

B Digital Health & Inclusion

B.1 Using smartphone-based daily diaries and coachings to support vocational inclusion of people with disabilities

Research

Regina Schmid¹, Simon Orlandt², Regina Weißmann¹, Burcu Köse¹,
Christiane Bartosch¹, Joachim Thomas¹

¹ Catholic University of Eichstätt-Ingolstadt

² Justus Liebig University Giessen

1 Introduction

People with disabilities who are seeking employment on the primary labor market as an alternative to sheltered workshops face major challenges (Mattern et al., 2021). When leaving sheltered institutions, services like on-the-job supervision are often reduced or omitted (Moraß et al., 2018; Riedl et al., 2021). However, ongoing social support is discussed as indispensable for a sustainable inclusion, especially in times of occupational changes and transitions from sheltered institutions to the primary labor market (Mirbach et al., 2014; Slesina et al., 2010). The present study presents an innovative method of smartphone-based monitoring and coaching aiming to provide a basis for better self-reflection and improved social support and inclusion for people with disabilities during transition processes.

So-called daily diaries, experience sampling methods (ESM), ecological momentary assessments (EMA), or ambulatory assessments are increasingly used in occupational health research (Beal, 2015; Ilies et al., 2015). In contrast to traditional one-time surveys, data are collected while subjects engage in their normal daily routine (Bolger et al., 2003). Usually, short questionnaires about participants' well-being, their current situation or their day are repeatedly answered on smartphones. Doing so, fluctuations within persons over time are recorded in real-life and real-time without retrospective biases, which is discussed as highly beneficial (Ohly et al., 2010), especially when studying people with disability (McKeon et al., 2017). Given the aforementioned strengths and growing technological capabilities, ambulatory assessment emerged as popular tool in many applied disciplines. However, only few ambulatory studies have so far been conducted among people with disabilities (Chen et al., 2015; Hintzen et al., 2010). Pioneering research suggests that diary methods are quite feasible in this context under certain conditions (e.g., short, simple and clearly worded items). Doing so, Seekins et al. (2007) found that participants showed greater sense of community and fulfillment when they spent time with others and were not facing barriers or secondary conditions. In a recently published study, Wilson et al. (2020) provided evidence for a negative relationship between task difficulty and momentary fun.

While ambulatory assessment typically refers to short cross-sectional data collections, ambulatory monitoring describes continuous longitudinal recordings aimed at identifying changes over time. A promising application in the clinical context is the combination of monitoring with interventions, e.g., to support patients in coping with critical situations (Heron & Smyth, 2010). Many researchers also implement monitoring-based, personalized feedback to participants in order to provide insights into their experiences and to promote self-reflection (Bos et al., 2019; van Os et al., 2017; Wichers et al., 2011). By presenting diary data to the participants, they see their average well-being depending on different environments or conditions. Participants may thus gain an awareness of beneficial or detrimental influences and may accordingly seek out these contexts more or less often (Hartmann et al., 2015; Kroeze et al., 2017). Previous research showed positive effects of such feedback on symptom reduction (Kramer et al., 2014), changes in behavior (Snippe et al., 2016), positive affect (van Roekel et al., 2017), empowerment (Simons et al., 2015), and compliance (Rofey et al., 2010).

To the authors' knowledge, the study by Moraß et al. (2018) is the only one that incorporates an ambulatory monitoring with personalized feedback among people with disabilities. Adolescents in vocational rehabilitation completed self-reports for four weeks, and discussed them weekly with a coach. Results showed significant increases in self-efficacy from pre- to post-intervention and an overall high feasibility.

Given the large research gap, McKeon et al. (2017) called for more studies, as "it is important to understand how people with intellectual disability feel about their own social participation, including what they like and do not like, and to understand this from the person's perspective, rather than through proxy" (Wilson et al., 2020, p. 2). In fact, there is evidence that people with disabilities benefit from such e-services or internet-based communication tools, as they reduce barriers, are independent of time and place, and allow for remote monitoring as well as supporting people while they access and participate in the world of work (Manzoor & Vimarlund, 2017).

