Research Exposé

Health habits and well-being: Investigating the incidence of smartwatches on runners.

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Academic Year: 2022 / 2023

Kassel, 23/10/2022

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Abstract

As wearable devices are growing in popularity, many individuals are approaching the running environment to be healthier and develop good habits. This paper aims to understand how much runners' physical and psychological well-being is boosted by using smartwatches[1]. It will follow a quantitative approach to better understand the extent to which wearable devices can impact the running world and, in particular, how smartwatch users are involved in Gaming, Instructing, Sharing, and Tracking features, according to the GIST (Gaming Instructing Sharing Tracking) Model by Oc and Plangger (2021). The target sample comprises over eighteen years old Italian runners that have used smartwatches at least once. By focusing on just smartwatches and, particularly on Italian professional and recreational runners, this research tries to fill the gaps in the current literature. Indeed, most articles deal with wearables in general and do not allude to a specific target country sample. This thesis will also contribute with direct feedback from the smartwatch's users, enabling practitioners to understand the consumer's behavior. In addition, citizens will be encouraged to adopt healthy habits, and the best way to practice running will be promoted, ultimately contributing to policymakers and society.

Keywords: Well-being, Health, Smartwatches, GIST Model, Gaming, Instructing, Sharing, Tracking, Runners.

[1] When the word 'smartwatch' is used, reference is also made to wearable devices with similar functionality, such as 'gears', 'smart bands' and other wrist-mounted running trackers.

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List of Abbreviations

WD	Wearable Devices
QS	Quantified Self
GIST	Gaming, Instructing, Sharing, Tracking
SMT	Smart Wearable Technologies
PWB	Psychological Well-being
S-R	Stimulus-Response
S-O	Stimulus-Outcome

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1. Introduction

The wearables technology trend started as a symptom of "fashnology". Wearable devices are intelligent computers which are either worn on the human body or incorporated into different accessories of clothing (Iqbal et al., 2021). Those devices were considered either good-looking to be added to an outfit and at the same time, they had some valuable functionalities for everyday life. Just recently consumers started to perceive wearables as motivational technology and as a support for their aspirations toward a healthy lifestyle (Calvo et al., 2014). Moreover, using quantified self (QS) technology raises psychological and physical well-being and health awareness. The data collected by consumers is automatically integrated and processed into customized and visualized feedback, which facilitates the interpretation of the data, ultimately leading to behavior change (Stiglbauer et al., 2019).

More than 90% of regular runners – recreational or professional runners that use to run on a regular basis – use GPS-equipped tracking devices (Moore et al., 2019). Therefore, WD especially smartwatches are very popular among runners. They serve as fitness trackers for running training and provide simultaneous measurement of critical parameters such as distance, duration, pace, and calories burnt, as well as biological, behavioral, or environmental information to monitor health and well-being. According to the World Health Organization, health is explicitly linked with well-being, which is "a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity" (Feng et al., 2021).

The research idea started by applying the GIST Model by Oc and Plangger to runners as a target and smartwatches as wearable devices. According to the self-regulation and self-evaluation theory (Stiglbauer et al., 2019), wearables make it possible to monitor, interpret and compare data about the self, ultimately leading to behavior changes in terms of physical and psychological well-being. However, in the current literature, a link between these theories is missing, identified as people's involvement in running. Indeed, depending on nationality and city of origin, people may have a different approach and engagement with WD and such sport.

Regarding involvement, countries that are considered to be close in culture may have utterly different running habits. For instance, Italy is the sixth country in Europe for the number of running routes per 10'000 citizens, while Spain is not even in the top ten[2]. Moreover, the

[2] Le località italiane con più runner | L'angolo del running | SportsShoes.com. (n.d.). Www.sportsshoes.com. Retrieved October 10, 2022, from https://www.sportsshoes.com/it-it/running-hub/motivation/le-localita-italiane-con-piu-runner/

same applies to the cities within the same country. Following the example of Italy, the northern part is certainly more active than the south under this perspective. Cities like Milan (217), Florence (187), and Bologna (127) far exceed the 100 running routes per 10'000 citizens. On the other hand, the biggest cities in the south of Italy, Palermo, and Naples do not even reach 10.

This thesis aims to understand how much runners' physical and psychological well-being is boosted by using smartwatches.

Furthermore, this research provides academic and business contributions to the current literature, as well as provide social benefits. The contribution to the academy would be the resolution of the previously mentioned gaps. Indeed, from a practical point of view, this thesis breaks away from the literature as the focus is on smartwatches, not wearables in general, specifically on Italian users, and on both professional and recreational runners.

The theoretical basis of the research consists of the GIST model, the self-regulation theory, the self-evaluation theory, and the Operant Conditioning theory. According to the GIST model, users' autonomous motivations inspire habitual use of wearable fitness devices, both directly and indirectly, through four motivational features of these technologies: gaming, instructing, sharing, tracking and users' preferences for these features depend on the users' characteristics, namely, their age and gender (Oc et al., 2021). Self-regulation theory deals with affective, cognitive, and behavioral techniques to accomplish objectives across time and circumstances. It has three stages: self-monitoring, self-improvement, and social cognitive or control theory. In compliance with the self-evaluation theory, people strive to either confirm or enhance their perceptions about themselves. Therefore, customers will adopt healthier habits as they seek to receive feedback that at least matches their expectations. Furthermore, as specified by the Operant Conditioning theory, wearable devices support the accomplishment of health-related goals and reinforce the corresponding beneficial habits, by providing external incentives, such as virtual badges for goal achievement, that could result in rewards themselves (Stiglbauer et al., 2019).

Those theories consider the impact of smartwatches on the physical and psychological well-being of runners. Nevertheless, the following theories deserve mention, as consulting them while finalizing the research framework was helpful. The Self Determination Theory by Deci and Ryan deals with intrinsic and extrinsic motivation and explains how human beings

are moved by competence, autonomy, and relatedness. The Reactivity Theory by Stiglbauer, Weber, and Batinic affirms that performance can be improved by measuring and monitoring parameters, ultimately leading to healthy behaviors.

In the upcoming sections, the theoretical framework will be presented with a focus on the GIST model, involvement, and physical and psychological well-being, followed by the literature review which will introduce the reader to the critical papers and articles to elaborate on the research. The fourth chapter will discuss the hypothesis, and the research model will be presented. After that, the methodology and items such as target sample characteristics, and data collection procedures will be shown. Chapter six will be dedicated to the expected contributions to Academy, Practitioners, Policymakers, and Society, followed by the chapter overview.

