Co-designing an Intervention Protocol and Web-based Interface for Identifying and Setting Qualitative Goals

Sruzan Lolla
School of Computing and Communications
Lancaster University
Lancaster, UK
s.lolla@lancaster.ac.uk

Corina Sas
School of Computing and Communications
Lancaster University
Lancaster, UK
c.sas@lancaster.ac.uk

Abstract

Personal informatics research has predominantly explored the setting and tracking of quantitative goals, with less focus on qualitative goals. To address this gap, we report staged participatory design sessions with 26 stakeholders, including goal-oriented work practitioners, self-trackers, and designers. Leveraging practitioners' expertise, we co-designed a novel multi-session, 4-week intervention for goal identifying and goal setting, consisting of sequentially scheduled tools from goal-oriented work. We also explored the intervention's pre-use acceptability, the perception of user interaction, and usability of the digital format. Our findings informed four design implications to support identification of ambitious yet realistic goals, structured and customizable support for goal identification and setting, iterative goal revision, and reduced reliance on quantitative tools. We also reflect on the value of engaging multiple stakeholders in participatory design.

CCS Concepts

• **Human-centered computing → Empirical studies in HCI**.

Keywords

qualitative goals, goal elicitation, goal setting, goal-oriented work, personal informatics, qualified self, participatory design

ACM Reference Format:
Sruzan Lolla and Corina Sas. 2026. Co-designing an Intervention Protocol and Web-based Interface for Identifying and Setting Qualitative Goals. In *Designing Interactive Systems Conference (DIS '26), June 13–17, 2026, Singapore, Singapore.* ACM, New York, NY, USA, 18 pages. https://doi.org/10.1145/nnnnnnn.nnnnnnn

1 Introduction

A growing body of HCI research has focused on goals or *end-states* that individuals desire to attain [6]. As means through which motives are translated into actions [14], goals support users' engagement across a range of domains from health and wellbeing to learning and work [100]. Thus, goals could target both the change of less desirable current behaviors, and the optimization or maintenance of desirable behaviors [25, 53].

Given the technological affordance for reliable tracking, much HCI research on goals has prioritized measurable goals which allow tracking, feedback, and performance regulation [53]. These measurable goals are specific representations of motives, translated into actionable behaviors, i.e., *how*, such as "walk 10K steps". However, the over-reliance on measurable (i.e., SMART) goals for behavior change has been critiqued for its limited theoretical and empirical underpinning [89]. Goal-oriented practice, i.e., therapeutic approach supporting clients to reflect on goals through tools for goal identification, setting, or tracking [22, 91], has the potential to address such limitations, but most such tools have been less used in HCI. For instance, Personal Project Analysis involves broad and in-depth reflection on many goal related criteria, as well as structured facilitation [51], while decision matrices are cognitively taxing due to the many criteria for prioritizing goals [84].

Moreover, while measurable goals are often emphasized, less research has explored the complementary qualitative goals as abstract representations of motives which provide long-term vision, i.e., *why*, such as "be healthier" [25]. Such qualitative goals focus on identity, meaning, aspiration, or personal growth, reflecting desired end-states which are more proximal to values and motives. In contrast, quantitative or measurable goals are usually distant from underlying motives, but linked to motives through qualitative goals, which quantitative ones operationalize into actions [82]. This hierarchical organization, i.e., motives, aligned qualitative goals, and informed measurable quantitative goals, supports both sustained motivation and effective behavior regulation [53, 82].

The predominant focus of personal informatics on quantitative goals has been critiqued by scholars arguing for the value of supporting also self-reflection [8, 11], meaning through qualitative goals [66] in single or multiple domains [29, 100], and associating with lived informatics experiences [34], evolving lives and contexts [30, 56]. For instance, Niess and Woźniak [66] noted that typical end-users' goals targeted by personal informatics systems are foremost qualitative, becoming subsequently translated into trackable, quantitative goals. However, the support for qualitative goals has been limited [29, 79, 100]. Notably, a recent systematic review of HCI research on behavior change goals [100] indicated the value of *goal-oriented work* for designing effective behaviour change technology-based interventions. The authors reported the value of goal oriented tools and techniques for supporting users' awareness of their deeper motives; when such motives are linked to qualitative goals, users' commitment is stronger due to these goals' alignment with the user's identity and value. As a result, such

DIS '26, Singapore, Singapore

ACM ISBN 978-x-xxxx-xxxx-x/YYYY/MM
https://doi.org/10.1145/nnnnnnn.nnnnnnn

commitment is extended also to the concrete actions or quantitative goals grounding or operationalizing the qualitative goals.

However, despite the potential value of goal-oriented work for personal informatics, emerging HCI research leveraging it tends to involve the use of single goal-oriented tools such as the personal projects analysis kit (e.g., used in [16]), or motivational interviewing (e.g., used in [18]). Moreover, goal oriented work in HCI studies is commonly facilitated by researchers or goal-oriented work practitioners rather than by end-users alone. While highly valuable, the scarcity and high cost of such expertise limit users' easy access, which matters because minimal reliance on ongoing external expertise is crucial for scalable and accessible interventions [69]. Yet, we know little about how to design goal-oriented work interventions to support user-led identification and setting of qualitative goals.

Drawing from human-centered design and health research frameworks for the development of interventions [64], we report the iterative co-design of a structured protocol to support user's goal identification and setting. The protocol is intended to form the foundation for a future user-led digitized intervention. Its aim is to support, as far as possible, independent user engagement in goal identification and setting. The co-design process was staged, with initial sessions to design the protocol's logic and structure. The protocol focused on the selection and sequence of a set of analogue tools commonly used in the practice of goal oriented-work (e.g., [55]), together with the specification of their duration and frequency of use. Then, the structured sequence was translated into wireframes representing a potential digital format, which were subsequently refined to enhance interaction flow and user engagement. Since most goal-oriented work tools leverage language through structured or open questions, probing reflection and introspection, wireframes are particularly suited to digitize such language-based intervention protocol through the sequence of prompt-responses interactions. Our study addresses the following research questions.

> RQ1: How might we integrate tools from goal-oriented work to design an intervention protocol for goal identification and goal setting?
> RQ2: How can the intervention protocol be represented in the digital format of wireframes?

In answering them, we followed a staged co-design process involving 26 participants, through individual sessions with 10 goal-oriented work practitioners [**P1**-**P10**] to co-design the intervention protocol and define the intervention content, followed by group workshops with 8 self-trackers [**S1**-**S8**] to explore their perception of the intervention protocol, pre-use acceptability [65] and ideate wireframes. These wireframes were refined through group workshops with 8 interaction designers [**D1**-**D8**] to improve user interaction and usability. Our contributions are as follows.

- Novel 4-week intervention protocol for goal identification and setting including the sequence, frequency, and duration of using selected tools from goal-oriented work
- Rich empirical accounts from both goal-oriented experts and self-trackers to co-design the protocol with the former, and explore its pre-use acceptability with the latter.
- Wireframes as exploratory representations of the digital format of intervention protocol
- Design guidelines for goal-oriented work technologies.

2 Related Work

This co-design study builds on the tools of goal oriented work and prior goal support research. In this section, we briefly review previous work with co-design approaches in personal informatics, origins of qualitative goal support, goal support tools within and outside of HCI, broadly captured under the umbrella of goal-oriented work.

2.1 Co-design in Personal Informatics

Co-design involves the active collaboration of designers and non-designers in the design process by sharing knowledge and embracing collective creativity [77] and therefore is beneficial for the development and outcomes of a technology [85, 87]. Co-design and participatory design approaches are now being widely used in HCI and also specifically for the design of personal informatics tools [56].

In personal informatics, co-design has been commonly practiced for generative research [76], involving participants in discussing and ideating design opportunities [36, 58, 72, 96], or also actively collaborating with them in creation of user interfaces such as mobile app screens [49, 57, 71, 78], conversational interactions [83] or data visualizations [15]. Studies have commonly carried out co-design with segments of users towards which a technology is targeted, such as specific age groups (e.g., teenagers [36]), people living with particular health conditions (e.g., autism [47]), or potential future users, either approximated through current users of a similar technology (e.g., self-trackers [83]) or those who expressed interest in a system (e.g., connected plant growth [58]). To scaffold participants in ideation, these studies are commonly accompanied by brainstorming sessions, activity worksheets, custom toolkits, personas, and storyboarding. The participants then create their designs through techniques of paper-based, digital, or physical prototyping.

