional screen. A further explanation mentioned by Katsigiannis et al. (2018) could be the difference between computer generated images versus recorded images. Individuals are generally more accustomed to viewing recorded images, making them less likely to experience cybersickness in comparison to a digital virtual reality setting. Moreover, a user's previous exposure to virtual reality environments plays a significant role in the onset of cybersickness, with individuals who have prior experience being less affected. Interestingly, the quality settings of the virtual environment do not seem to impact motion sickness scores

(Katsigiannis et al., 2018). The occurrence of cybersickness could potentially influence an individual's adherence to virtual reality-based exercises, thereby affecting their level of physical activity and could ultimately influence a decision to use such device.
The usage of virtual reality might also depend on economic aspects. Devices can be costly and that might represent a barrier for adoption. The effectiveness of simplified and low-cost virtual reality solutions has been recently explored. Weißensteiner (2023) verified that a simple setup with goggles made from cardboards and a smartphone might be promising to enhance the adherence for physical activity, once it showed enhanced mood states and less perceived exertion on users.
However, the combination of virtual reality and exercise/sports brings many benefits in terms of physical activity. Studies have shown positive effects regarding adherence, motivation, mood, enjoyment and perceived exertion (Liu et al., 2019; Murray et al., 2016; Ulas & Semin, 2021; Plante et al., 2003; Ng et al., 2019; McClure & Schofield, 2019; Weißensteiner, 2023). Murray et al. (2016) demonstrated that virtual reality stationary biking sessions are attended with a higher frequency compared to non-virtual reality stationary biking sessions. Furthermore, Ulas & Semin (2021) and Liu et al. (2019) explored motivation in virtual reality with complete immersion. Consequently, it can be inferred that virtual reality has the potential to enhance physical activity due to the increased motivation to regular engagement (Ng et al., 2019). Moreover, individuals participating in virtual reality environments exhibited longer distances covered and exerted greater power during cycling (Murray et al., 2016).
When using virtual reality during sports/exercise higher enjoyment levels were measured and the ratings of perceived exertion were lower in the group which performed the exercise in the virtual reality environment comparing a control group (Zeng et al., 2017; Murray et al., 2016; Ulas & Semin, 2021; Sauchelli & Brunstrom, 2022; Kowal et al., 2021; Bird et al., 2021).
For a better overview of the applicability and implementation potentials of a technology, it is important to assess its acceptance inside the targeted group or community (Venkatesh & Bala, 2008). The method of using a Technology Acceptance Model tries to identify some of the psychological determinants that may impede or threaten the intention to use a technology, despite its objectively proven effectiveness. When a technology is presented to potential users through a text, photo, verbal discussion or video, they may form an opinion about the presented technology and decide whether or not to adopt its use (Li et al., 2019). Of course, this opinion may change after use, or it may be maintained.

One common model which is regularly used in the field of acceptance studies (in an adapted form) is the Technology Acceptance Model introduced by Davis (1985). It is extensively used in various fields, including healthcare, finance, gaming, and education (Rivera et al., 2015; Rahimi et al., 2018; Alsyouf et al., 2023; McKechnie et al., 2006; Priantinah et al., 2019; Wang & Goh, 2017; Chen et al., 2017; Granić & Marangunić, 2019; Masrom, 2007). The Technology Acceptance Model is a framework for assessing the acceptance of technologies. It was developed based on the "Theory of Planned Behaviour" (TPB) and "Theory of Reasoned Action" (TRA) (Ajzen, 1985; Fishbein & Ajzen, 1975). The model aims to predict the likelihood of new technologies being accepted within an organisation or group (Tang & Chen, 2011). The model comprises several acceptance variables, including "perceived usefulness" (PU), "perceived ease of use" (PEOU), "attitude toward using" (ATT), "intention to use" (ITU), and "actual use of the system" (AUS) (Davis, 1985) (Figure 1).

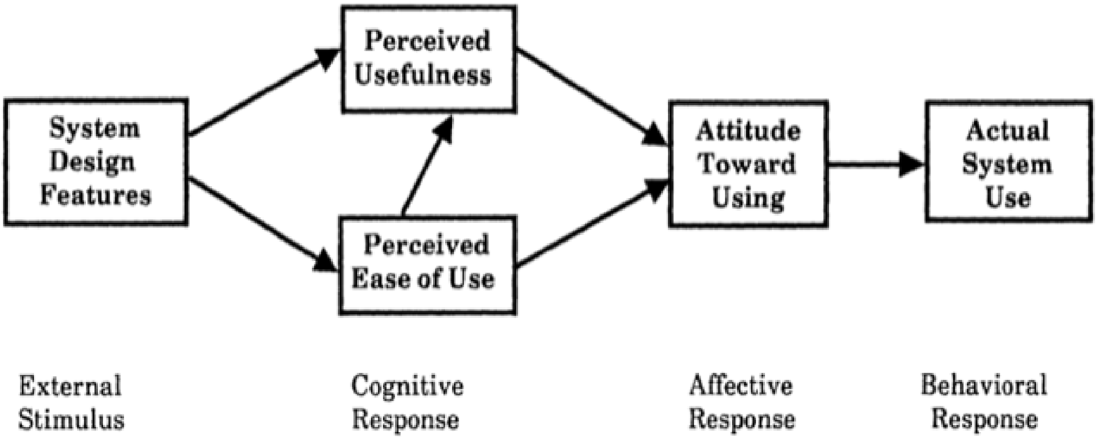


Figure 1. *Technology Acceptance Model (Davis, 1985).*

The model suggests that external variables, such as demographic factors, can affect both perceived ease of use and the perceived usefulness of a system. Furthermore, a system's perceived ease of use can positively impact its perceived usefulness. A user-friendly system can help users understand the benefits of the system. These two variables, in turn, influence users' attitudes towards system use. If users have a positive attitude towards system use, this can contribute to the intention to the usage of the system. If the intention to use a system is already present, this can lead to the actual usage of the system in the final step and achieve acceptance of the system (Davis, 1985).

Perceived usefulness is described as "the degree to which a person believes that using a particular system will enhance his or her job performance" (Davis, 1985). Davis (1989) further subdivided the perceived usefulness variable into ten items: "quality of work",

"control over work", "work more quickly", "critical to my job", "increase productivity", "job performance", "accomplish more work", "effectiveness", "makes job easier" and "useful" (Davis, 1989).
The individual items are formulated as questions, which could be rated on a seven-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree). Davis assumes that systems with a high perceived usefulness by the users speak in favour of a positive connection between the use and the service provided (Davis, 1989).
In contrast, perceived ease of use refers to the "degree to which a person believes that using a particular system is free of effort" (Davis, 1985). Davis (1989) identified ten items that make up perceived ease of use, including "cumbersome", "ease of learning", "frustrating", "controllable", "rigid & inflexible", "ease of remembering", "mental effort", "understandable", "effort to be skillful" and "easy to use". These items are also formulated in form of a questionnaire, as mentioned above (Davis, 1989).
For this master's thesis topic an adapted version of the Technology Acceptance Model regarding virtual reality is used which will be displayed in the methods section (Sagnier et al., 2020).
The Technology Acceptance Model has not yet been validated for the use of virtual reality in context of physical activity, either before or after its use. However, this model has been applied to athletes' acceptance of other sport technologies in various fields of sports. For example, it has been used to study running on a social exercise platform, sports wearable technology, exergames in sports for older adults, fitness apps and sport products (Kim & Chiu, 2019; Tsai et al., 2021; Nawaz et al., 2016; Beldad & Hegner, 2018; Song et al., 2018). According to Angosto et al. (2020) recent review on the acceptance of fitness and physical activity apps, the Technology Acceptance Model as found to be the most commonly used model in sports acceptance.
The general existing literature regarding the anticipated acceptance of virtual reality in the context of sport or exercise is slim, especially in terms of physical activity. Only a few authors have addressed his topic of sport or exercise thus far. Gradl et al. (2016) surveyed 227 athletes to determine the acceptance of virtual reality headsets for training in various sports. The questionnaire contained 13 questions. These involved sport-related demographic questions, an assessment of the subject's knowledge of virtual reality headsets, the experience with virtual reality headsets and the subject's opinion of the applicability of virtual reality headsets in training and sports. The questionnaire asked whether the athletes could see themselves using a headset during training and sports activities, and what concerns

would arise while using a virtual reality headset. For answers, the questionnaire included Likert-scale, free text responses and multiple-choice questions. The survey featured seven popular virtual reality setups (Sony HMz-T1, Sony Project Morpheus, Fove, Samsung Gear VR, Oculus Rift Microsoft HoloLens and Google Glass). The assessed data displays that the main sports selected by the participants were running (17.5%), volleyball (16.5%), and soccer (8.5%). Most participants (52.4%) engage in their sport two to three days a week, with only 3.8% doing so on a daily basis. It is noteworthy that only 49.5% of the participants have ever heard of virtual reality headset. The majority of this subgroup are aware of Google Glass, while other headsets are less well-known. The percentage of participants who used virtual reality headsets before is 10.5%. Whereas two thirds (67.2%) of the surveyed athletes could imagine using a virtual reality headset for training in their main sport. The main concern Gradl et al. (2016) identified was that athletes indicated that the virtual reality headsets may be too heavy, large or cumbersome. Furthermore, 43.1% believe that using virtual reality headsets could benefit performance.

Mahalil et al. (2020) reviewed articles regarding the acceptance of virtual reality where the authors assessed acceptance mainly through the ad hoc use of some variables of the Technology Acceptance Model after the exercise was performed. However, it should be noted that the acceptance of virtual reality was not always the main focus of the study performed. The test variables were notably perceived ease of use and perceived usefulness. Nevertheless, these variables were investigated individually, and the interconnections among the various variables of e.g. the Technology Acceptance Model have yet to be explored (Zhao et al., 2017; Berkemeier et al., 2018; Yap et al., 2018; Kim et al., 2018; Perez-Aranda et al., 2018; Colombo et al., 2019).

With the Technology Acceptance Model in mind, Mascret et al. (2022) raised the question of athletes' acceptance of virtual reality to enhance sport performance. In particular, athletes of different levels and from different sports were the targeted group. Although it is known that the usage of virtual reality can enhance performance, the acceptance of such devices is yet to be addressed. To evaluate this, Mascret et al. (2022) adapted the Technology Acceptance Model and modified it with the terms of perceived enjoyment and subjective norms. Whereas perceived enjoyment questions the anticipated enjoyment when using virtual reality for the respective sport, and subjective norms represents a form of social influence regarding the opinions of important persons about the individual's potential for the use of a specific technology.

Mascret et al. (2022) mention an important point in the concept of acceptance studies. This is the process of non-acceptance, which is well known in the literature. For example, when older people find a technology too difficult before using it for the first time, even though this technology was developed specifically for easy use by older people (Chen & Chan, 2014). Furthermore, some teachers have no desire to incorporate a new technology into their courses, even if it is objectively useful, simply because they have not yet tried it (Scherer et al., 2019). This could well be true for athletes in their respective sports if they feel that virtual reality is totally inapplicable despite validated results (Neumann et al., 2018).

After reading information via a text about virtual reality, the 1162 athletes filled in a questionnaire regarding their acceptance of this technological device before a first use. The text before the online survey describes what virtual reality is, how it can be used in sports, and its potential to improve athletic performance. In studies investigating the acceptance of a technology prior to its initial use, this type of procedure is mandatory (Mascret et al., 2022). The gathered data was analysed with a structural equation modelling (SEM) analysis based on the maximum likelihood estimations was conducted to evaluate the hypotheses which represented the connections in the Technology Acceptance Model. Further analysis regarding sport level and sport practised were conducted to draw conclusions. The authors concluded that the structural equation modelling analysis was suitable for assessing the acceptance of virtual reality regarding sport performance enhancement. Therefore, the athletes' intention to use virtual reality was positively predicted by the ease of use, the perceived usefulness, the enjoyment and the subjective norms. The results are therefore consistent with the general literature regarding the acceptance of (sports-) technology with the use of the Technology Acceptance Model (Mascret et al., 2020; Manis & Choi, 2019; Venkatesh & Bala, 2008; Angosto et al., 2020; Kim & Chiu, 2019). The perceived enjoyment and the perceived usefulness seem to be the strongest predictors of the intention to use virtual reality to enhance sport performance. These aligning with the general literature of acceptance studies, where perceived usefulness is often the strongest predictor (Angosto et al., 2020). Furthermore, the results suggest that subjective norms, meaning people around the athlete, were positive predictors regarding all other variables of the Technology Acceptance Model. This means, that the more people around an athlete encourage the use of virtual reality the more the athletes find it easy to use, useful, pleasant and would intend to use virtual reality (Mascret et al., 2022).

All questioned athletes found the virtual reality quite useful (except for the recreational level), quite pleasant and quite easy to use. Therefore, in general no significant differences between the sport levels were discovered. The authors suggest that this is due to the fact that all questioned athletes were relatively young and therefore there is a digital proximity. Furthermore, the fact that virtual reality is a hedonic technology and that is particularity stated that performance can be enhanced, contributed to this assumption (Van der Heijden, 2004; Mascret et al., 2022).

In general athletes of all sports considered the virtual reality pleasant and easy to use regardless of the sport performed. The authors do not consider this as a surprise because the perceived enjoyment and the ease of use are not linked to the specifics of a sport rather than the virtual reality used. Although athletes of some sports (e.g. swimming, triathlon) have indicated that there is no intention to incorporate the virtual reality in the training. The authors suggest that this may originate from the fact that the athletes in this study were unable to identify the specific ways in which the virtual reality could improve their performance in their respective sports (Mascret et al., 2022).

The study by Mascret et al. (2022) revealed that a virtual reality system designed to enhance athletic performance is generally well-received by athletes of varying skill levels prior to initial use, despite some variations observed in certain sports.

Other authors such as Seong & Hong (2022) or Xu et al. (2023) addressed virtual reality sport games acceptance in connection with an adapted form of the Technology Acceptance Model. In Seong & Hong (2022), screen golf which is widely considered the most commercially successful virtual reality sports game and the acceptance of this kind of sport was tested. The results indicate that the virtual sport's perceived utility was the most influential factor in individuals' decision to participate. Xu et al. (2023) addressed virtual reality exergames among Chinese older adults via a survey after the usage to gain insight whether these games with proven benefits regarding health and well-being are accepted and which factors are contributing to the acceptance. The results indicate that older adults who are younger, have higher education, good health conditions and better financial means, have a more positive view of virtual reality exergames. Additionally, perceived usefulness, perceived ease of use, and perceived enjoyment have a positive impact on the intention to play virtual reality exergames.

Despite the lack in literature on the topic of the acceptance of virtual reality in the context of physical activity with the use of the Technology Acceptance Model, there are findings of the authors mentioned above with similar studies or similar topics with the Technology Acceptance Model, which indicate that the selected model seems suitable to inspect the anticipated acceptance of virtual reality for physical activity. So, to gain a better understanding of the factors influencing respondents' anticipated use of virtual reality for physical activity the following factors (age, past use, curiosity, price willing to pay, perceived ease of use, perceived usefulness, perceived enjoyment, attitudes towards using virtual reality, attitudes towards purchasing/building of virtual reality, intention use virtual reality and intention to build/purchase virtual reality) regarding the acceptance will be evaluated.

5. Methods

5.1 Sample

The study sample comprised 315 individuals (138 women, 177 men; mean age = 35.4 ± 20.6 years; mean height = 173.5 ± 10.1 cm, mean weight = 73.3 ± 17.2 kg, BMI = 24.3 ± 5.5) who participated on an anonymous and voluntary basis. There were no inclusion criteria for participating in the survey. The study was conducted according to the Declaration of Helsinki and needed no approval by the Ethics Committee of the University of Vienna.