2. Theoretical Framing

2.1 Wearable devices

Wearable devices and "Smart Wearable Technologies" (SWT) are two concepts connected to the development of wearable computers and ubiquitous computing (Soh et al., 2015). Smart wearables integrate technology into daily life, making them omnipresent. Developers have tried to make clothing more practical throughout the history and development of wearable computing, or to design wearables as accessories that can give consumers monitoring tools (Sultan, 2015). Currently, there is a lot of research being done on SWTs that mostly focuses on the engineering side of SWT, such as the development of sensors or actuators. The development of new generations of creative, high value-added products will be made possible by the successful introduction and use of SWT. As a result, a variety of everyday items, such as clothing, accessories, and cars, fall under the area of SWT applications (Balanou et al., 2013). Over the past few decades, there have been numerous attempts to design and create a variety of wearables that may be used for various tasks. However, the interest in SWT and the filing of patents has significantly increased. Numerous various types of wearable technology have been developed, and their capabilities, as well as their ease of use, functionality, aesthetics, and comfort, have all improved over time. Recently, a large number

of new businesses that focus on specific niches in the industry of smart clothes and accessories have emerged (Dehghani et al., 2017; Cho et al., 2016). By taking use of the possibilities in new creative materials and clever applications, they have become competitive (Rauschnabel et al., 2015).

According to the criteria given above, the term "self-contained computer" has changed during the past ten years to refer to any accessory or embedded portable device that can be worn on any portion of the body. Based on the concepts given above, SWTs are defined as embedded portable computers and cutting-edge electronics that smoothly blend into people's daily lives and allow them to engage in a smart environment whenever and whenever they want. SWT development requires multidisciplinary expertise from a variety of domains, including materials, computer-human interaction, and information science (Chan et al., 2012). SWTs have a wide range of applications, including in the domains of gaming, healthcare, military, entertainment, education, music, and sport. So far, SWTs have had the biggest impact on consumers in the healthcare, medicine, and fitness sectors (Saleem et al., 2017). The industry has seen a sharp rise in demand for several categories of smart wearable goods during the last few years. Some examples of products in SWTs include smart glasses, headbands, smart watches, wristbands, clothes, and jewelry. SWTs are expected to become widely used shortly because of a progressively lower cost, greater connectivity, increased dependability, improved usability, and longer battery life. (Bartlett-Bragg, 2014). However, there are a lot of difficulties in the area of SWTs product development. For example, the majority of smart wearables have expensive costs (Dehghani, 2016). Additionally, given the nature of wearable technology, elements like visual appeal are crucial since they influence users' behavior and their intention to use the product continuously (Dehghani et al., 2018). As such, they must be appropriately considered during the design process.

2.2 Well-being

2.2.1 Psychological well-being

Satisfaction, happiness, perception of quality of life, and level of anxiety are all results of the quality of psychological experiences and are also deeply linked to well-being (Deci & Ryan, 2008; Weinstein, 2018). Psychological well-being deals with the users' assessment of their happiness at a certain moment or in a period of their life. Furthermore, a positive well-

being effect makes people consider a desirable change in their personas to enhance their situations (Frazier et al., 2012; Loveday et al., 2018).

Ryff (1989) described PWB as the different effects of subjective aspects on individuals' life. Such aspects are self-acceptance, positive relations with others, autonomy, environmental mastery, purpose in life, and personal growth. Self-acceptance is one of the most relevant features of mental health. It is emphasized that positive psychological functioning is the main reason for having a positive attitude toward the self and others. Positive relations with others, intended as the ability to love and trust someone else, is a critical component of psychological health. Thus, relating to others is considered to be a criterion of maturity to improve the self. Autonomy and other self-actualizers definitely enhance the self. Indeed, having an internal locus of evaluation makes a person better as it emphasizes the fact of comparing itself with personal standards. Adaptability and Environmental mastery deal with the skill of making an environment suitable for the individual. This ability accordingly affects the process of self-development by allowing the person to manipulate and control different environments. Purpose in life defines maturity and it is a measure of directedness and intentionality. To be healthy and psychologically wise, it is necessary to have goals, intentions, and directions that contribute to make the life of a person meaningful. Finally, personal growth emphasizes the personal need for self-actualization and realizing the own potential. Continued growth and confronting new challenges allow a person to be in a dynamic situation of developing and becoming, striving to continuously face new challenges and solve new problems.

In conclusion, people who tend to prioritize extrinsic goals more than intrinsic ones are more likely to experience psychological outcomes, such as lower levels of vitality, self-actualization, and self-esteem; higher levels of depression, anxiety, and narcissism; a higher likelihood of engaging in high-risk behaviors; and more tense interpersonal relationships (Vansteenkiste et al., 2004).

2.2.2 Physical well-being

From a medical point of view, physical exercise has to be strongly encouraged as it bolsters several relevant answers to issues such as diseases and disorders (Fox, 1999). The measurements of physical well-being have been classified as subjective and objective. The former includes self-reported symptoms and inquiries concerning the magnitude of the effect on either specific, such as teeth pain, headaches, or general physical functioning, for instance,

how many days the person has not felt well (Schwarzer et al., 1994; Gallo et al., 2000). Moreover, subjective health assessments are critical, as sometimes it could be difficult to identify certain symptoms from the outside and can be exclusively recognized by asking the person (Sherbourne et al., 1992). Objective health assessments, on the other hand, comprise indexes and indicators like blood pressure (Bailey, 1984).

According to Fox (1999), physical training has to be stimulated among the population as it would be an inexpensive and accessible alternative for everyone in order to improve self-perceptions, social interaction, mood, quality of life, and satisfaction. Furthermore, there is sufficient evidence in the literature to sustain and promote exercise as a key factor in the process of treating psychological diseases, such as depression and anxiety. However, there is no ultimate formula recommended for every individual. Indeed, training features like the intensity or the duration of a session are up to the person and have different results on the self.

Among the training practice, outdoor activities and running are becoming increasingly common. About the latter, there is a growing fear that many runners could get caught in the "training trap" and overexert themselves. The results would seem to be a reverse of the beneficial effects, with sensations of exhaustion and muscle soreness. There seems to be a contrast between the beneficial effects of running, such as physical health, weight loss, and positive mood, and the negative effects that individuals reported when they skipped a training run, such as guilt, low energy, and melancholy (Shipway et al., 2010).

