Original Paper

Compassion-Focused Implementation of Smartwatches in Acute Mental Health Care: Mixed Method Replicated Single-Case Study

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Abstract

Background: Smartwatches can support mental health care by providing insights into activity and sleep, which are closely linked to mental health and daily functioning. However, their implementation in mental health care practice remains limited. Professionals can feel resistance toward digital mental health interventions if they feel their use is not aligned with therapeutic values, and report a need for guidance on how to use technologies in ways that do align with such values. Compassion, a core value in mental health care, may offer a meaningful frame for implementation. Therefore, we previously co-designed compassion-focused implementation materials: a card set offering practical suggestions of how smartwatch data can support group treatments in ways that counter the self-optimization logic of commercial devices and instead align with compassion.

Objective: The current study evaluated the compassion-focused card set in practice, to explore whether the introduction of the card set influenced the use of smartwatches in treatment sessions, and mental health professionals' experienced compassion when working with smartwatches, the therapeutic alliance, and acceptance of smartwatches.

Methods: The card set was evaluated in a mixed methods replicated single-case design with 5 social psychiatric nurses from an acute mental health care team. Data collection included pre- and post-questionnaires, repeated measures, a focus group, and interviews.

Results: For smartwatch use, no significant intervention effects were found, though several participants did report the start or increase of use of the smartwatch in sessions during the intervention phase. For compassion, only P2 showed a significant effect of the intervention on experienced compassion when using smartwatches (Tau-U=0.53, 95% CI –0.11 to 0.86*; P*=.02). This participant reported that the card set helped to make the use of smartwatches more concrete and insightful. For therapeutic alliance and acceptance of the smartwatches, no intervention effects were found. These scores were rather stable over time for most participants. The card set was experienced as flexible and easy to use, supporting session structure and enabling more in-depth, compassionate conversations. At the same time, barriers to sustained smartwatch integration included low patient uptake, challenges in mixed groups in which only some patients wore the smartwatch, and varying digital affinity among professionals.

Conclusions: These findings suggest that compassion-focused materials may trigger initial adoption and help reframe smartwatch use in line with therapeutic values. Broader implementation strategies, including further training and tailoring to patient readiness, are required for sustainable integration.

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Keywords: digital mental health interventions; compassion; implementation; smartwatches; wearables; nursing

Introduction

Digital mental health interventions (DMHIs) offer opportunities to improve and diversify mental health care [1]. An example is the use of smartwatches, which can help to monitor and respond to sleep patterns and physical activity, 2 important pillars for mental health [2,3], and can contribute to enhanced treatment outcomes [4]. They can do so at a low-cost and with minimal patient burden [5]. Clients report finding a smartwatch helpful for tracking and increasing physical activity, to become more self-aware and motivated, and for goal setting [6]. They are especially open to the use of smartwatches in their treatment if they can stay in control over their own data and receive constructive feedback on it [4].

However, the implementation of smartwatches in daily practice is challenging, and understudied in comparison to other forms of DMHIs [4,7,8]. Therefore, despite the availability of smartwatches in several mental health care settings, their use in treatment remains sporadic and unstructured. In the Dutch acute mental health care department studied here, smartwatches had already been introduced but were only sporadically worn by patients. In addition, no guidance was available for professionals in the team on how to use the data meaningfully in therapeutic conversations, or how such use could align with core clinical values.

This is in line with literature in which professionals indicate the need for a clear motivation and practical guidance to be able to integrate technologies such as smartwatches in treatments in helpful ways [9,10]. As smartwatches are almost always originally designed for a fitness context [11], they tend to promote a mental model of self-tracking and optimization: data are framed as performance metrics, and progress is equated with personal responsibility. In a mental health care setting, such framings risk negative effects, such as clients' overreliance on quantified health data [12] and demotivation if goals are not achieved [13]. Therefore, guidance is needed to reframe smartwatch use in ways that also foster goals related to dialogue and care rather than only focusing on improving performance.

The need for reframing the value of smartwatches to better fit goals of mental health treatment is underscored by research on technology acceptance and the therapeutic alliance. Acceptance of technology, which includes perceived ease of use and perceived usefulness, is a strong predictor of intended use [14-16]. In mental health care, usefulness is not just functional but also relational: technologies are judged by how they affect the empathic bond between client and professional. Clients and professionals highly value personal contact in treatments [17], and the therapeutic alliance, which refers to the collaborative aspects of the relationship between the client and the professional [18]. Mental health professionals have reported concerns about the effect of using technology on the empathic bond [12,19]. Technologies have the image of being "cold" [20] and impersonal [21,22] and are sometimes feared to detract from "warm" and personal care [23]. These perceptions likely negatively influence the perceived usefulness and in turn the acceptance and adoption of DMHIs.

Taking the motivations and values of stakeholders into account is essential for the effective implementation of technology [23,24]. A key value in mental health care is compassion [25,26]. The experienced presence of compassion in treatments has been linked to a wide range of beneficial effects for both clients and professionals, such as improved treatment outcomes, higher satisfaction of clients with care, and higher job satisfaction for professionals [27-29]. A comprehensive definition of compassion consists of 5 elements: (1) recognizing suffering, (2) understanding the universality of suffering, (3) empathizing with the suffering, (4) being able to tolerate difficult feelings that someone who is suffering evokes in you, and (5) wanting to alleviate the suffering [30]. This definition of compassion describes the work and driving force of mental health professionals very well, as well as the needs and preferences of their clients [17]. Yet, how DMHIs are perceived in terms of compassion is rarely studied [31]. To address this, the recently developed Compassionate Technology Scale for Professionals makes it possible to evaluate the effects of DMHIs on compassion according to professionals [32], allowing to explore whether DMHIs such as smartwatches can be integrated in a way that preserves and strengthens core therapeutic values.

Despite the importance of supporting the mental health professional with the implementation of technology and taking core care values into account when doing so, there seems to be little attention in scientific literature for the systematic and in-depth mapping of their perspectives on implementing a new form of technology over time [33]. This is an important omission, as mental health professionals often act as gatekeepers who determine whether DMHIs become integrated into treatment [34]. One reason why smartwatches have not yet become part of daily care may be the absence of structured, value-sensitive implementation materials that can guide professionals in the use of smartwatches in treatment. To address this need, we previously used co-design methods with patients and professionals from acute mental health care to develop compassion-focused implementation materials [35]. The resulting card set offers concrete and accessible guidance on how smartwatches can be meaningfully used in treatment, for example by discussing sleep consistency to better understand a patient's experience. In doing so, the materials make the notion of compassionate technology [31] tangible: they translate compassion from an abstract value into concrete therapeutic dialogue, showing how technology can become a natural and supportive part of care.

The current study examines how compassion-focused implementation materials influence the implementation process and integration of smartwatches into routine clinical practice from the perspective of professionals in an acute psychiatric setting. We used a mixed method replicated single-case design to systematically evaluate the effect of the

implementation materials on the following variables in a team of acute mental health professionals: (1) use of smartwatches in treatment sessions; (2) experienced compassion when using smartwatches; (3) therapeutic alliance; and (4) acceptance of smartwatches. In doing so, the study provides concrete insight into how compassion-focused implementation materials shape smartwatch use and professional experiences within one acute mental health care team, while also offering an essential step toward understanding their role in technology use across settings.

Methods

Setting

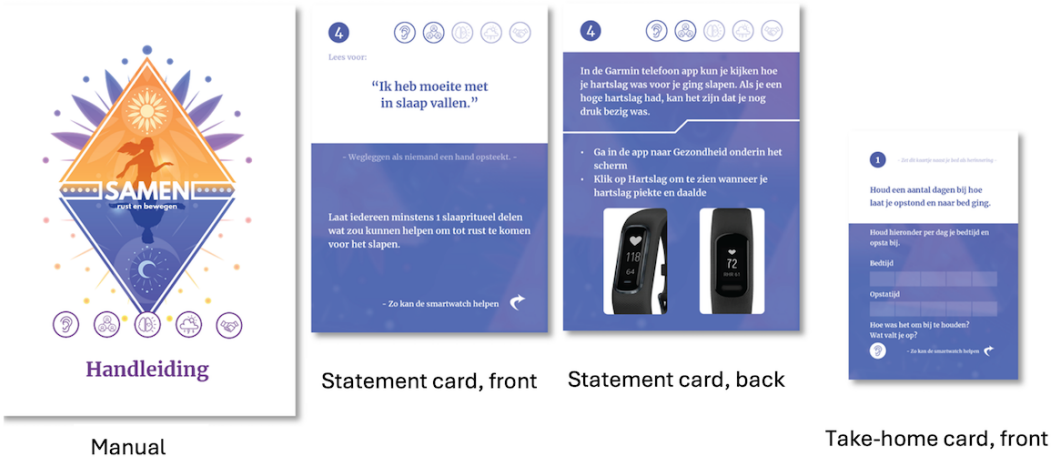
This study took place within an Intensive Home Treatment (IHT) team of a specialized mental health care organization in the east of the Netherlands. The IHT team provides acute mental health treatment to adults with severe psychiatric problems, including psychotic disorders, severe mood disorders, and trauma-related crises. The outpatient part-time treatment offered by the IHT team takes place every working day, is followed in a group, and lasts an average of 6 weeks. As participation is voluntary, attendance fluctuates, leading to a dynamic group composition. Part-time treatment consists of different sets of modules each day, such as psychomotor therapy, crisis skills, and psychoeducation. These modules are often given by social psychiatric nurses.