5.2 Procedures

An online survey available in English and German was distributed through social media networks (Instagram, WhatsApp). The methodology of the survey was structured in accordance with the procedure typically employed in the technology acceptance literature (Li et al., 2019; Manis & Choi, 2019). The procedure, which comprises a text followed by questions regarding the text, is a mandatory component of studies investigating the acceptance of a technology prior to its initial deployment.

In detail, the structure was as follows. After an introduction with a short overview of the aims and procedures of the survey, the demographic data of the participants was queried. Then a short informational text explaining what virtual reality is and what benefits it contains regarding physical activity followed. Afterwards, questions which could be answered with a five-point Likert-scale relating to the general acceptance (subtopics like age, past use, curiosity, price willing to pay, perceived ease of use, perceived usefulness, perceived enjoyment, attitudes towards using virtual reality, attitudes towards purchasing/building of virtual reality, intention use virtual reality and intention to build/purchase virtual reality were surveyed) of virtual reality in the context of physical activity are presented. After completing the first part of the questionnaire, another short informational text about a low-cost self-build setup proposed by (Weißensteiner, 2023) was presented and questions with the same subtopics regarding the acceptance for a low-cost self-build setup for physical activity followed. The full questionnaire is available in the appendix.

A total of 379 surveys were submitted, of which only 315 were usable due to incomplete surveys, representing a response rate of 83%.

The dataset, which will be produced through the five-point Likert-scale, is thus divided into two parts. One is the general anticipated acceptance and the other is the anticipated acceptance of the self-built low-cost setup. With Microsoft Excel Version 16.66.1 (Redmond, USA) and JASP 0.17.2.1 (Amsterdam, Netherlands) an attempt is made to answer the research question and falsify/verify the hypotheses.

5.3 Models

Both research models are adapted versions of the original Technology Acceptance Model (Davis, 1989). In order to provide a point of reference for the adaptation process, the verified model proposed by Manis and Choi (2019) has been considered. As the model of Manis and Choi (2019) was developed for the general acceptance of virtual reality (not in a sports context), the underlying constructs and the survey questions that formed the model were adapted to align with virtual reality in context of physical activity and for the self-built low-cost setup (Figure 2 and Figure 3).

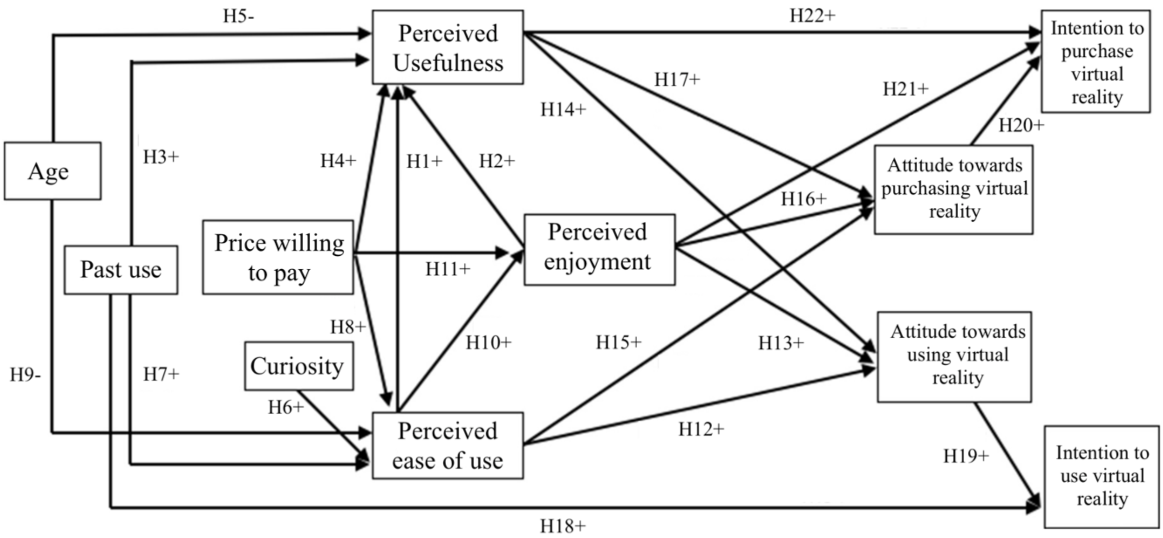


Figure 2. *Adapted Technology Acceptance Model for the acceptance of virtual reality for physical activity.*

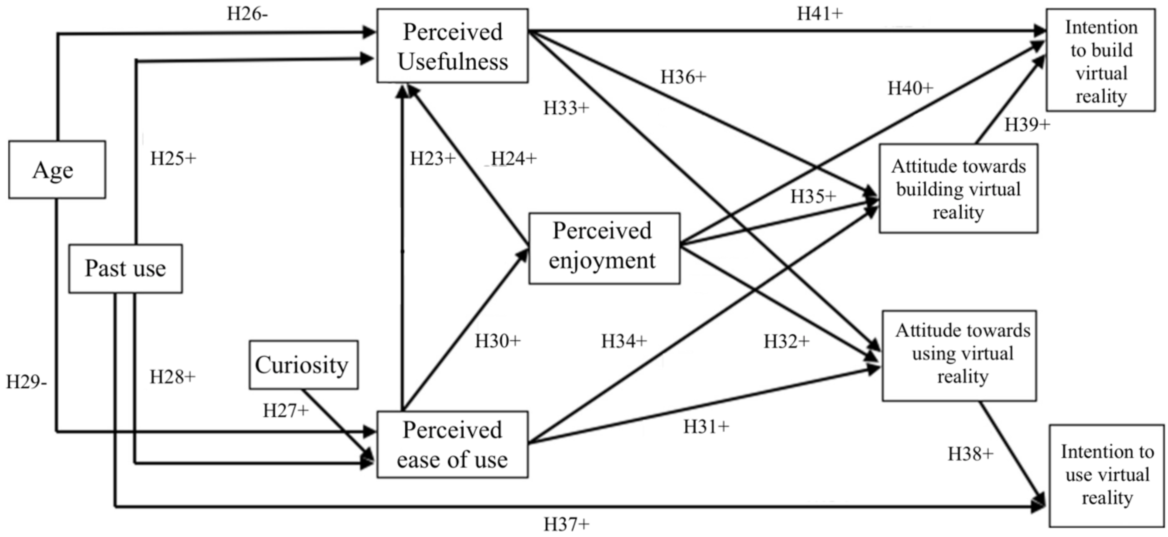


Figure 3*. Adapted Technology Acceptance Model for the acceptance of self-built low-cost setup for physical activity. All constructs except form age, curiosity and price willing to pay are referenced in the text with the abbreviation sblcs to indicate the model of self-built low-cost setup.*

The following sections provide an overview of the constructs of both models, offering a brief explanation of each. It should be noted that the variables of age and curiosity are identical for both models. Conversely, the variable price willing to pay only plays a role in the general acceptance model for virtual reality in the context of physical activity. For explanation of how the variables function within the model, it is necessary to examine the paths that reflect the hypotheses. The presence of a plus sign indicates a positive association, which can be understood to mean that as the variable in question increases, the subsequent variable also increases. Conversely, the presence of a minus sign indicates a negative association, which can be understood as the variable in question increases, the subsequent variable decreases (Figure 2 and Figure 3).

Age

The research suggests that younger generations place greater value on the usefulness of technology compared to older generations (Venkatesh et al., 2003). Additionally, older generations tend to perceive their technology skills as lower than those of younger generations, which may be due to experiencing more technology anxiety and lower self-efficacy (Chung et al., 2010; Cazja et al., 2006). Technology acceptance and perceived usefulness are key parts in the process of technology adoption, both of which are affected by age. When evaluating the usefulness of a system, older generations tend to place greater emphasis on its ease of use (Cazja et al., 2006; Ijsselsteijn et al., 2007; Arning & Ziefle, 2007).

As people age, learning to use new devices or services may lead to a more time-consuming process. Therefore, it is important to consider the tradeoff between the perceived usefulness and the perceived ease of use of the system (Melenhorst et al., 2001). The findings that age has no influence on perceptions of ease of use or usefulness results in an investigation into the effects of the content and possibilities of the services from the perspective of the variable age (Ijsselsteijn et al., 2007; Chung et al., 2010). The so-called digital divide between generations has emerged as younger generations are increasingly exposed to digital technologies at an earlier age (Ijsselsteijn et al., 2007; Morris & Venkatesh, 2000).

In the survey the age was measured via an independet input as a number.

Past use / Past use (sblcs)

The user's experience with a specific technology is associated with greater use of that technology (Thompson et al., 1994). Past usage has a positive influence on perceived ease of use, perceived usefulness, behavioural intention and actual usage. This indicates that automatic processes, rather than conscious decision-making, play a crucial role in continued use (Kim & Malhotra, 2005). Other authors support the positive influence of past use on perceived ease of use whereas the effects of past use are inconsistent regarding perceived usefulness (Jackson et al., 1997; Bajaj & Nidumolu, 1998; Dishaw and Strong, 1999).

The past use and past use (sblcs) needed an independent input as a number to estimate the hours used.

Price willing to pay

The price of a product or service plays a key role in the consumer decision process. Consumers evaluate the value of a purchased service or product while taking price into account. For this reason, price is a vital factor for consumers attempting to evaluate usefulness, enjoyment and ease of use prior to purchase. Research suggest price is more likely to be used as an indicator for quality under following conditions. When the price is the primary differentiating factor and when there are significant differences in comparative prices for alternatives. In the virtual reality market, the cost of virtual reality hardware ranges from $15 to over $1000 with multiple factors contributing to it (Monroe & Petroshius, 1981;

Cronin et al., 2000; Anderson et al., 1994; Zeithaml, 1988). Therefore, price must be considered as a part in the Technology Acceptance Model (Manis & Choi, 2019).
In the survey the price willing to pay provided five price ranges to select.

Curiosity

Curiosity is defined as the desire to seek and obtain new information (Litman, 2010; Loewenstein, 1994). This includes two goals: firstly, obtaining information that is expected to stimulate positive feelings of interest, also known as interest curiosity, and secondly, reducing undesirable states of informational deprivation, also known as deprivation curiosity (Litman, 2008). In the context of virtual reality, curiosity refers to interest curiosity for the reason that the user engages with virtual reality out of interest and not deprivation.
Interest curiosity may lead to activities for finding new information. Therefore, three types of behavioural innovativeness can be classified. Firstly, the informative innovativeness which is expressed in acquiring new information about a new product. Secondly, the adoptive innovativeness which is displayed in adopting a new product. Thirdly, the use innovativeness which is demonstrated by knowing all the different uses of a particular product or using a product in a different way (Hirschman, 1980).
While curiosity has not been examined in previous Technology Acceptance Model research, Manis & Choi (2019) theorise that people who are generally more curious will find a product or service easier to use due to their desire to explore which motivates them to learn about the product or service.
For the measurement participants responded with a five-point Likert-scale (1 = strongly disagree; 5 = strongly agree) with three statements associated with curiosity.

Perceived usefulness / Perceived usefulness (sblcs)

Perceived usefulness is described as "the degree to which a person believes that using a particular system will enhance his or her job performance" (Davis, 1985). In context of this research regarding virtual reality, this relates to the persons believes that virtual reality will be beneficial or advantageous for individuals to engage in physical activity and furthermore enhance the physical activity performed in form of adherence, enjoyment, mood. In general, perceived usefulness is a positive predictor of behavioural intention to use a technology or product, which is a predictor of its actual usage and (Davis, 1989; Venkatesh & Bala, 2008).
For the measurement participants responded to with a five-point Likert-scale (1 = strongly

disagree; 5 = strongly agree) with five statements associated with perceived usefulness and perceived usefulness (sblcs).

Perceived ease of use / Perceived ease of use (sblcs)

Perceived ease of use refers to the "degree to which a person believes that using a particular system is free of effort" (Davis, 1985). This considers in the framework of virtual reality and physical activity describes the use of the virtual environment as well as the usage of the goggles. Therefore, perceived ease of use plays a vital part in the anticipated acceptance of virtual reality regarding physical activity.

For the measurement participants responded to with a five-point Likert-scale (1 = strongly disagree; 5 = strongly agree) with five statements associated with perceived ease of use and perceived ease of use (sblcs).

Perceived enjoyment / Perceived enjoyment (sblcs)

Perceived enjoyment is defined as "the degree to which the activity of using technology is perceived to be enjoyable in its own right apart from any performance consequences that may be anticipated“ (Davis et al., 1992). In is indicated that enjoyment play a vital part regarding the motivation of the usage of a new technology (Davis et al., 1992; Bruner & Kumar, 2005; Lee et al., 2005).

For the measurement participants responded to with a five-point Likert-scale (1 = strongly disagree; 5 = strongly agree) with four statements associated with perceived enjoyment and perceived enjoyment (sblcs).

Attitude towards purchasing virtual reality / Attitude towards building virtual reality (sblcs)

The attitude towards purchasing/building virtual reality is described a lasting a cohesive state of readiness to purchase/build virtual reality. Furthermore, is also suggested, that attitude can also be described as positive or negative, such as liking or disliking, or being favourable or unfavourable towards purchasing/building virtual reality for physical activity (Ajzen & Fishbein, 1980; Ho & Kuo 2010; Cohen & Reed, 2006).

Due to the imbalance between cost and benefit, the relationship between perceived usefulness and attitude (to purchase) may be affected. This may be the case when consumers do not find virtual reality very useful, but have a positive attitude towards purchasing and using virtual reality due to gaming aspects or content viewing. In addition, for some aspects of virtual reality, especially goggles or environments in development the perceived ease of

use may play a vital part, as the functionality of the goggles or environment may not yet provide maximum efficiency or usefulness to the consumer (Manis & Choi, 2019).
For the measurement participants were queried by selecting bad-good, negative-positive, unsatisfactory-satisfactory, unfavorable-favorable, unpleasant-pleasant by 1 to 5 associating with the attitude towards purchasing virtual reality and the attitude towards building virtual reality (sblcs).

Attitude towards using virtual reality / Attitude towards using virtual reality (sblcs)
The attitude towards using virtual reality is understood a lasting a cohesive state of readiness to purchase virtual reality. It also can be stated that attitude can also be described positive or negative, such as liking or disliking, or being favourable or unfavourable towards using virtual reality for physical activity (Ho & Kuo 2010; Ajzen & Fishbein, 1980; Cohen & Reed, 2006).
For the measurement participants were queried by selecting bad-good, negative-positive, unsatisfactory-satisfactory, unfavorable-favorable, unpleasant-pleasant by 1 to 5 associating with the attitude towards using virtual reality and the attitude towards using virtual reality (sblcs).

Intention to purchase virtual reality / Intention to build virtual reality (sblcs)
An intention (to purchase/build) is defined as an individual's consciously formulated plan to perform or engage in a particular behaviour (purchasing/building virtual reality) (Deci & Ryan, 1987). It is evident, that the attitude to a behaviour (purchase/build virtual reality) has a strong relationship with the intention for a behavior (purchasing/building virtual reality) (Ajzen & Fishbein, 1977; Bian & Forsythe, 2012; Sweeney & Soutar, 2001; Jang & Namkung, 2009).
For the measurement participants responded to with a five-point Likert-scale (1 = strongly disagree; 5 = strongly agree) with four statements associated with intention to purchase virtual reality and intention to build virtual reality (sblcs).

