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Digital Coaching Motivating Young Elderly People towards Physical Activity

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Abstract: The share of the elderly population is increasing globally, and it is important to help them to maintain their physical activity levels and ability to function to as late an age as possible. This qualitative intervention study focused on the experiences of young elderly on the ability of a sport and wellness technology digital coach to motivate them towards physical activity as well as on what needs and wishes this group has concerning digital coaching solutions. The findings of the study show that young elderly perceive digital coaching as potential in motivating them towards physical activity by providing instructive information and motivational feedback. It was also perceived to have positive influence on their exercise self-efficacy. However, it was also apparent that digital coaching devices should be tailored for this target group and be easy to learn in order to attract interest among them. Our findings provide insights for professionals and companies in sport technology field as well as to health professionals working in health promotion with young elderly people. Overall, this research aims to address social and economical sustainability of elderly people and their physical activity.

Keywords: digital coaching; exercise psychology; motivation; self-efficacy; sport technology; young elderly

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1. Introduction and Previous Research

The proportion of elderly people and the healthy life expectancy at older ages is increasing globally [1,2]. For example, in EU countries already more than 20% of the population is aged over 65 years [3]. Globally, the number of people aged over 65 years is projected to double by 2050 [1]. Unsurprisingly, this raises the importance of finding ways to effectively support a healthy aging population. One essential factor in healthy aging is physical activity (PA). For example, regular PA has significant health benefits and contributes to the prevention of non-communicable diseases [2]. One of United Nations' goals for sustainable development is ensuring healthy lives and promoting well-being for all at all ages [4].

PA has been shown to be a vital factor in keeping older people independent and mobile by helping to improve and maintain physical and mental functions [5]. Moreover, PA also aids in maintaining the ability to function when a person gets older and is essential to ward off frailty and age-related illness [6]. Considering the essential role of physical activity in healthy aging [5,6], it is imperative to find suitable solutions that can support and encourage elderly people to be more physically active, make exercising more enjoyable, and help them feel more confident about participating in PA in general. In our research, we aim to find out how using sport and wellness technology, and especially digital coaching, can affect young elderly people's exercise motivation and explore how they perceive the use and influence of digital coach solutions.

In recent years, the use of sport and wellness technology has become more popular as the variety of applications and devices has increased. Currently, sport and wellness technology devices are targeted to many different types of users from athletes to beginners and

from young people to elderly users. This type of technology can provide its users several benefits, such as increased PA levels e.g., [7–9], increased awareness related to personal PA e.g., [10,11] and support in goal-setting e.g., [12], among many others. However, it should also be noted that sometimes users encounter negative and harmful experiences with such technologies [13]. One central issue is that many sport and wellness technology devices provide mostly numerical information rather than instructional information. Receiving clear information on how to increase PA and exercise can make the use of sport and wellness technology more goal-oriented e.g., [14], which in turn, can lead to increased motivation [15]. Thus, providing more instructional and personal feedback could make PA and the use of sport and wellness technology more goal-oriented and subsequently lead to increased motivation towards it.

One of the latest developments related to sport and wellness technology is a digital coaching feature. This refers to a "service on a technological device that not only gives feedback but also offers advice, suggestions and future steps for a user to follow in the pursuit of their wellness and fitness goals" [16] p. 3. Advantageously, a digital coaching feature can provide personalized feedback based on the user's own data and give specific adaptive instructions on daily basis. In this study a digital coach does not refer to a sport and wellness technology device or application that merely tracks activity or allows manual programming of training. In the case of digital coaching the device itself creates and updates the personalized plan without human interference. As the general interest towards sport and wellness technology digital coaching solutions has increased, so has academic interest in the topic, and the research on the use of digital coaching solutions, also referred to as eCoaching e.g., [17] or virtual coaching e.g., [18], has been on the rise. Digital coaching has been recognized as potential in PA promotion, but has also been acknowledged to have limitations, particularly in being able to adequately adapt to individual differences in the user's values, goals, and behaviors that a human coach would otherwise easily be able to do e.g., [16,19–23]. This research aims to find ways how to better adapt to these individual needs and differences.

Moreover, research on the use experiences of older user populations with such solutions is scarce, despite being a user group with distinct needs and challenges [24]. Hence, it is important to advance the research on this topic.

Sport and wellness technology have been found promising in terms of promoting PA among older populations. However, questions have been posed regarding their effectiveness. In studies focusing on older populations, Ref. [25] found that mobile solutions can promote PA and PA self-efficacy. Ref. [26] found eHealth interventions to be effective in promoting PA at least on a short-term scale. Likewise, Ref. [27] found mobile health application-based interventions to have potential in promoting PA on short term. Ref. [8] found low-quality evidence for physical activity monitor-based interventions to promote PA. Ref. [28] found that digitally deployed behavior change interventions could increase PA and the ability to function. From these studies, it is apparent that more advanced solutions are needed.