For example, exploring the design space of health data representations for older adults, Cajamarca et al. [17] conducted remote co-design workshops individually with interested older adults. In the workshops, after being familiarized with the types of health data, the participants brainstormed relevant health data, ideated meaningful data representations on their selected personal objects, and were encouraged to make a figure with modeling clay which was provided to them in advance. Through their active participation, data representation concepts were imagined, discussed, and critiqued, which uncovered novel design opportunities. In another study exploring support for recovery from substance use, Schmitt & Yarosha [78] conducted a series of workshops with women residing in a care home setting. Through these workshops, authors understood participants' technology use in their current support, gathered their impressions on the utility of a few selected mobile apps, brainstormed with them on key problems and solutions related to recovery, and assisted them in sketching their best ideas as mobile app screens. The study resulted in a collection of desired functionalities for a recovery app, a greater understanding of user needs, and how they can be supported through technology.

Besides target users, co-design studies have been conducted with segments of non-primary users, including stakeholders who are impacted by a technology (e.g.: gig workers [96]), experts who can inform the design of a health-related technology (e.g. pediatrician

[72], dietitians [57], therapists [47]), and developers of a technology (e.g.: AI researchers and industry collaborators [7]). Notably, for health-related self-tracking technologies, inclusion of expert clinicians in the early stage is valued, as they can contribute with guidance on *'what to track'* and *'how often to track'* [99]. Despite the wide application of co-design methods, the inclusion of multiple stakeholders or segments of users is relatively less practiced. Such studies have reported benefits including mutual learning, opportunities for idea validation, and exercise of unique points of view [7, 47]. To manage the expectations of different team members, clarification of research objectives and participant roles was recommended at the beginning of co-design sessions [7].

In summary, co-design has been explored in personal informatics research with rich techniques for active collaboration from participants. Engaging multiple stakeholders, especially clinicians, has been recommended for their experience in clinical care.

2.2 Goal Support in Personal Informatics Prior to Goal Tracking

We now briefly review goal support explored in personal informatics, particularly before tracking a goal. HCI studies offering goal support largely focus on self-tracking of quantitative goals [56, 100] with a data-centric design ideology [56], supporting later stages of goal support such as data collection and reflection from data [32], with less than a quarter of them even considering intrinsic motivation of recruited participants in receiving a specific goal support (e.g. stress reduction) [100].

Goal support prior to tracking has earlier been limitedly theorized as *'deciding to track'* [34] with little consideration to processes involved in goal setting [40]. Furthermore, only a few studies supported this stage of goal support [32], through strategies such as scaffolded or guided goal setting. Theoretical advancements have recognized the presence of qualitative goals [66] and stages of setting goals, such as selecting a goal among multiple goals and simplifying [1]. Studies have revealed that almost all users of personal informatics, such as fitness trackers, have qualitative goals and that users generally associate *'goal'* to be a *'qualitative goal'* [66]. However, users struggle to describe their qualitative goals and even lack an understanding of their higher-level needs or motivations [66]. Further, system assigned goals often misalign with actual user goals due to lack of support for reflection during goal setting or goal changes [40].

Thus, prior work has underscored the presence and importance of qualitative goals and also highlighted issues such as difficulties in goal articulation for end users, limited current support, and complexities involved in goal setting. Although limitedly explored, qualitative goals and their goal setting have started to receive attention in HCI works [29], also including goal-oriented work [100].

2.3 Goal-Oriented Work Tools Within and Outside of HCI

Informed by health research in clinical settings, goal-oriented work involves health staff facilitating people's reflection on their goals through a range of tools for identifying, setting, and tracking goals [22, 91]. Given their recent emergence and value [55, 100], we briefly review the application of goal-oriented work tools and the related literature.

In HCI works, qualitative goals are mainly elicited through self-set approaches asking users to specify their goals directly [54, 90], participatory methods involving stakeholders such as health staff [13, 98], and scaffolded methods where the system proposes goals for selection [79, 97]. To elicit goals, one study used Little's Personal Project Analysis (PPA) workbook in their participatory design, albeit only a written exercise [16]. In another study implementing goal-oriented work for hospitalized children [98], goals were conceptualized as belonging to three hierarchical levels, and SMART criteria [26] were applied for low-level goals.

Relatively, more support has been explored for a goal has been elicited. For example, an app-based artifact designed to support career focused goals, appraised goals on criteria such as perceived difficulty, novelty, and required goal resources [90]. In other studies, self-efficacy scores and subjective goal reasons have been appraised [4, 50]. For motivating people to pursue their personal goals, AI generated self-voices have been explored [35] and motivational interviewing techniques have been applied in peer-to-peer counseling platforms [18], though the latter was delivered exclusively by people.

Beyond HCI, goal-oriented work tools have long been applied in clinical as well as non-clinical settings [44, 80, 94]. Several coaching frameworks, such as cognitive behavioral-oriented coaching, have been explored and evaluated, which resulted in improved goal attainment [94]. Common tools for goal support include miracle question, focusing on strengths, answering scaling questions, setting individualized goals, and actionable steps [44]. Unlike direct elicitation of goals from people, the miracle question [80] poses it indirectly by asking a person to describe their desired ideal day in the future. To identify a person's strengths, the Values in Action Inventory of Strengths (VIA-IS) is a questionnaire within the positive psychology framework [60, 70] to determine their top strengths from the 24-character strengths, such as curiosity, honesty, or kindness. A visualization, wheel of life [27, 48] is an exercise where a person rates their current satisfaction across life domains out of 10, with 10 being an ideal state.

Little's PPA and Emmons' Personal Strivings Assessment Packet (PSAP) [31] are detailed goal appraisal kits. These kits offer goal elicitation, appraisal of goals against more than 20 criteria such as goal importance, likelihood of success, intrinsic and extrinsic goal reasons. Emmons' PSAP also offers visualizations on combinations of goal criteria as radial charts [31]. The Eisenhower decision matrix is another such visualization made using the criteria importance and urgency, which can be used for prioritizing important goals among competing goals [61]. Goal appraisal also involves rating alignments or conflicts between goals [51] and identifying the necessary goal resources. For resource appraisal, four kinds of resources were recommended by resource conservation theory [42]. These include objects or possessions (e.g., a home), personal characteristics or traits, external conditions such as job tenure, and resources such as time and money.

For goal elicitation, recent work has found that instructions from Little's PPA have led to listing of more goals from participants while the goal characteristics remained the same [62]. The authors concluded that the name of the construct, 'goal' or 'personal project',

did not matter to participants' understanding. For setting actionable goals, commonly explored goal breakdown strategies include breaking down a main goal into subgoals [4, 93]. For goal setting, the commonly used tool SMART goals was criticized for usage as a standalone tool due to limited validity and a lack of theoretical underpinning, and an alternate tool, well-formed goal [24] was recommended, which consists of the POWER mnemonic in addition to other goal-oriented work.

To conclude, while qualitative goals have begun to receive support in HCI, and early efforts to integrate goal-oriented approaches are emerging, their use of goal-oriented work tools and interventions has been limited, and digitized interventions, which may be used without experts' facilitation, have been less explored. Collectively, the goal-oriented work tools have the potential for offering more comprehensive goal support through their integration into personal informatics technologies. We conceptualized eight of these tools in this work and co-designed a 4-week longitudinal intervention with stakeholders.

3 Curating Tools for Goal Oriented Work

From the set of goal-oriented work tools summarized above, we selected those that (i) can be digitized, (ii) can be completed through self-reports, and (iii) without the assistance of a goal-oriented work practitioner. We also wanted to identify tools with both textual and visual content to develop both a semantically rich and visually engaging intervention. For goal identification, these were goal listing from PPA [62], miracle question from solution-focused therapy [88], 96-item VIA-IS [60], and wheel of life [48]. For goal setting, the tools identified were goal appraisal from PPA and PSAP [31, 51], Eisenhower decision matrix and other decision matrices from PSAP [31, 61], goal breakdown strategies [5, 93], and well-formed outcomes [24]. All the chosen tools had a theoretical underpinning, barring the wheel of life and the Eisenhower decision matrix. We included these, given their wide usage in practice [48], and due to their visual modality, which allowed us to arrive at a mix of visual as well as writing-based tools.

