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# Women's Opinions about Using Interactive Activity-Based Technology

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## Abstract

**Aim:** The purpose of this study was to glean insight from women about their experience using activity-based technology and how it may assist them to better understand their cardiovascular disease risk.

**Methods:** Following completion of a 12-week study in which 36 women were asked to interact with Vivametrica™ technology, each participant engaged in a semi-structured interview focused on their experience and opinions about the use of the technology. Conventional content analysis was used to analyze the text data derived from the audio-recorded interviews.

**Results:** The participants were 45-63 years of age, with varying previous experience using wearable devices. Four themes were identified: confusion, convenience, measurement, and sleep. Introducing two forms of technology created confusion for some participants. Participants expected the technology to be convenient (it was) and effortless (it was not). Though the participants appreciated measuring their health and activity scores, they were frustrated and discouraged when data were missing. The participants sought out other information when using the technology and this was focused on their sleep patterns. Participants valued knowing their health (heart) scores and activity (step count), but this was reduced as participants seemed more consumed by the functions of the technology, and the technology itself.

**Conclusion:** This innovative technology has great potential for supporting women to understand their personal cardiovascular risk. However, people who use this technology need to be trained and supported with resources to enable them to use this technology to its capacity.

**Keywords:** Cardiovascular Risk; Opinions; Wearable Technology; Women

**Precis:** Study participants appreciated the resource VivametricaTM particularly with regard to having access to cardiovascular/health risk scores.

Clinical Implications

- Participants utilized technology to access cardiovascular health scores
- Participants needed the technology to be easy to use
- Participants wanted the technology to be accessible on their smart phones
- Introducing more than one type of technology at one specific time created confusion

## Background

Women continue to be burdened with heart disease despite the overall decrease in Cardiovascular Disease (CVD) mortality rates over the last six decades [1]. Recently, Heart and Stroke [2] reported that CVD in women is "under-researched, under-diagnosed, under-supported" and women are "under-aware" of their CVD risk. To help bridge these gaps, more research is needed to predict the possible development of CVD in women. The Framingham Risk Score is accepted (with modifications) as the 'gold standard' for predicting CVD risk [3-7]. The tool was developed over 60 years ago at a time when women's cardiovascular health was of less concern relative to men's. Moreover, physical activity which has been well documented to attenuate CVD risk, remains absent from most risk scoring [8,9].

Women's CVD risk may be reduced by providing them with a way to better understand their personal risk and supporting them to attenuate modifiable risk factors. Thus, we undertook a prospective study to determine if women would engage with an online platform (Vivametrica™) to estimate their CVD risk. To benefit from VivametricaTM, women were required to wear a

sensor-based activity tracker (in this case, the Garmin Vivosmart® HR (GVWT), which can stream an individuals' physical activity to Vivametrica™. VivametricaTM was able to provide a personalized CVD risk score when individuals signed onto the web-based program (Vivametrica™) and provided individual physical activity information, in conjunction with certain personal health information.

In the context of this study, we were also interested in women's opinions about VivametricaTM and how this technology might be used in future studies. We thus took the opportunity to ask participants about their experience with using this technology. Here, we report the qualitative descriptive findings from those interviews.

## Method

We undertook a qualitative descriptive approach to this phase of study. This method is useful for obtaining answers to questions when little is known about a particular topic and the intention is to describe, but not to theorize [10,11].

### Sample and Data Collection

This study was approved by the Conjoint Health Research Ethics Board. Following informed consent, 36 women were interviewed, after they had worn a GVWT for 12 weeks, and had access to Vivametrica™. The semi-structured interviews were guided by four major questions aimed at garnering participants' opinions about using Vivametrica™. These questions were: (1) Did you like using the GWVT and VivametricaTM? (2) Tell me why (not)?; (3) Tell me more about your experience using this technology?; and 4) Is there anything else you would have liked to have gleaned from Vivametrica™?. Field notes were taken during and following the interviews to augment the narrative from each participant.