Intention to use virtual reality / Intention to use virtual reality (sblcs)
An intention (to use) is defined as an individual's consciously formulated plan to perform or engage in a particular behavior (using virtual reality) (Deci & Ryan, 1987). It is evident, that the attitude to a behaviour (use virtual reality) has a strong relationship with the intention for

a behavior (using virtual reality) (Ajzen & Fishbein, 1977; Bian & Forsythe, 2012; Sweeney & Soutar, 2001; Jang & Namkung, 2009).

For the measurement participants responded to with a five-point Likert-scale (1 = strongly disagree; 5 = strongly agree) with four statements associated with intention to use virtual reality and intention to use virtual reality (sblcs).

6. Analysis

6.1 Data analysis

To test the hypotheses, a structural equation model (SEM) analysis was performed using the statics program JASP 0.17.2.1. In Table 3 and Table 4 (results section) the results regarding the hypothesis are listed. Figure 6 and Figure 7 (results section) depicts the hypothesised models, which are displayed with the standardised path coefficients as well as significance levels. Table 5 (results section) displays the means of the constructs.

The model fit was evaluated using the following statistics. The chi-squared to degree of freedom ratio ($\chi2$/df), the Tucker–Lewis Index (TLI), the comparative fit index (CFI), the standardized root-mean-square residual (SRMR) and the root-mean-square error of approximation (RMSEA).

The process of measurement validation includes the testing of Cronbach Alpha, composite reliability, average variance extracted and factor loadings. Cronbach Alpha values, composite reliability and AVE (average variance extracted) were assessed for each item of the applied model. Furthermore, for each question in the survey a factor loading was calculated.

6.2 Results

6.2.1 Model Fit

The threshold for $\chi 2/df$ blow 3 is met, the TLI and CFI are above 0.9 and with the SRMR as well as RMSEA below 0.08. The model fit statistics suggest that the model fits the data in an acceptable moderate way, with all regarded model fit statistics lying within the threshold suggestions. (Awang, 2012; Hair et al, 2010; Schumaker & Lomax, 2016). Cronbach Alpha values and composite reliability range from 0.85 to 0.97 and all AVE are higher than 0.5 (Nunnally & Bernstein, 1978; Bagozzi & Yi, 1988; Xu et al., 2023; Seong & Hong, 2022; Manis & Choi, 2019; Mascret et al., 2022). For exact figures, see Table 1 and Table 2.

Table 1. *Measurement validation for the constructs of the structural equation model for virtual reality for physical activity. Composite reliability = CR; Cronbach Alpha = α; Average variance extracted = AVE.*

Construct		Factor Loadings
Perceived Usefulness	CR = 0.94; α = 0.94; AVE = 0.77	
	I believe using virtual reality would help me do more physical activity.	0.862
	I believe using virtual reality would help me to stick to physical activity more regularly.	0.879
	Using virtual reality would be useful in my life for physical activity.	0.896
	Using virtual reality would improve my life regarding physical activity.	0.920
	Using virtual reality would enhance my effectiveness in doing physical activity.	0.825
Perceived ease of use	CR = 0.89; α = 0.89; AVE = 0.61	
	I believe using virtual reality for physical activity would be easy for me.	0.774
	I believe it would be easy to get virtual reality to do what I want it to do.	0.754
	I believe using virtual reality would be clear and understandable.	0.769
	I would find virtual reality flexible to interact with during physical activity.	0.821
	It would be easy for me to become skillful at using virtual reality for physical activity.	0.786
Perceived enjoyment	CR = 0.94; α = 0.94; AVE = 0.79	
	I believe I would find using virtual reality enjoyable during physical activity.	0.824
	I believe I would have fun using virtual reality during physical activity.	0.912
	Using virtual reality would be exciting during physical activity.	0.880
	Using virtual reality would be enjoyable during physical activity.	0.934
Intention to use	CR = 0.92; α = 0.91; AVE = 0.74	
	There is a high likelihood that I will use virtual reality for physical activity within the foreseeable future.	0.858
	I intend to use virtual reality for physical activity within the foreseeable future.	0.952
	I will use virtual reality for physical activity within the foreseeable future.	0.920
	Using virtual reality for physical activity in the foreseeable future is important to me.	0.672
Intention to purchase	CR = 0.95; α = 0.95; AVE = 0.82	
	There is a high likelihood that I will purchase a virtual reality setup for physical activity within the foreseeable future.	0.906
	I intend to purchase a virtual reality setup for physical activity within the foreseeable future.	0.945
	I will purchase a virtual reality setup for physical activity within the foreseeable future.	0.946
	Purchasing a virtual reality setup for physical activity in the foreseeable future is important to me.	0.811
Curiosity	CR = 0.85; α = 0.85; AVE = 0.66	
	I like to shop around and look at displays.	0.867
	I often read advertisements just out of curiosity.	0.819
	I like to browse through catalogs or online stores even when I don’t plan to buy anything.	0.746
Attitude towards using virtual reality	CR = 0.92; α = 0.92; AVE = 0.73	
	Bad - good	0.835
	Negative - positive	0.887
	Unsatisfactory – satisfactory	0.873
	Unfavorable – favorable	0.799
	Unpleasant – pleasant	0.769
Attitude towards purchasing virtual reality	CR = 0.92; α = 0.92; AVE = 0.71	
	Bad - good	0.853
	Negative - positive	0.859
	Unsatisfactory – satisfactory	0.877
	Unfavorable – favorable	0.788
	Unpleasant – pleasant	0.833

Table 2. *Measurement validation for the constructs of the structural equation model for the self-built low-cost setup. Composite reliability = CR; Cronbach Alpha = α; Average variance extracted = AVE.*

Construct		Factor Loadings
Perceived usefulness regarding the low-cost virtual reality setup	CR = 0.97; α = 0.97; AVE = 0.87	
	I believe using this virtual reality setup would help me do more physical activity.	0.919
	I believe using this virtual reality setup would help me to stick to physical activity more regularly.	0.937
	Using this virtual reality setup would be useful in my life for physical activity.	0.951
	Using this virtual reality setup would improve my life regarding physical activity.	0.947
	Using this virtual reality setup would enhance my effectiveness in doing physical activity.	0.919
Perceived ease of use regarding the low-cost virtual reality setup	CR = 0.94; α = 0.95; AVE = 0.80	
	I believe using this virtual reality setup for physical activity would be easy for me.	0.876
	I believe it would be easy to get this virtual reality setup to do what I want it to do.	0.908
	I believe using this virtual reality setup would be clear and understandable.	0.866
	I would find this virtual reality setup flexible to interact with during physical activity.	0.910
	It would be easy for me to become skillful at using this virtual reality setup for physical activity.	0.899
Perceived enjoyment regarding the low-cost virtual reality setup	CR = 0.95; α = 0.95; AVE = 0.84	
	I believe I would find using this virtual reality setup enjoyable during physical activity.	0.918
	I believe I would have fun using this virtual reality setup during physical activity.	0.928
	Using this virtual reality setup would be exciting during physical activity.	0.914
	Using this virtual reality setup would be enjoyable during physical activity.	0.897
Intention to use regarding the low-cost virtual reality setup	CR = 0.94; α = 0.94; AVE = 0.81	
	There is a high likelihood that I will use this virtual reality setup for physical activity within the foreseeable future.	0.920
	I intend to use this virtual reality setup for physical activity within the foreseeable future.	0.938
	I will use this virtual reality setup for physical activity within the foreseeable future.	0.947
	Using this virtual reality setup for physical activity in the foreseeable future is important to me.	0.788
Intention to build regarding the low-cost virtual reality setup	CR = 0.95; α = 0.95; AVE = 0.83	
	There is a high likelihood that I will build this virtual reality setup for physical activity within the foreseeable future.	0.957
	I intend to build this virtual reality setup for physical activity within the foreseeable future.	0.918
	I will build this virtual reality setup for physical activity within the foreseeable future.	0.941
	Building this virtual reality setup for physical activity in the foreseeable future is important to me.	0.815
Attitude towards using this low-cost virtual reality setup	CR = 0.94; α = 0.94; AVE = 0.76	
	Bad - good	0.875
	Negative - positive	0.905
	Unsatisfactory – satisfactory	0.898
	Unfavorable – favorable	0.817
	Unpleasant – pleasant	0.844
Attitude towards building this low-cost virtual reality setup	CR = 0.94; α = 0.94; AVE = 0.76	
	Bad - good	0.875
	Negative - positive	0.893
	Unsatisfactory – satisfactory	0.874
	Unfavorable – favorable	0.872
	Unpleasant – pleasant	0.839

6.2.2 External Variables

The external variables included age, past use, price willing to pay and curiosity.
The surveyed participants (male 55%; female 45%) covered a wide age span, ranging from 13 to 86 years old, as can be seen in Figure 4.

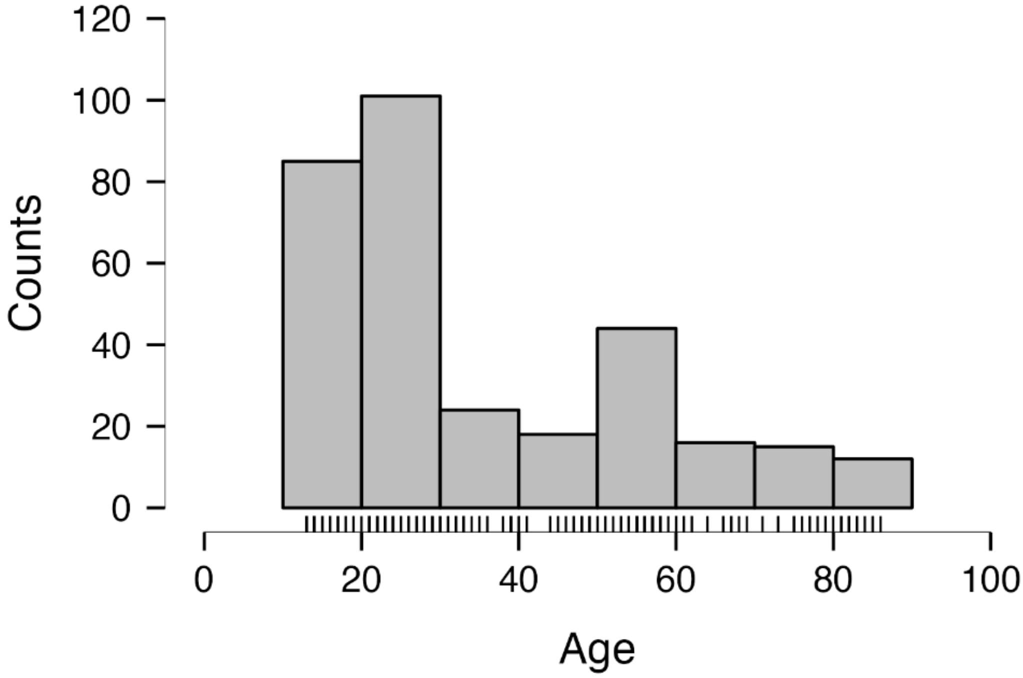


Figure 4. *Age distribution of the survey's participants.*

Approximately 36% of all participants confirmed to have used virtual reality in the past. The average usage in hours is 4.80 ± 18.07 (Table 5).
For the price ranges, participants displayed the following statistics (Figure 5). 122 (39%) participants indicated \$0-50 is the price they are willing to pay, whereas 50 (16%) marked \$50-100 as the preferred range. The range \$100-300 was indicated as preferred by 86 (27%) and the \$300-500 range by 43 (14%) participants. Only 14 (4%) participants are willing to pay \$500-1000 for virtual reality in the context of physical activity.

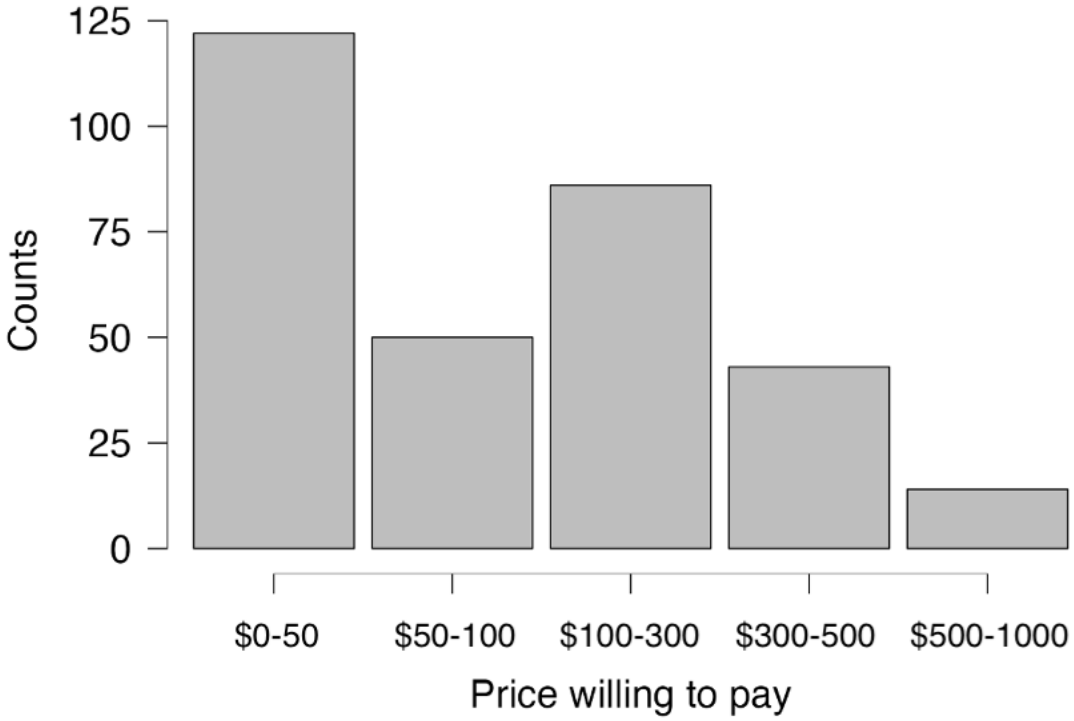


Figure 5. *Price willing to pay. Participants' price distribution and the amount they would be willing to pay for virtual reality in context of physical activity.*

When considering the results of the general model (Table 3 and Figure 6), it is evident that the *price willing to pay* does not significant affect the *perceived usefulness* (H4), *perceived ease of use* (H8) or *perceived enjoyment (*H11). Furthermore, the construct *perceived usefulness*, which was hypothesised to be affected by the variable *past use* (H3) and *age* (H5), has no significant links to the constructs mentioned.

The effect of *curiosity* on *perceived ease of use* (H6) is also non-significant, indicating that with the fact that this is only the one connection of the construct *curiosity*, respondents' anticipated use of virtual reality for physical activity is not influenced by the variable *curiosity* (Table 3 and Figure 6).