We conceptualized the eight goal-oriented work tools as self-guided worksheets (See Figure 1) after adapting them for consistency and greater understanding. For instance, for the goal listing worksheet, we used the goal elicitation instructions from PPA and replaced 'projects' with 'goals', as prior work shows that readers interpret the two terms similarly [62], and to maintain consistent terminology across our tools. For the miracle question, we provided a large area for capturing detailed responses. The VIA-IS questions were presented with 5-item Likert responses. The visual tool, the wheel of life was presented with 8 life domains, and instructions were included.

For goal appraisal, we included appraisal matrices from PPA and PSAP on several goal criteria, as well as conflict and resource appraisals. In the decision matrix worksheet, the prioritized quadrant of important and urgent goals was highlighted for visual distinction. The radial charts from Emmons' PSAP [31] were also included as alternatives to the decision matrix. For goal breakdown, we included two strategies, a top-down pyramid structure (Figure 1G top) arising from breaking down a high-level or long-term goal into mid and low-level goals [93], and a bottom-up timeline approach (Figure 1G bottom), listing short and medium-term goals and then linking them to long-term ones [5]. Lastly, the POWER mnemonic (positive, own, what specifically, evidence, and resources) was presented with individual questioning with examples for facilitating the articulation of a well-formed goal [24].

4 Method

Participatory approaches are beneficial for designing desirable technologies, and the involvement of diverse stakeholders [7], including experts [99] has been recommended for their unique contributions. Following such a participatory approach, our staged co-design process involved participatory sessions with both individual participants, i.e., goal-oriented experts, and small groups workshops, i.e., self-trackers and designers. To design an expert-led 4-week intervention protocol for goal identification and goal setting, we conducted individual co-design sessions with goal practitioners to leverage their expertise in goal support, and small group co-design workshops with self-trackers as potential end-users, and with designers for their knowledge of interface design. Our study received Institutional ethics approval.

4.1 Participants

Through purposive sampling on online directories, we recruited goal-oriented work practitioners with a minimum of three years of experience in delivering goal work. The sample included 10 goal practitioners with an average of 9.7 years of practice, range 3-30 years; 8 female, 2 male, 0 other; average age: 48 years, range 24-70; all based in the UK. Self-trackers and designers were recruited through convenience sampling, with self-trackers additionally selected based on specific inclusion criteria: openness to exploring personal goals and active self-tracking of one or more goals for at least six months within the past year. These criteria were selected to represent future users of goal-oriented applications. The self-trackers comprised 7 students and 1 researcher (4 females, 4 males, 0 other) with an average age of 30 years (range: 22–53 years), all based in the UK. The 8 designers included product designers (4), user experience designers (3), and one HCI researcher with an average of 6.5 years of practice, range 3-9 years, 3 female, 5 male, 0 other; average age: 30 years, range 28-32; and based in the UK (4), India (2), UAE (1), and Germany (1).

4.2 Procedure

We conducted 17 participatory design sessions with 26 participants. These consisted of ten one-to-one online sessions with 10 goal-oriented work practitioners, and seven small group workshops (2-3 participants): three in person with 8 self trackers, and four online with 8 designers, respectively. Table 1 summarizes participant demographics, session format, and the content explored. The sessions lasted an average of 80 minutes (range 60-113), were audio-recorded, and fully transcribed. The participant tasks were facilitated using Miro for online sessions and paper-based for in-person ones. Goal practitioners and designers were compensated with an equivalent of 50 USD, and self-trackers with an equivalent of 18 USD for their time.

Participatory design sessions were structured in two parts: one focused on goal-oriented work tools, their strengths and limitations,

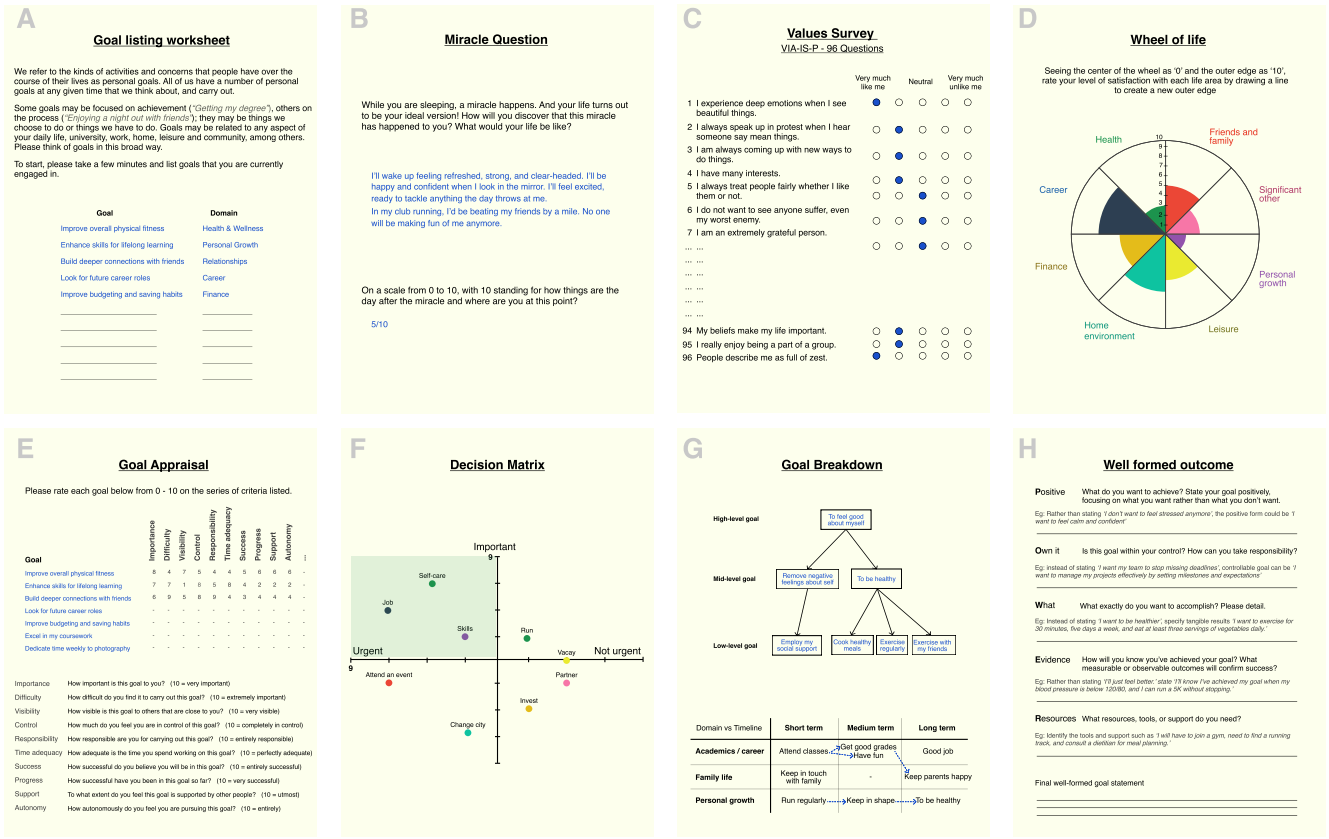

Figure 1: Worksheets for the eight curated tools of goal-oriented work adapted from the respective sources: tools for goal identification (top) consisted of goal listing (A) [62], miracle question (B) [88], value survey (C) [60] , and wheel of life (D) [48], while tools for goal setting (bottom) included goal appraisal (E) [31, 51], decision matrix (F) [31, 61], goal breakdown (G) [5, 93], and well-formed outcome (H) [24]. Only selective parts of eachworksheets are shown for illustration.

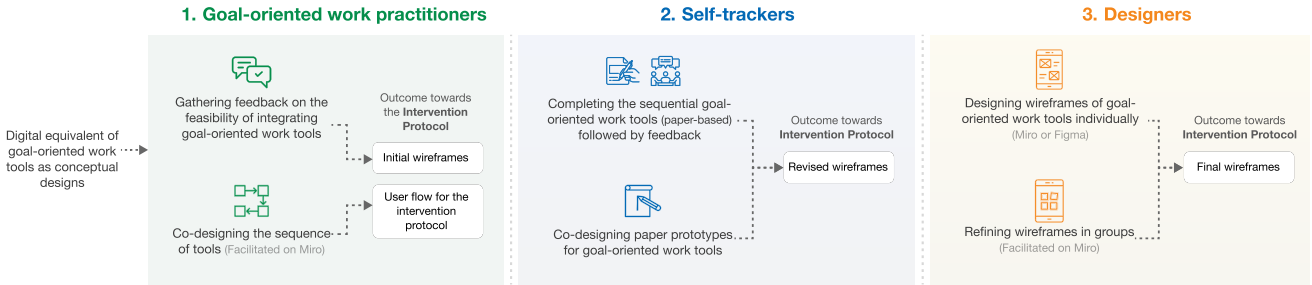

Figure 2: Overall procedure of participatory design sessions with (1) goal-oriented work practitioners, (2) self-trackers, and (3) designers conducted sequentially including main activities and generated outcomes towards the design of the intervention protocol and its web-based interface.