Digital coaching has been recognized as having potential for PA promotion across different age groups. For example, Kettunen and Kari (2018) found that among teenagers, digital coaching is generally perceived as interesting and able to provide needed instructions concerning PA. They also found that it positively influenced the users' PA behavior [16]. Ref. [16] found a mobile application with a digital coaching feature to support PA motivation and PA behavior among physically inactive young adults. In addition, they found that the use also influenced other aspects of physical wellness as the users began to pay more attention to their wellness behavior between the instructed PA sessions [20]. Ref. [29] found digital coaching solutions had potential in increasing PA of inactive older adults. These studies indicate that sport and wellness technology digital coaches can promote PA among different age groups. However, it seems that certain design considerations need to be taken into account for digital coaching solutions to be successful.

In a scoping review, Ref. [30] identified key components of persuasive digital coaching and self-tracking which have the potential to positively influence both health behavior and technology use: personalization of goals, reduction (setting short-term goals to eventually reach long-term goals), reminders to input data, use of validity-tested devices, praise messages, and the integration of self-tracking and persuasive digital coaching. Ref. [31] further highlight the significance of goal-setting functionalities and PA programs. Ref. [32] found that digital coaching solutions could increase PA adherence by utilizing high quality prompts, motivators, and feedback, and by personalizing and simplifying the user experience. However, they also note that the design challenges go beyond the information technology domain, as developing a successful persuasive digital coaching solution requires co-design and co-creation with the users, as well as the implementation of behavior change techniques and persuasive strategies that are appropriate for the target population [32].

While these studies provide important insights on sport and wellness technology digital coaches and their use, it seems to us that only a few (e.g., [29]) have investigated their use among older populations. Overall, more research on sport and wellness technology digital coaches is warranted.

To address the aforementioned research gap, this study continues the investigation of digital coaching in the PA setting and among the specific segment of young elderly [24], which consists of people aged approximately 60–75 years. The target group for the study was selected in order to find ways to help them lead a more physically active life at older age. As mentioned above, the main aim of this qualitative intervention study was to find out how using a sport and wellness technology digital coach can affect young elderly people's exercise motivation and explore how they perceive the use and influence of such solutions in their pursuit of reaching or maintaining a physically active lifestyle. The study's theoretical background is based on exercise psychology theories, more precisely, on self-determination theory by [33,34] social cognitive theory, focusing on two important aspects of them: self-efficacy and proxy agency.

The research questions the present study seeks to answer are the following: First, how does sport and wellness technology digital coaching influence motivation to exercise, particularly related to feelings of autonomy, competence, relatedness, and self-efficacy in young elderly people for maintaining and achieving a more physically active lifestyle? Second, how do young elderly users describe their experiences of using a digital coach? This topic encompasses the experiences this population had while using a sport and wellness technology digital coach, their perceptions on the central feature, the adaptive training guidance of a digital coach, and their opinions on a digital coach's ability to support PA and fitness, including ideas on the kind of digital coach device that would be ideal for young elderly users.

By answering these research questions, this study contributes to the research streams on digital coaching, technology and behavior, and information systems (IS) use by increasing the theoretical and practical understanding of usage experiences with digital coaching sport and wellness technology solutions among the young elderly. Moreover, insights on how a digital coach influences perceptions and understanding of PA can increase knowledge on ways to foster long lasting PA motivation and sustained PA behaviors. The study also offers practical insights for companies designing and developing sport and wellness technologies on how to create products that meet the needs and wants of the older user populations. On a larger scale this study aims to find ways to better support possibilities of elderly people to stay physically active and give them a possibility to use modern technology. Ultimately, this is related to supporting sustainable development from a social and an economic perspective.

2. Theoretical Background

The study's theoretical background is based on exercise psychology, more precisely, on Bandura's (1986) social cognitive theory and two important aspects of it: self-efficacy and proxy agency. It also focuses on Deci & Ryan's theory of Self-determination (2000).

2.1. Self-Determination Theory

The second important theory, which relates more specifically to motivation, is Deci & Ryan's theory of self-determination (SDT) [33]. Self-determination theory is a well-known theory in psychology that focuses on three "needs" that affect motivation: the needs for competence, autonomy, and relatedness. Each of these needs can, individually, or in combination with each other, facilitate motivation. SDT makes an important distinction in the types of motivation, distinguishing between extrinsic and intrinsic motivation, both of which have different determinants and outcomes on a person's behavior. Generally, people who possess intrinsic motivation to do a task, particularly in the area of exercise, will find the activity more fun and enjoyable over the long-term than someone who is extrinsically motivated [35].

Intrinsic motivation is characterized by having satisfaction come from achieving of a task itself, rather than from an additional reward or stimuli. High intrinsic motivation is usually connected with being more engaged in a task over the long-term and is particularly influential in the field of sports and exercise, as a high level of intrinsic motivation has been shown to improve positive exercise habits and active lifestyle outcomes.