Table 3. *Hypotheses regarding the structural equation model (Figure 2) with model fit statistics, describing the paths of the model between two constructs and their association.*

Hypotheses	Hypotheses	Association	CS	Significance
H1	Perceived ease of use → Perceived usefulness	(+)	0.256	< .001 (*)
H2	Perceived enjoyment → Perceived usefulness	(+)	0.496	< .001 (*)
H3	Past use → Perceived usefulness	(+)	0.004	0.904
H4	Price willing to pay → Perceived usefulness	(+)	-0.001	0.985
H5	Age → Perceived usefulness	(-)	0.065	0.190
H6	Curiosity → Perceived ease of use	(+)	0.065	0.338
H7	Past use → Perceived ease of use	(+)	0.100	0.032 (*)
H8	Price willing to pay → Perceived ease of use	(+)	0.073	0.308
H9	Age → Perceived ease of use	(-)	-0.187	0.010 (*)
H10	Perceived ease of use → Perceived enjoyment	(+)	0.672	< .001 (*)
H11	Price willing to pay → Perceived enjoyment	(+)	0.040	0.377
H12	Perceived ease of use → Attitude towards using virtual reality	(+)	0.293	< .001 (*)
H13	Perceived enjoyment → Attitude towards using virtual reality	(+)	0.370	< .001 (*)
H14	Perceived usefulness → Attitude towards using virtual reality	(+)	0.255	< .001 (*)
H15	Perceived ease of use → Attitude towards purchasing virtual reality	(+)	0.225	0.004 (*)
H16	Perceived enjoyment → Attitude towards purchasing virtual reality	(+)	0.152	0.127
H17	Perceived usefulness → Attitude towards purchasing virtual reality	(+)	0.262	0.002 (*)
H18	Past use → Intention to use virtual reality	(+)	0.084	0.001 (*)
H19	Attitude towards using virtual reality → Intention to use virtual reality	(+)	0.544	< .001 (*)
H20	Attitude towards purchasing virtual reality → Intention to purchase virtual reality	(+)	0.413	< .001 (*)
H21	Perceived enjoyment → Intention to purchase virtual reality	(+)	-0.003	0.952
H22	Perceived usefulness → Intention to purchase virtual reality	(+)	0.212	< .001 (*)

CS = Completely standardized path coefficient; SRMR = 0.072; CFI = 0.911; $\chi2$ = 1571.335; $\chi2$/df = 2.459; RMSEA = 0.068; TLI = 0.902; df = 639.

(*) Significant difference and therefore the hypothesis is supported.

6.2.3 Users Perceptions

Users perceptions include perceived ease of use, perceived usefulness, perceived enjoyment, attitudes towards using virtual reality, attitude towards purchasing virtual reality, intention to use virtual reality and intention to purchase virtual reality.

The influence of *perceived enjoyment* on *attitude towards purchasing virtual reality* (H16) and *intention to purchase virtual reality* (H21) yield non-significant p-values, implying that *perceived enjoyment* only affects *attitude towards using virtual reality*.

All other hypothesis - (H1) (H2) (H7) (H9) (H10) (H12) (H13) (H14) (H15) (H17) (H18) (H19) (H20) (H22) - showed statistical significance, therefore, are predictors of anticipated use of virtual reality for physical activity, as can be seen in Figure 6.

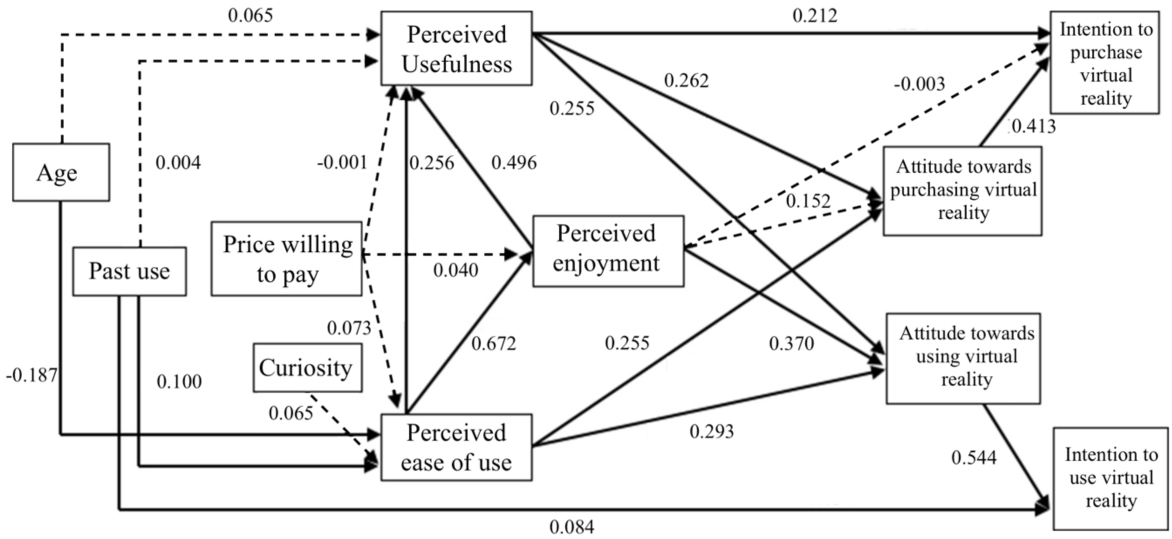


Figure 6. *Validated structural model with standardised path coefficients for the acceptance of virtual reality for physical activity. Statistically significant paths are represented with bold lines and non-significant paths are represented with dashed lines (p<0.05).*

6.2.4 External Variables (self-built low-cost setup)

The external variables (sblcs) include age, past use (sblcs) and curiosity. When regarding the results of the model (Table 4), it becomes apparent, that the variable *age* does not have significant influence on *perceived usefulness (sblcs)* (H26) and *perceived ease of use (sblcs)* (H29), leaving the construct of *age* without significant links. This is the same for the variable *past use (sblcs)* with links to *perceived ease of use (sblcs)* (H28) *and intention to use (sblcs)* (H37), also being non-significant. Regarding the self-built low-cost setup, 19% of the participants indicated a past use. The average hours for all participants are 0.72 with a standard deviation of 1.68 (Table 5). Therefore, respondents' anticipated use of the self-built low-cost setup for physical activity is not influenced by the variable *age* and *past use (sblcs)*.

Table 4. *Hypotheses regarding the structural equation model (Figure 3) with model fit statistics, describing the paths of the model between two constructs and their association.*

Hypotheses	Hypotheses	Association	CS	Significance
H23	Perceived ease of use (sblcs) → Perceived usefulness (sblcs)	(+)	0.147	0.033 (*)
H24	Perceived enjoyment (sblcs) → Perceived usefulness (sblcs)	(+)	0.683	< .001 (*)
H25	Past use (sblcs) → Perceived usefulness (sblcs)	(+)	0.096	0.008 (*)
H26	Age → Perceived usefulness (sblcs)	(-)	0.046	0.207
H27	Curiosity → Perceived ease of use (sblcs)	(+)	0.129	0.038 (*)
H28	Past use (sblcs) → Perceived ease of use (sblcs)	(+)	0.069	0.105
H29	Age → Perceived ease of use (sblcs)	(-)	-0.097	0.105
H30	Perceived ease of use (sblcs) → Perceived enjoyment (sblcs)	(+)	0.819	< .001 (*)
H31	Perceived ease of use (sblcs) → Attitude towards using virtual reality (sblcs)	(+)	0.074	0.265
H32	Perceived enjoyment (sblcs) → Attitude towards using virtual reality (sblcs)	(+)	0.619	< .001 (*)
H33	Perceived usefulness (sblcs) → Attitude towards using virtual reality (sblcs)	(+)	0.193	0.002 (*)
H34	Perceived ease of use (sblcs) → Attitude towards building virtual reality (sblcs)	(+)	0.180	0.074
H35	Perceived enjoyment (sblcs) → Attitude towards building virtual reality (sblcs)	(+)	0.260	0.035 (*)
H36	Perceived usefulness (sblcs) → Attitude towards building virtual reality (sblcs)	(+)	0.069	0.469
H37	Past use (sblcs) → Intention to use virtual reality (sblcs)	(+)	0.058	0.108
H38	Attitude towards using virtual reality (sblcs) → Intention to use virtual reality (sblcs)	(+)	0.652	< .001 (*)
H39	Attitude towards building virtual reality (sblcs) → Intention to build virtual reality (sblcs)	(+)	0.353	< .001 (*)
H40	Perceived enjoyment (sblcs) → Intention to build virtual reality (sblcs)	(+)	0.199	0.006 (*)
H41	Perceived usefulness (sblcs) → Intention to build virtual reality (sblcs)	(+)	0.208	0.002 (*)

CS = Completely standardized path coefficient; SRMR = 0.077; CFI = 0.923; $\chi 2$ = 1627.188; $\chi 2$/df = 2.676; RMSEA = 0.073; TLI = 0.916; df = 608.

(*) Significant difference and therefore the hypothesis is supported.

6.2.5 Users Perceptions (self-built low-cost setup)

Users perceptions include perceived ease of use (sblcs), perceived usefulness (sblcs), perceived enjoyment (sblcs), attitudes towards using virtual reality (sblcs), attitude towards building virtual reality (sblcs), intention to use virtual reality (sblcs) and intention to build virtual reality (sblcs).

The variable *perceived ease of use (sblcs)* displays two non-significant links to the *attitude towards using (sblcs)* (H31) and *attitude towards building (sblcs)* (H34). All other paths (H23) (H24) (H25) (H27) (H30) (H32) (H33) (H35) (H38) (H39) (H40) (H41) are significant and therefore predict the respondents' anticipated use of the self-built low-cost setup for physical activity. A graphic display is represented in Figure 7.

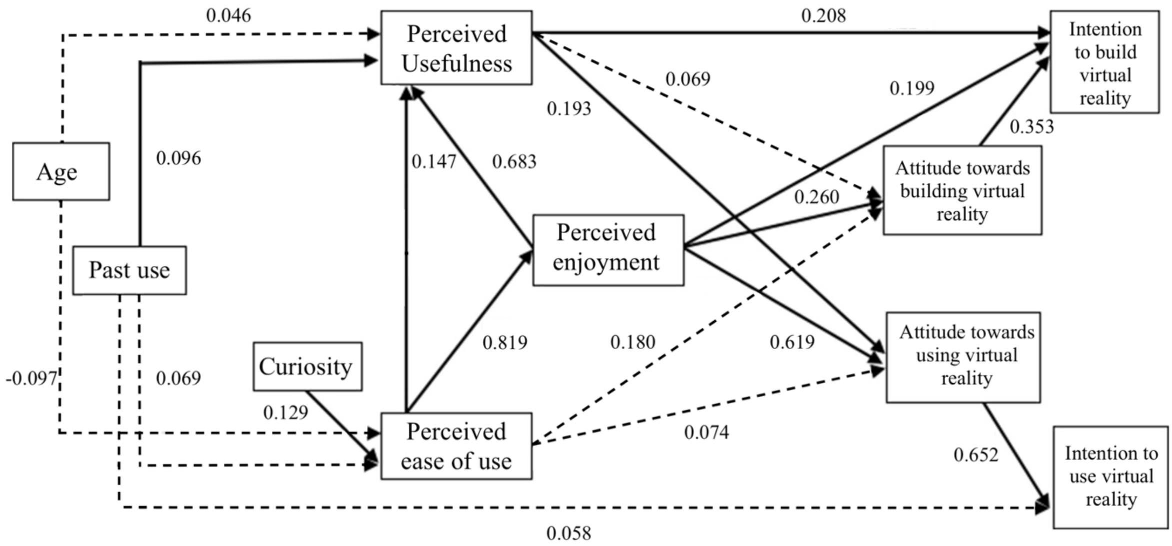


***Figure** 7. Validated structural model with standardised path coefficients for the acceptance of virtual reality for physical activity. Statistically significant paths are represented with bold lines and non-significant paths are represented with dashed lines (p<0.05).*

***Table 5.** Descriptive statistics of variables of interests depicted in hours, dollars and results of the Likert-scale.*

Construct	Minimum	Maximum	Mean	Standard deviation
Perceived usefulness	1	5	2.81	1.19
Perceived ease of use	1	5	3.33	1.16
Perceived enjoyment	1	5	3.46	1.29
Intention to use	1	5	2.23	1.18
Intention to purchase	1	5	1.94	1.18
Curiosity	1	5	3.23	1.31
Attitude towards using virtual reality	1	5	3.19	1.14
Attitude towards purchasing virtual reality	1	5	2.70	1.07
Age	13	86	35.36	20.60
Past Use	0	210	4.80	18.07
Price	0	1000	2.29	1.24
Perceived usefulness (sblcs)	1	5	2.86	1.30
Perceived ease of use (sblcs)	1	5	3.44	1.31
Perceived enjoyment (sblcs)	1	5	3.30	1.36
Intention to use (sblcs)	1	5	2.33	1.26
Intention to build (sblcs)	1	5	2.11	1.21
Attitude towards using virtual reality (sblcs)	1	5	3.16	1.26
Attitude towards building virtual reality (sblcs)	1	5	2.83	1.20
Past Use (sblcs)	0	12	0.72	1.68

7. Discussion

7.1 External Variables

The majority of the respondents were between 15 and 25 years old, which could indicate digital technologies proximity and therefore yielding a higher acceptance of virtual reality (Hauk et al., 2018).

Nevertheless, an examination of the mean values of the *intention to use/purchase* revealed, with averages lower than 3 (neutral) for the acceptance of virtual reality for physical activity is not high, even less than neutral.

Age did not show a significant impact on *perceived usefulness* (H5). However, the findings indicated a negative correlation between *age* and *perceived ease of use* (H9), meaning the higher the *age*, the less *perceived ease of use*. This demonstrates that as individuals age, their perceived ability to utilise technical devices becomes increasingly challenging. Both results align with the literature (Czaja et al., 2006; Manis & Choi, 2019; Chung et al., 2010).

The average *past use* of the respondents were 4.8 hours, this may suggest a high acceptance. However, the factor *past use* displayed small but positive correlation for *perceived ease of use* (H7) and *intention to use* (H18), meaning that in the event that a previous utilisation has occurred, the probability of *intention to use* and *perceived ease of use* is higher. Whereas no significant influence was found when regarding the *perceived usefulness* (H5).

The fact that *curiosity* had no significant impact on *perceived ease of use* (H6) implying that the variable of *curiosity* plays no role in this structural equation model, contraindicating the existing literature and therefore suggesting that for the participants curiosity did not affect the anticipated use of virtual reality (Manis & Choi, 2019). Interestingly, *curiosity* has already been reported in literature as the most powerful predictor of the external variables *age, past use, curiosity* and *price* (Manis & Choi (2019). Thus, it is not clear to how the factor *curiosity* influences the utilisation of virtual reality.

At first glance the variable *price willing to pay* did not offer any clear insight. From one perspective, the distribution of *price willing to pay* demonstrated that the majority of the participants are willing to pay between \$0 and \$50 for virtual reality technologies for physical activity. This suggests that price may be considered as a barrier for its usage, opening space for low-cost alternatives.

Interestingly, from the other perspective, all three paths of the *price willing* to pay were non-significant (*perceived usefulness* (H4), *perceived ease of use* (H8) and *perceived enjoyment* (H11)). Since these three were the only connections of the construct *price willing to pay* in the structural equation model and all were not statistically significant, it can be concluded that the respondents' anticipated use of virtual reality for physical activity was not influenced by the variable *price (willing to pay).* This is a contrast which posits that the price to purchase virtual reality should be as low as possible, yet demonstrates that price is not a factor in the model for acceptance in the context of physical activity.

In conclusion, it can be stated that external variables exert a lesser influence than previously assumed, as only three out of nine paths are significant. This demonstrates that previous use and age are pivotal factors in determining acceptance. Price, which is often perceived as a barrier, appears to have no influence on use, which is a notable finding. The assumption that people's curiosity could motivate them to use the device is also contradicted by the results. The key takeaways are that individuals should be encouraged to utilise virtual reality from an early age to counter the age effect. This approach has the potential to foster familiarity with virtual reality for physical activity, which may subsequently increase the likelihood of reuse.