Table 1: Participant Demographics. Participant ID (P = Goal-oriented Work Practitioner, S = Self-tracker, D = Designer), gender, age, profession with years of experience in parenthesis for practitioners and designers, highest education level for P and D, participatory design (PD) session type and delivery format, and tools explored during the session (WoL= Wheel of life, VIA = Values survey, MQ = Miracle Question, GLW = Goal listing worksheet, GA = Goal appraisal kit, DM = Decision matrices, GC = Goal conflict matrix, GR = Goal resources, GB = Goal breakdown, WFO = Well-formed outcomes). ● denotes tools explored, — denotes tools skipped during a PD session.

ID	Gen	Age	Profession (exp. in years)	Education	PD session format	Tools explored									
						Goal identification				Goal setting					
						WoL	VIA	MQ	GLW	GA	DM	GC	GR	GB	WFO
P1	F	70	Psychotherapist (30)	Diploma	individual, virtual	●	●	●	●	●	●	●	—	●	●
P2	F	63	Counsellor (18)	Diploma	individual, virtual	●	●	●	●	●	●	●	●	●	●
P3	F	52	Coach (10)	Post-graduate	individual, virtual	●	●	●	●	●	●	●	●	●	●
P4	M	42	Coach (9)	Post-graduate	individual, virtual	●	●	●	●	●	●	●	●	●	●
P5	F	52	Counsellor (8)	Post-graduate	individual, virtual	●	●	●	●	●	●	●	●	●	●
P6	F	44	Psychotherapist (6)	Post-graduate	individual, virtual	●	●	●	●	●	●	●	●	●	●
P7	M	42	Psychotherapist (5)	Post-graduate	individual, virtual	●	●	●	●	●	●	●	●	●	●
P8	F	24	Counsellor (4)	Undergraduate	individual, virtual	●	●	●	●	●	●	●	●	●	●
P9	F	45	Counsellor (4)	Diploma	individual, virtual	●	●	●	●	●	●	●	●	●	●
P10	F	42	Counsellor (3)	Diploma	individual, virtual	●	●	●	●	●	●	●	●	●	●
S1	F	30	Student	Post-graduate	group, in-person	●	●	●	●	●	●	—	—	●	—
S2	F	25	Student	Post-graduate											
S3	M	28	Student	Undergraduate	group, in-person	●	●	●	●	●	●	●	—	●	●
S4	F	27	Student	Undergraduate											
S5	M	23	Student	Undergraduate											
S6	M	22	Student	Undergraduate	group, in-person	●	●	●	●	●	●	—	●	●	—
S7	M	53	Researcher	Post-graduate											
S8	F	31	Student	Post-graduate											
D1	M	31	UX Designer (8)	Undergraduate	group, virtual	●	●	●	●	●	●	—	—	—	●
D2	F	31	UX Designer (8)	Undergraduate											
D3	M	31	Product Designer (9)	Undergraduate	group, virtual	—	●	●	●	●	—	—	●	—	—
D4	M	32	Product Designer (9)	Undergraduate											
D5	F	28	HCI Researcher (3)	Post-graduate	group, virtual	—	●	●	●	●	—	—	●	—	—
D6	F	28	Product Designer (3)	Undergraduate											
D7	M	31	Product Designer (8)	Undergraduate	group, virtual	●	●	—	—	—	—	●	●	●	—
D8	M	30	UX Designer (5)	Post-graduate											

and one focused on using the most suitable tools to co-design the sequence of activities for the 4-week intervention. For each part, the tools for goal identification were explored first, followed by those for goal selection and setting. Figure 2 presents an overview of the co-design activities across the three stakeholders. During the sessions with goal practitioners, we presented digital worksheets of all the 8 tools (Figure 3A) and brief usage instructions, asking practitioners about their perceived strengths, challenges, and suggestions to improve these tools. For appraisal kits, we asked about their five most preferred criteria for goal selection from the list of available criteria. For goal breakdown strategies and decision matrices, we asked for their preferred version, and reasons for their preference, as well as further suggestions.

After discussing individual tools, we focused on co-designing the sequence of activities for the intervention protocol (Figure 3B) and practitioners' rationale. For this activity, we provided movable cards and allocated spaces on Miro boards, a collaborative online platform [63]. As sessions progressed, we also discussed common sequence that arose from previous one(s), and refined it with the practitioner's feedback. We also recorded their recommended frequency of each tool usage (e.g., one-time, weekly, or daily) and duration (e.g., 30 minutes), including both the minimum time required for using each tool and the ideal time for achieving the greatest gains. The sessions concluded with a discussion on the value of an app for the delivery of the intervention. For this, we asked whether a portable digital format, leveraging goal-oriented tools may be useful for end-users interested in goal exploration. We also asked what benefits a portable digital format might offer, and how user acceptability might fare. To structure the conversation, after designers shared their ideas, we also presented them with sample wireframes showing the interaction with goal-oriented work tools, for both goal identification and goal setting (Figure 3C).

Using the feedback of the practitioners, we created initial wireframes as web-based interfaces for mobile screens. These wireframes were used in the subsequent co-design workshops with self-trackers conducted in person. For this, we created paper-based activities for each tool (Figure 3D), which participants completed in under 3 minutes (per tool), to explore if they can be comfortably completed within a limited time. Then, we asked the self-trackers

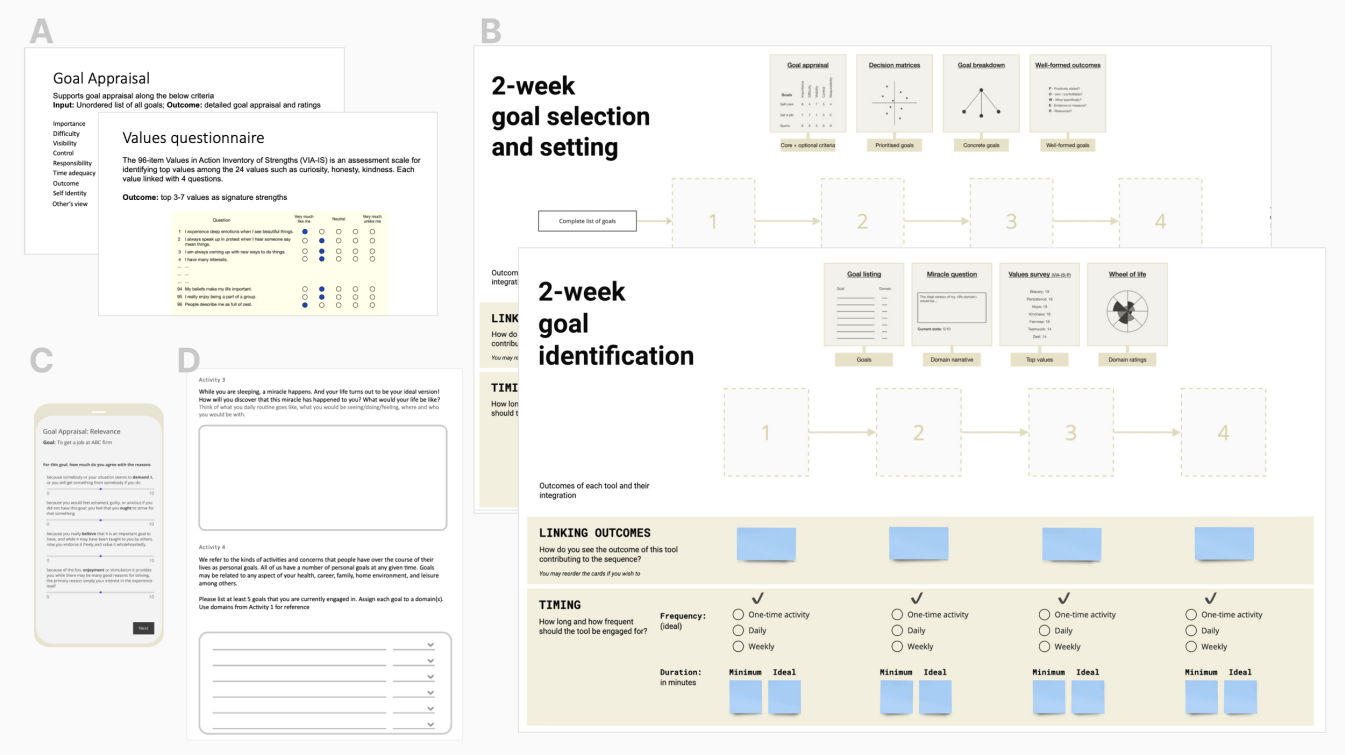

Figure 3: Material for participatory design sessions: (A) goal-oriented work tools, (B) Miro board for deciding the order of the tools presented as cards, notes for rationale, and allotting frequency of usage, (C) sample wireframes for portable web-based interface, (D) worksheet used with self-trackers.