As mentioned, self-determination theory uses the three "needs", which drive human behavior and serve as the building blocks for creating intrinsic motivation. Briefly, the need for autonomy relates to an individual's ability to manage and organize their own behavior. Coaches who are controlling towards their athletes, for example, may not encourage satisfaction of this need. The need for competence relates to a person experiencing some feelings of being effective and confident in what they are doing. Not only does this need relate to a person's actual skills, but also to social factors, such as verbal encouragement from peers or coaches. Finally, the need for relatedness is also a social need, relating to desiring a sense of connectedness and belonging with others with similar goals or values.

Given that extrinsic motivation necessarily requires some sort of external reward to sustain motivation, it is unsurprising that most physical activity interventions and devices, such as digital coaches, would be most focused on improving the intrinsic motivation of an exerciser. There are many things that can have both a short- and a long-term effect on a person's motivation to exercise extrinsically and intrinsically. In this study the focus was not on the participants' levels of intrinsic and extrinsic motivations and the possible changes in motivation. Rather, since studying a person's motivation is such a broad concept, in this research the focus was narrowed to study only the potential effects that a digital coach has on the feelings of competence, autonomy and relatedness. Instead of focusing on the ways motivation is affected by the digital coach, it is important to study and develop knowledge of the fundamental building blocks of intrinsic motivation in Self-Determination Theory—the needs for competence, autonomy, and relatedness.

2.2. Self-Efficacy

Social cognitive theory is frequently used as a framework for studying PA and motivation, particularly in the context of the concept of self-efficacy. Self-efficacy refers to how a person perceives their own capability to perform a certain task, where persons with high self-efficacy look at difficult tasks as an opportunity or a challenge, and persons with low self-efficacy may see those same challenges as too difficult and try to avoid them [34]. Self-efficacy can be affected by information a person receives, which is generally categorized into four groups: previous accomplishments, verbal persuasion, physiological states, and vicarious experiences [34]. As a result of a person's self-efficacy and the way they view tasks, their motivation to attempt the task can also be affected. A task that seems challenging but achievable will have a positive effect on motivation and the opposite effect is seen when tasks seem impossible [36].

Self-efficacy's significance in positive exercise behavior has been consistently shown in previous research. Ref. [37] found that exercise self-efficacy was a significant contributor to the maintenance of exercise behavior in middle-aged adults. Self-efficacy was also found to have a strong correlation to subjective measures of performance, demonstrating that

self-efficacy affects a person's perception of how successful they were in performing the task at hand [38] A positive execution of a healthy activity, for example, would increase a person's perception of their capability to perform it again next time, thus increasing self-efficacy and healthy exercise behaviors. Self-efficacy has also been shown to have a significant effect on adherence to exercise in both the adoption and early maintenance phase, which span the first year of a person changing a health behavior [39]. While there may be many factors that influence health behaviors, self-efficacy is one component that clearly has a significant influence.

2.3. Proxy Agency

The human-computer interaction to facilitate improvements in a person's well-being was also theorized within Bandura's social cognitive theory, with the term "proxy agency" [40]. Agency refers to a person's ability to influence the world around them through their actions. By extension, therefore, proxy agency is where the person uses a third party to act on their behalf. Bandura suggested three typical reasons why a person would utilize a proxy agency [40]. A person might use a proxy agent when they feel the task exceeds their perceived skill or knowledge level. They also may use a proxy agent if they have identified someone else who is capable of bringing themselves closer to their goal than they might have achieved alone. Finally, in situations when people actually have the required skills or knowledge, they may wish to transfer control or responsibility to someone else, in which case they may use a proxy agent. Proxy agents are common in sports and exercise, the most obvious example being a coach or a personal trainer. Someone who helps a person manage the task demands required to achieve a desired exercise behavior, and can also provide instruction, feedback, or social support, all of which are, as mentioned, factors that may affect a person's self-efficacy. Any number of other common behaviors exercisers use can serve as proxy agencies, such as observing other athletes to provide vicarious experiences, verbal persuasion from other teammates or exercisers, or sport psychology skills such as goal setting or imagery [41].

In this study, the theory of proxy agency is applied through the use of a sport and wellness technology device that has a digital coaching feature. The digital coaching feature aims to, in some form, replicate the role of a human coach, by providing a training plan tailored to the user's goals, specific feedback on their fitness and performance, as well as encouragement and persuasion to continue exercise, and also by adjusting recommendations based on the progress of the user.

As a counter-point to the previously discussed purported benefits of proxy agents, some research has also suggested that use of a proxy agent lowers the self-regulatory skills of a user, effectively making them less capable of managing their behavior independently [42]. However, this research has generally been focused on the use of human proxy agents, and there is limited research studying the effects of a non-human PA proxy agent. A digital coach, serving as a proxy agent in this context, may prove to be more effective than a human proxy agent because it still requires at least a certain amount of independence to utilize effectively. This may also have a positive impact on a person's feelings of autonomy, although it will also transfer some of the responsibility of personal management over to the user, which can be a limiting factor for new exercisers with lower self-efficacy. This makes it essential that a digital coach be effective in its delivery of information to enable a user to feel capable of understanding and acting upon the digital coach's instructions.