In the present study, an ambulatory monitoring and coaching was used to assist adult people with disabilities during transitions to the primary labor market. Our first aim was to investigate the feasibility of this smartphone-based approach.

Second, we intended to explore relations between job characteristics and affective mood. According to the job demands-resources (JD-R) model (Bakker & Demerouti, 2017), job demands are associated with strain. However, this relation can be attenuated by stress-buffering resources. People with disabilities often experience their first job on the primary labor market as particularly demanding: They are usually confronted with unknown people, new tasks and an unfamiliar environment (Moraß et al., 2018). Difficult situations such as interpersonal conflicts or high task complexity may be accompanied by reduced well-being, which in turn may represent

an increased risk of giving up and returning to the sheltered institution (Riedl et al., 2021). In such periods, it is crucial to quickly provide targeted resources. The present ambulatory monitoring and coaching is designed to constitute such a resource by offering an unobtrusive, low-threshold and needs-oriented support to the participants.

Third, we sought to describe trajectories of mood and job characteristics over time based on theories of adaptation (Frederick & Loewenstein, 1999; Luhmann et al., 2012; Wilson & Gilbert, 2008). According to Diener (1997), adaptation follows a certain reactivity-recovery pattern in which subjects initially react strongly to important events or new circumstances, but then adjust and return to pre-event levels after some time. Regarding adaptation to a new job, Suh et al. (1996) estimate this recovery process to take up to three months.

2 Methodology

2.1 Participants

Our original intention to recruit people receiving a “Budget für Arbeit” (§ 61 SGB IX), a German initiative to support vocational inclusion of people with disabilities, had to be revised due to low numbers of cases. For this reason, individuals were included in the study who were employed in a sheltered workshop (90%) or a vocational training center (10%), but started an external internship or outsourced workplace in companies of the primary labor market. The final sample consisted of ten people (five females) who provided a total of 106 diary reports. The participants were aged between 18 and 43 years ($M = 29.4$, $SD = 8.00$). The most prevalent form of disability was learning disability (80%), which was partly accompanied by physical disability. Other diagnoses included post-traumatic stress disorder and pulmonary or muscular disease. They worked in an amusement park, a supermarket, a kindergarden, a veterinary practice, a retirement home, an assembly company, or a laundry. All participants signed an informed consent form. There was no incentive. The study was approved by the ethics committee of the Catholic University of Eichstaett-Ingolstadt (approval no.: 120-2022).

2.2 Design and procedure

First, subjects participated in a digital media literacy workshop designed as training for using smartphones and the application “workcoach”. Subsequently, participants received a smartphone, a project description, and a calendar including the coaching appointments. In face-to-face dialogues with their job coaches, the information was additionally communicated verbally, and participants were able to ask questions. For the first two to four weeks after entering the primary labor market, the individuals responded to short smartphone-based questionnaires about their workday and well-being on a daily basis. On average, participants took part in the study for 3.4

weeks, depending on their individual needs and wishes (50% for four weeks, 40% for three weeks, and 10% for two weeks). The surveys could be completed flexibly on weekdays between 4 and 11 p.m. via the app „workcoach“. If no diary entry was made by 6 p.m., the smartphone sent a reminder signal. The questionnaire included a total of eleven items, of which three were included in the present analysis (mood, supervisor support, ease of work).

In regular coaching sessions held once a week, the participants reflected on their diary data together with a job coach. The participants received personalized feedback in the form of tables shaded in traffic light colors. These tables were used to explore personal strengths (shaded in green) and risk factors (shaded in red), which were then addressed in the resource- and solution-oriented coaching (see Figure 1). The coaching sessions were conducted by telephone or face-to-face and were led by case managers who were firmly assigned to the participants.