2.3 Self-regulation theory

Self-regulation theory has three stages - self-monitoring, self-improvement, and social-cognitive or control theory - that have direct and indirect effects on the accomplishment of goals, through affective, cognitive, and behavioral techniques (Stiglbauer et al., 2019). Concerning self-monitoring, disclosing parameters and making the user detect them is a way to provide feedback, which leads to behavioral changes in terms of health and well-being. According to the self-improvement stage, through their wearables, users can collect data that may change their perception, leading to behavior changes. Finally, as far as social cognitive theory is concerned, almost all QS technologies allow users to confront their parameters with

objectives and standards, and if they find relevant discrepancies, they are stimulated to adopt behavioral changes.

Self-regulation refers to the internal and/or transactional mechanisms that allow a person to direct their goal-directed behaviors throughout time and in the face of changing circumstances. Regulation is the intentional or automatic use of particular mechanisms and auxiliary meta-skills to modify thinking, affect, behavior, or attention. By definition, the processes of self-regulation are started when routine activity is interrupted or when goal-directedness is otherwise brought to light, (e.g., the appearance of a challenge, or the failure of habitual action patterns). Goal selection, goal cognition, directional maintenance, directional change or reprioritization, and goal termination are the first five interrelated and iterative component phases of self-regulation. The accomplishment of personal goals logically depends on the choice of a set of directions among numerous and occasionally conflicting options. On the other hand, it is crucial to recognize that simply choosing, intending, desiring, or anticipating a result does not ensure its realization (Heckhausen 1991; Heckhausen et al., 1985). Goal cognition refers to all striving-referent thoughts, evaluations, construals, or abstracting characteristics. In the absence of any systematic assessments of people's declarative knowledge base, instrumental skill repertoire, or instantiation of specific goal-coordination mechanisms, goal cognition has been found to predict a variety of indicators of mental and physical health state (Emmons 1992; Omodei et al., 1990; Palys et al., 1983; Ruehlman et al., 1988).

One must concentrate on task-specific goal content and goal intensity to forecast present performance (factors influencing task engagement or commitment, such as expectancy and self-efficacy). This is the viewpoint provided by the goal-setting theory developed by Locke et al. (1990). possibly the most influential self-regulation theory in modern industrial and organizational psychology. According to some theories, goals have an impact on how well employees accomplish their jobs by focusing attention, energizing on-task effort (in proportion to task complexity), maintaining performance through time, and promoting strategic planning. However, factors including the availability of feedback, ability, commitment, task complexity, and knowledge can limit their facilitative benefits.

Goals control perceptions of our mental and sensory states as well as our interactions with the environment. Goal-directed organisms pay selective attention to and perceive information that is relevant to their directive or command functions (Klinger 1977). Self-

reflective responses that may change the occurrence of observed events or the precision with which they are listed are among the numerous benefits of self-observation, which also include the gathering of goal-relevant information, the improvement of motivation, and these effects.

2.4 Self-evaluation theory

According to the self-evaluation theory, correctly instructed fitness tracker users seek to adopt healthier habits in order to receive positive feedback that confirms or improves their expectations (Stiglbauer, et al., 2019).

According to philosophical terminology, the self is both a Schopenhauerian Wille and a Cartesian ego, politely wondering. This realization led experimentally oriented psychologists to identify and research four fundamental self-evaluation motives, or self-motives, that are important for the formation, upkeep, and alteration of self-views. These include self-improvement, self-enhancement, self-assessment, and self-verification (Sedikides et al., 1997). Self-improvement refers to the desire to view oneself favorably (Alicke et al., 2011). Self-promotion (playing up one's positive traits) or self-protection (playing down one's bad traits) can both be involved. One frequently cited example of self-improvement is the fact that most people score themselves above average on the majority of personally valued attributes, which defies statistical logic (Alicke et al., 2005; Guenther et al., 2010; Sedikides et al., 2003).

Self-verification refers to the need to support an existing self-perception (Swann, 1997; Swann et al., 2003). The concept is that an individual can increase the predictability and controllability of the social environment, both pragmatically and epistemically, by making one's social interactions easier and more intelligible. The concept is that an individual can increase the predictability and controllability of the social environment, both pragmatically and epistemically, by making one's social interactions easier and more intelligible. People with unfavorable self-views tend to interact more with those who support them than with those who challenge them, which is an apparent sign of self-verification (Giesler et al., 1996; Swann et al., 1989; Swann et al., 1992). Self-assessment refers to the desire to discover one's true nature (Trope, 1986).

Self-evaluation is indeed the preference for challenging tasks that can provide correct information about oneself over simple tasks that can merely provide pleasing information

(Gregg et al., 2011; Trope, 1980). Finally, the desire to enhance oneself above one's current state is referred to as self-improvement (Pyszczynski et al., 2003; Taylor et al., 1995). It entails acquiring competencies, prowess, and capacity in areas considered to be central or personally significant (Markus, 1977). One sign of self-improvement is that people frequently attempt to put off immediate enjoyment in order to accomplish a long-term goal, such as giving up unhealthy food in order to obtain a lean physique (Baumeister et al., 1998; Heatherton et al., 1994; Sedikides et al., 2009).

One primary means of self-motives satisfaction is to ask for feedback that would likely yield the needed information (Brown et al., 1995; Sedikides, 1999). Therefore, it is possible to deduce indirectly from the type of feedback that people seek on how self-motivation functions. Feedback-seeking thus offers an empirical lens through which to examine the self's intrapsychic driving forces.

Changes in a dependent variable, such as feedback seeking, have been interpreted as evidence that a self-motive is or is not present in a certain situation, or that it is either stronger or weaker than another self-motive. In other words, evidence for the existence or relative prevalence of certain self-motivations in various circumstances has been gathered. This research, however, has little bearing on the question of whether self-motivations vary from person to person. According to Sedikides and Skowronski (2003), self-motives functioned adaptively to elicit knowledge that aided in survival and reproduction throughout the history of human evolution. They suggested, more particularly, that self-assessment and self-improvement functioned as an interactive pair of learning motives, the former leading to the acquisition of knowledge about one's current state and the latter to the knowledge of future progress (Sedikides et al., 2009).