7.2 Users Perceptions

Perceived ease of use displayed significant paths to *perceived usefulness* (H1), *perceived enjoyment* (H10), *attitude towards using virtual reality* (H12) and *attitude towards purchasing virtual reality* (H15). Whereas literature indicates a stronger relationship of *perceived ease of use* regarding *perceived usefulness*, only a small effect was found in the present study (Lee et al., 2012; Gao et al., 2013; Manis & Choi, 2019; Schepers & Wetzels, 2007). Nevertheless, this link provides valuable insight on how to increase the utility of virtual reality for physical activity. An option to achieve this is by producing an easy-to-understand and simple setup which can be labelled as user-friendly and straightforward, resulting in greater consumer engagement. This aspect is emphasised by previous literature, suggesting *perceived usefulness* is typically identified as the primary determinant of one's use of a technology (Davis, 1989; Davis et al., 1992; Childers et al., 2001). Furthermore, *perceived ease of use* implied positive relationships regarding *attitude towards using virtual reality* and *attitude towards purchasing virtual reality*, contributing in the same strength as other significant factors for these two variables. These findings indicate that if virtual reality is perceived as user-friendly, attitudes towards it tend to become more positive, which is beneficial for the intention to use it.

The link regarding *perceived ease of use* and *perceived enjoyment* yielded the highest path coefficient of this dataset indicating the strongest relationship and therefore suggesting that through an increase of *perceived ease of use* the *perceived enjoyment* is increased. The strength of the path is in accordance with previous studies (Manis & Choi, 2019). In the context of the design process, it is of importance to prioritise the simplicity of the system, which has a beneficial impact on the user experience regarding enjoyment.

In addition, the link of *perceived enjoyment* to *perceived usefulness* (H2) was the strongest among the paths that diverge form *perceived enjoyment* (*attitude towards using virtual reality* (H12), *attitude towards purchasing virtual reality* (H16), *intention to purchase virtual reality* (H21)) and therefore predicting with the path *form perceived ease of use* over *perceived enjoyment* to *perceived usefulness* the acceptance of virtual reality for physical activity in a crucial way.

Furthermore, *perceived enjoyment* was the strongest predictor for *attitude towards using virtual reality*, whereas the paths to *attitude to purchase* and *intention to purchase* were interestingly non-significant. In other models, *perceived enjoyment* emerged as a strong predictor for a*ttitude towards purchasing* and the *intention towards purchasing*, but literature is non-consistent. Some studies suggest *perceived enjoyment* is the most powerful predictor for the attitudes as well as intentions and therefore better than *perceived ease of use* and *perceived usefulness* (Childers et al., 2001; Bruner & Kumar, 2005; Lee et al. 2005; Manis & Choi, 2019). Others indicate that *perceived enjoyment* has to be placed behind the constructs of *perceived ease of use* and *perceived usefulness* (Davis et al., 1989; Davis et al. 1992; Davis, 1989; Childers et al., 2001). The notion would also be reinforced by the available dataset, which suggests that *perceived usefulness* and *perceived ease of use* should be prioritised for a higher acceptance of virtual reality. However, there is room for future research to understand better this relationship.

Perceived usefulness displayed three significant positive paths, indicating that *perceived usefulness* was a predictor for the *attitude towards using virtual reality* (H14), *attitude toward purchasing virtual reality* (H17) and *intention to purchase* (H22). The findings suggest that the perceived usefulness of virtual reality for physical activity is a significant factor influencing its acceptance. This highlights the importance of designing new devices with careful consideration of their utility and suggests that marketing strategies should emphasise the positive effects of virtual reality on physical activity, to enhance its appeal.

The comparison with *perceived ease of use* revealed that both variables predict *attitude towards purchasing virtual reality* and *attitude towards using virtual reality* to roughly the same degree, classifying both contracts as primary determinants. Whereas *perceived enjoyment* only predicted *attitude towards using virtual reality*, but did this to a stronger degree.

As *attitude towards using virtual reality* can be considered as a strong predictor *for intention to use virtual reality* (H19) and *attitude towards purchasing virtual reality* a strong predictor for the *intention to purchase virtual reality* (H20), the intention to use or purchase virtual reality is, apart from other factors such as *past use* (H18) or *perceived usefulness* (H22) which contribute less, mainly depended on the respondents' attitudes.

In conclusion, it can be summarised that users perception indicate that if a virtual reality system for physical activity has an accessible and straightforward configuration, which can be described as uncomplicated and user-friendly, the likelihood for acceptance and implementation tend to be higher. Therefore, in the steps for the design of such devices it is of importance to prioritise the simplicity of the system over other factors, which has a beneficial impact on the user experience in terms of enjoyment. Which in turn promotes acceptance and physical activity.

7.3 External Variables (self-built low-cost setup)

When regarding the adapted Technology Acceptance model for the self-built low-cost setup, it was found that *age* does not have a significant influence on *perceived usefulness (sblcs)* (H25) and *perceived ease of use (sblcs)* (H29). Therefore, the factor *age* of the respondents does not predict the anticipated use of the self-built low-cost virtual reality setup for physical activity.

The construct *past use (sblcs)* yielding two non-significant paths to *perceived ease of use (sblcs)* (H28) and *intention to use virtual reality (sblcs)* (H37) and one significant link to *perceived usefulness (sblcs)* (H25), albeit only a weak indicator. This demonstrates a weak connection between the use of the self-build low-cost setup and the *perceived usefulness (sblcs)*, indicating that if the setup has been used previously, the benefit may be recognised and therefore the *perceived usefulness (sblcs)* is higher. However, the factor *past use (sblcs)* should be treated with caution for the reason being that only 0.72 hours on average usage is displayed by the respondents. This is due to the reason that the self-built low-cost virtual reality setup was a prototype suggested by Weißensteiner (2023) with only 20 participants plus a handful of people using this device.

The variable *curiosity* emerges as a small positive predictor for *perceived ease of use (sblcs)* (H27) contributing to one of the two significant factors of the three external variables (*age*, *past use (sblcs)*, *curiosity*) in this model. Here, it may be suggested that the uniqueness of the self-build setup may attract people who may be associated with a “Maker“, “Craftsman/Craftswoman“, “Builder“ or a “Hobbyist“ and therefore measuring a significant path.

The construct *price willing to pay* was removed due to the fact that self-built low-cost virtual reality “ready-to-go” setup cannot be bought and therefore must be built. However, taking into account that majority of the respondents were unwilling to spend a significant amount of money on virtual reality for physical activity, expressed through the majority selecting $0 and $50 as price willing to pay, this may suggest that the anticipated acceptance of the self-built low-cost virtual reality may be higher.

Furthermore, it may be summarised that external variables only contribute to the anticipated acceptance of self-built low-cost virtual reality setup in a small extent.

In conclusion, the impact of external factors (sblcs) can be considered to be limited. This is evidenced by the fact that two of the six paths identified are significant.

It is noteworthy that curiosity exhibited by individuals regarding the self-built low-cost system appears to be a determinant of their perceptions. This may be attributed to the fact that the system is a novel and prototype-like concept, which cannot be purchased and therefore attract certain people. Consequently, it may be assumed that if virtual reality is designed in an unconventional (new) manner, it may result in a greater number of individuals finding it straightforward to utilise.

Furthermore, the past usage of this device has a positive influence on the perceived usefulness. This indicates that if this system has been utilised previously, it was perceived as being beneficial, which may be interpreted as a positive evaluation of the system's effectiveness in promoting physical activity.

7.4 Users Perceptions (self-built low-cost setup)

Perceived ease of use (sblcs) has no significant impact on *attitude towards using virtual reality (sblcs)* (H31) and *attitude towards building virtual reality (sblcs)* (H34). Whereas, the link to *perceived enjoyment (sblcs)* (H30) displays the strongest path in the model aligning with findings of the other Technology Acceptance Model for the general acceptance of virtual reality for physical activity (Mascret et al., 2022; Manis & Choi, 2019). This highlights the notion that an easy-to-use device, an integral component of a self-build low-cost setup, may offer a considerable degree of enjoyment.

Furthermore, *perceived ease of use (sblcs)* is a small predictor for *perceived usefulness (sblcs)* (H23), deviating from the existing literature as mentioned above (Lee et al., 2012; Gao et al., 2013; Manis & Choi, 2019; Schepers & Wetzels, 2007). It is unclear what a possible reason behind this poor connection is because this finding is at odds with the notion that the most straightforward and user-friendly system is perceived as the most useful.

The path of *perceived enjoyment (sblcs)* to *perceived usefulness (sblcs)* (H24) is the strongest among the paths that depart form *perceived enjoyment* (*attitude towards using virtual reality (sblcs)* (H32), *attitude towards building virtual reality (sblcs)* (H40), *intention to build virtual reality (sblcs)* (H21)) and therefore anticipating with regard of the path form *perceived ease of use (sblcs)* over *perceived enjoyment (sblcs)* to *perceived usefulness (sblcs)* the acceptance of the self-built low-cost virtual reality setup for physical activity. This suggests that the anticipation is higher when a higher *perceived ease of use (sblcs)* implies a higher *perceived enjoyment (sblcs)* and this further affects the *perceived usefulness (sblcs)* of this self-build low-cost reality setup. The simplicity of this setup is a key factor in users' positive perceptions of enjoyment, which in turn affects their overall impression of the product's user-friendliness. Nevertheless, it is unclear why there is such a significant discrepancy between the direct link (H23) to the paths over *perceived enjoyment (sblcs)* (H30) (H24), contraindicating e.g. Manis & Choi (2019) and aligning with e.g. Mascret et al. (2022).

Furthermore, *perceived enjoyment (sblcs)* is a positive predictor for *attitude towards building virtual reality (sblcs)* and *intention to build virtual reality (sblcs).* Whereas *perceived enjoyment (sblcs)* acts as a strong predictor for *attitude towards using virtual reality (sblcs).* This illustrates that *perceived enjoyment (sblcs)* is a pivotal element in this model, as it is the sole variable with multiple paths that exhibits all significant paths. It can thus be concluded that the anticipated enjoyment of the participants towards the low-cost self-build system plays a key role in the acceptance process and is a substantial determinant of the anticipated acceptance.

Perceived usefulness (sblcs) displaying two positive paths to *attitude towards using virtual reality (sblcs)* (H33) and *intention to build virtual reality (sblcs)* (H41), whereas one non-significant path *to attitude towards building virtual reality (sblcs)* (H36). This showed that if the low-cost self-build setup is perceived as helpful to increase physical activity by the participants, this can be linked to the intention to build this setup. Interestingly, perceived usefulness did not affect the attitude for building the self-build setup. One potential explanation for this could be that, as previously discussed, a “Maker“, “Craftsman/Craftswoman“, “Builder“ or a “Hobbyist“ is an individual who is inclined to take action and with an immediate and direct approach, bypassing the attitude and focusing solely on intention.

Observing all three predictors for attitude *(perceived ease of use (sblcs), perceived enjoyment (sblcs)* and *perceived usefulness (sblcs)), perceived enjoyment (sblcs)* emerges as the most powerful predictors despite weak links displayed. This is only due to all paths being significant. Whereas the other factors demonstrate only one or non-significant paths. Therefore, *perceived ease of use (sblcs)* in a not a direct contributing factor, contrary to previous research, where *perceived ease of use* is regarded as a secondary determinant behind *perceived usefulness*, classifying as primary determinant (Davis et al., 1989; Davis et al. 1992; Davis 1989; Childers et al., 2001).

The construct *attitude towards using virtual reality (sblcs)* manifests a strong connection to the *intention to use virtual reality (sblcs)* (H38), supporting the assumption, that the attitude for a behaviour is a strong predictor for the intention to perform the behaviour (Davis, 1985). This in combination with *attitude towards building virtual reality (sblcs)* having a moderate positive effect on *intention to build virtual reality (sblcs)* (H39), completes the Technology Acceptance Model which considers the anticipated acceptance of a self-built low-cost virtual reality setup for physical activity.

In conclusion, it may be argued that peoples perceived enjoyment regarding the self-build low-cost device, which is enhanced by its perceived user-friendliness, is a significant factor influencing its utilisation for an increase in physical activity. It may be observed that the central element of perceived enjoyment appears to assume a primary role in the context of low-cost devices. Consequently, in the design of low-cost devices intended to promote physical activity, it would be advisable to direct particular attention to this aspect in order to gain the maximum number of users.

7.5 Anticipated Acceptance: Costly x Low-Cost Virtual Reality

When comparing the anticipated acceptance of virtual reality for physical activity with the anticipated acceptance of virtual reality for physical activity with self-built low-cost setup, it becomes evident that the external variables (*age, past use, curiosity* and *price*) differ in their influence. Whereas *age* negatively predicts *perceived ease of use*, *age* regarding the self-built low-cost setup does not play a role in the structural equation model. These findings should be considered with caution, as the distribution of the age covers a wide range of age, but the majority of respondents are relatively young.

The factors *past use* (4.8 hours on average) and *past use* (sblcs) (0.7 hours on average) differ in their significance. It can be observed that the path being significant in the model for the general acceptance (link to *perceived ease of use* and link to *intention to use virtual reality*) are non-significant in the model for the low-cost self-built setup. Further, the link to *perceived usefulness* is non-significant whereas the link to *perceived usefulness (sblcs)* is significant, depicting how the variable *past use* is distinct between the two models. The average hours regarding *past use (sblcs)* are small and therefore conclusions should be treated with caution. It has been established that the variable *past use* / *past use (sblcs)* is inconsistent with respect to the two given models. Consequently, the effect regarding the acceptance when these two models are considered, cannot be accurately described.

A difference is also observed when examining the construct *curiosity*, revealing a non-significant path in the general model and a significant one in the self-built low-cost model. With an average score of 3.23, classifying the participants a slightly more curious than a neutral person. *Curiosity* plays a role in the acceptance of the self-built low-cost, may suggesting, as mentioned above, the task of building the setup may be interesting for a certain group of people.

The factor *price willing to pay* was only present in the general acceptance model, due to the fact, that the self-built low-cost cannot be bought and therefore had no place in this structural equation model. Interestingly, this is also the case for the general acceptance. With no significant links displayed, *price willing to pay* appears to not be involved in the process of acceptance. One may suspect beforehand that the price is a vital part in the acceptance of virtual reality for physical activity, due to the high cost of such devices. This was also one rationale behind Weißensteiner's proposal (2023) for a self-built low-cost system. The main idea was to avoid the barrier price and achieve availability for the masses to benefit from the improvements for physical activity. Here, further research is necessary to determine the role of the price of the device for further application and whether this is a factor to consider when building future devices.

Perceived ease of use has a role of significant importance in the structural equation model anticipating the acceptance of virtual reality for physical activity. This is underlined by the circumstance that all paths being significant. Whereas *perceived ease of use (sblcs)* yielding two non-significant paths. This is particularly interesting, as the mean *of perceived ease of use (sblcs)* is slightly higher (3.44) than the mean of *perceived ease of use* (3.33), suggesting that the *perceived ease of use (sblcs)* for the self-built low-cost system is slightly higher or roughly even, despite *perceived ease of use (sblcs)* having two non-significant paths in the structural equation model. Further, it may be suggested that the self-built low-cost setup is as easy to use (or slightly easier) as the general virtual reality applications.

When assessing *perceived enjoyment* and *perceived enjoyment (sblcs*), *perceived enjoyment* with two non-significant paths appears to have lesser impact in the model for the general acceptance than its counterpart *perceived enjoyment (sblcs)*. Both variables yielding a mean higher than 3 (3.46 and 3.30 (sblcs)), indicating that enjoyment is slightly higher than neutral. Curiously, the *perceived enjoyment* regarding general acceptance is higher despite playing not a vital part *as perceived enjoyment (sblcs)* in the model.

Perceived usefulness and *perceived usefulness (sblcs)* are key contributors in the acceptance model. Whereas *perceived usefulness (sblcs)* contributing slightly less for the reason that one path is non-significant. Both variables are yielding scores lower than 3 indicating that the perceived usefulness for physical activity of general virtual reality devices and the self-built low-cost setup may be classified as slightly less than (3) neutral.