3. Methodology

Methodologically, this study follows a qualitative approach. A qualitative approach was selected because the aim was not to measure the possible changes in the participants' behavior but rather to increase the understanding of the multiple ways a digital coach can affect physical activity and wellbeing. The qualitative approach also enables richer descriptions and explanations of the users' experiences [43].

3.1. The Digital Coach Used in the Study

The device used for this study was the Suunto 3 Fitness sports watch, made by the Finnish company Suunto Oy based in [44]. The Suunto 3 is marketed as a training watch, focused on the fitness market, primarily for running/walking or cycling. The device includes a wrist-based heart rate monitor, 24/7 activity tracking, sleep monitoring, stress and recovery reports, and all of the typical fitness watch features, such as a timer and GPS tracking when paired with a smartphone.

One particular feature promoted for this device is "personalized adaptive training guidance", a feature that takes into account the user's physiological information, training history, and personal fitness goals to recommend a training schedule and daily workouts. When first using the device, the user may select a training goal they would like to achieve, and the device will recommend workouts to achieve said goal. As the user's fitness changes, the workouts will adjust to be sufficiently challenging without becoming too difficult. Each specific daily workout is based on the user's fitness level and their recent training history, ensuring appropriate training recommendations. If a user decides not to follow the recommended daily workout, the device will automatically adjust the training recommendations to allow the user to still achieve their fitness goals in consideration of their day-to-day lifestyle.

When a user decides to follow the recommended workout, the device will also provide real-time guidance, ensuring the user stays in the proper intensity. The plan is presented to the user on the screen, typically showing a measure of time for the workout, a distance, a speed, or a target heart rate. During the workout, the device will monitor the user's heart rate and speed, if available, and provide real-time feedback on whether the user is staying in the proper intensity zone.

After the workout, the user is presented with a report on how the workout went, how it affected their fitness, how long they should recover for, and what the future workout recommendation will be. If the workout seemed too hard or too easy, the device will adjust future workouts to be more appropriate to the individual user's fitness level. The adaptive training guidance feature is not a compulsory feature of the watch, and users may choose to follow it all of the time, some of the time, or never.

3.2. Data Collection and Sample

The target population of this intervention study was young elderly people. The data collection was done in the summer 2019. The participants were recruited from a Finnish University of the 3rd Age (UTA), which works as a meeting spot for elderly people. 80% of the participants were recruited during UTA's weekly scientific lecture session and the rest were recruited via snowball method. 62 people signed up for the study of which 30 people were randomly chosen as participants for this intervention, meaning the participants' PA level did not have a role in the sample selection. The 30 participants were provided with a sport and wellness technology digital coach device for the intervention period of 10–12 weeks. The reason for limiting the number of participants to 30 was due to the number of available digital coach devices. To make the user experience as convenient and pleasant as possible, the participants were asked to use the device in the way that best suited them, though encouraging them to wear it as much as possible. In other words, during the intervention period, participants used the digital coach and conducted PA purely according to their own preferences. Choosing to follow the PA program provided by the digital coach was completely voluntary.

The data was collected using qualitative semi-structured interviews, which took place immediately after the intervention period. A semi-structured interview includes an incomplete script, but typically a pre-formed structure is prepared for the interviewer to follow [45]. The interview script had mostly open questions. In the few occasions there was a closed question, participants were encouraged to elaborate if so desired. The interview script comprised of the following sections: 1. Background information, 2. Expectations for digital coaching, 3. User experiences, 4. Adaptive training guidance and real-time feedback,

5. Effects of the digital coach on exercising and 6. Ideal digital coach. Sections 2–6 also included questions specifically related to motivation and self-efficacy issues. After the 10–12-week intervention period the participants were interviewed separately or in groups of two people. The total number of interviews was 26. The interview lengths varied from 46 to 81 min and on average lasted about 60 min.

Of the participants, 20 were female and 10 were male. Their ages varied between 61 and 76 years. We also determined their PA class via categories derived from the Finnish National Sport Survey [46]. This classifies people into seven PA categories based on their frequency and intensity of PA as well as central reasons for being physically active. The categories are: competition athletes, fitness athletes, fitness participants, physically active for health, active in commuting and non-exercise, occasionally active, and inactive or sedentary. This information regarding PA class was determined retrospectively after the study had already finished. Table 1 below presents descriptive statistics of the participants.

Table 1. Background of the participants.