### Data Analysis

Conventional content analysis was used to analyze the text data [12]. Two categories from the adapted Technology Acceptance Model (TAM) [13,14]; ('perceived ease of use' and 'perceived usefulness') and 'other' were used as a beginning framework to code the text data. Venkatesh and Bala [14] describe a person's 'perceived ease of use' and 'perceived usefulness' of technology as key determinants that will affect an individual's intention to adopt new technology.

Each participant's interview was analyzed in its entirety and not limited to their responses to the guiding questions. The researcher (KH) listened carefully to each interview several times to enable understanding of the participants' narrative/description. By using the TAM to guide the analysis and moving the actual texts from heading to heading, it became clear what comments (codes) belonged together. If the codes did not belong under either TAM heading ('ease of use' or 'perceived usefulness') the comment (code) was placed in the 'other' category. The themes became clear and were identified with supporting sub-categories.

### Findings

As seen in (Table 1), a sample of 38 women was recruited over approximately 6 week period. Two women were excluded after enrollment, as their electronic devices would not connect to VivametricaTM. Thirty-six women who varied in age from 45 to 63 years ultimately participated in this study (Table 1). Most women had post-secondary education and over half (58%) of the participants indicated that they had previous experience with activity monitoring devices. There was great variability in the range of participants' body mass index (BMI), and the sample's mean BMI suggested overweight [15].

| Variable | X (SD) | Range |
|---|---|---|
| Age (years) | 52.94 (4.89) | 45-63 |
| Weight (kg) | 74.07 (16.03) | 49.1-127.6 |
| BMI (kg/m$^2$) | 28.35 (6.75) | 19.64-55.59 |
| Education | n (%) | |
| High School | 4 (11.1) | |
| College | 13 (36.1) | |
| University | 19 (52.8) | |
| Previous Experience with…. | 21 (58) | |
| Garmin | 5 (14) | |
| Other | 16 (44) | |

**Table 1:** Participant Characteristics (n = 36).

Participants seemed at ease when expressing their opinions about the GVWT but tended to need prompting to provide their opinions about Vivametrica™. The themes fit well into the 'ease of use' (confusion, convenience) and 'perceived usefulness' (measurement, sleep) categories of the TAM14 (see (Table 2-5) for exemplar quotes).

| Category | Sub-categories | Exemplar Quotes (pseudonym) |
|---|---|---|
| Confusion | Difficulty finding meaning from the scores within Vivametrica™. | Vivametrica™ did not do anything functionally to help me see what was beneficial. I got on no problem but it (Vivametrica™) just said my first number when I logged on. It (cardiovascular score) never seemed to change *(*Jody*)*<br><br>I did not find Vivametrica™ meaningful because (the number) did not change. It was at a 100 the whole time... no changes seen. The back pain (score) did not change (either). I really did not understand that score. It did not make sense (Ella).<br><br>Also, the score for spine was zero, and I don't think I am clear on why... nothing is wrong with my spine (Grace).<br><br>I used Vivametrica™ more at the beginning, the score never changed so..(why bother)...(Beth) |
| Confusion | Desire for education/ tutorials about the technology would improve meaning. | I would have liked a tutorial. I would like Vivametrica™ to be more comprehensive. What do they look at when they are giving you a score? What makes it go up? What makes it go down? On the program, it says general population... I thought it was more personalized (Beth)<br><br>Vivametrica™ was interesting (but) I would have liked a tutorial (Kathryn)<br><br>There could have been more explanation of where you were and how you could go to the next level (Vivametrica™) (Christy)<br><br>I did not have time to try and figure it out. If I had learned how to use the properly I may have gotten more out of it (Jody). |
| Confusion | Losing Interest | It was interesting at first but it became boring. I would like something more comprehensive, like to be able to read about the different categories. What makes it go up and down? It compares me to others in (cohort) group (women like me). I like to read and I would like to understand the numbers better. I would like more opportunity to look at graphs and graphing. My one score was different than others. The general health score confused me. It was not giving me enough to keep me interested. My back pain had a goal lower than I was actually at. The lung score was confusing (Beth)<br><br>Viva (Vivametrica™), scanned through it, not much there for me (Lorraine). |