2.5 Operant Conditioning theory

The Operant Conditioning theory highlights how wearable devices can be supportive in order to reach health-related goals and reinforce the corresponding beneficial habits. Indeed, wearable technologies provide external incentives, such as gamified goal achievement tools that could result in a reward, ultimately leading to an increase in health and well-being (Stiglbauer et al., 2019).

The acquisition of emitted responses was thought to be a component of the learning process known as instrumental operant conditioning. These outdated definitions made the implicit assumption that learning involves the acquisition of a stimulus-response association rather than a belief about the causes of a result. In modern mechanistic theories of classical and operant conditioning, indeed, the common assumption is that direct linkages between either the stimulus and outcome representations or the response and outcome representations are generated during conditioning. As a result, the outcome representations triggered by these linkages imply a basic level of outcome anticipation.

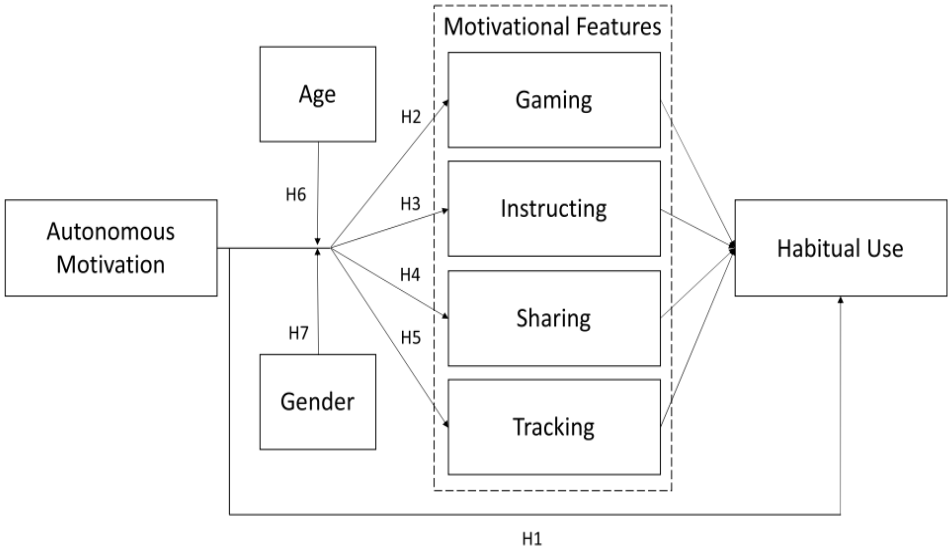
It is now spread the belief that conditioning involves the creation of expectations. The remaining theoretical disagreements on this topic focus on the degree of cognition and whether or not these cognitions may be appropriately represented as simple associations. The concept of anticipation as more than merely the activation of straightforward binary connections has been the focus of higher-order cognitive alternatives to these mechanical explanations. An expectation is a future-focused conviction; it is a conviction that something will occur. Consequently, they have also been referred to as subjective probabilities (Rotter, 1954). From a cognitive standpoint, instrumental learning scenarios create expectations that specific actions will result in specific results (for example, that food can be found in a specific location), and classical conditioning creates expectations that specific stimuli will be followed by other stimuli. Although expectancies have often been depicted as S-O relationships, not all S-O associations are. For instance, a piece of certain music can serve as a cue stimulus that brings back memories of a certain person from the past. However, this representation is not an expectation because there are already contextual clues in place that indicate that the person won't show up, thus it doesn't lead to the idea that they will. There are also specific S-R correlations that can be viewed as expectancies (Kirsch et al., 1999). In these linkages, the stimulus elicits a representation of the reaction rather than the actual response.

2.6 GIST Model

The GIST model is the result of the application of the self-determination theory (Ryan & Deci, 2000) and the U-Commerce framework (Watson et al., 2002). This model consists of a conceptual taxonomy of four different motivational technology characteristics. According to Oc et al. (2021), users' autonomous motivations inspire the habitual use of wearable fitness

devices, both directly and indirectly, through gaming, instructing, sharing, and tracking. Moreover, based on gender and age there are different effects on creating and sustaining fitness habits. Indeed, people that have different gender and belong to different age groups discern motivational features differently.

Figure 1 - GIST Model



The dimensions of the U-Commerce framework (Watson et al., 2002) can be used to justify and map the context-aware aspects of motivational technologies: ubiquity, universality, uniqueness, and unison. Motivational technologies exhibit ubiquity because they are both "everywhere" and "nowhere" at the same time. Because they are so ingrained in our lives, we are unaware of their existence. The availability and usability of technology and its data are referred to as universality. Given that users of motivational technologies receive personalized information depending on their time, location, and declared or learned preferences, uniqueness is almost completely fulfilled with these tools. Finally, unison refers to transparent data communication across devices, which is a characteristic shared by several motivational technologies. To support tailored (unique), consistent (unison), and ongoing (ubiquitous) interactions between users and their wearable devices that increase the incentive to fulfill goals, motivational technologies utilize accessible (universal) networks.

About age differences, various recent studies (e.g., Hirvonen et al., 2015; Lee et al., 2017; Pyky et al., 2017) advocate for greater exploration into the effects of age on the habitual use of motivating technologies. Younger users are more accustomed to using these technologies, which requires learning new skills, according to research on technology adoption

(Venkatesh et al., 2003). Also, younger adults appear to achieve greater results in a range of contexts, such as weight loss (Jakicic et al., 2016), sports involvement (Ha et al., 2015), and quitting smoking (McClure et al., 2017). On the other hand, aged users frequently demand motivational elements that boost their enjoyment and interaction with technology post-adoption (Wu et al., 2016). In light of this, although younger users may accept these technologies more readily, they might not fully use the motivational aspects to achieve these favorable results as older users do.

Regarding gender differences, when examining the differences in men's and women's preferences for physical activities, the literature reveals a range of results. Some studies on physical activity note significant gender differences. For instance, women are twice as likely than men to look for information on physical activity (Berry et al., 2011), are more committed to their exercise regimens (Royer et al., 2015), and have higher intentions to continue exercising (Hamari et al., 2015). However, men are more likely to use fitness wearable gadgets early on (Canhoto et al., 2017; Venkatesh et al., 2003). Additionally, research shows that women prefer recreational wearable technology features while males are more inclined to favor utilitarian ones (Venkatesh et al., 2012). According to Gupta et al. (2020), Indian men in Generation Y choose smartwatches, while women would rather have fitness trackers. However, according to a few research (Chuah et al., 2016; Wu et al., 2016), gender does not significantly affect the adoption of smartwatches or views toward diet or fitness apps (Cho et al., 2015). Female users may make use of motivational elements to develop healthy and long-lasting behaviors, while male users may adopt motivational technologies more readily.