about their pre-use acceptability, and willingness to use these tools in the future, and overall feedback. If they had ideas for the intervention's digital interface, we invited them to sketch them on paper. For the co-design workshops with designers, the overall procedure remained the same, albeit the content of activities differed: instead of defining the protocol and its temporal aspects, the focus was on wireframing for gathering ideas for the web-based interface design. Each iteration was discussed in terms of strengths and challenges towards the generation of the final wireframes.

4.3 Data Analysis

The analysis of session transcriptions was performed using Atlas.ti software [38], employing a conventional content analysis [43]. More than 700 detailed inductive codes were derived from the data following the subcoding technique [75], where primary codes categorized the data and secondary codes provided as much detail to preserve the richness of the raw data. As coding progressed, primary codes were revised, such as combining the ones with a similar category or modifying them to keep them distinct from separate data categories. Primary codes consisted of categories of participants' feedback pertaining to each tool, such as specific strengths (e.g., engaging, reflective), challenges (e.g., time constraints, difficulty in answering, absence of an expert), temporal recommendations, and suggestions to mitigate challenges.

5 Findings

All goal practitioners (10/10) agreed on the value of the eight tools for their integration into a technology-based intervention. Thus, no tool was discarded for exploration with self-trackers and designers. They also indicated the appreciation for a portable digital interface, mentioning that digital technologies can appeal to young adults for their ease of access, pervasiveness, familiarity, and technological capabilities such as goal tracking and progress reminders. Practitioners also pointed out that in addition to the traditional paper-and-pencil format, digital technologies can guide users' goal-oriented work with contextual help and support for goal ideation.

5.1 Temporal Aspects of Intervention Protocol: Tool Sequence, Frequency, and Duration

This section summarizes the temporal aspects of the intervention protocol, namely the sequence of tools, their frequency, and duration of use, informed by goal practitioners, for both goal identification, and goal setting.

5.1.1 Goal identification: Tool sequence. We found common patterns in the recommended sequence for tools for goal identification. As the first tool, practitioners suggested either wheel of life (7/10) *"to introduce important life domains"* [P7], or the values questionnaire (3/10) for exploring oneself, *"key parts of my existence that are non-negotiable"* [P4], *"authentically who you are"* [P10]. Miracle

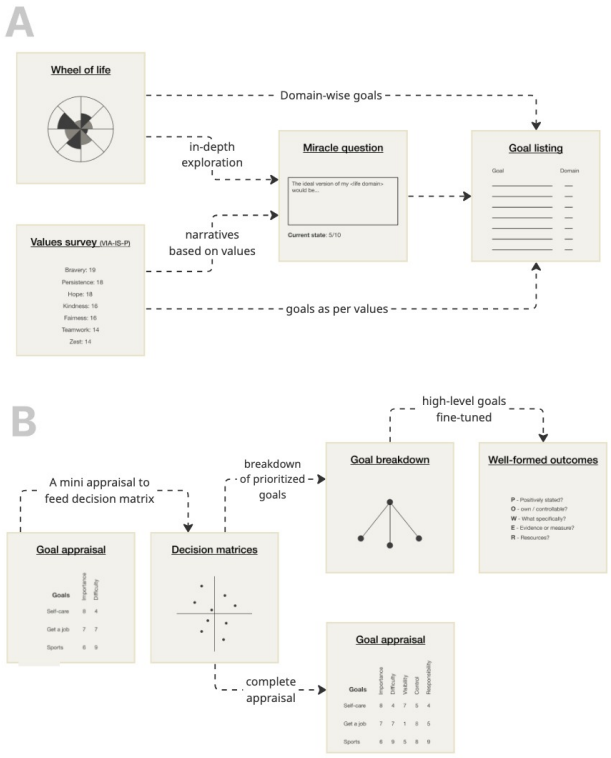

Figure 4: Tool sequence co-designed by practitioners, from left to right: (A) Sequence for goal identification, (B) Sequence for goal setting.

question was linked to the outcome of values questionnaire *"an opportunity for me to create a narrative of those values based on what I would really love"* [P4], and life domains of wheel of life *"how they would like things to be in each life area"* [P6]. Goal listing was commonly recommended to be the concluding tool for this stage (8/10), *"I know what exactly I want because of this whole process"* [P3], and was linked to all the other tools, *"you can look at goals for each one(domain)"* [P7], *"gather goals from responses to miracle question and doing values also helps them identify their goals"* [P1].

We generated an emerging common version of the sequence, refined in subsequent sessions by incorporating practitioners' ongoing recommendations. We attained a stable sequence after 5 participatory design sessions, which is shown in Figure 4A. All practitioners agreed that either the wheel of life or the values questionnaire can begin the goal identification. They suggested an extended activity for goal listing, where goals were mapped to the life domains and the identified values of the person, *"to find out which of their values the goal is in alignment with or whether the goal is backed up by their values"* [P2]. Further, they also suggested modifying or discarding goals based on this mapping tool, *"if a goal doesn't align with their values, it is not really their goal"* [P3].

Goal identification: Frequency and duration. Findings indicate the cognitive demand of goal identification and the importance of scheduling the use of the tools over a few weeks. This is due to both the number of questions presented by each tool and the reflection needed to answer them. With the exception of the goal listing tool, the other tools of goal identification were recommended to be accessed only once for end-users (8/10). Practitioners justified this by noting that personal values, life domain satisfactions, and ideal narratives are relatively stable constructs and, therefore, unlikely to change over short periods of time. For goal listing, weekly frequency was recommended to add or revise goals (8/10), *"somebody might be in a different space after a week's time"* [P6], *"if they would like to adapt any"* [P8], *"because people always forget things"* [P2]. Practitioners considered the wheel of life to be a short task, requiring 5–10 minutes, and the rest of the tools to be longer, requiring anywhere from 15 minutes to 2 hours. For these, they recommended breaking down the tasks into manageable amounts, spread over 10 to 12 days, for instance, by focusing the miracle question on a specific life domain each day.

5.1.2 Goal setting: Tool sequence. The goal setting tools take as input the complete list of high-level goals discovered with previous tools, in order to identify the current most relevant goals that the person is ready to pursue. Several practitioners (8/10) suggested appraisal kits and a decision matrix to be the initial set of tools for goal setting. The decision matrix was recommended to attain prioritized goals and, to enable this, a mini-appraisal was suggested, such as to gather importance and urgency criteria ratings for all goals, *"feeds onto the decision matrix"* [P4]. A detailed appraisal was then recommended for these selected goals, *"initially on one level, you're appraising yourself, and of the second part of it, you're appraising the outcome of your understanding of your goal"* [P1]. Many practitioners (7/10) have also suggested well-formed outcomes as the concluding tool *"because it feels like the most detailed that you can go into planning that goal"* [P8].

For this stage, we attained a stable co-designed sequence after participatory design sessions with seven practitioners (Figure 4B). Goal breakdown was recommended for the prioritized goals; as it can support users define well-formed outcomes of their high-level goals: *"the process of breaking down the goal will help you to understand more about the direction you're moving in"* [P1]. The detailed goal appraisal tools were split into goal criteria appraisal, conflict matrix, and goal resources.