It can thus be summarised that perceiving virtual reality as ease of use, enjoyable and useful are significant factors, although the extent to which they are reflected in both models differs. When considering the general category of virtual reality devices, it becomes evident that the *perceived ease of use* and *perceived usefulness* are of significance in determining the success of anticipated acceptance of these devices. In the case of the self-build low-cost device, which has attempted to integrate both factors, it appears that *perceived enjoyment (sblcs)* represents the most significant aspect.

The *attitude towards using virtual reality* and *attitude towards using virtual reality (sblcs*) are characterised to the same extent with mean values of 3.19 and 3.16, suggesting slightly better attitudes than neutral (3), predicting roughly in the same power the *intention to use virtual reality* and *intention to use virtual reality (sblcs)* with mean of 2.23 and 2.33. The mean values of the intentions of usage, which were close to 2 (disagree), indicated that the respondents had no intention to utilise virtual reality or the low-cost self-build setup for physical activity at the time of the survey.

For the *attitude toward purchasing virtual reality* and the *attitude towards building virtual reality (sblcs)* with their follow-*ups intention to purchase virtual reality* and *intention to build virtual reality (sblcs)*, direct comparison is not feasible due to the fact that these are situated in the same location within the models, yet they represent different constructs.

The comparison provides an overview depicting a varying impact of external variables. It is noteworthy that the factor price, which is present in only one model, is not statistically significant. This raises questions about the viability of a low-cost variable for virtual reality. In addition, it can be stated that the three key factors (perceived ease of use, perceived enjoyment and perceived usefulness) are of significant influence regarding the acceptance in both models, although their impact varies. It can thus be concluded that these three factors should be given particular attention when designing virtual reality, as they promote the anticipated acceptance and therefore the anticipated use, which in turn may impact a rise in physical activity.

7.6 General Overview

Although the participants were of a relatively young age, which would be expected to result in a high level of digital proximity, this was not reflected in the level of acceptance. This can be observed at both the general level and in the context of the self-built low-cost configuration.

The high cost of virtual reality hardware represents a significant barrier to entry for many potential users. To address this challenge, a low-cost self-build setup was developed with the aim of making virtual reality more accessible and affordable. Nevertheless, the factor of price did not exert a considerable influence on the overall acceptance of virtual reality in context of physical activity. This is reaffirmed by a comparison of the general acceptance of virtual reality and the self-build low-cost setup, which demonstrate comparable levels of acceptance.

As anticipated, the perceived usefulness and the perceived ease of use were identified as key factors influencing the acceptance of virtual reality in the context of physical activity. Therefore, it is recommended that devices be designed in a simple and user-friendly manner to achieve the highest possible level of acceptance.

It is noteworthy that the system designed by Weißensteiner (2023), which is aimed at user-friendliness through its straightforward design, does not exhibit a similar pattern. In this context, the perceived enjoyment is a pivotal element in the acceptance process.

However, the results display that the acceptance described through both models differ, as expected, recommending further research to be conducted into the reasons for this difference and more suitable models for the anticipated acceptance of virtual reality for physical activity with special consideration of a self-built low-cost setup.

Further, when taking into account the means of the variables and following the significant links the acceptance of virtual reality for physical activity or the self-built low-cost setup is not as high as desired to classify virtual reality as a feasible contender to be on the forefront to solve the problem of physical inactivity and therefore not an intervention against physical inactivity, contraindicating suggestions of Ng et al. (2019).

7.7 Limitations

It is important to consider the following limitations when regarding the results. Firstly, the number of participants, which can be considered small, represents a limiting factor, as a larger sample size is required for generalised statements. Additionally, the distribution of age, which is expressed by a higher proportion of younger participants than older participants, may distort the findings and therefore the rustles may be inclined to mirror the viewpoint of younger demographics. This limitation is a consequence of the used format of an online questionnaire. As the online questionnaire was distributed via social networks, where there is a higher prevalence of use among younger people than older people, the distribution was also accordingly towards this demographic. It is recommended that further studies should aim to survey an even distribution of all age groups.

Secondly, the limited time spent by participants with virtual reality before this questionnaire indicates that this technology is not yet widely adopted and remains a relatively novel phenomenon. However, this also suggests that the impact of this variable should be interpreted with caution.

Thirdly, both informational texts, which had to be read prior to completing the linked questionnaire, provided only an overview of the benefits of virtual reality regarding physical activity. The provision of further details may result in a better anticipated acceptance. Although the present study yielded intriguing insights into the acceptability of virtual reality in the context of physical activity prior to initial use, the literature indicates that the acceptability of the technology may changes after the initial use and/or regular use (Venkatesh & Davis, 2000; Venkatesh & Bala, 2008). Therefore, a pre-post study design would be a valuable addition for further research to contribute to the existing literature, as it would provide further insights for drawing conclusions regarding the acceptance of virtual reality for physical activity and on how the acceptance changes after the first usage.

8. Conclusion

This thesis applied, assessed and compared two structural equation models to anticipate the acceptance of virtual reality for physical activity with special consideration of a self-built low-cost setup. The following factors were considered for the acceptance: age, past use, curiosity and the price respondents are willing to pay. Furthermore, respondents' perceptions regarding the ease of use, usefulness, enjoyment, and attitudes towards utilising and purchasing/building virtual reality were examined. Finally, the probability of future utilisation and future purchase/build intention of virtual reality were evaluated.

The acceptable model fit and the differences obtained create a challenge in gaining many insights regarding the anticipated acceptance. Nevertheless, the data indicate that the acceptance of virtual reality as an intervention against physical inactivity may be too less to be considered as a key intervention against physical inactivity.

The findings can be summarised as follows. Previous usage increases the likelihood of future use regarding costly and low-cost devices. It would therefore be beneficial to implement general health strategies, whereby individuals utilising health or sporting facilities could be provided with the opportunity to experience virtual reality devices, thus forming an impression and increasing the probability of future or continued use and therefore an enhancement in physical activity. Furthermore, the data indicates that price is not a significant barrier for usage, although this is the aspect that most markedly differentiates the two virtual reality concepts. The evidence suggests that other factors may exert a greater influence and it may be beneficial to conduct an evaluation to identify whether costly or low-cost devices are the most appropriate to enhance physical activity.

In the case of devices that require a purchase, simplicity and perceived usefulness are the primary factors influencing anticipated acceptance. From this, future developers may conclude that particular attention should be paid to these aspects, or that additional information should be provided for these two aspects in order to attract as many people as possible. It should be considered whether this information should be accessible via health authorities' information. Regarding the low-cost variant, perceived enjoyment is the most significant factor. One potential explanation for this phenomenon is that the notion of accessibility and straightforwardness of the low-cost concept of the virtual reality devices, which is a consequence of the cost reduction, is already present within the concept, thus the emphasis is on the perceived enjoyment. The key takeaway from this is that the acceptance of cost-effective devices can be enhance by prioritising the perceived enjoyment for the consumers in the design process. Similarly, the devices would undoubtedly benefit from an opportunity for individuals to test such devices and experience the potential for enjoyment while physical activity.

This is the first report of anticipated acceptance of virtual reality for general physical activity. Therefore, further research in this field is needed to verify the results obtained. Especially, larger sample sizes in different ages groups should be on the agenda.

9. Literature

Alsyouf, A., Lutfi, A., Alsubahi, N., Alhazmi, F. N., Al-Mugheed, K., Anshasi, R. J., Alharbi, N. I., & Albugami, M. (2023). The Use of a Technology Acceptance Model (TAM) to Predict Patients' Usage of a Personal Health Record System: The Role of Security, Privacy, and Usability. *International journal of environmental research and public health*, *20*(2).

Ajzen, I. (1985). From intentions to actions: A theory of planned behavior. *In Action control: From cognition to behavior*. Berlin, Heidelberg: Springer Berlin Heidelberg.

Ajzen, I., & Fishbein, M. (1977). Attitude-behavior relations: A theoretical analysis and review of empirical research. *Psychological Bulletin*, 84 (5), 888–918.

Ajzen, I., & Fishbein, M. (1980). Understanding attitudes and predicting social behavior. *Englewood cliffs.*

American Heart Association. (2024). Accessed May 20 at https://www.heart.org/en/healthy-living/fitness/fitness-basics/target-heart-rates.

Anderson, E., & Durstine, J. L. (2019). Physical activity, exercise, and chronic diseases: A brief review. *Sports Medicine and Health Science*, *1*(1), 3-10.

Anderson, E. W., Fornell, C., & Lehmann, D. R. (1994). Customer satisfaction, market share, and profitability: Findings from Sweden. *Journal of Marketing*, *58*(3), 53.

Angosto, S., García-Fernández, J., Valantine, I., & Grimaldi-Puyana, M. (2020). The intention to use fitness and physical activity apps: A systematic review. *Sustainability*, *12*(16).

Agarwal, R., & Prasad, J. (1998). A conceptual and operational definition of personal innovativeness in the domain of information technology. *Information Systems Research*, *9*(2), 204–215.

Arning, K., & Ziefle, M. (2007). Understanding age differences in PDA acceptance and performance. *Computers in Human Behavior*, *23*(6), 2904–2927.

Awang, Z. (2012). A Handbook on SEM (Structural Equation Modeling). *Using AMOS Graphic*. UiTM Press.

Bagozzi, R. P., & Yi, Y. (1988). On the evaluation of structural equation models. *Journal of the Academy of Marketing Science*, *16*(1), 74–94.

Bajaj, A., & Nidumolu, S. R. (1998). A feedback model to understand information system usage. *Information and Management*, *33*(4), 213–224

Beldad, A. D., & Hegner, S. M. (2018). Expanding the technology acceptance model with the inclusion of trust, social influence, and health valuation to determine the predictors of German users' willingness to continue using a fitness app: A structural equation modeling approach. *International Journal of Human-Computer Interaction*, *34*(9), 882–893.

Berkemeier, L., Menzel, L., Remark, F., & Thomas, O. (2018). Acceptance by design: towards an acceptable smart glasses-based information system based on the example of cycling training. Luneburg.

Bian, Q., & Forsythe, S. (2012). Purchase intention for luxury brands: A cross cultural comparison. *Journal of Business Research*, *65*(10), 1443–1451.

Bird, J. M., Karageorghis, C. I., Baker, S. J., Brookes, D. A. & Nowicky, A. V. (2021). Ready Exerciser One: Effects of music and virtual reality on cycle ergometer exercise. *British Journal of Health Psychology*, 26 (1), 15-32.

Borle, P., Boerner-Zobel, F., Bias, H., & Voelter-Mahlknecht, S. (2021). Start moving-benefits of an onsite workplace health program in the age of digitalization. *Journal of Occupational Medicine and Toxicology*, *16*, 1-10.

Bruner, G. C., & Kumar, A. (2005). Explaining consumer acceptance of handheld Internet devices. *Journal of Business Research*, 58(5), 553–558.

Chen, H., Rong, W., Ma, X., Qu, Y., & Xiong, Z. (2017). An extended technology acceptance model for mobile social gaming service popularity analysis. *Mobile Information Systems,* (1).

Chen, K., & Chan, A. H. S. (2014). Gerontechnology acceptance by elderly Hong Kong Chinese: A senior technology acceptance model (STAM). *Ergonomics*, *57*(5), 635–652.

Childers, T. L., Carr, C. L., Peck, J., & Carson, S. (2001). Hedonic and utilitarian motivations for online retail shopping behavior. *Journal of Retailing*, *77*(4), 511–535.

Christofaro, D. G. D., De Andrade, S. M., Mesas, A. E., Fernandes, R. A., & Farias Junior, J. C. (2016). Higher screen time is associated with overweight, poor dietary habits and physical inactivity in Brazilian adolescents, mainly among girls. *European journal of sport science, 16*(4), 498-506.

Chung, J. E., Park, N., Wang, H., Fulk, J., & McLaughlin, M. L. (2010). Age differences in perceptions of online community participation among non-users: An extension of the technology acceptance model. *Computers in Human Behavior*, *26*(6), 1674–1684.

Cohen, J. B., & Reed, A. (2006). A multiple pathway anchoring and adjustment (MPAA) model of attitude generation and recruitment. *Journal of Consumer Research*, *33*(1), 1–15.

Colombo, V., Mondellini, M., Gandolfo, A., Fumagalli, A., & Sacco, M. (2019). Usability and Acceptability of a Virtual Reality-Based System for Endurance Training in Elderly with Chronic Respiratory Diseases. *International Conference on Virtual Reality and Augmented Reality*. 87-96.

Cronin, J. J., Brady, M. K., & Hult, G. T. M. (2000). Assessing the effects of quality, value, and customer satisfaction on consumer behavioral intentions in service environments. *Journal of Retailing*, *76*(2), 193–218.

Czaja, S. J., Charness, N., Fisk, A. D., Hertzog, C., Nair, S. N., Rogers, W. A., & Sharit, J. (2006). Factors predicting the use of technology: Findings from the Center for Research and Education on Aging and Technology Enhancement (CREATE). Psychology and *Aging*, *21*(2), 333–352.

Davis, F.D. (1985). A Technology Acceptance Model for empirically testing new end-user information systems; theory and results. Massachusetts Institute of Technology, Massachusetts USA.

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, *13*(3), 319–340.

Davis, F. D., Bagozzi, R. P., & Warshaw, P. R. (1989). User acceptance of computer technology: A comparison of two theoretical models. *Management Science*, *35*(8), 982–1003.

Davis, F. D., Bagozzi, R. P., & Warshaw, P. R. (1992). Extrinsic and intrinsic motivation to use computers in the workplace. *Journal of Applied Social Psychology*, *22*(14), 1111–1132.

Ding, D., Lawson, K. D., Kolbe-Alexander, T. L., Finkelstein, E. A., Katzmarzyk, P. T., van Mechelen, W., & Pratt M. (2016). The economic burden of physical inactivity: A global analysis of major non-communicable diseases. *The Lancet*. 1311–1324.

Dishaw, M. T., & Strong, D. M. (1999). Extending the technology acceptance model with task technology constructs. *Information & Management*, *36*, 9–21.

Deci, E. L., & Ryan, R. M. (1987). The support of autonomy and the control of behavior. Journal of *Personality and Social Psychology*, *53*(6), 1024–1037.

Delfino, L. D., dos Santos Silva, D. A., Tebar, W. R., Zanuto, E. F., Codogno, J. S., Fernandes, R. A., & Christofaro, D. G. (2017). Screen time by different devices in adolescents: association with physical inactivity domains and eating habits. *The Journal of sports medicine and physical fitness*, *58*(3), 318-325.

Dynamio 360. https://www.youtube.com/watch?v=6mVCNounqSk. Accessed on February the 18th, 2024.

Fishbein, M., & Ajzen, I. (1975). Belief, Attitude, Intention and Behavior: An Introduction to Theory and Research. Addison-Wesley.

Gao, T., Rohm, A. J., Sultan, F., & Pagani, M. (2013). Consumers un-tethered: A three-market empirical study of consumers' mobile marketing acceptance. *Journal of Business Research*, *66*(12), 2536–2544

Gomes, M., Figueiredo, D., Teixeira, L., Poveda, V., Paul, C., Santos-Silva, A., & Costa, E. (2017). Physical inactivity among older adults across Europe based on the SHARE database. *Age and ageing*, *46*(1), 71-77.

Gradl, S., Eskofier, B. M., Eskofier, D., Mutschler, C., & Otto, S. (2016). Virtual and augmented reality in sports: An overview and acceptance study. *UbiComp 2016 Adjunct – Proceedings of the 2016 ACM International Joint Conference on Pervasive and Ubiquitous Computing*, 885–888.