	Male	Female	Total
N	10	20	30
Age			
60–65 years	4	3	7
66–70 years	3	12	15
71–75 years	2	5	7
>75 years	1	0	1
Socioeconomic status			
Working	1	1	2
Retired	9	19	28
Physical activity class			
Fitness athletes	1	1	2
Fitness participants	5	6	11
Physically active for health	2	9	11
Active in commuting and non-exercise	1	3	4
Occasionally active	1	0	1
Sedentary	0	1	1

Out of all the participants, eight participants did not have any previous experience with any kind of sport and wellness technology devices or applications. The other 22 had some experience with heart rate monitors, activity bracelets, PA applications, or pedometers. However, with most participants the previous experiences were limited to testing or short period usage. None of the participants had previous experience with a digital coach device or application.

3.3. Data Analysis

Thematic analysis method was chosen for this study. This method is the most widely used analysis method in qualitative research [47]. It is used for "analyzing, identifying and reporting patterns within data" [48] p. 79. Thematic analysis enabled studying, identifying and comparing the occurring themes from the data set, and also helps in organizing and describing the data set and its aspects in rich detail. In the analysis phase the guidelines of [48] were followed. The guidelines were applied in a flexible manner in order to fit the research questions and data.

To increase the understanding of the analysis process, a more detailed example of the analysis of one participant's interview data will be provided. The interview's structure included the following sections: exercising habits in general, expectations about digital coaching and its effects, usage of the digital coach, adaptive training guidance and feedback, effects of digital coaching on behavior and motivation, digital coaching in general, and the ideal digital coach. Each section provided more specific questions related to a topic. For example, the section regarding exercise motivation included questions about general exercise motivation, how the digital coach can affect motivation, in what ways digital coach affects self-efficacy, and how could a digital coach affect a user's motivation. However, answers related to exercise motivation and overall usage experiences could also found in many sections. This was because interview questions were semi-structured and the participants easily linked motivation and overall usage of digital coach to many different interview sections. The data analysis continued by getting familiar with the data and transcribing the relevant parts of the interviews under each interview section. In the analysis process, a recursive process was used, allowing moving back and forth between the analysis phases. The analysis was performed section-by-section. In order to clarify the analysis process, the answers from each person were written down in an Excel file to better find the similarities, differences and themes related to each topic. The answers from different participants were then compared between each other. The most highlighted themes and issues discovered during this comparison process are reported in the following findings section. The data analysis was performed by a writer who was also responsible for doing the interviews.

4. Findings

The findings are presented in two chapters with each focusing on a different research question. The chapters are presented in the same order as the research questions they aim to answer.

4.1. Effects on Exercise Motivation

The participants were asked what has previously motivated them to exercise and take care of their wellbeing in general. The most common motivator was to maintain their fitness and mobility regardless of the challenges of aging. Other important motivators were the fact that exercising brings pleasure and that it has already become a habit throughout their entire lives. A few participants also mentioned weight loss and competitions as their motivators. In general, participants also considered themselves to be relatively knowledgeable when it comes to understanding the basics of physical activity and health. When asked about their expectations towards the study, participants had expected that using a digital coach would slightly increase their physical activity levels by making exercising more goal-oriented or by providing encouraging and educational feedback and instructions. This indicates that the participants were expecting that a digital coach as proxy agent could be capable of bringing themselves closer to their physical activity goals than they can achieve alone.

Out of the 30 participants, 26 reported that using a digital coach had had a positive effect on their exercise motivation. These positive effects took place primarily at the beginning of the study but also in the later phase when participants were able to see the result of their work from the watch data and feedback. It seemed that the most important way a digital coach can affect exercise motivation is by providing personalized data about current fitness level and physical activity and about the progress that a person has made. This data made exercising more goal-oriented as well as make the user more knowledgeable about their physical activity and wellbeing. When looking at this from the point of view of self-determination theory it could be seen that increased knowledge about personal fitness and its progress can increase the feeling of competence. In addition to the increased knowledge some participants also found the positive messaging and acknowledgements from the digital coach to bring pleasure and support and increase motivation. This impact on motivation could be seen as being part of the feeling of relatedness.

Seven participants reported that after the study they felt more confident about themselves. The participants suggested that the reason for increased self-efficacy related to exercising was the perceived increase in physical activity provided by the received data. For some participants the increased self-efficacy was less related to exercising but more related to their ability to use modern technology. Four participants felt less confident after the study but this decrease in self-efficacy was only related to the use of technology rather than their ability to exercise.

In general participants found digital coaching to be motivating and suitable for many types of users. Some participants felt that particularly people who do not exercise enough would benefit more from a digital coach since the device would create positive pressure for them to start exercising more. Some participants also said that younger people whose exercising is more goal-oriented would benefit more from a digital coach. A common opinion was that the most motivating part of using a digital coach is the received data that will teach the user more about themselves. However, as one participant reminded: "*Exercising should not be too technological and goal-oriented but rather it should be fun*" (male, 74 y, participant 22). Participants also felt that no matter the age it is important that users have an initial interest in technology. One participant commented that age could be a factor when finding a suitable target group for digital coaching: "*Even though this could be a good product for elderly people it could be challenging for us since we already seem to know very well how our bodies behave*" (female, 71 y, participant 10).