Day	Ease of work	Co-worker support	Supervisor support	Availability of help	Task clarity	Pride	Showing one's potential	Enjoyment	Mood	Physical condition	Leisure time
24.04.2023	4,00	4,00	4,00	4,00	3,00	4,00	3,00	4,00	4,00	4,00	4,00
25.04.2023	3,00	3,00	3,00	4,00	3,00	3,00	3,00	3,00	4,00	3,00	4,00
26.04.2023	3,00	3,00	3,00	4,00	2,00	3,00	3,00	4,00	4,00	4,00	4,00
27.04.2023	3,00	3,00	3,00	3,00	3,00	2,00	3,00	3,00	2,00	1,00	1,00
28.04.2023	3,00	3,00	3,00	3,00	3,00	2,00	3,00	4,00	4,00	4,00	4,00
29.04.2023											
30.04.2023											
01.05.2023	3,00	3,00	4,00	4,00	3,00	4,00	3,00	4,00	4,00	2,00	4,00
02.05.2023	3,00	3,00	3,00	4,00	3,00	4,00	4,00	4,00	4,00	4,00	4,00

Figure 1: Example of personalized feedback table during coaching

In addition, the diaries were continuously monitored and checked for acute intervention needs. As soon as predefined cut-off criteria were met indicating participants' discomfort or problems at work, an irregular coaching session was immediately offered by the job coach. This was the case, e.g., whenever there were three consecutive days with critical (= red) values for mood or with no diary entries at all. Of course, participants could also contact the coach at any time outside regular or irregular appointments if they needed support.

At the end of the project, participants and coaches were interviewed in order to deliver feedback. The semi-structured interviews via telephone focused on the experience of participation, the usability and functionality of the smartphone and the app, as well as on the perceived benefits of the monitoring and coaching.

2.3 Instruments

If possible, the items for the daily diary were taken from validated instruments. The item for mood (“Today I was in a good mood”) was based on Wilhelm and Schoebi (2007), the items for supervisor support (“Today I felt supported by my supervisor”) and ease of work (“Today the work was easy for me”) were formulated in accordance with Nübling et al. (2007), but own considerations were also taken into account when formulating the items. Note that both items on job characteristics were formulated positively (in the sense of resources) to make it easier for the participants to understand, although low values for both variables can of course also be interpreted in the sense of demands. To meet the needs of people with limited reading ability, single items in simple language combined with four-point, smiley-based Likert scales and audio files were presented (see Figure 2).

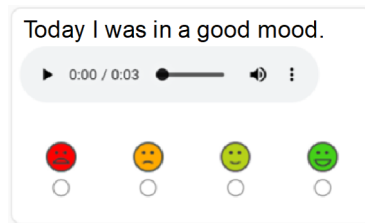


Figure 2: Example of smiley-based single items with integrated audio-files

2.4 Statistical analyses

On the one hand, characteristics of the working day (supervisor support, ease of work) were considered as predictors of mood in order to identify beneficial or detrimental relationships with well-being. On the other hand, time (day, day*day) was used as a predictor to analyze temporal patterns in all study variables.

We ran multilevel models with SPSS (version 29; IBM Corporation, 2022) to account for the hierarchical nature of data, in which daily diaries (level 1) were nested within persons (level 2) (Nezlek, 2011). All level 1 predictors were person-mean centered (Ohly et al., 2010). For analyzing relationships with mood, we computed a linear random intercept and slope model in which we included both predictors simultaneously. For analyzing changes over time, we specified multilevel longitudinal models. Linear and quadratic effects of time were modeled in order to draw conclusions about curvilinear growth. The time series multilevel models incorporated autocorrelations to account for dependencies between any two days within individuals. The alpha level was set to 0.05 (two-sided).

3 Results

3.1 Feasibility: Feedback and compliance rate

In order to determine feasibility, qualitative feedback from participants and coaches as well as compliance rates were evaluated.

All participants gave the highest possible recommendation rates and expressed great pleasure and fun in participating: “It was good to know that [coach] was always there when I needed help”, “I got to know myself in a new way”. The fact that some subjects continued to use the app on a voluntary basis after the end of the study clearly illustrates the personal benefit. In addition, the smiley scales and audio files were appreciated in terms of improved comprehensibility. Only few critical aspects were expressed with regard to technical issues, e.g., that the sampling schedule could be made more flexible in the future. In addition, free-text fields for entering keywords about special events were desired. Some subjects also wished for larger tablets instead of smartphones.