Goal setting: Frequency and duration. Goal setting tools were predominantly recommended to be answered only once (9/10 practitioners), in order to decide a prioritized set of goals, and to move forward with pursuing them. While mini-appraisal, decision matrix, and well-formed outcomes were considered to be shorter tasks, each requiring 5–10 minutes, the detailed appraisal aspects and goal breakdown were considered complex, requiring up to 60 minutes. To make the latter tasks manageable, each of the 3 prioritized goals was recommended to be individually appraised. Furthermore, many participants (5/10) also suggested revising subgoals or target outcomes on a weekly or need basis: *"it would be beneficial to revisit the goal breakdown weekly because sometimes when we set goals and we break them down, barriers can get in the way"* [P10], another participant noted that is important *"to see if the goals changed or there was something going on"* [P6]. Therefore, for our intervention, we considered a week-long goal setting, followed by a goal pursuit week to support revisions of the set goals, if needed.

5.2 Digital Format of Intervention Protocol

We now present our detailed findings on participants' feedback with respect to each tool. We also include the co-designed wireframes for tools where major changes were made in relation to the digital version of worksheets provided to the participants. An overview of the findings from practitioners and self-trackers is presented in Table 2. The tools are presented in the order of the above recommended sequence of the intervention.

5.2.1 Wheel of life. Practitioners noted the wheel of life's appeal due to its engaging visual format *"people very much like visual stuff"* [P5] and ease of use, *"clients can just scale domains from 0 to 10 easily... It's really effective in my practice"* [P6]. Three practitioners expressed concerns regarding the tool focusing on users scoring their satisfaction level with each life domain: *"cannot get too reliant on the scores"* [P3], rather than on the relative satisfaction across domains, suggesting, instead, an abstract sense of balance among life domains: *"where you feel strongly and where you don't"* [P4], *"almost to show what's missing"* [P5]. Therefore, within the design of the wheel of life wireframes, the satisfaction scores for each domain is not shown, only relative scores as percentages.

Upon trying the tool (paper-based), self-trackers found it reflective (6/8), *"a first-stage understanding about myself"* [S4], *"understand what all areas of life one should strive to improve"* [S2] while being simple (4/8), *"easy and very quick to use"* [S5]. For the tool, we chose a set of eight life domains (Figure 1D) [48]. However, many self-trackers (5/8) preferred having custom domains. While three denied requiring any customization due to the holistic nature of the chosen domains: *"It would ruin the experience as I would then set a few specific pies like kickboxing, jogging, than the broader areas like career or family"* [S6], others preferred the option to customize as well as persona-based templates (2/8) such as an undergraduate student, or customization limited to one domain (2/8), such as adding a domain on *"fulfillment or life meaning"* [S7] or replacing any inapplicable domains (e.g., 'significant other' for single users). User group based templates and subtle customizations of life domains can be useful to scaffold users' holistic thinking while allowing also for personalization. Notably, life domains are established by studying specific user segments such as age groups or cultures [20].

Designers and self-trackers imagined the interface for taking the input of user satisfaction as sliders. Further, designer D2 suggested dynamic emojis to display the satisfaction ratings.

5.2.2 Values survey. Nine of the ten practitioners found personal values to be important for identifying personal goals: *"values inform everything - without understanding who you are, life will drift"* [P4]. One practitioner exemplified this insight through the lens of goal misalignment that can hamper intrinsic motivation:

> *"Goals need to be based on our values...If you can't fulfill your values then you don't deeply want to have that goal. There will be an inner resistance to it...Say your goal is to work to earn loads and loads of money, but you mainly value compassion or kindness, and find meaning in life through helping other people rather than having a successful, fruitful career. Those two things don't align and there will be resistance ."* [P2]

Practitioners (9/10) recommended verifying the alignment of goals against the person's top values, particularly checking for misalignments. Despite its relevance, four practitioners highlighted the length of the questionnaire as a key challenge: *"they might look at it and go: I can't be bothered"* [P9].

To address the concern with the questionnaire's length, most practitioners and self-trackers (13/18) agreed to breaking down the 96 items into clusters of smaller sets, while the rest were unsure *"it's easier for me to have a burst motivation than to have it sustained each day"* [S6]. To support this, a self-tracker recommended the option to finish more clusters while allowing them to save the progress (S6, Figure 5). A practitioner suggested prompting users to respond instinctively: *"ask them to fill quickly out of gut instinct"* [P3].

Self-trackers found the tool to help in reflection (3/8): *"think about who I am"* [S4]. Designers recommended presenting only a single question at once, with progress indicators (D2, Figure 5) to help users focus on the specific item at a given time. Self-trackers found some terms unclear, for which clarification with help text or similar assistance was deemed to be useful. A self-tracker mentioned that some questions felt uncomfortable: *"too specific and a little negative at times in judging personality"* [S5]. However, the VIA survey is a validated questionnaire [60], and altering its items will hinder validity.

5.2.3 Miracle question. Practitioners (5/10) opined that answering the miracle question can be engaging for users, *"people love to write about their ideal lives"* [P10] and can aid in thinking, *"the bigger thinking, it helps with identifying actually what do I want my life to be like"* [P4]. They also highlighted the associated challenges, such as writing unrealistic narratives, *"you don't have to be attuned to what's happening, you could just kind of make anything up"* [P9]. To mitigate this, although unable to be enforced or verified automatically, instructions were recommended, such as *"it's helpful to you if you can be honest"* [P9]. Further, four practitioners highlighted that the concept can be challenging, *"could be a difficult concept to get your head around"* [P1]. For this, they suggested allowing for expansion of responses, such as, by domain specific narrative elaboration (6/10) *"focus on a specific life domain"* [P7] and including instructions (3/10) clarifying the emphasis on self, *"this is not a generalized question, it's really about you"* [P8]. Two practitioners suggested removing the scaling question from the activity, *"if you number everything then, that will appear less emotional to them"* [P1].

Concerning the length of response, overall, a minimum 100-word response was recommended to nudge self-reflection of ideal future narrative with provision to write multi-page narratives, *"it's a creative exercise, it'd be nice if it's not restricted"* [P2], *"Some people like to write a lot. Some people write little. I think if you go for a minimum of 100 words, you are going to get something that comes from that in terms of being able to work with."* [P10].

Several self-trackers found the tool interesting (4/8), *"it was a dreamy exercise"* [S2], and reflective (3/8), *"made me think about things on a bigger scale than usual"* [S7] but demanding (3/8), *"fun to write and imagine but a lot of writing wears me out"* [S6] and particularly difficult to start answering (1/8), *"too much starting effort, I wouldn't do it if I wasn't pressured to. But once I tried it, it was super engaging"* [S5]. In their short responses to this tool, participants expressed their ideal day narrative with their desired fitness

Table 2: Overview of participant feedback for each tool, including themes of strengths and challenges reported by goal practitioners (with frequencies), the number of self-trackers willing to use the tool in the future, their average rating of perceived interest in using the tool (1–5 Likert scale), and themes identified from self-trackers.

Tool name	Goal practitioners (n=10)		Self-trackers (n=8)			
	Strengths	Challenges	Will. use	Int. (/5)	Strengths	Challenges
Goal Identification						
Wheel of life	engaging visual (5), easy exercise (2)	unreliable scores (3), recency bias (1)	8/8	4	reflective exercise (6), simple exercise (4)	fixed set of domains (2)
Values questionnaire	links to goals (9), assists in understanding self (4), stable responses (1)	lengthy survey (4), terms can be unclear (1)	8/8	3.3	*10-item version*: reflective (3), quick (2)	unclear terms (1), judgmental tone (1)
Miracle question	engaging to write about ideal self (3), higher-level thinking assists in goal identification (2), easy exercise (2)	difficult concept (4), unachievable goals can crop up (2)	7/8	4.1	interesting exercise to think about ideal self (4), reflective (3)	reflection was demanding (3), difficult to begin with (1)
Goal listing worksheet	Appropriate to list goals by life domain (6)	difficult under time pressure (1), bias to concrete goals (1)	8/8	4.4	reflective (2), important (1)	unclear whether immediate or life goals (2)
Goal Setting						
Goal appraisal	important to appraise goals (4)	unnecessary depth in appraisal (2), tedious task (2), unclear terms (1)	6/8	3.2	helpful for realizing priorities (3)	lot of thinking (2), lack of confidence in the reported answers (1)
Decision matrix	self-explanatory visual (3)	-	6/8	3.2	clear categorization (3)	overlapping criteria (3), disagremment on deprioritized quadrant (1)
Goal conflict matrix	useful to realize any goal conflicts (4), informs goal importance (1)	can be a tedious task (2)	1/3	2.3	useful to realize any goal conflicts (1)	could not find relevancy to goal setting (2)
Goal resources	resources are necessary for pursuing goals (4)	-	0/3	1	-	confusing (2)
Goal breakdown	*Pyramid*: clear visual (4), *Timeline*: clear visual (2), for long term goals (1)	*Pyramid*: -, *Timeline*: overload (2)	6/8	3.7	*Pyramid:* helpful in ideating (5)	*Pyramid:* difficult exercise (2)
Well-formed outcomes	clear steps (3)	-	2/3	3.3	useful to set specific goals (2)	difficult for some goals (1)

levels, environmental surroundings, social circles, and healthy daily routines.