Granić, A., & Marangunić, N. (2019). Technology acceptance model in educational context: A systematic literature review. *British Journal of Educational Technology*, *50*(5), 2572-2593.

Hair, J. F., Black, W., Babin, B., & Anderson, R. (2010). Multivariate data analysis: A global perspective.

Hassenzahl, M. (2008). User experience (UX): Towards an experiential perspective on product quality. *In Proceedings of the 20th International Conference of the Association Francophone d'Interaction Homme-Machine on – IHM '08*.

Hauk, N., Hüffmeier, J., & Krumm, S. (2018). Ready to be a Silver Surfer? A Meta-analysis on the Relationship Between Chronological Age and Technology Acceptance. *Computers in Human Behavior*, *84*, 304–319

Hirschman, E. C. (1980). Innovativeness, novelty seeking, and consumer creativity. *Journal of Consumer Research*, *7*(3), 283.

Ho, L. A. & Kuo, T. H. (2010). How can one amplify the effect of e-learning? An examination of high-tech employees' computer attitude and flow experience. *Computers in Human Behavior*, *26*(1), 23–31.

Ijsselsteijn, W., Nap, H. H., de Kort, Y., & Poels, K. (2007). Digital game design for elderly users. *Proceedings of the 2007 conference on future play.*

Jackson, C. M., Chow, S., & Leitch, R. A. (1997). Toward an understanding of the behavioral intention to use an information system. *Decision Sciences*, *28*(2), 357–389.

Jang, S. C., & Namkung, Y. (2009). Perceived quality, emotions, and behavioral intentions: Application of an extended Mehrabian-Russell model to restaurants. *Journal of Business Research*, *62*(4), 451–460.

Kennedy, R. S., Lane, N. E., Bierbaum, K. S., & Lilienthal, M. G. (1993). Simulator sickness questionnaire: An enhanced method for quantifying simulator sickness. *Int. J. Aviation Psychol*, *3*(3), 203–220.

Kim, G., & Biocca, F. (2018). Immersion in virtual reality can increase exercise motivation and physical performance. *International Conference on Virtual, Augmented and Mixed Reality.*

Kim, S. S., & Malhotra, N. K. (2005). A longitudinal model of continued IS use: An integrative view of four mechanisms underlying postadoption phenomena. *Management Science*, *51*(5), 741–755.

Kim, T., & Chiu, W. (2019). Consumer acceptance of sports wearable technology: The role of technology readiness. *International Journal of Sports Marketing & Sponsorship*, *20*, 109–126.

Klompstra, L., Jaarsma, T., & Stromberg, A. (2014). Exergaming to increase the exercise capacity and daily physical activity in heart failure patients: A pilot study. *BMC Geriatrics, 14*(1).

Knight, J. A. (2012). Physical inactivity: associated diseases and disorders. *Annals of Clinical & Laboratory Science*, *42*(3), 320-337.

Kowal, M., Piskorz, J., & Czub, M. (2021). Virtual Reality Could Improve Exercise Performance on a Stationary Bike. *Polish Psychological Bulletin*, *52*(4), 365-372.

Lee, I.-M., Shiroma, E. J., Lobelo, F., Puska, P., Blair, S. N., & Katzmarzyk, P. T. (2012). Effect of physical inactivity on major non-communicable diseases worldwide: An analysis of burden of disease and life expectancy. *The Lancet*, *380*, 219–229.

Lee, M. K. O., Cheung, C. M. K., & Chen, Z. (2005). Acceptance of internet-based learning medium: The role of extrinsic and intrinsic motivation. *Information and Management*, *42*(8), 1095–1104.

Li, J., Ma, Q., Chan, A. H., & Man, S. S. (2019). Health monitoring through wearable technologies for older adults: Smart wearables acceptance model. *Applied Ergonomics*, *75*, 162–169.

Litman, J. A. (2008). Interest and deprivation factors of epistemic curiosity. *Personality and Individual Differences*, *44*(7), 1585–1595.

Litman, J. A. (2010). Relationships between measures of I- and D-type curiosity, ambiguity tolerance, and need for closure: An initial test of the wanting-liking model of information-seeking. *Personality and Individual Differences*, *48*(4), 397–402.

Liu, W., Zeng, N., Pope, Z. C., McDonough, D. J., & Gao, Z. (2019). Acute Effects of Immersive Virtual Reality Exercise on Young Adults' Situational Motivation. *Journal of Clinical Medicine*, *8*(11).

Loewenstein, G. (1994). The psychology of curiosity: A review and reinterpretation. *Psychological Bulletin.*

Mahalil, I., Yusof, A. M., & Ibrahim, N. (2020). A literature review on the usage of Technology Acceptance Model for analysing a virtual reality's cycling sport applications with enhanced realism fidelity. *In 8th international Conference on information Technology and multimedia.* 237–242.

Manis, K. T., & Choi, D. (2019). The virtual reality hardware acceptance model (VR-HAM): Extending and individuating the technology acceptance model (TAM) for virtual reality hardware. *Journal of Business Research*, *100*, 503–513.

Mascret, N., Delbes, L., Voron, A., Temprado, J. J., & Montagne, G. (2020). Acceptance of a virtual reality headset designed for fall prevention in older adults: Questionnaire study. *Journal of Medical Internet Research*, *22*(12).

Mascret, N., Montagne, G., Devrièse-Sence, A., Vu, A., & Kulpa, R. (2022). Acceptance by athletes of a virtual reality head-mounted display intended to enhance sport performance. *Psychology of Sport and Exercise*.

Masrom, M. (2007). Technology acceptance model and e-learning. *Technology*, *21*(24), 81.

McClure, C., & Schofield, D. (2019). Running virtual: The effect of virtual reality on exercise. *Journal of Human Sport and Exercise*, *15*(4), 861-870.

McKechnie, S., Winklhofer, H., & Ennew, C. (2006). Applying the technology acceptance model to the online retailing of financial services. *International Journal of Retail & Distribution Management*, *34*(4/5), 388-410.

Mclaughlin, M., Delaney, T., Hall, A., Byaruhanga, J., Mackie, P., Grady, A., Reilly, A., Campbell, E., Sutherland, R., Wiggers, J., & Wolfenden, L. (2021). Associations between digital health intervention engagement, physical activity, and sedentary behavior: systematic review and meta-analysis. *Journal of medical Internet research*, *23*(2).

Melenhorst, A.-S., Rogers, W. A., & Caylor, E. C. (2001). The use of communication technologies by older adults: Exploring the benefits from the user's perspective. *Proceedings of the Human Factors and Ergonomics Society 45th annual meeting.* 221– 225.

Mikus, C., Oberlin, D., Libla, J., Taylor, A., Booth, F., & Thyfault, J. (2012). Lowering physical activity impairs glycemic control in healthy volunteers. *Medicine & Science in Sports & Exercise*, *44*(2), 225–231.

Monroe, K. B., & Petroshius, S. M. (1981). Buyers' perceptions of price: An update of the evidence. *Perspectives in consumer behavior*, *3*(23), 43-55.

Moreno-Llamas, A., García-Mayor, J., & De la Cruz-Sánchez, E. (2020). The impact of digital technology development on sitting time across Europe. *Technology in Society*, *63*, 101406.

Morris, M. G., & Venkatesh, V. (2000). Age differences in technology adoption decisions: Implications for a changing work force. *Personnel Psychology*, *53*(2), 375–403.

Murray, E. G., Neumann, D. L., Moffitt, R. L., & Thomas, P. R. (2016). The effects of the presence of others during a rowing exercise in a virtual reality environment. *Psychology of Sport and Exercise*, *22*, 328–336.

Nawaz, A., Skjæret, N., Helbostad, J. L., Vereijken, B., Boulton, E., & Svanaes, D. (2016). Usability and acceptability of balance exergames in older adults: A scoping review. *Health Informatics Journal*, *22*(4), 911–931.

Neumann, D. L., Moffitt, R. L., Thomas, P. R., Loveday, K., Watling, D. P., Lombard, C. L., Antonova, S., & Tremeer, M. A. (2018). A systematic review of the application of interactive virtual reality to sport. *Virtual Reality*, *22*(3), 183-198.

Ng, Y.-L., Ma, F., Ho, F. K., Ip, P., & Fu, K.-W. (2019). Effectiveness of virtual and augmented reality-enhanced exercise on physical activity, psychological outcomes, and physical performance: A systematic review and meta-analysis of randomized controlled trials. *Computers in Human Behavior*, (99), 278-291.

Nunnally, J. C., & Bernstein, I. H. (1978). Psychometric Theory, New York, NY: McGraw-Hills.

Rahimi, B., Nadri, H., Lotfnezhad Afshar, H., & Timpka, T. (2018). A Systematic Review of the Technology Acceptance Model in Health Informatics. *Applied clinical informatics*, *9*(3), 604–634.

Perez-Aranda, J., Robles, E. M., & Urbistondo, P. A. Sport- related physical activity in tourism: an analysis of antecedents of sport based applications use. *Information Technology and Tourism.*

Rivera, M., Gregory, A., & Cobos, L. (2015). Mobile application for the timeshare industry: The influence of technology experience, usefulness, and attitude on behavioral intentions. *Journal of Hospitality and Tourism Technology*, *6*, 242–257.

Plante, T. G., Aldridge, A., Bogden, R., & Hanelin, C. (2003). Might virtual reality promote the mood benefits of exercise*? Computers in Human Behavior*, *19*(4), 495-509.

Priantinah, D., Aisyah, M. N., & Nurim, Y. (2019). The analysis of technology acceptance model (TAM) for personal financial management on mobile application technology. In *International Conference on Banking, Accounting, Management, and Economics (ICOBAME 2018)*, 262-266.

Sagnier, C., Loup-Escande, E., Lourdeaux, D., Thouvenin, I., & Valléry, G. (2020). User acceptance of virtual reality: an extended technology acceptance model. International *Journal of Human–Computer Interaction*, *36*(11), 993-1007.

Sauchelli, S., & Brunstrom, J. M. (2022). Virtual reality exergaming improves affect during physical activity and reduces subsequent food consumption in inactive adults. *Appetite, 175.*

Schepers, J., & Wetzels, M. (2007). A meta-analysis of the technology acceptance model: Investigating subjective norm and moderation effects. *Information and Management*, *44*(1), 90–103.

Scherer, R., Siddiq, F., & Tondeur, J. (2019). The technology acceptance model (TAM): A meta-analytic structural equation modeling approach to explaining teachers' adoption of digital technology in education. *Computers & Education*, *128*, 13–35.

Schumaker, R. E., & Lomax, R. G. (2016). A beginner's Guide to Structural Equation Modeling. New York: Routledge.

Seong, B. H., & Hong, C. Y. (2022). Corroborating the effect of positive technology readiness on the intention to use the virtual reality sports game "Screen Golf": Focusing on the technology readiness and acceptance model. *Information Processing & Management*, *59*(4).

Song, J., Kim, J., & Cho, K. (2018). Understanding users' continuance intentions to use smart-connected sports products. *Sport Management Review*, *21*(5), 477–490.

Sweeney, J., & Soutar, G. (2001). Consumer perceived value: The development of a multiple item scale. *Journal of Retailing*, *77*(2), 203–220.

Tang, D.P., & Chen, L.J. (2011). A review of the evolution of research on information technology acceptance model. *Business Management and Electronic Information (BMEI), 2011 International Conference on 13-15 May 2011 in Guangzhou, China*, 588-591.

Thompson, R. L., Higgins, C. A., & Howell, J. M. (1994). Influence of experience on personal computer utilization: Testing a conceptual model. *Journal of Management Information Systems*, *11*(1), 167–187.

Tsai, T. H., Chang, Y. S., Chang, H. T., & Lin, Y. W. (2021). Running on a social exercise platform: Applying self-determination theory to increase motivation to participate in a sporting event. *Computers in Human Behavior*, *114*, 106523.

Ulas, K., & Semin, I. (2021). The Biological and Motivational Effects of Aerobic Exercise with Virtual Reality. *Research Quarterly for Exercise and Sport*, *92*(3), 321-326.

Van der Heijden, H. (2004). User acceptance of hedonic information systems. *MIS Quarterly*, *28*(4), 695–704.

Venkatesh, V., Morris, M. G., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *MIS Quarterly*, *27*(3), 425–478.

Venkatesh, V., & Bala, H. (2008). Technology acceptance model 3 and a research agenda on interventions. *Decision Sciences*, *39*(2), 273–315.

Venkatesh, V., & Davis, F. D. (2000). A theoretical extension of the technology acceptance model: Four longitudinal field studies. *Management Science, 46*(2), 186–204.

Wang, X., & Goh, D. H. L. (2017). Video game acceptance: A meta-analysis of the extended technology acceptance model. *Cyberpsychology, Behavior, and Social Networking*, *20*(11), 662-671.

Weißensteiner, M. (2023). Effects of a low-budget virtual reality system on mood, enjoyment and perceived exertion during cycling in healthy people. Wien.

Xu, W., Liang, H. N., Yu, K., Wen, S., Baghaei, N., & Tu, H. (2023). Acceptance of virtual reality exergames among Chinese older adults. *International Journal of Human–Computer Interaction*, *39*(5), 1134-1148.

World Health Organization. WHO guidelines on physical activity and sedentary behaviour. Geneva: World Health Organization; 2020.

Yap, H. J., Hau, T. C., Taha, Z., Wee, C. S., Sekaran, S. C., & Lim, W. W. (2018). Design and development of a spatial immersive track cycling simulator. *Malaysian Journal of Movement, Health and Exercise*.

Zeithaml, V. A. (1988). Consumer perceptions of price, quality, and value: A means-end model and synthesis of evidence. *The Journal of Marketing*, *52*(3), 2–22.

Zeng, N., Pope, Z., & Gao, Z. (2017). Acute effect of virtual reality exercise bike games on college students' physiological and psychological outcomes. *Cyberpsychology, Behavior, and Social Networking*, *20*(7), 453-457.

Zhao, Y. X., Su, Y. S., & Chang, Y. C. (2017). A real-time bicycle record system of ground conditions based on Internet of Things. *IEEE Access*.

10. Appendix

On the following pages the questionnaire for the respondents is listed.

The anticipation of the acceptance of virtual reality for physical activity with special consideration of a self-built low-cost setup in austrian people.

Dear Ladies and Gentleman,
first of all, thank you for being so kind as to complete the following survey. The text below is intended to give you a rough overview of what the survey looks like.

In general, the following questionnaire addresses the topic of virtual reality in the context of physical activity. The focus is on the anticipated acceptance of virtual reality devices while doing physical activity. The answering of the following questions contributes to gain an impression of people's attitudes towards the acceptance of virtual reality.

The structure of the following pages can be summarised as follows:

- Demographics
- A short text explaining what virtual reality is and what benefits it contains regarding physical activity
- Questionnaire relating to virtual reality in general
- Short text about a low-cost self-built setup
- Questionnaire relating to the low-cost self-built setup

(If you are answering the questionnaire via your smartphone, please tilt it sideways so that that all content is displayed correctly)

Page 02

1. Please state your sex:

Female

Male

2. Please state your age in years:

3. Please state your height in cm:

4. Please state your weight in kg:

Page 03

General description for virtual reality and physical activity

Virtual reality is becoming more common and is being used in physical activity. It uses HMDs (head-mounted displays also known as goggles) and sensors to show images to the user, which adapt to the user's movements. In virtual reality, the user sees a computer-generated or recorded world. At the same time, the real world is blocked out to create the greatest possible immersion. Immersion is the feeling that the virtual environment is real. If the user reacts to the displayed image, the sensors detect the movement and the image adjusts. This creates visual feedback. Scientific studies report that when exercising in virtual reality, you can enjoy psychological and physiological benefits. This means you will enjoy it more and feel better. You will also feel less exertion, which will make you more likely to exercise.
Virtual reality goggles cost about 500 USD.