Coaches also considered the procedure to be very helpful, allowing many clients to be monitored and supported at the same time. According to them, the tool has great potential for empowerment, resource activation and self-determination, as well as for making participants feel important and valued.

With respect to compliance, 106 out of 159 daily prompts were answered and 53 were ignored, resulting in a response rate of 67%. On average, 10.60 daily diaries ($SD = 4.60$, range: 3–20) were completed per person. Compared to other ambulatory studies among people with intellectual disabilities (e.g., Wilson et al., 2020), such a compliance rate can be considered normal to good, hence, feasibility can also be attributed in this respect.

3.2 Multilevel models predicting mood

First, relationships between mood and job characteristics were analyzed. Both supervisor support ($\gamma = 0.42$, $t(85) = 2.59$, $p < .05$), and ease of work ($\gamma = 0.34$, $t(85) = 2.67$, $p < .01$) were positively associated with heightened mood.

3.3 Time series multilevel models predicting trajectories

Second, longitudinal analyses over the course of the study were calculated. While no linear time effects could be detected from day 0 to 40, quadratic time effects were found for both mood ($\gamma = 0.001$, $t(40) = 2.06$, $p < .05$) and supervisor support ($\gamma = 0.001$, $t(39) = 2.57$, $p < .05$). For ease of work ($\gamma = 0.001$, $t(40) = 1.80$, $p = .08$), the quadratic time effect narrowly failed to demonstrate statistical significance. The trajectories are shown in Figure 3.

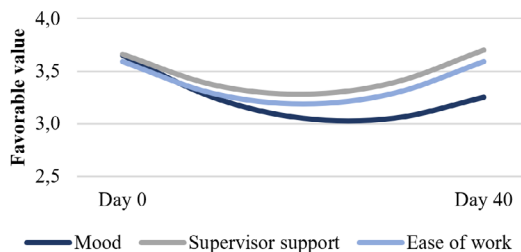


Figure 3: Adaptation curves for mood, supervisor support, and ease of work

4 Discussion

This study shows how digital media can help provide an innovative, economical, and practical support system for people with disabilities entering the primary labor market. Qualitative feedback from participants and coaches suggests high feasibility of the ambulatory monitoring and coaching concept, and statistical analysis also yields promising results.

With respect to relationships between affective well-being and job characteristics, the participants reported better mood on days when they experienced good cooperation with their supervisors and when they found it easy to complete tasks. These findings are consistent with the JD-R model and other evidence (Bakker & Demerouti, 2017; Slesina et al., 2010; Wilson et al., 2020). Transferring these findings into practical implications, it would be important to further strengthen the two resources. Concerning temporal changes in mood, supervisor support, and ease of work, our results showed U-shaped patterns: The participants started their new job (and the monitoring and coaching) with favorable values for all three variables, which then temporarily declined before finally increasing again in the further course. These trends are in line with theories of adaptation (Frederick & Loewenstein, 1999; Suh et al., 1996) and suggest that support is especially important in the medium term following vocational transition.

The main limitation of this study is the small sample size and the resulting lack of generalizability of the results. In addition, it was not possible to collect data from a control group, hence, conclusions about the effectiveness of the intervention should be drawn with caution. On the other hand, the feedback clearly indicates high benefits for the participants and other studies also showed that personalized, monitoring-based feedback may lead to positive changes in experience and behavior (Leertouwer et al., 2022). Future work should nevertheless verify our evidence with larger samples and randomized controlled designs. Another critical aspect is that participants may have responded socially desirable, which should be considered in further studies, e.g., by providing explicit instructions. In addition, feedback

could not always be discussed with participants using the colorful tables, because the smartphone display was too small for them or participants had no computer or printer, which calls for alternative solutions of visualization (e.g., via tablets).

Notwithstanding, such tools can be considered well suited “to optimize clinician time and reduce costs”, as they “may more accurately assess the complex and dynamic nature of disability over the long-term through an [...] ecologically-valid data source” (McKeon et al., 2017, p. 1). Concluding, the present smartphone-based monitoring and coaching can be seen as an effective and tailored approach offering high potential for fostering sustainable, vocational inclusion through digitalization.

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