One of these modules is called "Lifestyle," and this is the first, fixed module in the part-time treatment every morning. At the start of this study, this module lasted 75 minutes, but during baseline measurements, it was shortened to 60 minutes. The department aimed to use smartwatches in this module to gain a clearer picture of the sleep and activity of patients, and to respond better to this. When the current study started, the team had 10 smartwatches in its possession, which were not yet integrated into the professionals' daily practice [35]. Apart from technical setup instructions, no guidance was available on how smartwatches could be used therapeutically. A technical staff member was available to support as an enthusiastic ambassador and to help with device setup and troubleshooting.

Materials

In a previous study, compassion-focused implementation materials for the use of smartwatches were developed using co-design sessions with patients and professionals from the IHT team [35]. This resulted in a card set that has the aim of offering guidance to professionals in the use of smartwatches in treatment sessions (Figure 1).

Figure 1. An impression of the compassion-focused card set. The manual (left) outlines its use and smartwatch integration and includes symbols representing the 5 elements of compassion. Statement cards include exercises or discussion prompts on the front and explanations of smartwatch support on the back. Take-home cards (right) support between-session practice and tracking of sleep and activity.



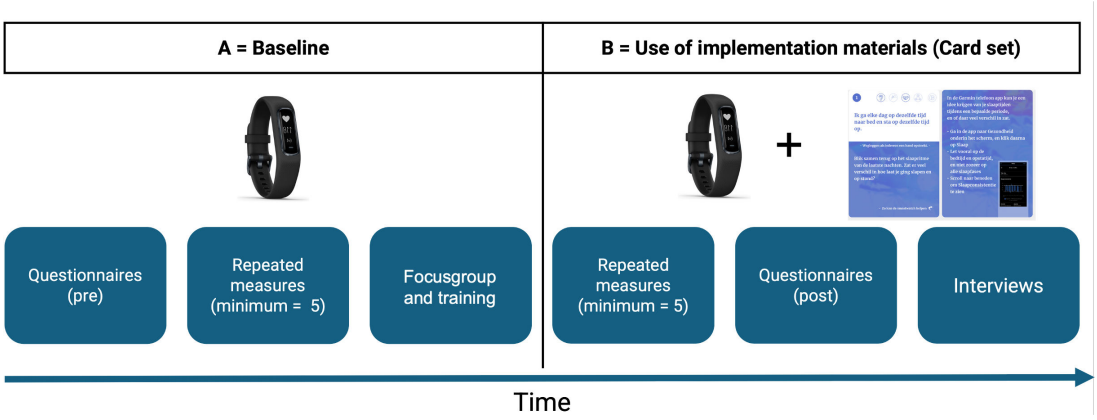
The set is called "SAMEN" ('Samen' is Dutch for "together" in a literal sense, but also conveys a sense of compassionate solidarity) in which each letter of the acronym refers to one of the 5 elements of compassion as defined by Strauss et al [30]. It consists of cards in the categories sleep and relaxation, activity, and reflection. The set contains "statement cards" with a statement that patients can respond to, to determine the relevance of the card for a specific session. Below the statement, a discussion topic or exercise is described that is related to the statement. On the back of the cards, there is an explanation of how the smartwatch or the accompanying smartphone app can contribute to the topic on the card. Each "statement" card is paired with a take-home card containing exercises and practical guidance for patients. All cards contain symbols referring to elements of compassion to show which elements a card can contribute to, and focus on patients' subjective experiences rather than (only) quantitative data. The card set can be used with and by patients who do or do not wear a smartwatch.

Study Design

This mixed methods replicated AB single-case study [36] evaluated value-sensitive implementation materials rather than the clinical effectiveness of smartwatches.

It systematically investigated whether and how the addition of compassionate implementation materials influenced smartwatch use, compassion, the therapeutic alliance, and the acceptance of smartwatches for professionals in acute psychiatry. Single-case designs are appropriate for evaluating implementation processes in small clinical samples by examining within-person change over time.

Figure 2. Study design. During phase A (baseline), participants completed questionnaires, a minimum of 5 repeated measures surveys, and took part in a combined focus group and training. During the training, the card set was introduced. In phase B, participants could make use of the card set. Participants again completed a minimum of 5 repeated measures surveys and questionnaires, and took part in interviews.



In this study, we followed participants during a baseline phase (A) and an intervention phase (B), during which the card set was introduced simultaneously for all participants. An AB design was selected because all professionals treated the same patient group, making a multiple-baseline design vulnerable to contamination between conditions. The design was replicated across 5 professionals to increase its robustness, which is above the recommended minimum of 3 participants including potential participant drop-out [37]. Quantitative data were collected through pre- and post-questionnaires and repeated measures, while qualitative data were obtained through a focus group and training session and interviews (Figure 2 for study design). Blinding of participants to conditions was not possible in our study design. To combine the qualitative and quantitative data, we used a sequential explanatory mixed methods design, in which qualitative data help to clarify and deepen the quantitative findings [38]. The Single-Case Reporting Guideline in Behavioral Interventions (SCRIBE) was used to report this study [39]. The checklist can be found in Checklist 1.

Participants

Participants were recruited via email from the staff of the acute mental health care department. They had to be employed at the department at the time of the study and had to regularly provide the part-time treatment. This was the case for 6 professionals, and out of these, a total of 5 professionals responded in time for the study start and were included. Of the 5 participants, 3 identified as female and 2 as male. Participants had a mean age of 37.2 (SD 13.57) years. All participants were senior psychiatric nurses.

Ethical Considerations

Ethical approval for this study was granted by the ethics committee of the faculty of Behavioural, Management, and Social Sciences of the University of Twente (registration number 240959) and by the internal scientific research committee of the involved mental health care organization (registration number CWO/CvR24012022). Before participating, participants signed written informed consent forms. They were informed that they could withdraw from the study at any time without consequences and without needing to provide a reason. As compensation, participants received one gift card of €25 (US $28) after completing the pre-questionnaire, the baseline repeated measurements, and the focus group and training session. They received a second €25 (US $28) gift card after completing the full study. All participant data was pseudonymized.

Measurements

Questionnaires (Pre and Post)

The pre- and post-questionnaires focused on the outcome measures of experienced compassion while using smartwatches, the therapeutic alliance, and acceptance of the smartwatches. Before the pre-questionnaire, participants reported if they had previously used or discussed the smartwatches in treatment sessions. Although hypothetical items were planned for participants without experience, all participants had prior exposure, so these items were not used. Multimedia Appendix 1 consists of the complete pre- and post-questionnaires.

Compassion

To measure compassion, the Dutch version of the Compassionate Technology Scale for Professionals (CTS-P) was used [32]. Although psychometric validation of the Dutch CTS-P is still in progress, the scale was systematically developed in collaboration with stakeholders [32] and grounded in the 5 elements of compassion [30].

Therapeutic Alliance

The therapeutic alliance was measured using the Working Alliance Inventory Short Form Revised Therapist Version

(WAI-SR-T) [40]. The WAI-SR-T has good reliability (α=.94). For this study, the items were adapted to refer to participants in group sessions rather than individual clients.

Acceptance

Acceptance was measured using several questionnaires. First, the 2 determinants of user acceptance according to the Technology Acceptance Model (TAM) [41] were used: perceived ease of use and perceived usefulness. Both scales have good reliability (perceived ease of use: α=.98, perceived usefulness: α=.94) [41]. Additionally, we used the Normalization Measure Development (NoMAD), which is designed to evaluate the level of implementation [42]. This scale also shows good reliability (α=.89).

Affinity for Technology

Finally, we measured attitudes towards technology using the Affinity for Technology scale [43]. The scale demonstrates good reliability (α=.88). The scores on this scale were reported in the short description of each participant.

Repeated Measures

For each research question, relevant items that were suitable for repeated measurements were developed based on the previously mentioned questionnaires (TAM, NoMAD, CTS-P, and WAI-SR-T), in Multimedia Appendix 2. From each existing questionnaire, relevant and appropriate items with high factor loadings were selected and adapted to specifically relate to the use of the smartwatch within the context of a treatment session, as recommended [37]. Two questionnaire versions were used depending on whether smartwatches had been used or not used during the session, in the latter case with items phrased hypothetically.