4.2. Usage Experiences

4.2.1. General Experiences in Using a Digital Coach

In the beginning of the intervention the participants received instructions on how to start using the watch. However, the actual initialization setup was left for the participants to do themselves. One third of the participants reported not having major problems in setting up the watch but the remaining 20 participants reported having problems. Most of them needed extra help from family members, relatives or even sports store service people. Many participants highlighted that the instructions that came with the digital coach needed to be clearer. Some participants also wished that the researcher had physically helped them in the setup process, which could have made the start of the intervention easier. Participants who felt the most confident in their abilities to learn to use the new device were usually the younger participants close to ages 60–65.

Almost all participants reported wearing the device all the time during the 10–12-week intervention period. Most participants wore it also during the night. Only a few participants reported wearing the device less as time went by. The participants were interested in many different features of the device. The most often used features in the watch were step counting, distance measurement, heart rate monitoring and sleep analysis. The next most popular features were the training calendar and the adaptive training guidance. Some participants were also paying attention to the stress level monitoring but almost none of them really trusted the stress information or at least did not understand the reasons behind it.

Participants were also asked what they thought were the most positive and the most negative issues related to using a digital coach. Since most of the participants had not regularly used a sport and wellness technology device before, the most positive thing that surprised them was receiving interesting data about their own training and performance. Getting various types of data helped participants better keep track of their exercising: "*It seemed I was receiving realistic information about what I was doing. It seemed I was doing less exercising than I thought I was doing*" (female, 66 y, participant 4). Some participants felt that wearing a digital coach created more pressure, which made them feel they needed to exercise more. However, this pressure was usually considered positive. The appearance and the comfort of the device received positive comments. Many participants also said that getting comments and remarks from the device made them feel like someone cared about what they are doing. Receiving information about their accomplishments made them feel

proud of themselves. Participants were not interested in sharing their data on social media; however, they found it generally interesting to discuss their digital coach experiences with friends and family.

The biggest negative issues related to usability since many participants had problems learning how to use the device. As one participant said. "*It is easy to lose your motivation towards learning to use a new device if it takes too long*" (female, 68 y, participant 19). pAlso, some participants felt that the buttons or the text on the screen was too small, which made them less confident and less excited to use the product. Often, participants forgot to start and/or stop the watch when doing an exercise and this was considered annoying. A few participants felt that the 10–12-week intervention period was too short and would have liked to keep on learning more about the watch and about themselves. The accuracy of the data was also questioned by some participants especially since the heart rate measurements did not always seem consistent with the participants' own feelings.

Many participants reported having an increased interest towards sport and wellness technology in general but added that it takes time and patience to really get the full benefits from the device. Two participants reported feeling less confident about sport and wellness technology after the intervention due to usability difficulties: "I felt less confident since I felt I was not able to utilize the product efficiently enough" (female 69, participant 5). Seven participants felt more confident on their abilities to use these technologies.

4.2.2. Adaptive Training Guidance and Feedback

At the beginning of the intervention the participants input their background information into the watch. After that the watch asked the users to do a short aerobic workout based on which it estimated the user's fitness level. Based on this information the watch was able to create an initial exercise plan for aerobic fitness for the users to follow if so desired. The users were also able to choose whether they wanted to maintain, improve or quickly improve their fitness; that way they had an option to choose how hard they wanted their exercise program to be. On average participants chose the middle level, which was to improve your fitness. Their initial reaction to the program was that it seemed relatively easy and doable. Only one participant felt that the program seemed too hard for them; however, after two weeks of following the program their feelings had changed: "*In the beginning I thought this is too hard since I don't feel I am able to do anything. After two weeks I realized that the watch might know me even better than myself*" (female, 62 y, participant 30).

Even though most participants felt confident in their abilities when seeing the program for the first time, some participants had negative first reactions since it seemed too easy and included less exercise compared to what they were already doing. This made the users speculate what the digital coach was basing its suggestions on, and whether the exercise program was going to be effective. Most participants who shared these feelings did not follow the recommended exercise plan but rather continued to exercise the way they were used to. Another questionable issue related to adaptive training guidance was that some participants did not feel the timing of the exercises fit their current weekly plan. They wanted to determine for themselves which days they exercised and which were rest days. In all, many participants did not follow the exercise plan precisely but adapted it to better suit themselves.

Despite many participants not following the exercise program given by the digital coach very strictly or at all, they felt that having a program tailored for their own fitness was able to bring a boost to their exercising. The adaptive training guidance was said to create positive pressure to get moving and made exercising more goal-oriented by bringing more structure to the week.