**Table 2:** Confusion

## Confusion

Despite having had an explanation about the purpose of the study, a thorough 30-minute orientation at the outset of the study (which included the participant demonstrating use of the technology, and receipt of an instruction pamphlet), some of the participants (n=8) did not appreciate the intended use for the Vivametrica™ platform. They did not understand the need to use their computer to access the Vivametrica™ platform and check on their cardiovascular health scores. The introduction of two types of technology, the GVWT and Vivametrica™, at the same time caused confusion for these participants and may have resulted in this omission. Some participants said they would have appreciated a tutorial and/or more education about Vivametrica™. Other participants who accessed and used VivametricaTM, found the additional health scores offered within the platform (e.g., back/lung health) were distracting and confusing, and they did not find them helpful. This was interesting because several of the participants did seek out the additional information offered by the GVWT such as duration and quality of sleep. Lastly, participants talked about 'losing interest' when they did not have enough knowledge/ information about the technology.

## Convenience

The participants emphasized the need for convenience. Participants expected that the technology would be effortless. One must access a website to use Vivametrica™ and the GVWT requires changing modes to capture different levels of activity. The participants identified that they were busy with their families, lives, and employment and did not want to have to access websites or adjust settings to be able to obtain a cardiovascular health score. Participants were willing to interact with the technology, but ease of use was essential. The majority of women who participated in this study identified that it was inconvenient to gain access to Vivametrica™ from a computer and wondered why this platform was not available as a smart phone application, similar to GVWT.

When considering the functions and modes, the women both embraced and tolerated them. Some participants found altering the mode, settings, and navigating the technology was helpful but others found it caused angst and frustration. Several participants appreciated the notifications, time keeping, and visibility of the GVWT.

### Measurement

Most participants described how Vivametrica™ provided interesting information about their overall health. Indeed, all participants identified they were eager to understand their CVD risk numbers when entering the study. However, measurement of this risk and its elements meant different things to different participants. Some participants looked at measurement as the step/activity count that motivated them to do more. Other participants found measurement illuminated the level of activity in their daily lives (e.g., created awareness). This was evident when participants would be reminded to move (GVWT buzzing), or that their step count was under the recommended amount (5000/day). This information coupled with the CVD risk information from Vivametrica™ identified a need for change in the participant's level of activity and some participants found this to be very helpful. Activity became very important to participants over the course of the study and some participants found it challenging to achieve certain activity metrics because the measurement was not calculated (e.g., they did not have their GVWT on or they did not have the correct mode/setting).

### Sleep

An unexpected finding of this study was that the participants often spoke about sleep. The GVWT, provided information about the participants' sleep creating an awareness of their sleep patterns (hours of sleep per night, lengths of time they were in deep sleep, and number of awakes times). Additionally, some women learned adjusting their sleep routine (e.g., limiting computer, television, etc. screen-time prior to retiring) [16,17] created an opportunity for change that was not realized prior to this study. The participants also learned that stress had an impact on their sleep. One participant described the decrease in 'deep' sleep she would experience if she had her grandchildren staying with her. Several of the participants commented about the value of learning about sleep.

## Discussion

Overall, the study participants appreciated the notion of having a resource such as Vivametrica™ particularly with regard to having cardiovascular/health risk scores. However, some participants felt disappointed that they could not navigate or understand the platform or the scores, and thus, the potential realized benefits were reduced.

The TAM forms the foundation for this study describing the importance of 'perceived ease of use' and 'perceived usefulness' as key components when individuals are considering adoption of new technology [13]. Perceived confidence in one's ability to use technology has a positive effect on an individual's perception of usefulness of the technology [18]. How the information is received (what data are available) and the individual's motives are factors when considering engagement, suggesting if an individual's perceived needs are not addressed, engagement may not be successful [19].