2.7 Application of the mentioned theories

In this section, some examples of the application of the aforementioned theories will be presented. The references cited are coherent with the context of the present research and therefore deal with the examination of the impacts of wearable devices on motivation, health consciousness, and well-being.

Stiglbauer et al., (2019) examined the proposed health-related impact of wearable QS technologies by means of a longitudinal randomized controlled study among those users that have less experience and skills regarding the quantified-self processes. Therefore, the objective of the study was to examine the impact of health-related QS technologies on several health indicators, based on the self-regulation, self-evaluation, and operant conditioning theory. It was

analyzed how health-related QS technology usage positively influences health consciousness (Hypothesis 1), perceived physical health (Hypothesis 2), and psychological well-being (Hypothesis 3). According to this study's findings, wearing a technology device to monitor one's activity and other factors has a statistically minor but significant impact on users' perceptions of their physical health and sense of accomplishment. The favorable benefits of self-reported health and well-being markers became more obvious the more heavily users engaged with the tracking, as shown by their increased use of the apps. Particularly, more frequent use of the companion app led to higher increases in perceived physical health, good emotions, and feelings of success and significance in life. Users can gather information about themselves and receive feedback by simply wearing the tracker without activating the mobile application, according to the steps of the self-quantification process (Li et al., 2010). The smartwatch does not allow deeper cognitive processing of the data because it does not provide any information in order to interpret data to encourage reflection. However, most theoretical explanations require it, and the accompanying app appears to support this.

Oc and Plangger (2022) tested the GIST model in a large sample of 360 men and 240 women between 18 and 50 years old of various income and education levels who are regularly physically active and use motivational technologies. This research expanded earlier studies that looked at users' perceptions of device performance and usability by analyzing the effects of gaming, instructing, sharing, and tracking regular usage intentions. Wearable gadget capabilities were improved by improved sensor technologies, which also improved user experiences. When it comes to purchasing decisions, consumers are sensitive to gadget characteristics, and technological capabilities also impact their long-term use. In the framework of motivational technologies, we noted the significance of GIST for habit development. This study also investigates the influence of users' characteristics, specifically their age and gender, on their preferences for the elements of motivating technologies (gaming, instructing, sharing, or tracking). Based on these findings, behavior change programs and motivational technologies can be adapted to users' individual traits and feature preferences in order to induce healthier behaviors.

3. Literature Review

The research to develop the theoretical basis of the present study, was conducted entirely online. The databases used have been Google Scholar, Web of Science, ResearchGate, Elsevier, ScienceDirect, IEEE Xplore, JSTOR, ACM Digital Library, and PubMed. The queries used to find references on the mentioned platforms have considered many keywords and mixed them in different orders with the AND conjunction; they were: "wearables", "runners", "well-being", "health", "smartwatches", "gears", "performance". No exclusion criteria were used, and the papers found with such search criteria have been quickly analyzed to understand whether they could have been useful for the drafting of this study. The number of papers opened amounted to 157, of which 104 have now been used in this paper. The following table highlights the most relevant papers, with a brief analysis of the contents and proper references.

Table 1. Literature review

	References	Content
1	Oc, Y., & Plangger, K. (2021). GIST do it! How motivational mechanisms help wearable users develop healthy habits. Computers in Human Behavior, 107089. https://doi.org/10.1016/j.chb.2021.107089	Wearable technology has spread widely as individuals are more careful about their health. Through the GIST model (gaming, instructing, sharing, and tracking), this paper studies how WD affect the users' motivation, thus leading them to a more active and healthy life. Moreover, the model was tested to understand the motivational discrepancies by age and gender, taking advantage of a large sample.
2	Stiglbauer, B., Weber, S., & Batinic, B. (2019). Does your health really benefit from using a self-tracking device? Evidence from a longitudinal randomized control trial. Computers in Human Behavior, 94, 131–139. https://doi.org/10.1016/j.chb.2019.01.018	This article presents the main theoretical assumptions to discover whether self-tracking devices affect in a positive way the users' well-being. In addition, a longitudinal randomized control study was conducted, and the results showed that the WD have a statistically small but relevant positive effect on physical well-being, and an even more significant impact on the health consciousness of the sample.

3	Lee, J., Kim, D., Ryoo, H.-Y., & Shin, B.-S. (2016). Sustainable Wearables: Wearable Technology for Enhancing the Quality of Human Life. *Sustainability*, 8(5), 466. https://doi.org/10.3390/su8050466	This paper discusses the WD trend, with a focus on status monitoring, multi-wearable device control, and smart networking amongst wearable sensors. Furthermore, it studied how this technology is going to develop, and also the application of these devices from a sustainable point of view is investigated.
4	Ferreira, J. J., Fernandes, C. I., Rammal, H. G., & Veiga, P. M. (2021). Wearable technology and consumer interaction: A systematic review and research agenda. *Computers in Human Behavior*, 118, 106710. https://doi.org/10.1016/j.chb.2021.106710	As the literature on wearable technology is fragmented, and there is a lack of delimitation of its implications, this paper investigates the currently available reference to identify the different trends in these devices. Five main themes were highlighted: wearable technology decision-making; wearable technology well-being; wearable technology consumer behavior; wearable technology utility, and wearable technology and big data analytics.
5	Moore, I. S., & Willy, R. W. (2019). Use of Wearables: Tracking and Retraining in Endurance Runners. *Current Sports Medicine Reports*, 18(12), 437–444. https://doi.org/10.1249/JSR.0000000000000667	This paper provides a more complete overview of recent studies about wearable devices for runners, aiming to understand how much this technology can be valid and valuable for runners' coaching and rehabilitation. The research reveals data in favor of the usage of wearables to enhance running performance, monitor the runner's overall training loads, and provide real-time feedback on running pace and cadence.
6	Feng, S., Mäntymäki, M., Dhir, A., & Salmela, H. (2020). How Self-tracking and the Quantified Self Promote Health and Well-being: A Systematic Literature Review (Preprint). *Journal of Medical Internet Research*. https://doi.org/10.2196/25171	In the context of self-tracking and quantified self, this study was conducted to address and cluster research themes to three types of stakeholders: end users, patients and people with illnesses, and health care professionals and caregivers. Eleven research themes were identified, and as a consequence of that, four future research directions are proposed: users' cognitions and emotions related to processing and interpreting the information produced by tracking devices and apps; the dark side of self-tracking; self-tracking as a societal phenomenon; and systemic impacts of self-tracking on health care and the actors involved.