Another feature guiding the participants' exercising was real-time feedback by giving them signals whether the pace of their exercise was optimal for them. Almost all participants tested this feature, but most did not end up using it or following its advice. The reason for this was that users wanted to determine their pace themselves, and constant signaling was considered more of an annoyance than helpful. A few participants who

followed the real-time feedback information reported that they had made changes to their exercising which usually meant reducing their pace. As one participant said: "*It is good to have a reminder that one does not have to train so hard at this age*" (female, 62 y, participant 30). When participants were asked after the intervention whether they would like to use adaptive training guidance or the real-time feedback feature in the future, 22 participants showed interest in the real-time feedback feature and 15 participants mentioned interest in adaptive training guidance. However, participants also felt these features could be further developed to be more accurate and more personalized, and that way they would be more interesting and helpful for the users. As one participant commented: "*I don't doubt that digital coach would be useful, but it needs to be a lot more personalized and even have an option to personalized it by myself*" (male, 71 y, participant 3).

4.2.3. Perceived Influence on Physical Activity and Fitness

A third of participants reported having made changes to their physical activity during the study period. The most common change was the increased frequency and length of their walking exercises. Other changes were related to general exercising, such as having a more planned training routine or for example taking walking poles along. Also, one participant noted that slowing down their pace can have a positive outcome on general fitness: "*I don't always have to go with a very fast pace, slower walks seem to be meaningful too*" (female, 68 y, participant 14).

Even though only a few participants reported feeling that their fitness level had increased during the intervention period, most participants reported learning new things about themselves during the intervention. Some people claimed to be more realistic about their physical fitness since they had seen actual physical data. Many participants also learned more about their recovery during sleep as well as between exercise periods. As one person reported: "*I am now more capable of taking to account how tired my body is when planning exercising and therefore it is easier to prevent overtraining*" (male, 62 y, participant 15). Some participants were surprised at how fast their physical fitness could improve. However, most realized that it takes time and patience to see results. Only a few participants were following their stress level and its development from the digital coach. However, participants did not appear to make any changes based on the stress level information but were only looking at the information out of interest.

After the study participants reported that they wished to learn more regarding their physical activity and wellbeing. The participants felt that more detailed data and explanations about sleeping and recovery was missing. Some participants would have liked more deeper knowledge on what exactly the digital coach is basing its data and personalized suggestions on.

4.2.4. Ideal Digital Coach

Participants were also asked what their ideal digital coach would be like. Half of the participants said they would prefer a watch since it is easy to wear. The other half would be happy to have their digital coach as an application maybe combined with a heart rate belt to receive more data. Most people agreed that since it can be challenging to read the feedback and information from the watch, digital coach information should also be able to be read from a computer or at least from an application.

When participants were asked what type of information they would want their ideal digital coach to provide, most said they would be satisfied having basic training related information that would include recovery and sleep data. However, many participants wanted health related information from their digital coach such as blood pressure, blood sugar, nutrition, energy consumption or tips for muscle training. Notifications related to eating times, taking medication, or even sleeping times were also considered interesting possible additions in the future development of digital coaching solutions.

After the intervention participants were asked whether they would choose a human coach or a digital coach as their mentor in the future. Exactly half of the participants said

they would choose a human coach. Their reasoning was that they would prefer a human connection and the ability to communicate with someone. A human coach would also offer training plans with more explanations and guidance, and it would be more personalized. The other half who chose a digital coach felt that it would provide them more freedom and independence, since the digital coach is always around. It was also considered a more affordable option. As one participant said: "*A digital coach will continue to cooperate with me as long as I want, and it also provides me with unbiased information*" (female, 71 y, participant 10). However, almost all participants agreed that having both a human coach and a digital coach would be the ideal situation. When looking at participants' wishes related to their ideal coach it could be interpreted that the lack of feeling of relatedness is a reason for many young elderly participants to choose a human coach over a digital coach. However, it does seem that participants who would choose a digital coach over a human coach appreciated the feeling of autonomy that a digital coach would provide.

5. Discussion and Conclusions

The main aim of this qualitative study was to find out what kind of experiences young elderly encounter with sport and wellness technology digital coaching solutions and how they perceive the use and influence of such solutions in their pursuit of reaching or maintaining a physically active lifestyle. This study approached the topic from an exercise psychology angle focusing more closely on self-efficacy and motivation. However, since the focus was also to find out what type of digital coaching best suits this target group the paper also focused on issues related to user experience. The research questions were the following: First, how does sport and wellness technology digital coaching influence motivation to exercise, particularly related to feelings of autonomy, competence, relatedness, and self-efficacy in young elderly people for maintaining and achieving a more physically active lifestyle? Second, how do young elderly users describe their experiences of using a digital coach? This topic encompasses the experiences this population had while using a sport and wellness technology digital coach, their perceptions on the central feature, the adaptive training guidance of a digital coach, and their opinions on a digital coach's ability to support PA and fitness, including ideas on the kind of digital coach device that would be ideal for young elderly users.