Items 1 to 5 were focused on the use of smartwatches and the card set during treatment sessions, and were answered with yes or no response options or a numeric response option. To measure smartwatch use in the sessions, participants were asked whether any patients were wearing a smartwatch during the session, and whether a smartwatch was used or discussed in the session. If either or both were the case, this was counted as smartwatch use. Thus, while patients were the end-users of the device, professionals were seen as facilitators of its integration. Items 6 to 18 focused on the acceptance of smartwatches, their effect on compassion, and the therapeutic alliance. These were answered using a Likert scale ranging from 0 (strongly disagree) to 5 (strongly agree).

Focus Groups (Pre)

After the baseline measurements were completed, 2 focus groups were conducted. The focus groups were mainly aimed at gaining insight into whether any noteworthy changes had taken place during the baseline that could influence the study (Multimedia Appendix 3 for the focus group guide).

Interviews (Post)

After all other measurements, semistructured interviews were conducted with the participating professionals. In these interviews, participants were asked whether and how they addressed the smartwatches in the sessions, what they thought of the smartwatches and the card set, whether there were differences in using the smartwatches with and without the card set, and how working with the smartwatches and the card set could be improved (Multimedia Appendix 3 details the interview guide).

Procedure

Before the study start, participants received an information sheet, were asked to sign an informed consent form, and had the opportunity to ask questions. Then, participants completed the pre-questionnaire. Next, baseline repeated measures started, in which one repeated measures survey took participants an average of 4 minutes (SD 10 minutes) to complete. All repeated measurements questionnaires were conducted via Qualtrics (Provo, UT) [44], each time after the participating professionals delivered the “Lifestyle” module. Baseline measurements continued until a minimum of 5 data points had been collected for each participant, as recommended [37] (mean 6.4, SD 3.13).

After the baseline repeated measurements, and before the card set was introduced as an intervention, participants received a combined focus group and training session on location at their department (duration: 90 minutes). These sessions were held twice to accommodate all participants’ schedules. The first session was audio recorded. The audio recording was pseudonymized and transcribed verbatim, and all written answers and notes were pseudonymized as well. In the first session, one participant could not join the focus group-part due to the unpredictable nature of the work in acute mental health care, and therefore gave their answers via email. In the second session, the audio recording of the focus group part failed, so notes from the focus group were used and the 2 participants from this session also gave their answers via email. In the training component of the sessions, participants received information about the smartwatch features, how the card set works, and practiced using the card set during a role-play. Professionals were instructed to emphasize the qualitative experiences of patients, rather than focusing solely on the quantitative smartwatch data. The specific card to be used in each session was determined by the professionals themselves. Participants were asked to use the card set for approximately 15 minutes during each Lifestyle module.

Next, participants continued with repeated measures in the intervention phase, in which one repeated measures survey took participants an average of 2.9 minutes (SD 2.1 minutes) to complete. Again, a minimum of 5 data points was collected per participant (mean 8.2 SD 2.77). After repeated measures were complete from all participants, participants completed the post-questionnaire. Next, semistructured interviews were conducted in which participants were asked about their experiences with the smartwatch and the card set. These interviews took place online via MS Teams and lasted an average of 28 minutes (SD 2.3 minutes). Video recordings of the interviews were made, transcribed verbatim, and anonymized.

Analyses

Data from the focus groups was summarized to check whether significant changes had taken place during the baseline phase that could influence further data collection, and to get an overview of the use and perception of the smartwatches before the introduction of the card set. Pre- and post-questionnaire data were described per participant using descriptive statistics, but not tested for significance due to the small sample size.

For the analysis of the repeated measures items, scores on the outcome measures acceptance, therapeutic alliance, and compassion were calculated by averaging the relevant items per construct for each timepoint. The outcome measure "use" was binary: if a participant indicated that one or more patients wore a smartwatch during the session and/or the smartwatch was used or discussed during the treatment session, this was counted as use; otherwise, it was non-use. Then, graphs were constructed per participant in R (version 4.5.1; R Core Team) [45]) using the scplot package (version 0.6.0), an add-on package to the scan package (version 0.65.1) for visualizing single-case data. The repeated measures data were first analyzed through case-level visualizations, which were primarily used to gain an impression of the fluctuations over time [46]. Additionally, piecewise linear regression models [47] and Tau-U [48] were used to examine whether the addition of compassion-focused implementation materials led to significant increases in the outcome measures (use, compassion, therapeutic alliance, and acceptance) within individuals.

Data from the semistructured interviews were transcribed and coded by the first author (CvL) using a pragmatic, deductive approach [9]. Following the person-level quantitative analysis, themes were developed for each case, and no attempt was made to create overarching themes. Case-level themes followed the outcomes measures use, compassion, the therapeutic alliance, and acceptance, and theme definitions were constructed a-priori based on the concept definitions described in the introduction of this paper. For each of these themes, a rich quote was selected per participant to help interpret the quantitative findings. Any additional findings from the interviews, mainly on the participant's experiences with the card set and the smartwatches, were documented for each case, but no inductive themes were constructed.

Results

Overview

First, we will present the results of the focus groups and descriptive statistics. Next, we will discuss the repeated measures results for each participant individually, supported with relevant quotes from their interviews based on the coded outcome measures of use, compassion, therapeutic alliance, and acceptance, as well as a brief description of their experiences with the card set and the smartwatches.

Focus Groups

The focus groups were conducted prior to the introduction of the compassion-focused card set. At this time, participants reported hardly ever using the smartwatches in sessions. They generally viewed the smartwatches as supportive rather than essential tools, with potential added value in objectifying sleep and activity patterns and facilitating therapeutic dialogue. Participants also mentioned a relevant change during the baseline phase, as the "Lifestyle" sessions in which the use of smartwatches and the card set was envisioned had been shortened from 75 to 60 minutes. This change could have impacted the possibilities for using the smartwatches and card set.

Descriptive Statistics

Table 1 contains the descriptive statistics per participant.

Table 1. Descriptive statistics per participant, showing the mean and standard deviation of each outcome measure in the pre- and post-questionnaire. An upward arrow (↑) indicates that scores increased, a downward arrow (↓) that scores declined, and an equal sign (=) that scores remained the same.

Participants and Variables (min.-max.)	Pre-questionnaire, mean (SD)[a]	Post-questionnaire, mean (SD)[a]
P1		
Use (0%-100%), % (n/N)	20 (1/5)	60% (3/5) ↑
Acceptance (1-5)	3.49 (0.84)	3.61 (0.8) ↑
Compassion (1-5)	3.5 (0.64)	2.89 (0.86) ↓
Recognition and helping	3.5 (0.55)	3.5 (0.55) =
Universality, empathy, and distress tolerance	3.45 (0.73)	2.33 (0.71) ↑
Therapeutic alliance (1-5)	3.42 (0.79)	3.83 (0.72) ↑
P2		
Use (0%-100%), % (n/N)	0 (0/5)	33% (2/6) ↑
Acceptance (1-5)	3.08 (1.13)	3.24 (0.79) ↑
Compassion (1-5)	3.22 (1.44)	2.95 (1.22) ↓
Recognition and helping	3.67 (1.03)	3.67 (0.52) =
Universality, empathy, and distress tolerance	2.67 (1.58)	2.11 (1.17) ↓

Participants and Variables (min.-max.)	Pre-questionnaire, mean (SD)[a]	Post-questionnaire, mean (SD)[a]
Therapeutic alliance (1-5)	3.5 (1.09)	3.42 (0.79) =
P3		
Use (0%-100%), % (n/N)	0 (0/5)	73% (8/11) ↑
Acceptance (1-5)	2.66 (0.97)	3.30 (0.76) ↑
Compassion (1-5)	3.06 (0.99)	2.78 (0.96) ↓
Recognition and helping	3.33 (1.03)	3.84 (0.41) ↑
Universality, empathy, and distress tolerance	3.00 (1)	2.33 (0.71) ↓
Therapeutic alliance (1-5)	3 (0.60)	3.25 (0.45) ↑
P4		
Use (0%-100%), % (n/N)	60 (3/5)	37.5% (3/8) ↓
Acceptance (1-5)	3.60 (1.07)	3.98 (0.88) ↑
Compassion (1-5)	3.28 (0.64)	3.5 (1.06) ↑
Recognition and helping	3.84 (0.75)	4.5 (0.55) ↑
Universality, empathy, and distress tolerance	3.22 (0.44)	2.78 (0.67) ↓
Therapeutic alliance (1-5)	3.83 (0.72)	4 (0) ↑
P5		
Use (0%-100%), % (n/N)	25 (3/12)	64% (7/11) ↑
Acceptance (1-5)	2.74 (0.86)	2.98 (0.74) ↑
Compassion (1-5)	3.33 (0.74)	3.45 (0.74) ↑
Recognition and helping	3.5 (0.55)	3.5 (0.84) =
Universality, empathy, and distress tolerance	3.33 (0.87)	3.34 (0.71) ↑
Therapeutic alliance (1-5)	3.83 (0.58)	4.17 (0.58) ↑

[a]For "use," we reported the percentage of sessions in which the smartwatch was used during the baseline (pre) and intervention (post) phases, together with the corresponding number of sessions.