In summery people feel:

- more enjoyment
- better mood
- less perceived exertion
- attend the physical activity more often
- higher chance for maintaining physical activity

Page 04

Please read each statement and check the relevant response to indicate how strongly you disagree or agree with each statement (1 through 5). There are no right or wrong answers. Answer spontaneously and intuitively.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

Perceived usefulness:

5. I believe using virtual reality would help me do more physical activity.

○ 1 ○ 2 ○ 3 ○ 4 ○ 5

6. I believe using virtual reality would help me to stick to physical activity more regularly.

○ 1 ○ 2 ○ 3 ○ 4 ○ 5

7. Using virtual reality would be useful in my life for physical activity.

○ 1 ○ 2 ○ 3 ○ 4 ○ 5

8. Using virtual reality would improve my life regarding physical activity.

○ 1 ○ 2 ○ 3 ○ 4 ○ 5

9. Using virtual reality would enhance my effectiveness in doing physical activity.

○ 1 ○ 2 ○ 3 ○ 4 ○ 5

Page 05

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

Perceived ease of use:

10. I believe using virtual reality for physical activity would be easy for me.

1 2 3 4 5

11. I believe it would be easy to get virtual reality to do what I want it to do.

1 2 3 4 5

12. I believe using virtual reality would be clear and understandable.

1 2 3 4 5

13. I would find virtual reality flexible to interact with during physical activity.

1 2 3 4 5

14. It would be easy for me to become skillful at using virtual reality for physical activity.

1 2 3 4 5

Page 06

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

Perceived enjoyment:

15. I believe I would find using virtual reality enjoyable during physical activity.

1 2 3 4 5

16. I believe I would have fun using virtual reality during physical activity.

1 2 3 4 5

17. Using virtual reality would be exciting during physical activity.

○ 1 ○ 2 ○ 3 ○ 4 ○ 5

18. Using virtual reality would be enjoyable during physical activity.

○ 1 ○ 2 ○ 3 ○ 4 ○ 5

Page 07

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

Intention to use:

19. There is a high likelihood that I will use virtual reality for physical activity within the foreseeable future.

○ 1 ○ 2 ○ 3 ○ 4 ○ 5

20. I intend to use virtual reality for physical activity within the foreseeable future.

1 2 3 4 5

21. I will use virtual reality for physical activity within the foreseeable future.

1 2 3 4 5

22. Using virtual reality for physical activity in the foreseeable future is important to me.

1 2 3 4 5

Page 08

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

Intention to purchase:

23. There is a high likelihood that I will purchase a virtual reality setup for physical activity within the foreseeable future.

1	2	3	4	5

24. I intend to purchase a virtual reality setup for physical activity within the foreseeable future.

1	2	3	4	5

25. I will purchase a virtual reality setup for physical activity within the foreseeable future.

1	2	3	4	5

26. Purchasing a virtual reality setup for physical activity in the foreseeable future is important to me.

1	2	3	4	5

Page 09

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

Curiosity:

27. I like to shop around and look at displays.

1 2 3 4 5

28. I often read advertisements just out of curiosity.

1 2 3 4 5

29. Reading mail advertising to find out what's new is a waste of time.

1 2 3 4 5

30. I like to browse through catalogs or online stores even when I don't plan to buy anything.

1 2 3 4 5

Attitude towards using virtual reality:

My impression of using a virtual reality setup for physical activity:

31. (1=)Bad – (5=)good

○ 1 ○ 2 ○ 3 ○ 4 ○ 5

32. (1=)Negative – (5=)positive

○ 1 ○ 2 ○ 3 ○ 4 ○ 5

33. (1=)Unsatisfactory – (5=)satisfactory

○ 1 ○ 2 ○ 3 ○ 4 ○ 5

34. (1=)Unfavorable – (5=)favorable

○ 1 ○ 2 ○ 3 ○ 4 ○ 5

35. (1=)Unpleasant – (5=)pleasant

1 2 3 4 5

Page 11

Attitude toward purchasing virtual reality:

My impression of purchasing a virtual reality setup for physical activity:

36. (1=)Bad – (5=)good

1 2 3 4 5

37. (1=)Negative – (5=)positive

1 2 3 4 5

38. (1=)Unsatisfactory – (5=)satisfactory

1 2 3 4 5

39. (1=)Unfavorable – (5=)favorable

○	○	○	○	○
1	2	3	4	5

40. (1=)Unpleasant – (5=)pleasant

○	○	○	○	○
1	2	3	4	5

Page 12

Price willing to Pay:

The price I am willing to pay for a virtual reality setup for physical activity:

41. Price ranges will be given in €:

○	○	○	○	○
0 – 50	50 – 100	100 – 300	300 – 500	500 – 1000

Page 13

Past Use:

I estimate that I used virtual reality for physical activity in the past for _ hours.

42. Estimated hours:

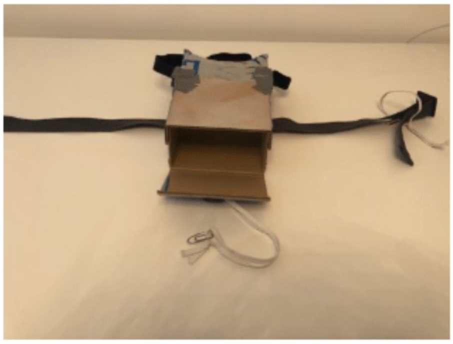
Page 14

Description for the low-cost virtual realty setup

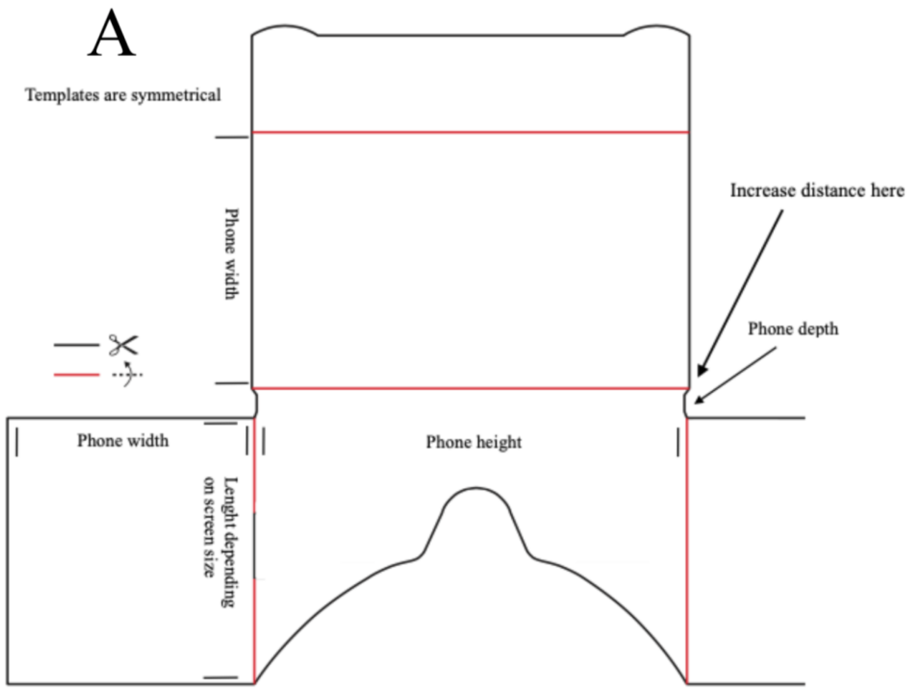
Weißensteiner and colleagues (2023) have proposed a low-cost system that can be build at home. It replicates the benefits of the general virtual realty goggles. The materials required are a smartphone with an internet connection, cardboard, adhesive tape and strips to mount the constructed goggles to the head. The version follows the virtual reality option presented by Google LLC, but with adaptations to make it simpler. A 360° YouTube video of cycling in Newport Beach, California was used as a virtual environment. The smartphone's gyroscope sensors detected head movement, aligning the video accordingly. This created a simple yet immersive environment.

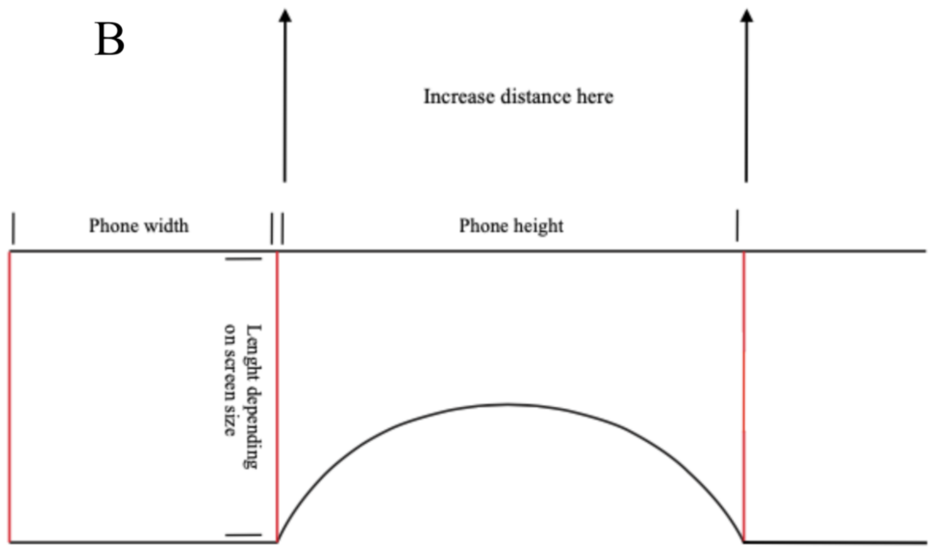
People feel:

- more enjoyment
- better mood
- less perceived exertion



Building the low cost goggle is very simple. From a template that you can find online and a cardboard, it is possible to cut the goggles frame. The measures for the frame depend a bit on the smartphone that will be used. The template A refers to the bottom part of the goggles, while template B refers to the upper part. After cutting the frame, both A and B should be glued together. Stripes should be attached so the goggles can be fixed in the head. The smartphone can, then, be placed in the flap.





Page 15

The virtual environment for the low cost setup is accessible via YouTube and will be represented with a short video.

www.youtube.com/watch?v=wwtGoaQuvSY

Page 16

The second part of the survey starts now. It relates to the self-built low-cost setup. The questions are similar but differ.

After getting aware of the existence of a low cost solution for virtual reality that can be used for physical activity, please read each statement and check the relevant response to indicate how strongly you disagree or agree with each statement (1 through 5). There are no right or wrong answers. Answer spontaneously and intuitively.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

Perceived usefulness regarding the low-cost virtual realty setup:

43. I believe using this virtual reality setup would help me do more physical activity.

○ 1 ○ 2 ○ 3 ○ 4 ○ 5

44. I believe using this virtual reality setup would help me to stick to physical activity more regularly.

○ 1 ○ 2 ○ 3 ○ 4 ○ 5

45. Using this virtual reality setup would be useful in my life for physical activity.

○ 1 ○ 2 ○ 3 ○ 4 ○ 5

46. Using this virtual reality setup would improve my life regarding physical activity.

○ 1 ○ 2 ○ 3 ○ 4 ○ 5

47. Using this virtual reality setup would enhance my effectiveness in doing physical activity.

○ 1 ○ 2 ○ 3 ○ 4 ○ 5

Page 17

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

Perceived ease of use regarding the low-cost virtual realty setup:

48. I believe using this virtual reality setup for physical activity would be easy for me.

○ 1 ○ 2 ○ 3 ○ 4 ○ 5

49. I believe it would be easy to get this virtual reality setup to do what I want it to do.

○ 1 ○ 2 ○ 3 ○ 4 ○ 5

50. I believe using this virtual reality setup would be clear and understandable.

○ 1 ○ 2 ○ 3 ○ 4 ○ 5

51. I would find this virtual reality setup flexible to interact with during physical activity.

○ 1 ○ 2 ○ 3 ○ 4 ○ 5

52. It would be easy for me to become skillful at using this virtual reality setup for physical activity.

1 2 3 4 5

Page 18

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

Perceived enjoyment regarding the low-cost virtual realty setup:

53. I believe I would find using this virtual reality setup enjoyable during physical activity.

1 2 3 4 5

54. I believe I would have fun using this virtual reality setup during physical activity.

1 2 3 4 5

55. Using this virtual reality setup would be exciting during physical activity.

○ 1 ○ 2 ○ 3 ○ 4 ○ 5

56. Using this virtual reality setup would be enjoyable during physical activity.

○ 1 ○ 2 ○ 3 ○ 4 ○ 5

Page 19

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

Intention to use regarding the low-cost virtual reality setup:

57. There is a high likelihood that I will use this virtual reality setup for physical activity within the foreseeable future.

○ 1 ○ 2 ○ 3 ○ 4 ○ 5

58. I intend to use this virtual reality setup for physical activity within the foreseeable future.

○ 1 ○ 2 ○ 3 ○ 4 ○ 5

59. I will use this virtual reality setup for physical activity within the foreseeable future.

○ 1 ○ 2 ○ 3 ○ 4 ○ 5

60. Using this virtual reality setup for physical activity in the foreseeable future is important to me.

○ 1 ○ 2 ○ 3 ○ 4 ○ 5

Page 20

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

Intention to build the low-cost virtual reality setup:

61. There is a high likelihood that I will build this virtual reality setup for physical activity within the foreseeable future.

○	○	○	○	○
1	2	3	4	5

62. I intend to build this virtual reality setup for physical activity within the foreseeable future.

○	○	○	○	○
1	2	3	4	5

63. I will build this virtual reality setup for physical activity within the foreseeable future.

○	○	○	○	○
1	2	3	4	5

64. Building this virtual reality setup for physical activity in the foreseeable future is important to me.

○	○	○	○	○
1	2	3	4	5

Page 21

Attitude toward using this low-cost virtual reality setup:

My impression of using this virtual reality setup for physical activity:

65. (1=)Bad – (5=)good

○	○	○	○	○
1	2	3	4	5

66. (1=)Negative – (5=)positive

○	○	○	○	○
1	2	3	4	5

67. (1=)Unsatisfactory – (5=)satisfactory

○	○	○	○	○
1	2	3	4	5

68. (1=)Unfavorable – (5=)favorable

○	○	○	○	○
1	2	3	4	5

69. (1=)Unpleasant – (5=)pleasant

○ 1 ○ 2 ○ 3 ○ 4 ○ 5

Page 22

Attitude towards building this virtual reality setup:

My impression of building the virtual reality setup for physical activity:

70. (1=)Bad – (5=)good

○ 1 ○ 2 ○ 3 ○ 4 ○ 5

71. (1=)Negative – (5=)positive

○ 1 ○ 2 ○ 3 ○ 4 ○ 5

72. (1=)Unsatisfactory – (5=)satisfactory

○ 1 ○ 2 ○ 3 ○ 4 ○ 5

73. (1=)Unfavorable – (5=)favorable

○ 1 ○ 2 ○ 3 ○ 4 ○ 5

74. (1=)Unpleasant – (5=)pleasant

○ 1 ○ 2 ○ 3 ○ 4 ○ 5

Page 23

Past Use:

I estimate that I used the low-cost virtual reality setup for physical activity for _ hours.

75. Estimated hours:

Last Page

Thank you for completing this questionnaire! You have vitally contributed to increasing the insight into the research field of virtual reality in the context of physical activity! - Michael Weißensteiner, M.Sc. B.Ed. B.Sc.