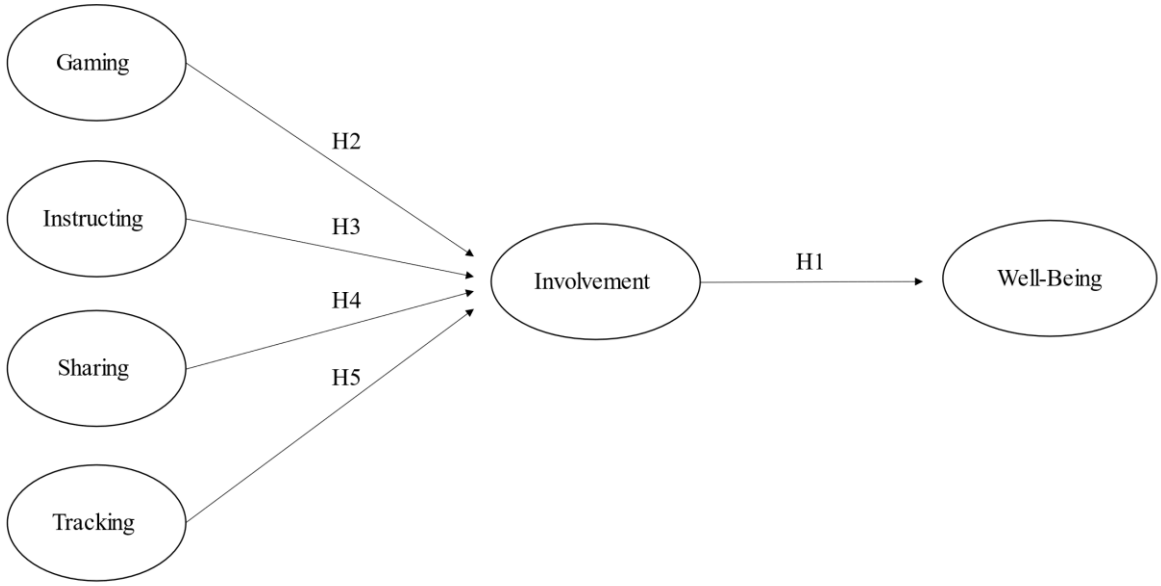
7	Hardey, M. M. (2019). On the body of the consumer: performance-seeking with wearables and health and fitness apps. *Sociology of Health & Illness*, 41(6), 991–1004. https://doi.org/10.1111/1467-9566.12879	The author conducted a critical analysis of qualitative information gathered from fitness apps and wearable users in the UK's running community. The research aims to understand how the long-term use of apps and wearable devices affects consumers interested in tracking fitness, and the collection of personal health parameters over time. It also presents an interpretive viewpoint on runners as performance-driven fitness consumers involved in long-term health self-management.
8	Wiesner, M., Zowalla, R., Suleder, J., Westers, M., & Pobiruchin, M. (2018). Technology Adoption, Motivational Aspects, and Privacy Concerns of Wearables in the German Running Community: Field Study. *JMIR MHealth and UHealth*, 6(12), e201. https://doi.org/10.2196/mhealth.9623	To determine what wearable technology runners of all ages and sexes utilise, a survey was conducted. Additionally, information on motivating factors was gathered. It was also examined if a runner's age was a reliable indicator of the level of body confidence, privacy concerns, and openness to volunteer data sharing. Younger runners and male long-distance runners were more likely to use tracking devices. Where wearable technology was used, 42.0% of respondents said they were unconcerned about a device vendor sharing personal data without their permission. 68.0% of runners who did not use technology claimed that they preferred to trust their own bodies over technology.

4. Research Model and Hypotheses

The target variable of this study is well-being. As already mentioned in the theoretical framing section (chapter 2), the focus will be on the psychological and physical dimensions of well-being. Indeed, it will be investigated whether the use of the wearable device, possibly with the combined support of fitness apps, can produce effective benefits for runners. The consequences for psychological well-being, understood as the ability to experience positive emotions and at the same time decreasing negative emotions, are considered direct; in contrast, those on physical well-being are identified as indirect.

This research applies the GIST factors as independent variables for the first time to investigate how the usage of smartwatches boosts well-being. Indeed, such a model was developed by Oc and Plangger in 2021 and utilized as a mediator between autonomous motivation and habitual use of motivational technologies. The following model will use involvement with the intention of mediating between gaming, instructing, sharing, and tracking features and well-being.

Figure 2 - Research model



4.1 Involvement

Whether a topic ignites self-concept ideals, individuals feel personally invested in the matter. Specifically, according to Sherif et al. (1947), ego involvement is crucial in social judgment theories as it examines how significant a topic is for self-identity or self-esteem (Salmon 1986). Nonetheless, ego-involvement can be extended to include values, identities, and attitudes, this expansion is consistent with their fundamental conceptualization. The main point is that when someone associates an attitude, value, or identity with their conception of themselves, they are ego-involved with those characteristics (Carpenter, 2019).

Following a cognitive approach, involvement deals with the conscious connections, references, or experiences that an individual continuously creates between the self and a stimulus. Three unique types of involvement can be distinguished: Impression Relevant Involvement, Outcome Relevant Involvement, and Value Relevant Involvement (Parcha, 2021).

Impression Relevant Involvement deals with the degree to which one cares about having opinions that the majority of people would accept (Parcha, 2021). A high Value Relevant Involvement is an indication that someone considers an opinion they hold on to a topic to be a central part of their identity (Carpenter, 2019). Individuals with a stronger outcome-relevant involvement will be more driven to process the risk information, are less likely to participate in peripheral processing, and are less likely to be significantly influenced by narrative examples of risk information (So et al., 2017).