Results From Repeated Measures and Interviews

We will now discuss the results from the repeated measures and interviews for each participant. The repeated measures data for each of the 5 participants are shown in the below subsections.

Results for P1

P1 was a man aged 27 years. P1 had a relatively high score on the Affinity for Technology scale (3.7/5, both at pre- and post-measurement). Figure 3 displays graphs of P1's repeated measures data.

P1 reported the start of smartwatch use in treatment just before the introduction of the card set, and use decreased during the intervention phase (Table 2). Compassion, therapeutic alliance, and acceptance scores all remained relatively stable, with no significant changes.

P1 was positive about the card set, which he felt was flexible and easy to use, helped to ask more to-the-point questions, and gave him more creative means to set up a treatment session.

P1 indicated finding the smartwatches a good addition to the treatment and noticed how they helped patients gain more concrete insights into their goals, sleep, and activity, which is in line with his high and stable acceptance scores. However, he mentioned several barriers to their integration in practice: (1) fluctuating groups of patients, with periods where no patients were partaking in the acute treatment, making it difficult to build his skills around the use of smartwatches; (2) the challenge of leading a group in which some people wore smartwatches and others did not, and maintaining a balanced group dynamic; (3) the dependence on patients in whether they were open to use a smartwatch.

Figure 3. Graphs of repeated measures data for P1, showing smartwatch use in sessions, and scores for the perceived contribution of the smartwatches to compassion, the therapeutic alliance, and acceptance of the smartwatches before and after the introduction of the card set, each accompanied by a rich quote on the topic.

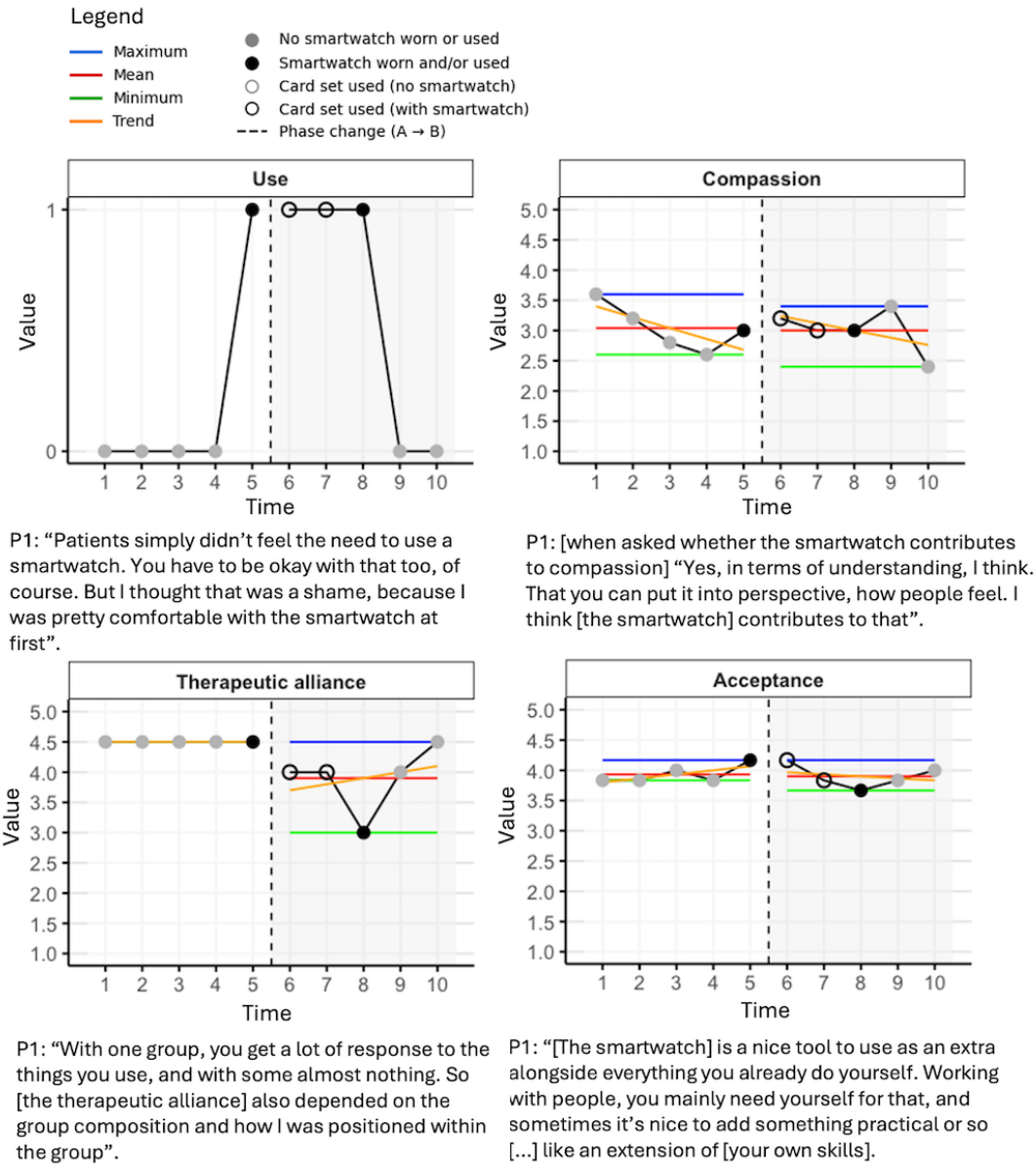


Table 2. Repeated measures results for P1 on smartwatch use in sessions, compassion, therapeutic alliance, and acceptance of the smartwatches.

Outcome variable	Piecewise regression: overall model	Piecewise regression: phase-specific effects	Tau-U intervention effect
Use	Significant, $F_{3,6}$=4.86; P=.048; R^2=.708	Significant slope change Phase B: B=–0.500, 95% CI –0.799 to –0.201, t_6=–3.273; P=.02	Not significant (P>.05)
Compassion	Not significant (P>.05)	No significant effects (P>.05)	Not significant (P>.05)
Therapeutic alliance	Not significant (P>.05)	No significant effects (P>.05)	Not significant (P>.05)
Acceptance	Not significant (P>.05)	No significant effects (P>.05)	Not significant (P>.05)

Results for P2

P2 was a woman aged 33 years. P2 had a relatively high Affinity for Technology score in the pre-measurement (3.8/5), but this score was lower in the post-measurement (2.9/5). Figure 4 displays graphs of P2's repeated measures data.

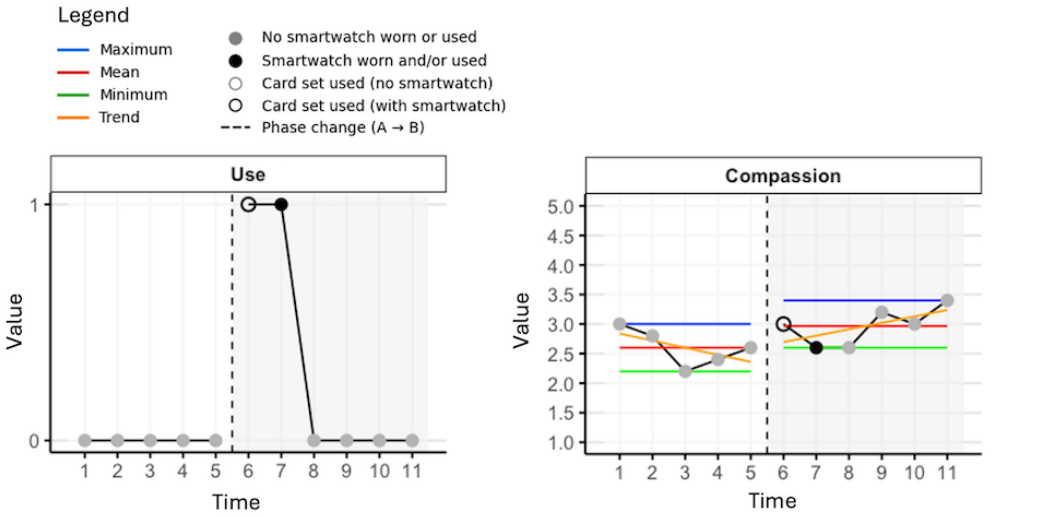
P2 started reporting use of the smartwatches in sessions after the introduction of the card set, but this use was not sustained over time. Compassion scores for P2 declined during the baseline phase, but this trend reversed during the intervention phase, with Tau-U indicating a significant effect of the intervention (Table 3). Therapeutic alliance and acceptance scores were stable and high.

P2 was positive about the card set and found it easy to use, despite not having used it much. The card set helped her to make the use of smartwatches more concrete. She

found the small take-home cards for patients useful to help create awareness for a certain topic, and said that the time she handed them out, patients really made use of them and were also positive. She liked that cards gave relatable and feasible examples. She also appreciated that the card set could be used for patients with and without a smartwatch and she did not have trouble using it in mixed groups.