In this study, some participants described not having enough information to understand the various components of the GVWT and Vivametrica™. Some participants would have liked the option of having more tutorials and training. Also, accessing the computer to realize their health scores was described as not convenient by most participants. When considering technology, it is imperative to realize the importance of an individual's personal preferences [20]. Women were wanting Vivametrica™ to be available on their smart phones, similar to GVWT. Additionally, the introduction of two forms of technology created confusion. Participants expressed they forgot they could/should access Vivametrica™ to access cardiovascular risk information and tended to use only the information within the GVWT application on their phones.

Findings from this qualitative descriptive phase of study are somewhat congruent with other study findings. Duus and Corray[21] studied 200 women, who identified activity monitoring devices as an active tool in the construction of their everyday lives and the benefits created such feelings as self-satisfaction, happiness, and motivation. The participants, in this study, expressed varying opinions about the benefits of the technology used (GVWT and Vivametrica™). However, participants were motivated to make changes such as awareness about their activity level and motivation to change sleep patterns. Most participants appreciated knowing their level of activity, sleep, and cardiovascular health scores. It is clear that women needed more resources (e.g., tutorials, ongoing support) to address their questions regarding this technology to receive the greatest benefit.

## Limitations

This was an observational study aimed at examining how and if women would access particular technology for monitoring cardiovascular health. Additionally, this is a small descriptive study and is not generalizable to the population. However, this study provides information about how women describe interacting with technology. Lastly, the women may have benefitted from having a more anonymous means to provide feedback about the technology.

## Implications for Practice

Women need ongoing access to resources when using this

kind of technology whether to troubleshoot issues with the software/hardware or to access and understand advanced elements of the technology. As technology is accessed by patients' nursing will need to be familiar with and understand the nuances of types of technology that can assist patients to achieve maximum health benefits.

## Conclusion

Women's opinions related to Vivametrica™ and GVWT were explored in this study. They were interested in the technology and the potential of the technology to motivate them towards increased activity and understanding of their personal cardiovascular health risk. However, some participants found the usefulness of the technology did not meet their needs. Additionally, participants were confused by the introduction of two forms of technology at the same time. This innovative technology has great potential for supporting women to understand their personal cardiovascular risk. However, people who use this technology need to be trained and supportive resources to enable them to use this technology to its capacity.

| Category | Sub-Categories | Exemplar Quotes |
|---|---|---|
| Convenience | Accessing a computer for information was a deterrent. | I used the Garmin App every day and I would have used the Vivametrica™ way more if it was an App... way more than going on the computer, all about convenience. I know she (Vivametrica™ resource person) showed me something but then it was gone, I never thought about what she showed me after I left the clinic. I would use an App but not computer. I am not going to search it out... too much work (Claire).<br>I need convenience. Signing into a web page is a recipe for non-compliance, there should be an App (Elaine).<br>I had a lot of trouble logging in (to Vivametrica™) ... (there was a) password issue. My numbers were always 70-74, and I went back to look before I came and it was still 70s! (Chloe)<br>I just scanned the numbers (in Vivametrica™). I liked the Garmin App more because it is sitting there (on the phone). I could go on the site so easily and did not have to sign into a website (Lorraine). |
| | Frustration with remembering modes and settings to capture activity. | I did not find the Garmin to be very accurate. I play competitive… (sports) and I am RUNNING! At the end of my game I would look and there would not be any vigorous minutes recorded. What does this thing want from me? Grr... It does record that my heart rate is up! I wondered, then what would it mean in the other (function, Vivametrica™). I want those vigorous minutes! (Claire).<br>So, if I did boxing, would I have to change the setting? That bugged me, would it not give me activity and then my (Vivametrica™) score would be low (Deborah).<br>I would like it (GVWT) to be more passive so I did not have to press SYNC, or my data would not show up (Elaine).<br>My activity is swimming and the Garmin does not work (for water activities). It's frustrating that I have to remember to change the setting, because it does not register swimming lengths, or I will not get any activity credit for my Vivametrica™ health score (Christy). |
| Convenience | Functions offered by GVWT were viewed as functional/advantageous features. | I loved that it alerted me when my phone was ringing. (I also liked) discretely seeing texts (Ella)<br>You can easily see the texts on the screen (Grace)<br>Subtle buzzing if you had a call coming in, you can see your emails, the watch itself is sleek (Maddy)<br>I liked the buzz to make me move, and that would motivate me to move (Peggy). |