To support an immersive imaginary exploration through a web-based interface, three participants suggested having multi-modality input such as, speaking, typing, or visualizing their narrative with images (S2 & D4, Figure 5) which can be a more involving interaction for users.

5.2.4 Goal listing. All the practitioners (10/10) found the domain-associated goal listing (e.g., health, career) applicable for probing several goals across life domains, *"help explore different areas of their life, if they have got a goal that they want to have a look at"* [P6]. Four practitioners emphasized that users should be free to pick or leave any domain. Four practitioners highlighted the challenge of listing only the goals that are on the top of the mind and not retrieving other important goals due to time pressure, *"often you have goals that are quite obvious that have already been in your mind, but if you haven't reflected, you might not realize that there's lots of other things that you haven't even thought about"* [P2]. For this, practitioners recommended allowing adding any new goals at a later stage to facilitate extended reflection over several days.

All self-trackers managed to enter a minimum of three goals and felt that the previous tools helped them to list their goals easily. They found the tool helpful and important (4/8), *"helps summarize goals"* [S7], *"it gives space for idea generation"* [S8], *"super-important to write your goals"* [S5]. Two self-trackers were unclear whether to list immediate tasks or longer-term goals, which informed us to clarify tool instructions on the preference for writing long-term or broad life goals over immediate low-level goals.

Given the recommendation for checking (mis)alignment of goals against the person's top values, we explored its interface design with designers. A designer (D4, Figure 5) achieved this by displaying alignment (green) or misalignment (red) as value tags on the listed goals.

5.2.5 Appraisal kits. Among the most preferred criteria were 'goal importance' (8/10) *"by rating importance of what all they want to achieve, they'll know where to focus"* [P7], 'goal reasons – 4 categories' (6/10) *"knowing why they want to do something will help*

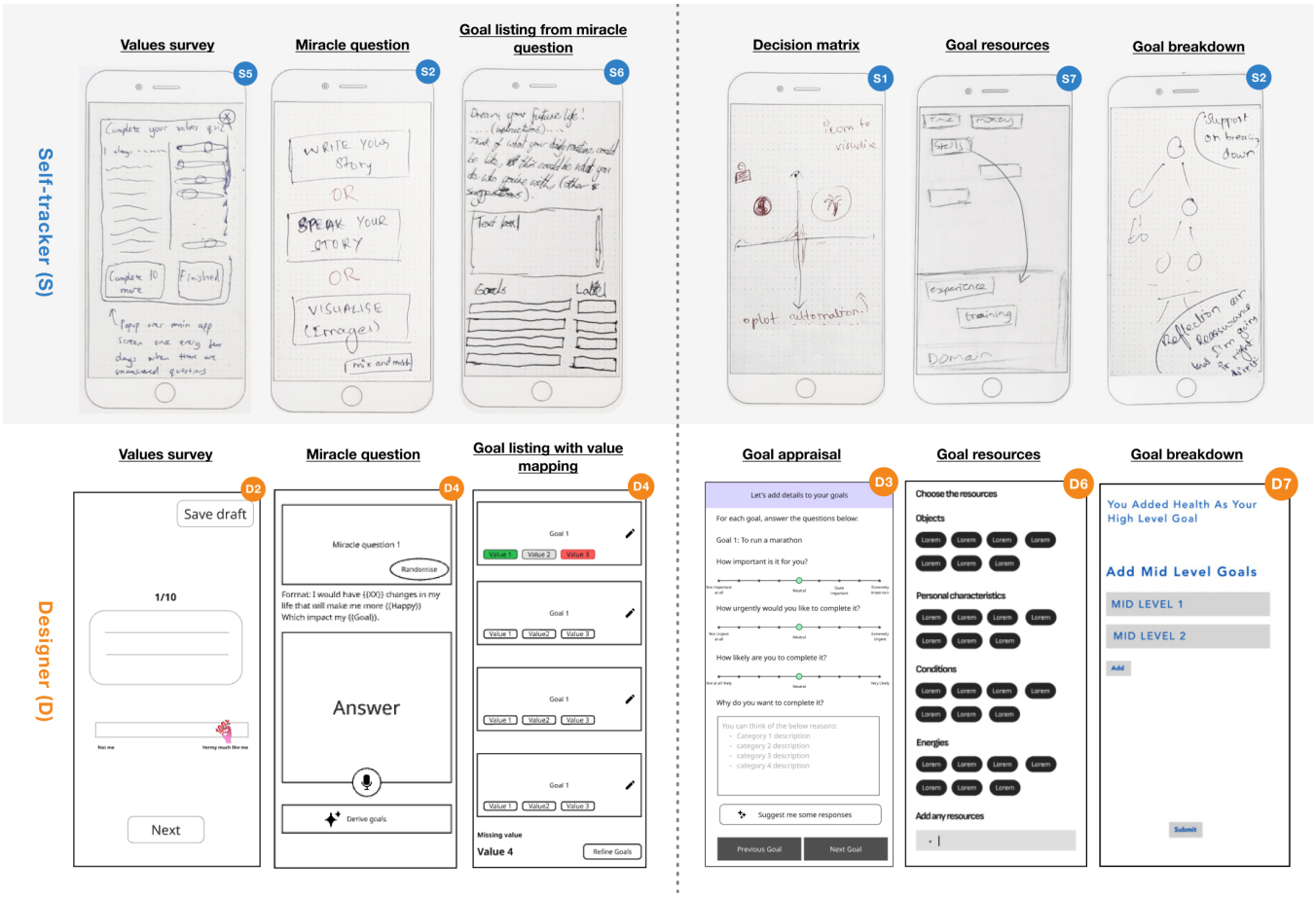

Figure 5: Co-designed wireframes for goal identification (left) and goal setting tools (right): paper prototypes ideated by self-trackers, and wireframes made by designers. Participant IDs are tagged in the top-right corner for each design.

with commitment" [P8], 'commitment' (4/10), *"how committed are they to this goal among everything else in their lives?"* [P2] and person's 'control' on their goal (4/10), *"you can achieve it only if you can control it"* [P5]. Despite their usefulness, practitioners (4/10) mentioned that rating goals on several criteria will be overwhelming for users *"even doing a set of 5 criteria is overwhelming"* [P3]. Criteria related to resource adequacy (such as time and skill), and success prediction were also observed, albeit with caution to be applied as ratings *"these are judgmental, which may interfere with positivity"* [P1]. Practitioners emphasized linking appraisal with action, *"because all a client is interested in is here is my goal, how can I get there?"* [P2].

Self-trackers have attempted the shorter version of the appraisal kit with 5 criteria, but still found the tool to be less appealing compared to the previous four tools. They found the tool useful *"helpful for prioritizing"* [S1], but demanding and even unreliable, *"I got confused, I might even put a different rating an hour later"* [S2].

For taking the input of goal appraisal, designers ideated interfaces with sliders for rating scales, a text box for free flow answers (D3, Figure 5), or draggable items for ranking goals.

Based on practitioners' feedback and the self-trackers' limited use, we refined criteria for goal appraisal. Since 'control' was deemed a necessary criterion to proceed with goals, we added instructions to the previous goal listing tool, asking users to generate only goals they had control over. For simplification, the four goal reasons were put together, and users were asked to pick a main reason type. For goal resources, instead of ratings, we relied on a separate tool which appraises specific resources (i.e., 5.2.7).

5.2.6 Decision matrix. The practitioners preferred the Eisenhower decision matrix for usefulness and straightforward visual over the other visuals, such as radial charts on PSAP criteria, for being complex and subjective *"too complicated"* [P6], *"an awful lot is happening in appraisal kits to put them into a realistic visual that can mean something"* [P7].