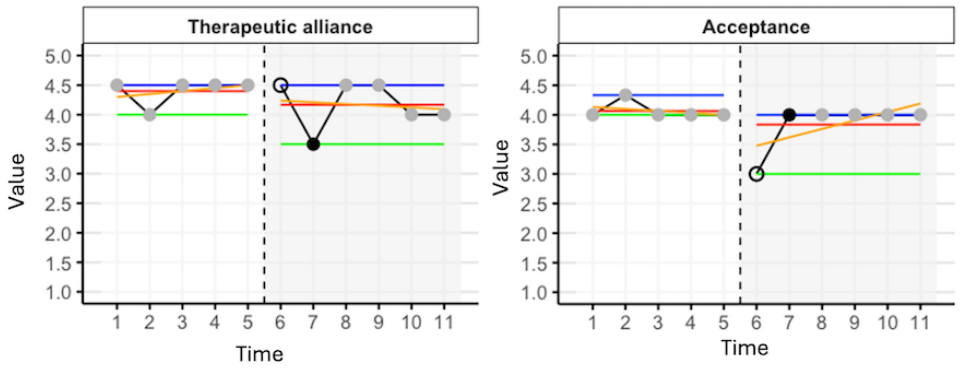
P2 shared that she appreciated the smartwatch for gaining more concrete and visual insight into patients' sleep behavior, as subjective and "objective" sleep measurements could differ. Furthermore, she found that sleep tracking can help start conversations, provide opportunities for psychoeducation, and monitor whether sleep medication is working. The added value of smartwatches was most clear to her in combination with a dedicated psychoeducation session on sleep, which takes place once every 6 weeks. As barriers for the use of the smartwatches and card set, P2 mentioned the limited time in a session, especially if the group of patients is large, and the lack of a clear organizational vision on whether and how the smartwatches should be sustainably integrated in treatment.

Figure 4. Graphs of repeated measures data for P2, showing smartwatch use in sessions, and scores for the perceived contribution of the smartwatches to compassion, the therapeutic alliance, and acceptance of the smartwatches before and after the introduction of the card set, each accompanied by a rich quote on the topic.



P2: "I haven't used [the smartwatches] much the last period [...]. This was also because there were people who didn't have a smartwatch."

P2: [When asked whether there was a difference with and without the card set in how the smartwatch influenced compassion] "No, not that much difference." [When told about the increase in her compassion scores] "It's undoubtedly related, but that's really just that one specific case [about discussing sleep], that I thought, it's good that we can really gain insight into it this way and show it to the patient, which allows us to help them better."



P2: "We build on what we've been doing for a long time, like how we plan the [patient's] day, how we start up, what we discuss, and this hasn't really changed because of the smartwatch."

P2: "With the questions on the card set, the use, or potential use, of the smartwatch becomes a bit more concrete. You ask more specifically 'OK, how was that for you? How many hours did you sleep?" [...] Once you know how [the smartwatch] works, then it's fine, and [acceptance] doesn't change much, I think."

Table 3. Repeated measures results for P2 on smartwatch use in sessions, compassion, therapeutic alliance, and acceptance of the smartwatches.

Outcome variable	Piecewise regression: overall model	Piecewise regression: phase-specific effects	Tau-U intervention effect
Use	Significant, $F_{3,7}$=6.78; P=.02, R^2=.744	• Significant level change Phase B: B=0.905, 95% CI 0.294 to 1.516, t_7=2.90; P=.02 • Slope change Phase B approached significance: B=–0.229, 95% CI –0.419 to –0.038, t_7=–2.36; P=.05	Not calculable (no variance in baseline)
Compassion	Not significant (P>.05)	• Slope change Phase B approached significance: B=0.229, 95% CI 0.008 to 0.449, t_7=2.03; P=.08	Significant, Tau-U=0.53, 95% CI –0.11 to 0.86, Z=2.31; P=.02
Therapeutic alliance	Not significant (P>.05)	• No significant effects (P>.05)	Not significant (P>.05)
Acceptance	Not significant (P>.05)	• No significant effects (P>.05)	Not significant (P>.05)

Results for P3

P3 was a woman aged 41 years. P3 had a moderate score on Affinity for Technology, both at pre- (2.5/5) and post-measurement (2.8/5). Figure 5 displays graphs of P3's repeated measures data.

For P3, the card set seems to have triggered the use of smartwatches in treatment, but this effect was not sustained over time. Compassion scores of P3 declined significantly during the baseline, followed by a significant positive slope change in the intervention phase (Table 4). Scores on the therapeutic alliance remained stable and high over time. P3's acceptance of smartwatches increased significantly over time, but the increase slowed in the intervention phase. Across outcomes, Tau-U did not indicate intervention-specific effects.

P3 liked using cards from the set as conversation starters and found them easy to use, but said that she did not necessarily use them in combination with the smartwatch in treatment sessions.

P3 found the smartwatches nice to work with as long as a colleague was responsible for setting them up with patients, but also felt some resistance towards the ubiquitousness of digital tools in daily life. She integrated the smartwatch in sessions by having patients compare their experiences with smartwatch data. However, these were short conversations, and she found it difficult to go more in depth. She found it challenging to work with the smartwatches and card set in mixed groups of patients in which a minority wore the smartwatch. Another barrier she mentioned was that a small number of patients with anxiety-like complaints became very preoccupied with sleep data, so that the smartwatch might not be helpful for them.

Figure 5. Graphs of repeated measures data for P3, showing smartwatch use in sessions, and scores for the perceived contribution of the smartwatches to compassion, the therapeutic alliance, and acceptance of the smartwatches before and after the introduction of the card set, each accompanied by a rich quote on the topic.

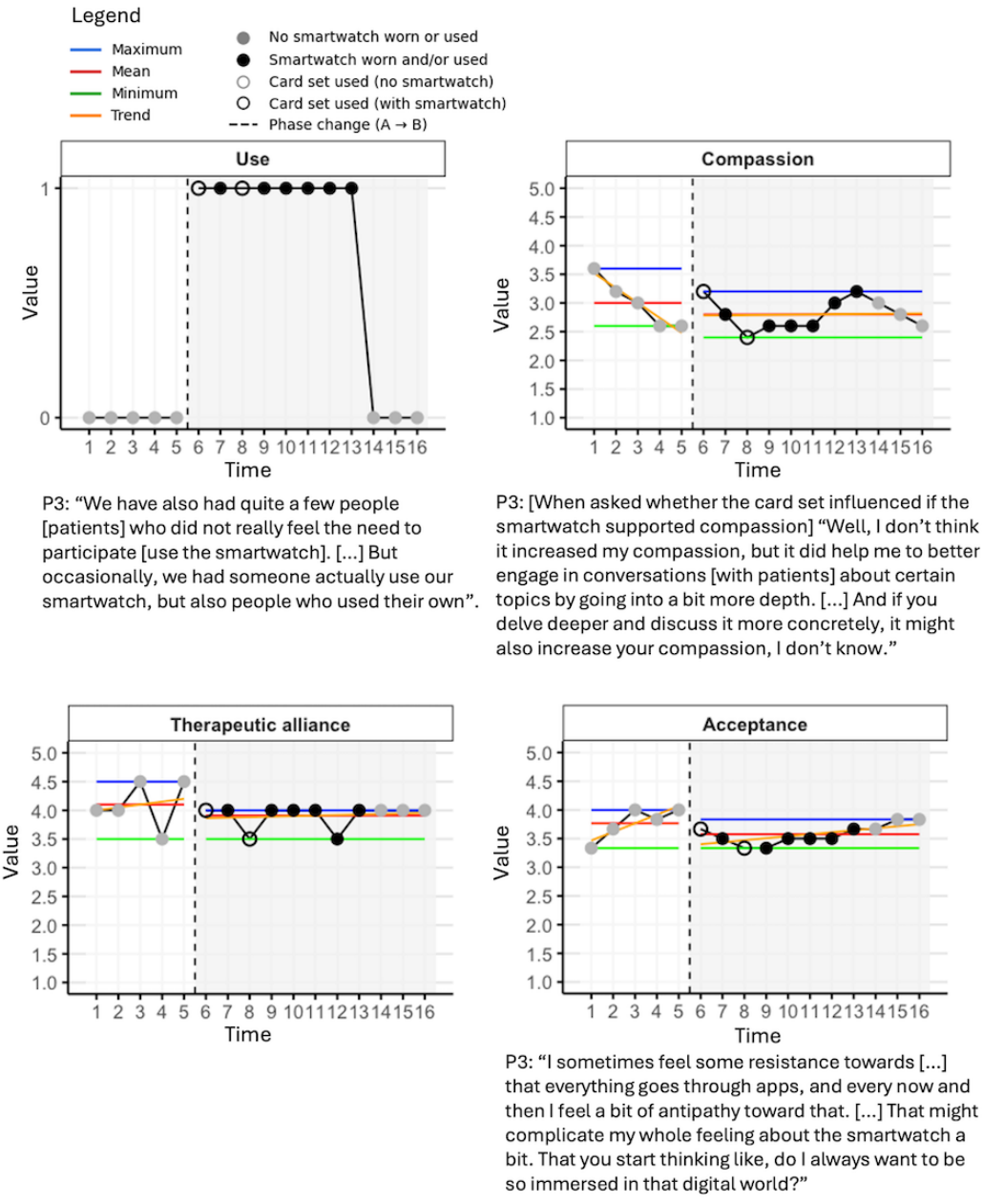


Table 4. Repeated measures results for P3 on smartwatch use in sessions, compassion, therapeutic alliance, and acceptance of the smartwatches.