5.1. Theoretical Contribution

The findings of the study highlight that sport and wellness technology digital coaching can seem interesting to the young elderly target group. The biggest reason that seemed to motivate participants towards exercising were learning new things about themselves and their exercising due to the received data from the digital coach. Participants also found the feedback and messages motivational, making them feel proud of their exercise accomplishments as well as gave a feeling that someone cared about whether they were staying active or not. It also seemed that tracking one's exercising made people more aware about their own PA and what they are capable of doing.

Looking at the results from a theoretical point of view it seems that a digital coach can have an effect on young elderly people's exercise self-efficacy particularly by providing them accurate and unbiased information about their exercising and fitness level and thus making exercising more goal-oriented. These findings support the findings of [25], stating that mobile solutions have an effect on elderly people's PA self-efficacy. For some people the digital coach made them realize they are not as active as they thought. For other participants the information received made them realize they are more capable of doing PA that they thought. This suggests that a digital coach could affect the feeling of competence related to PA. In both cases the feedback was seen as motivational, encouraging the participants to push even harder. Receiving messages from the digital coach increased the feeling of relatedness since it made them feel someone, even a device, cared about what they were doing.

Participants did not necessarily feel the need to follow the adaptive training guidance they received from the digital coach. Most participants already had exercise routines and wanted to stick with their own schedule rather than modify their plans according to new advice. This shows that for the participants in the study having autonomy was important. Participants also felt the personalized programs created by the adaptive training guidance were too easy and this decreased their interest in following the program. However, some participants received extra motivation since the program did not seem too demanding in the beginning. This made them feel more confident in their abilities. Also, the real-time feedback was perceived as an interesting feature. However, most participants did not use it since they felt the pace the device was suggesting was not suitable for their own familiar pace. Despite these, most participants said they would be interested in using digital coaching features in the future, especially if some small modifications would be made. According to previous research [49] the use of digital coaching has been viewed as having potential in increasing exercise motivation by increasing the feeling of autonomy. Based on these current results it can also be seen that having the need for autonomy might also prevent young elderly people from stepping out of their usual exercise routines and trying something different.

The biggest difficulties for young elderly people regarding the usage of digital coaching were related to usability. Many participants wished for more help when trying to set up the digital coach and start using it. Therefore, it can be seen that young elderly people do not necessarily feel confident and have high self-efficacy when it comes to adapting to new sport and wellness technology. These difficulties in the beginning might then also affect the actual usage of the digital coach in the later phase. Participants also highlighted some changes related to self-efficacy for using technology in general. It seemed that difficulties in using digital coaching did easily lower the participants' self-efficacy for other technology, and positive experiences increased participants' self-efficacy. In general participants wished the digital coach would be easier to use and have more clear messaging. Participants also said that digital coaching could be made even more personalized in the future.

Looking at the findings from a proxy agent perspective it can be seen that a technological device can work as a PA proxy agent for young elderly people by making them feel more competent in exercising independently. This finding supports the findings from [50] which highlighted that a physical activity application can be effective in promoting exercise self-efficacy among aged people. Even though digital coaching can work for young elderly participants it is clear that human contact and coaching is still very much appreciated. Therefore, the ideal coaching for this target group would be consist of both digital and human coaching. It is clear that a digital coach does not yet have all the needed qualities that a human coach can offer. Different users had different needs and wishes and therefore it can be said that ideal digital coaching means different things to different people. This idea supports the findings of [51] that highlighted the importance of a person-based approach, especially in digital interventions. However, the role of supportive, educational, and motivational messaging seems to play an important role in this target group irrespective of personalized wants and needs.

5.2. Practical Contribution

When considering the practical contributions of the study it seems important that the digital coaching devices and applications would be made more user friendly in order to attract young elderly participants. Font size should be big enough, buttons easy to use and in general, the digital coach needs to be easy to use. Difficulties in the beginning of the user experience affect the usage later on. It seems that sport and wellness technology can increase young elderly people's knowledge regarding their own PA which leads to positive results. However, this feedback and messaging should also be presented clearly and in an interesting and more personalized way. These results support the previous findings of [32]. In the target group of young elderly, positive messaging seems to have a positive effect on their belief in their own abilities.

6. Limitations and Future Research

There are some limitations to this study that are worth noting. First, the findings of this study are based on the user experience of one particular sport and wellness technology digital coach. It is understandable that if the study was repeated with a different type of digital coach some of the findings could vary. Secondly, it is worth noting that the study period lasted only three months which is a relatively short time period. Especially for the target group of young elderly, learning to use the device might take longer. Thirdly, the study consisted only of 30 participants. It would be beneficial for the study to be repeated using a larger sample size and/or a different type of digital coach and possibly with a longer time period. It is important to keep in mind that since participation was on a volunteer basis, it was hard to find less physically active young elderly people to join who would be interested in the study. Therefore, most participants were at least somewhat physically active.

Further studies could also focus on studying different target groups. However, it is still worth continuing to conduct research with the young elderly target group in this area.

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