**Table 3:** Convenience

| Category | Sub-categories | Exemplar Quotes |
|---|---|---|
| Measurement | Using data to create change (motivation/awareness). | It was very good and I found it fascinating. It increased my awareness, made me accountable. I worked out almost every day, skating, riding my bike and going to the gym, because the wrist thing (GVWT) was a reminder and then the number (Vivametrica™) was good to know (Kathryn).<br>I figured out that I walked 1000 steps in 10 min (Beth)<br>What I did realize very quickly is that I am not nearly as active as I could or should be. I discovered I was not moving for a large part of the day, because of my job. However, we are being more deliberate about getting activity as a whole family. It (Vivametrica™) has started that conversation and it is given us at realization, me particularly, to make time to do certain things that contribute to health and well-being (Olivia).<br>The Garmin was really good at making me aware of my activity (Nicole).<br>I love my Garmin, it motivates me to do more steps!"(Helen) |
| | Using data to understand activity/ health scores. | My experience was excellent, check my steps, sleep all my numbers and also the computer to see my heart score. At first, my numbers were really good. My routines changed when I …. got a cold. I saw my scores go down when my activity went down. When my activity increased my numbers increased. I liked seeing that (Kyla).<br>I liked comparing myself to others (using Vivametrica™), ballpark my health scores, what areas are strong and what areas needed more attention. Good awareness (Meg). |
| Measurement | Using data to encourage and maintain | I liked the Vivametrica™. It showed me my levels for the whole week and showed me when I did not get my goals. (Stephanie)<br>GVWT would buzz, if I was not on a conference call I would get up and walk around or do some steps (Olivia; Peggy).<br>More than anything it made me accountable, I would look at my heart rate or how many steps have I done (Kathryn).<br>Garmin (GVWT) kept pushing me... 13000 steps. I liked that the goal number would increase to motivate me. I did turn off the scolding, 'buzz' to make me move (Sophia).<br>Going on line (to Vivametrica™) did not impact change. (It was the goals and steps (that) helped me, because I wanted to get those steps (Ella) |
| Measurement | Frustration with what was/was not measured | One day, I was charging my Garmin and forgot to put it on. Something like that can really bring your average down. I was sick, then on a bus trip and that brought my average down. I would have liked an option to justify why my activity was low. I just did not find it that useful (Maddy).<br>I wanted to do biking one day how does it track that? So, if I did boxing, would I have to change the setting? That bugged me, it would not give me activity, so it would not show up in Vivametrica™ (Deborah).<br>I am working really hard and I would look and What!! No vigorous minutes, I wanted to cry" (Grace).<br>I found this frustrating. It made me mad because it did not track my hike, no credit. I did not benefit from this experience (Abigail). |

**Table 4:** Measurement

| Category | Sub-categories | Exemplar Quotes |
|---|---|---|
| Sleep | Sleep data encouraged behavior change. | I became interested in my sleep. I saw that function and explored it. I read my book (not on a screen) and my deep sleep improved. I felt better!! I would say that is my behavior change for sure. When I do that (read before bed), I feel rested the next day. I have definitely made a lifestyle change and I feel better (Lily). |
| Sleep | Using data to appreciate/ recognize sleep quality. | I know about deep sleep and light sleep. I found it interesting that if I had more stress, if the grandchildren were visiting, my sleep was much different. Last time they were visiting, I noticed that my device was not syncing with the other thing (Vivametrica™). I was mad because my Garmin (GVWT) did not track all my stuff. I missed seeing how my sleep had been interrupted (Lucy). |

**Table 5:** Sleep

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