Outcome variable	Piecewise regression: overall model	Piecewise regression: phase-specific effects	Tau-U intervention effect
Use	Not significant (P>.05)	• Significant level change Phase B: B=1.273, 95% CI 0.643 to 1.902, t_{12}=3.96; P=.002	Not calculable (no variance in baseline)
Compassion	Significant, $F_{3,12}$=4.27; P=.03, R^2=.517	• Significant baseline trend: B=–0.260; P=.007 • Significant slope change Phase B: B=0.264, 95% CI 0.100 to 0.427, t_{12}=3.17; P=.008	Not significant (P>.05)
Therapeutic alliance	Not significant (P>.05)	• No significant effects (P>.05)	Not significant (P>.05)
Acceptance	Significant, $F_{3,12}$=7.73; P=.004, R^2=.659	• Significant baseline trend: B=0.150, 95% CI 0.060 to 0.240, t_{12}=3.28; P=.007 • Significant level change Phase B: B=–0.815; P<.001	Not significant (P>.05)

Outcome variable	Piecewise regression: overall model	Piecewise regression: phase-specific effects	Tau-U intervention effect
		• Significant slope change Phase B: B=–0.115, 95% CI –0.209 to –0.022, t_{12}=–2.41; P=.03	

Results for P4

P4 was a man aged 26 years. Within the team of professionals, he was responsible for technical support with the use of smartwatches. He helped interested patients to install and set up the smartwatch and the accompanying phone app. Of the team, he had the highest affinity for technology (4.9/5, both at pre- and post-measurement). Figure 6 displays graphs of P4's repeated measures data.

For P4, smartwatch use increased over time but declined during the intervention phase. This was supported by a significant negative slope change during phase B in the piecewise regression, while Tau-U analyses did not indicate a clear intervention effect (Table 5). P4's scores on compassion and acceptance did not change significantly over time, nor was there any effect of the intervention. The scores on therapeutic alliance show a significant downward trend during the intervention phase, but according to Tau-U, this was not attributable to the intervention.

P4 used the card set several times and described it as a real asset that could be used with and without the smartwatches to start a conversation and let patients share advice with each other. He also mentioned that the use of the card set helped to stimulate interest in the smartwatch by indicating based on a card what the smartwatch could support people with.

P4 found the smartwatches convenient as a treatment tool to help set goals or activate patients. As barriers, he mentioned: (1) the effort it took his colleagues to get used to the smartwatches, resulting in smartwatches not always being offered to patients or being set aside; (2) difficulty of using the smartwatches in treatment since it was almost always the case that a minority of patients in the group wore a smartwatch; (3) that many patients found the smartwatch an extra burden, especially when they were in crisis, but also in case of paranoia, severe depression, or being easily overstimulated.

Figure 6. Graphs of repeated measures data for P4, showing smartwatch use in sessions, and scores for the perceived contribution of the smartwatches to compassion, the therapeutic alliance, and acceptance of the smartwatches before and after the introduction of the card set, each accompanied by a rich quote on the topic.

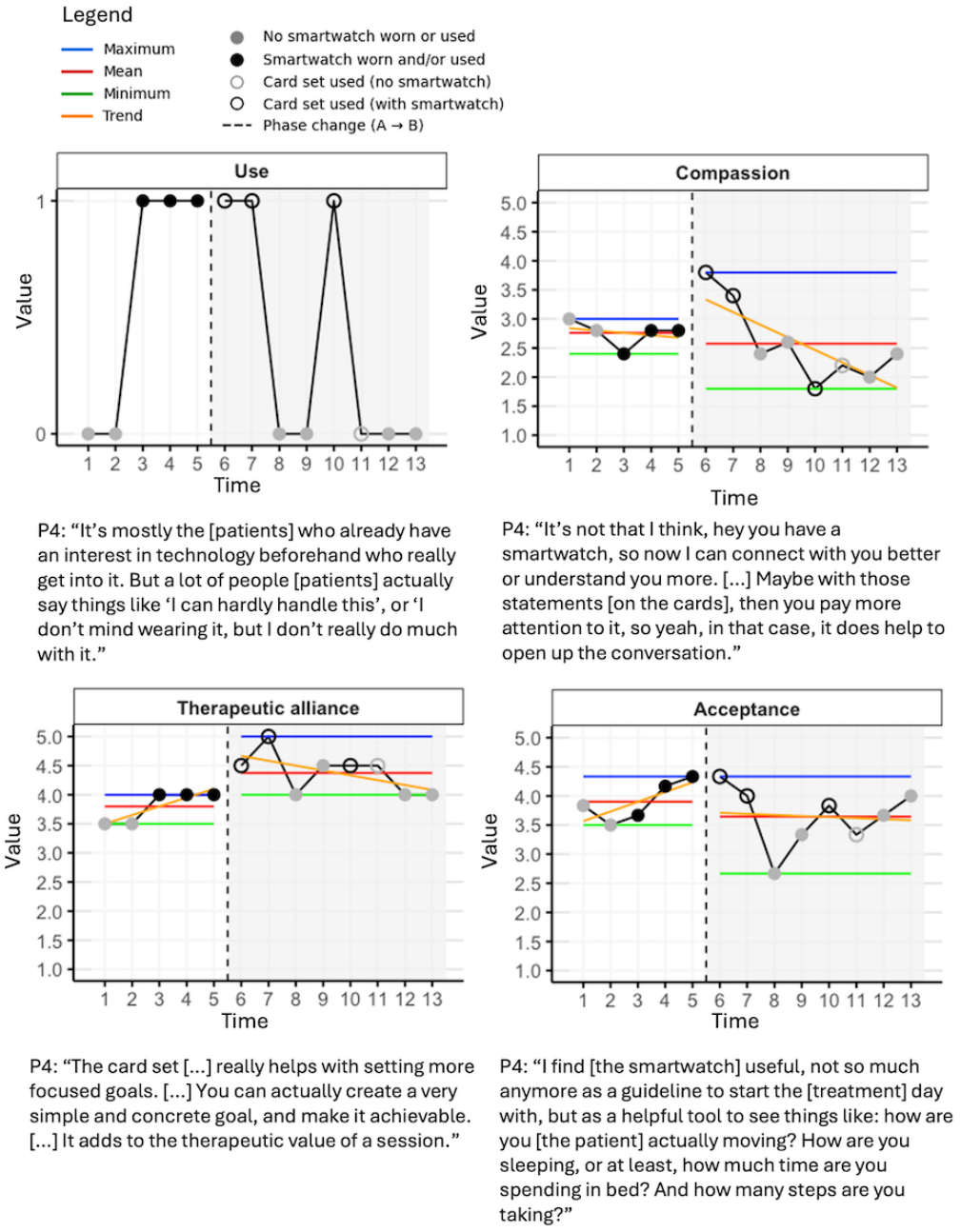


Table 5. Repeated measures results for P4 on smartwatch use in sessions, compassion, therapeutic alliance, and acceptance of the smartwatches.