Regarding the relationship between involvement and well-being, two primary hypotheses have been advanced. The "scarcity" hypothesis (Marks, 1977), by Goode et al. (1960), asserts that social structures typically produce excessively demanding role commitments. The more roles and interests a person undertake the more obligations are created. Because human energy is finite, the overload and conflict that come with playing several different, frequently contradictory roles negatively affect well-being. The "enhancement" hypothesis (Marks, 1977; Sieber, 1974), in contrast, emphasizes the advantages rather than the disadvantages of playing many roles and having many interests, including status, elevated self-esteem, privileges, and the capacity to trade off undesired aspects of those duties. Being involved in several tasks produces a range of sources of excitement, fulfillment, and social validation. Experimental findings and theoretical predictions are convergent, indicating that participation in a variety of roles helps both physical and mental health for both men and women. Considering the findings mentioned above, this research will develop the following hypothesis:

H1: Higher involvement in wearable devices positively affects well-being.

4.2 Gaming Features

Gaming features result from applying the gamification principles designed and applied to evoke in the users emotional and behavioral responses (Robson et al., 2015; Burke, 2014). According to Holbrook et al. (1982), not all consumption behaviors result from logical, deliberate choices; others are motivated by fantasies, emotions, and pleasure. As a result,

hedonic motivation, or perceived enjoyment, is frequently used as a predictor of usage intention (Venkatesh et al., 2012). Motivational technologies frequently include gaming elements, such as leaderboards showing users' progress compared to their friends, virtual achievement badges, status levels, and virtual awards. According to Koivisto et al. (2014), gaming characteristics boost perceived satisfaction and are essential for helping people picture their goals and continually drive themselves to pursue them. Gaming features offer engaging environments with frequently changeable stories or game-like experiences, leading to goal achievement, by utilizing wearable device performance data, seamlessly and continuously, in conjunction with apps (Plangger et al., 2019). Autonomous motivation causes users to perceive gamification features as more useful, consequently promoting the habitual use of motivational technologies (Oc et al., 2021). Being immersed in a game-like experience encourages users to employ motivating technology frequently, thus it is hypothesized that:

H2: Gaming features increase the users' involvement in wearable devices.

4.3 Instructing Features

Instructing features that offer personalized feedback to users are successful to changing the training habits (Hirvonen et al., 2012; Pyky et al., 2017). According to Nelson et al. (2016), instructing features assist users in modifying their workouts, fixing their diet, or preventing injuries, forming healthy habits. Thanks to instructing features, wearable devices can be used to lose weight (Hirvonen et al., 2015; Jakicic et al., 2016; Pyky et al., 2017), quitting smoking (McClure et al., 2017), and improving athletic performances (Ghasemzadeh et al., 2009; Novatchkov et al., 2013). Autonomous motivation causes users to perceive instructing features as more useful, consequently promoting the habitual use of motivational technologies (Oc et al., 2021). As a result of that, the following hypothesis is proposed:

H3: Instructing features increase the users' involvement in wearable devices.

4.4 Sharing Features

Sharing tools allow users to share information about their accomplishments with other users or non-users. Gaining social currency is a major driver of sharing behavior since it helps people with similar interests form favorable perceptions of one another (Berger, 2016). Users share their data with their social network thanks to these features, which increase their likelihood of progressing towards and ultimately achieving their goal (Bradford et al., 2017), frequently by forming good habits (Uetake et al., 2019). Autonomous motivation causes users

to perceive sharing features as more useful, promoting habitual use of motivational technologies (Oc et al., 2021). Based on the observations above, it was hypothesized that:

H4: Sharing features increase the users' involvement in wearable devices.

4.5 Tracking Features

With tracking features, motivating technologies can gather information about the user wearing the device, such as their location, body movements, heart rate, sleep quality, or speed. Using graphs, charts, or other visual representations created in the background by intelligent systems, users can visually access their workout history whenever and wherever they are (Pyky et al., 2017). Users get notifications depending on their activity history and other contextual elements, which may encourage them to exercise more than they had originally planned to (Hirvonen et al., 2015). As a result, these characteristics offer advantages that promote continuing acceptance and regular use (Nelson et al., 2016). Utilizing wearable technology regularly is encouraged by tracking capabilities that allow users who are intrinsically driven to evaluate their performance for self-improvement (Lee et al., 2017). Autonomous motivation causes users to perceive tracking features as more valuable, consequently promoting the habitual use of motivational technologies (Oc et al., 2021). Therefore, the following hypothesis was developed:

H5: Tracking features increase the users' involvement in wearable devices.

5. Methodology

The research will follow a quantitative approach to better understand the extent to which wearable devices can impact the running world. Moreover, as aforementioned, this is the first time that gaming, instructing, sharing, and tracking features are used as independent variables. Therefore, observing how the sample will be affected will be relevant.

The target sample is constituted of 250 Italian runners that have used smartwatches at least once, according to Slovin's formula. Additionally, such a sample comprehends male and female professional and recreational runners over eighteen years of age. There are no constraints regarding the brand of the device used, or whether the respondents use a fitness app linked to the WD. With the help of screening questions, the respondents that do not satisfy the requirements will be sorted out. An online anonymous self-administered questionnaire will be

used to collect the data. It will be shared via social media, emails, and word of mouth. Italian organizers of sports events will be contacted as well as companies and local shops to access their newsletter and directly reach their customers.

A 5-point Likert scale will be used to evaluate the items. Consequently, the possible answers will be: strongly disagree, disagree, neither agree nor disagree, agree, or strongly agree. In the following table, the items selected will be listed. Where not specified, the original items will be utilized. The required time to go through the questionnaire will not be too long in order to stimulate the respondents to stay focused. The research objective will be presented in the message containing the survey link and the first section so that the sample is informed about the content and the type of questions. The questionnaire will be developed on Sphinx DeClic and it will be developed in English and Italian due to the nationality of the sample. The translation will be done by native speakers and double-checked to confirm that the original meaning of the items is maintained. Finally, before being spread, the questionnaire will be tested in order to understand if the questions and the answers to select are clear. The data analysis will be performed in the same platform first to understand the main results and correlations. Then a more in-depth data evaluation will be carried out on SmartPLS, using structural equation modeling.