Outcome variable	Piecewise regression: overall model	Piecewise regression: phase-specific effects	Tau-U intervention effect
Use	Not significant (P>.05)	• Significant overall time trend: B=0.30; P=.04 • Significant slope change Phase B: B=–0.431, 95% CI –0.708 to –0.154, t_9=–3.05; P=.01	Not significant (P>.05)
Compassion	Significant, $F_{3,9}$=4.13; P=.04, R^2=.58	• No significant effects (P>.05)	Not significant (P>.05)
Therapeutic alliance	Significant, $F_{3,9}$=6.99; P=.01, R^2=.70	• Significant slope change Phase B: B=–0.233, 95% CI –0.420 to –0.047, t_9=–2.45; P=.04	Not significant (P>.05)
Acceptance	Not significant (P>.05)	• No significant effects (P>.05)	Not significant (P>.05)

Results for P5

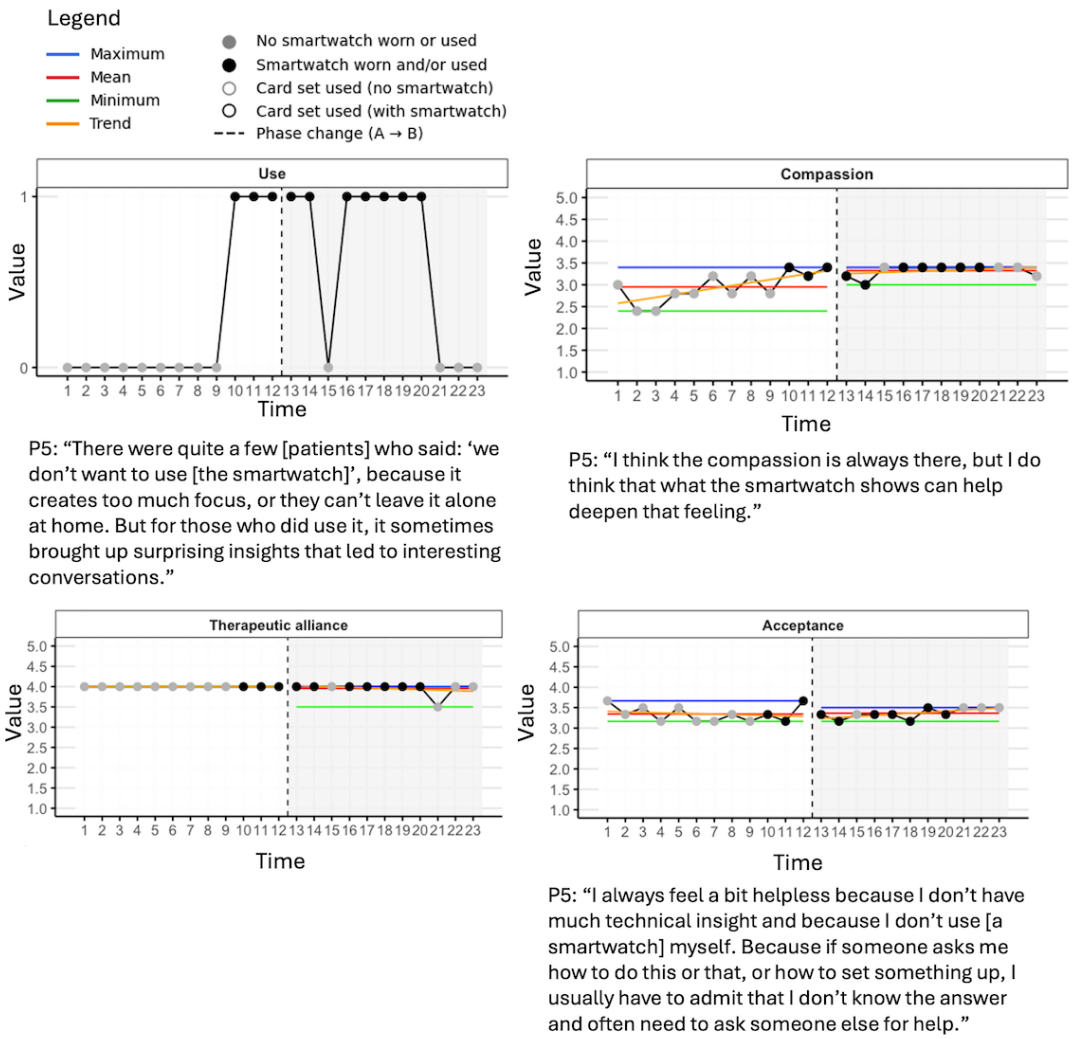
P5 was a woman aged 59 years. She was the professional who most frequently led the 'Lifestyle' sessions examined in this study. She had the lowest affinity with technology of the team, both at pre- (1.9/5) and post-measurement (2.3/5). Figure 7 displays graphs of P4's repeated measures data.

For P5, analyses showed changes over time for smartwatch use and compassion, but no effects that could be clearly attributed to the intervention (Table 6). Smartwatch use started during baseline but eventually stopped during phase B, indicating a reversal in trend during the intervention. Compassion similarly increased over time but appeared to level off during phase B. Acceptance and therapeutic alliance showed no meaningful changes over time, with alliance remaining high and stable throughout.

P5 found the card set relevant, but mostly in case multiple patients made use of smartwatches. She said she never used the card set if no patient wore the smartwatch, as she would not think of it then. In the repeated measures, she never reported using the card set. P5 explained that sometimes there were lots of topics to discuss in a session, leading to too little time for her to use the card set. She did appreciate the tangibility of the cards, to make discussion topics feel less abstract.

P5 described herself as neutral towards the smartwatches. If she used them in treatments, it was to create awareness in patients, evaluate the differences between experiences and data, and to set concrete and achievable goals. She mentioned several barriers to the use of smartwatches: (1) complicated to use in a group with a minority of patients wearing the smartwatch, (2) lacking technical insight to help patients with the smartwatch, (3) use of smartwatches by patients too sporadic to develop lasting skills, and (4) unhelpful preoccupation of some patients with smartwatch data (contra-indication).

Figure 7. Graphs of repeated measures data for P5, showing smartwatch use in sessions, and scores for the perceived contribution of the smartwatches to compassion, the therapeutic alliance, and acceptance of the smartwatches before and after the introduction of the card set, each accompanied by a rich quote on the topic.



P5: "There were quite a few [patients] who said: 'we don't want to use [the smartwatch]', because it creates too much focus, or they can't leave it alone at home. But for those who did use it, it sometimes brought up surprising insights that led to interesting conversations."

P5: "I think the compassion is always there, but I do think that what the smartwatch shows can help deepen that feeling."

P5: "I always feel a bit helpless because I don't have much technical insight and because I don't use [a smartwatch] myself. Because if someone asks me how to do this or that, or how to set something up, I usually have to admit that I don't know the answer and often need to ask someone else for help."

Table 6. Repeated measures results for P5 on smartwatch use in sessions, compassion, therapeutic alliance, and acceptance of the smartwatches.

Outcome variable	Piecewise regression: overall model	Piecewise regression: phase-specific effects	Tau-U intervention effect
Use	Significant, $F_{3, 19}$=6.52; P=.003, R^2=.507	• Significant baseline trend: B=0.094; P=.008 • Significant slope change Phase B: B=–0.176, 95% CI –0.271 to 0.081, t_{19}=–3.63; P=.002	Not significant (P>.05)
Compassion	Significant, $F_{3, 19}$=12.00; P<.001, R^2=.655	• Significant baseline trend: B=0.068; P=.001 • Slope change Phase B approached significance: B=–0.053, 95% CI –0.104 to –0.003, t_{19}=–2.06; P=.05	Not significant (P>.05)
Therapeutic alliance	Significant, $F_{3, 9}$=6.99 P=.01, (R^2=.70)	• No significant effects (P>.05)	Not calculable (no variance in baseline)
Acceptance	Not significant (P>.05)	• Slope change Phase B approached significance: B=0.037, 95% CI –0.003 to 0.076, t_{19}=1.83; P=.08	Not significant (P>.05)

Discussion

This study evaluated whether compassion-focused implementation materials, in the form of a co-designed card set, could support the integration of smartwatches into acute mental health care. Using a replicated AB single-case design with mixed methods, we examined the effects of these materials on smartwatch use in treatment sessions, and perceived contribution of the smartwatch to compassion, the therapeutic alliance, and acceptance of smartwatches in 5 mental health professionals.

Main Findings

Four of five professionals showed increased or newly initiated smartwatch use after the introduction of the card set, although use was not consistently sustained. Effects on perceived compassion, therapeutic alliance, and acceptance were mixed. Three participants showed an increase in perceived contribution of smartwatches to compassion, one increased acceptance, and one increased therapeutic alliance, either over time or in the intervention phase. One participant showed a decrease in perceived compassion, yet higher post-intervention evaluations of compassion. Since use influences the attitudes of mental health professionals towards digital tools [19], with more use linked to more positive attitudes [49], the relatively low use of the smartwatches in treatments may have limited the effects of the card set intervention.

Qualitative data showed that the card set was perceived as a flexible and easy-to-use tool that supported therapeutic dialogue and session structure, indicating that such accessible and practical tools are a promising form of offering guidance for technology use. Smartwatches were considered useful for increasing awareness of sleep and activity but were difficult to integrate consistently due to patient factors (eg, cognitive load, paranoia, and lack of motivation), group dynamics (including patients wearing and not wearing smartwatches), and varying levels of digital affinity among staff, which partly explain the differences in the patterns of use of the professionals. Therapeutic alliance was viewed as primarily shaped by group processes rather than smartwatch use. Overall, the card set supported reframing and initiation of use but was insufficient to ensure sustained integration. At the same time, a smartwatch might simply not always be the most suitable option for every case. The mentioned patient- and context-related factors are vital for mental health professionals to consider when deciding whether and how to make use of smartwatches during the sessions. Moreover, it is possible that for some patients, limited use of the smartwatch and card set was already sufficient to be of added value.

These findings are not intended for population-level generalization but to gain more insight into implementation processes in complex clinical settings. In line with single-case methodology, the emphasis of this study lies in understanding within-person and within-context change over time rather than estimating average effects across a population. This allows for a nuanced interpretation of how implementation materials may function differently across professionals in dynamic acute psychiatric care environments.