Table 2 - Research Items

Construct	#	Original Item	Adapted Item	Reference
Gaming	1	I think there are some features in my X that make me feel like I am playing a game.	Some features in my smartwatch make me feel like I am playing a game.	Oc, Y., & Plangger, K. (2021). GIST do it! How motivational mechanisms help wearable users develop healthy habits. *Computers in Human Behavior*, 107089. https://doi.org/10.1016/j.chb.2021.107089
	2	My X allows me to reach my goals in a fun way.	My smartwatch allows me to reach my goals in a fun way.	
	3	My X has gaming features (virtual badges, scoreboard, prizes, etc.) related to my activities.	My smartwatch has gaming features (virtual badges, scoreboards, prizes, etc.) related to my activities.	
	4	I think my X enables me to	I think my smartwatch enables	

		compete with my friends.	me to compete with my friends.	
Instructing	1	My X coaches me to do my activities.	My smartwatch coaches me to do my activities.	Oc, Y., & Plangger, K. (2021). GIST do it! How motivational mechanisms help wearable users develop healthy habits. *Computers in Human Behavior*, 107089. https://doi.org/10.1016/j.chb.2021.107089
	2	I am motivated by my X to be active.	I am motivated by my smartwatch to be active.	
	3	My X helps me reach my goals.	My smartwatch helps me reach my goals.	
	4	My X provides useful tips and advice for my activities.	My smartwatch provides useful tips and advice for my activities.	
Sharing	1	I think that my X has enough social features (sharing, following, etc.) that use my activity information.	My smartwatch has enough social features (sharing, following, etc.) that use my activity information	Oc, Y., & Plangger, K. (2021). GIST do it! How motivational mechanisms help wearable users develop healthy habits. *Computers in Human Behavior*, 107089. https://doi.org/10.1016/j.chb.2021.107089
	2	My X allows me to share information about my activities with my friends.	My smartwatch allows me to share information about my activities with my friends.	
	3	I think my X allows me to follow my friends' activities.	My smartwatch allows me to follow my friends' activities.	
	4	There are features (group chat, activity planning, etc.) that allow me to communicate with my friends in my X.	There are features (group chat, activity planning, etc.) that allow me to communicate with my friends in my smartwatch.	
Tracking	1	My X measures the activity data that I need.	My smartwatch measures the activity data that I need.	Oc, Y., & Plangger, K. (2021). GIST do it! How motivational mechanisms help wearable users develop healthy habits. *Computers in Human Behavior*, 107089. https://doi.org/10.1016/j.chb.2021.107089

	2	My X tracks my performance in my activities to show me my progress.	My smartwatch tracks my performance in my activities to show me my progress.	
	3	The data measured by my X are current enough to meet my needs in my activities.	The data measured by my smartwatch are current enough to meet my needs in my activities.	
	4	My X presents my data in a format that I can easily understand.	My smartwatch presents my data in a format that I can easily understand.	
Involvement	1	This product will help me attain the lifestyle I strive for.	This smartwatch will help me attain the lifestyle I strive for.	Mark B. Traylor; W. Benoy Joseph (1984). Measuring consumer involvement in products: Developing a general scale. , 1(2), 65–77. doi:10.1002/mar.4220010207
	2	I can relate this product to many things in my life.	I can relate this smartwatch to many things in my life.	
	3	When other people see me using this product, they form an opinion of me.	When other people see me using this smartwatch, they form an opinion of me.	
	4	This product helps me express who I am.	This smartwatch helps me express who I am.	
Well-being	1	I have felt cheerful and in good spirits.		Reinhard Heun; Marzia Bonsignore; Katrin Barkow; Frank Jessen (2001). Validity of the five-item WHO Well-Being Index (WHO-5) in an elderly population. , 251(2 Supplement), 27–31. doi:10.1007/bf03035123
	2	I have felt calm and relaxed.		
	3	I have felt active and vigorous.		
	4	I woke up feeling fresh and rested.		

6. Expected Contributions

6.1 Scholarly contributions

Previous research has already highlighted the importance of tracking devices to increase health and used well-being as a dependent variable (e.g., Stiglbauer et al., 2019). However, most of the articles accessed are about fitness trackers or wearables in general (e.g., Feng et al., 2020), and do not refer to a specific type of device. Furthermore, the literature hardly ever alludes to a specific target country sample, using personal characteristics as the main screening factors, such as age or gender (e.g., Oc et al., 2021). Therefore, scholars apparently have not had the opportunity to examine national and cross-cultural data yet. Regarding this last aspect, analyzing the training habits of wearable devices users can be relevant and can also give hints to improve engagement with them. As a result of this, this research tries to fill the mentioned gaps, by focusing on just smartwatches, particularly on Italian professional and recreational runners. Additionally, antecedent research evidenced the relevance of motivation in WD users (Oc et al., 2021). Nevertheless, since the exclusive target of the present project is the Italian population, the involvement factor is considered a valid mediating variable to be studied to break away from the current literature.

6.2 Implications for Business and Society

This study will not only contribute to the literature but is also intended to have implications for users, professionals, and institutions, as well as raise awareness in society.

For practitioners, this thesis will contribute with direct feedback from the smartwatch's users, enabling them to understand the consumer's behavior, and creating assumptions about future purchasing processes and procurement and pricing procedures. This would have some repercussions on the distribution channels of companies and retailers operating in tech and sports environments. Furthermore, new ways of promoting WD for running can be developed, as it is known that training has multiple benefits, but it is seen as something that does not fit with the interests of everyone. Studying the users' involvement may give hints on how to attract new customers.

The contribution to policymakers, such as political and influential authorities, or institutions like the World Health Organization would be to encourage citizens to adopt healthy habits. Evidencing how prolific could be to use smartwatches, the research will ultimately bring to society the promotion of the best way to practice running, by tracking and monitoring key parameters, leading to enhancement of overall well-being.

7. Chapters Overview

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8. Work Plan

Time period	Activity	Stage
5th Sept. 2022 – 23th Oct. 2022	Research and Exposé	☒
23th Oct. 2022	Exposé submission	☒
24th Oct. 2022 – 31st Oct. 2022	Questionnaire design and translation	☐
1st Nov. 2022 – 5th Nov. 2022	Questionnaire testing and improvement	☐
6th Nov. 2022 – 30th Nov. 2022	Data collection	☐
1st Dec. 2022 – 31st Dec. 2022	Data analysis and results	☐
1st Jan. 2023 – 10th Jan. 2023	Thesis final developments	☐
11th Jan. 2023 – 13th Jan. 2023	Proofreading and final check	☐
13th Jan. 2023	Thesis submission	☐
16th Jan. 2023 – 22nd Jan. 2023	Thesis defense	☐

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