Reframing Smartwatch Use Through Compassion

Smartwatches and other wearable technologies have been shown to contribute to monitoring activity, sleep, and physiological markers relevant to mental health [2,4] and can help to increase activity and improve fitness to a clinically meaningful degree [50]. However, a key challenge in the implementation of smartwatches in mental health care is the mismatch between the logic of consumer fitness wearables and therapeutic values. Commercial smartwatches often frame data as performance metrics, encouraging optimization and individual responsibility [11].

In contrast, mental health professionals emphasize compassionate care [17]. Prior research shows that without explicit reframing, wearable data can foster dependence on quantified measures or demotivation when goals are not achieved [12,13]. The card set used in the current study aimed to address this challenge. The positive qualitative evaluations of the card set in this study suggest that reframing smartwatch use through compassion, a value deeply embedded in mental health care, can help mitigate these risks by shifting the focus from optimization to understanding and therapeutic dialogue. Participants spoke about how the card set supported more in-depth and helpful conversations, both with and without the use of smartwatches.

An interesting pattern emerged in compassion ratings: participants consistently rated the smartwatch higher on recognizing and alleviating suffering than on universality, empathy, or distress tolerance. This pattern was stable across measurement moments and aligns with previous findings that professionals primarily associate digital tools with monitoring and alleviation of suffering rather than broader compassion processes [32]. This suggests future implementation materials may benefit from emphasizing these more directly perceived functions, while linking other compassion elements to broader clinical practice. Alternatively, it may be possible that future digital tools offer new functionalities which influence which aspects of compassion are most relevant to professionals.

Practical and Clinical Implications

This study offers an initial, empirically grounded step toward supporting professionals in integrating smartwatches into acute mental health care. Rather than focusing solely on the importance of patient engagement [51-53] or large-scale implementation (as done in practice), our findings highlight how compassion-based implementation materials can strengthen professional readiness and therapeutic alignment. Providing professionals with the card set and brief training created space for reflection, dialogue, and more intentional use of smartwatch data in sessions. This study provides a formative, evidence-based building block for future implementation of smartwatches in mental health care.

While this is only a first step, such early interventions are essential for building the professional and relational foundations that sustainable implementation depends on. In practice, professionals need opportunities to gain further experience with smartwatches and to exchange strategies for using them across diverse clinical settings. Guidance for professionals should also address how to work with mixed patient groups and how to respond to patient questions about data and privacy: issues that shape professional confidence and legitimacy in using digital tools.

Our findings align with broader calls in literature to approach the implementation of DMHIs not as a matter of technology adoption alone, but as a process that requires attention to organizational routines, clinical values, and human relationships [50,54]. In addition, as Sheperis et al [55] emphasize, the integration of digital health tools requires competencies across domains such as security, therapeutic adaptability, and technical proficiency. Moreover, Bowen [56] highlights that in increasingly technology-rich environments, professionals start to take on roles as innovators, enablers, differentiators, or coordinators. This indicates that future mental health care may benefit not only from upskilling existing staff but also from differentiated roles or even new professional profiles to effectively embed digital tools in practice.

While we currently focused on offering guidelines to professionals for the use of smartwatches in practice, as previous research called for [4], another previously mentioned barrier to their integration is the lack of sustained patient engagement [7]. In our study, this issue was echoed in professionals' reports that patients often declined smartwatch use, especially during crises, and that group settings complicated equitable integration. To stimulate patient engagement, the perceived usefulness and ease of use of smartwatches must also be clear for patients [57], and not just for professionals.

The participating professionals also reflected on which patient characteristics seemed to influence smartwatch use in treatment. They described that some patients, particularly those with some technological affinity, appeared more motivated and gained insight from wearable data, consistent with previous research [57]. At the same time, they mentioned possible contraindications such as paranoia, overstimulation, and preoccupation with health data, of which health anxiety has been discussed as a potential contra-indication in earlier studies [12,58]. It is important to note, however, that these observations represent the professionals' interpretations, not direct patient perspectives. Such judgments may be shaped by implicit clinical heuristics or protective caution; what is perceived as "unsuitable" may partly reflect how the smartwatch was introduced or framed. From this perspective, smartwatch implementation is not only about identifying the right type of patient, but also about professional reflexivity and shared decision-making in the use of digital tools.

Strengths and Limitations

The use of a replicated single-case AB design with mixed methods proved valuable for capturing individual differences among professionals. While some showed increased compassion or acceptance during the intervention, others reported declines. Such heterogeneity would likely have been obscured in a traditional group-level trial. This supports the view that single-case designs are suitable for studying implementation processes in complex and dynamic clinical settings [36,37]. Moreover, there is a lack of studies on the experiences of professionals with DMHIs in general [31] and wearables in particular [11], which makes optimizing their use in practice more difficult. A strength of the current study is that it did focus on the perspectives of professionals, enriching this field of research.

Nevertheless, several limitations must be acknowledged. First, though we used replication in 5 participants and mixed methods to strengthen our single-case design, we cannot make causal inferences as we were not able to use multiple baselines or alternating baseline and intervention phases [59]. However, while we could not use randomized multiple baselines, participants were all introduced to the intervention at different times due to a large variety in their work schedules. Second, participants had previously been involved in co-designing the card set [35]. As such, they were already familiar with the value of compassion and had discussed ways in which the smartwatch could contribute to compassion, which may have primed them towards compassionate use of technology, reducing the likelihood of measurable change. Third, relatively little use was made of the card set. Therefore, it is possible that the passing of time, the training session, or repeatedly filling out the short surveys influenced our outcomes rather than the card set. Finally, the fact that the lifestyle sessions were shortened from 75 to 60 minutes

during the baseline might have confounded our results, as 2 professionals (P2 and P5) mentioned feeling time pressure during the sessions.

Future Research

Future research should examine whether a similar card set with a more universal focus can be applied across different areas of mental health care, beyond acute psychiatry. Testing the materials in larger and more diverse teams, particularly those not previously involved in their co-design, would strengthen evidence for their effectiveness and generalizability [60]. Another important direction is to investigate how the card set functions as part of a broader implementation strategy. Research consistently shows that training, technical support, and organizational embedding are critical for sustaining digital health innovations [61,62]. Longer follow-up periods are also needed to assess whether effective integration can be maintained.

In addition, future research could explore how professionals' expectations, framing, and comfort with technology influence patient engagement and therapeutic outcomes. Furthermore, patients' perspectives on smartwatch use and compassion-focused materials warrant closer attention. Understanding how patients experience both the opportunities and risks of wearables is essential for designing interventions that are acceptable and supportive of therapeutic engagement [63], and can clarify for which patients the smartwatch or other types of digital technologies can be of added value. Finally, future studies could explore how smartwatch data can be combined with other digital interventions, such as ecological momentary assessments or biofeedback, to create more integrated and compassionate approaches to care [64,65].

Conclusion

This study provides preliminary evidence that compassion-focused implementation materials can help professionals frame smartwatch use in ways that align with therapeutic values. While the quantitative effects on acceptance, compassion, and therapeutic alliance were limited, qualitative findings highlight the potential of value-based tools to facilitate dialogue and foster professional engagement. Though structural and clinical barriers complicated sustained adoption of smartwatches, limited use of the smartwatch was also of value in some cases. Future implementation strategies should combine technical training, value-sensitive framing, and tailoring to patient needs, ensuring that digital tools enhance rather than disrupt the compassionate nature of mental health care.

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Data Availability

The datasets generated and analyzed during this study are available from the corresponding author on reasonable request to protect the privacy of the participants.

Authors' Contributions

Conceptualization: CMvL, SMK, GJW, MLN.
Formal analysis: CMvL (qualitative), TD (quantitative).
Investigation: CMvL.
Supervision: SMK, GJW, MLN.
Writing–original draft: CMvL.
Writing–review & editing: SMK, GJW, MLN.

Conflicts of Interest

None declared.

Multimedia Appendix 1

Pre- and post-questionnaires.
[DOCX File (Microsoft Word File), 230 KB-Multimedia Appendix 1]

Multimedia Appendix 2

Repeated measures items per research question (translated from Dutch).

[DOCX File (Microsoft Word File), 20 KB-Multimedia Appendix 2]

Multimedia Appendix 3

Guides for focus group and semistructured interviews.
[DOCX File (Microsoft Word File), 16 KB-Multimedia Appendix 3]

Checklist 1

SCRIBE 2016 checklist.
[DOCX File (Microsoft Word File), 24 KB-Checklist 1]

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Abbreviations

CTS-P: Compassionate Technology Scale for Professionals
DMHI: Digital Mental Health Intervention
IHT: intensive home treatment
NoMAD: Normalization Measure Development
TAM: Technology Acceptance Model
WAI-SR-T: Working Alliance Inventory Short Form Revised Therapist Version

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