While many self-trackers (5/8) agreed with their results of prioritization and found the tool useful *"clear categorization"* [S7], others (3/8) found the criteria overlapping, *"I tended to factor in urgency into the importance"* [S5]. Due to this overlap, we asked participants to decide their goal prioritization order based on 'importance' ratings alone.

5.2.7 Goal resources. All the practitioners agreed for end-users to appraise the four kinds of resources from the Conservation of Resources theory [42], such as personal characteristics and energies.

However, the self-trackers who tried the tool (3/3) expressed that they wouldn't be willing to use the tool in its current form. They found the categories confusing: *"I was confused about what I would have to put in... perhaps it's the prompts, energies as a group of resources is too abstract"* [S6], *"I'm not sure what I'm doing here"* [S7]. Instead of the categories, self-trackers preferred listing all resources: *"If you ask me what resources do I need for my health, I can give you them"* [S7] and felt that any scaffolding from the system can be useful. They suggested prepopulating a pool of resources (S7, Figure 5) based on a goal domain or topic which the users can then pick and appraise details on whether they possess or lack a resource and reflect on how they can meet the requirement.

Designers replicated the same interaction of choosing resources from a pool of prepopulated resources. A designer recommended having the categories of resources as separate entities: *"dividing into sections actually helps in easily going through, it gives a visual balance"* (D6, Figure 5).

5.2.8 Goal conflict matrix. Goal conflict matrix as a part of detailed goal appraisal was valued, but two practitioners have pointed out that the detailed rating is tedious and suggested a simpler version of cross-checking and reviewing any misaligned goals for a chosen goal, *"just read through your goals and reflect on if any of those goals might not be in alignment with the other goal. I think that sort of depth will be enough"* [P2].

Two out of the three self-trackers who attempted the tool opined that they wouldn't be willing to use it in its detailed format as they felt a lack of relevancy, *"I don't think these (ratings) are relevant, I feel like a simple priority list is enough for me to balance my goals"* [S5], *"not sure what is the goal of doing this"* [S4]. This points to the necessity of linking the tool to the overall outcome of goal setting.

In line with this feedback, we revised the conflict matrix tool by linking it to conflicts in limited personal resources, such as one's time or money, which will have been appraised and visualized directly without any additional input or ratings from the end-user. Designers visualized the split of a goal resource across all goals using pie charts and packed bubble charts with an option to select a different goal resource.

5.2.9 Goal breakdown. Practitioners mostly (7/10) preferred the pyramid structure from high to low-level goals to appeal to a wider audience *"easier to read"* [P5], *"can be received by anybody"* [P10], *"pyramid look can help you see how things cascade"* [P2] whereas the timeline based breakdown received mixed responses for its overload of all goals in one visual *"wee bit confusing in a way"* [P5], *"looks very scientific"* [P10]. Following this recommendation, we explored only the pyramid breakdown with self-trackers and designers.

While many self-trackers found the pyramid breakdown helpful for brainstorming subgoals (5/8), others found it difficult due to the reflection involved *"It's a deep exercise, I have difficulty in breaking down... I myself, don't have clarity with this goal"* [S2], *"I wouldn't want to be forced to do this for every goal"* [S5]. Therefore, end-users may need sufficient time and clarity to proceed with goal breakdown. We found that half of our participants (4/8) struggled with their attempt. Instead of hierarchically breaking down their high-level goal into mid and low-level goals, two self-trackers listed several tasks (or low-level goals) one after the other. In their cases, the chosen goal was either already a low-level goal, *'read a research paper for an upcoming study'* [S3], or was entirely new to the person, *'build a side hustle'*. Another self-tracker found the subgoals to be duplicating *"I put the same subgoal here again and I was stuck"* [S8] which emphasized the necessity of having mutually exclusive goals at a level. Therefore, contextual help or reference can assist the end-users in goal breakdown. Self-trackers expected the pyramid structure of subgoals to be replicated in digital interface (S2, Figure 5) but this was limitedly achieved by designers (D7, Figure 5).

5.2.10 Well-formed outcomes. All practitioners found the demonstration of the POWER criteria with examples to be useful for forming a well-formed goal. The five criteria include positive framing of the goal, ensuring the goal is under one's control, specifying a pathway, evidence, and resources.

Two of the three self-trackers who detailed their goal with the five criteria stated the tool to be useful, *"helpful for people who find it difficult to set a clear goal"* [S4] but one participant attempting it on their subjective goal *'being close with friends'* was unsatisfied with their listed outcome *"issues with trying to cram any possible goal into a few specific boxes... I wrote [pathway] I want to initiate a new activity with two of my friends once a week but I don't mean it, it sounds funny"* [S5]. This showed that users can lose interest in goal-oriented work if they are forced to set specific outcomes, particularly for more abstract goals without clear means of achieving them. In contrast, participants with more quantitative goals, such as *'lose weight'*, found the tool highly relevant by rephrasing their goal as *'I want to be more lively by staying active during the work hours'*. Therefore, the criteria specification can be considered as an optional aspect.

6 Discussion

Informed by participatory methods commonly employed for designing personal informatics systems, we conducted co-design sessions with three stakeholder groups to investigate how to design digital interventions for goal exploration. From previous work (e.g., [55, 100]) we identified a set of basic tools for goal-oriented work which we used to co-design a structured, 4-week intervention protocol for goal identification and goal setting (RQ1). We also co-designed protocol digital representations for a web-based interface using wireframes, and explored their merits and drawbacks with our three stakeholder groups (RQ2). Thus, our work focused on the initial two stages, i.e., Integrate and Design, of the IDEAS framework for the development of interventions [64]. We *integrated* insights from previous work on goal-oriented tools and their value for effective interventions for behavior change technologies [100], and through 17 participatory design sessions, we iteratively *co-designed* the intervention protocol and its web-based interface, focusing on intervention logic and interface pre-use acceptability. Future work will focus on the Assess and Share stages [64], through formative *evaluation* of the effectiveness of the technology-based intervention in naturalistic settings, and on *sharing* it through open access.

We now reflect on our main findings in relation to our research questions. Our study highlights key insights for the design of goal identification and goal selection protocol: exploring multiple goals,

across multiple life domains, and accounting for their temporal aspects. Each of these extend the state-of-the-art of personal informatics systems for behavior change, as further discussed.

6.1 Practice-informed Tool Selection for Goal Identification and Goal Setting Protocol

Prior research in personal informatics has identified users' problems for articulating their goals [66]. Furthermore, the dominant view prioritizing single goals has been critiqued, with more recent work arguing for the value of considering multiple goals for behavior change technologies [29, 100]. Emerging work has focused on multiple goals from a single, specific life area, such as physical health [79], mental health [1], or career [90], rather than from multiple goals across different life domains. To better resemble multiple goals across domains, the tools of goal-oriented work open up a design space for offering and customizing goal support, which can be applicable to any life domain. Our proposed sequence of goal-identification tools can assist users to list their main goals across life domains, while the goal-setting tools can help them identify a few prioritized goals which can be converted into actionable quantitative goals. Our findings also indicate the value of extending intervention protocol over 4 weeks, with a well-defined, structured sequence of tools. The intervention protocol supports focused exploration of self-relevant goals, goal prioritization, and also by iterative movement between qualitative and their quantitative goals, and consideration of goal feasibility.

Focused self-exploration. To support deep self-exploration, tools such as value identification, and the miracle question are particularly useful, as they prompt users to reflect on their ideal life narratives. Users can also be encouraged to set goals based on their identified personal values and motives. For eliciting goals belonging to specific life domains, reflective exercises such as miracle questions can be focused on specific domains (refer Figure 6 left), asking one to imagine their ideal future self. Recent HCI work has started to explore characteristics of the ideal self, for instance, through technologies such as AI-generated self voices [35], or synthetic selves in VR [21]. Such technologies can further leverage qualitative goal identification tools such as the ones explored in our study, to identify aspects for self-improvement, target references of ideal selves, and visualize future narratives.

Priority assessment. For a quick exploration of one's goals, tools such as the wheel of life, answering a generic miracle question, and goal listing can be applied. Then, for prioritizing their goals, we recommend tools such as a decision matrix with customized criteria for goal prioritization. These tools support the identification of one's most prioritized goals, albeit only from those initially elicited. User sessions can be conducted with such tools to support a bird's eye view of one's life with emphasis on the user's interests (e.g., [16]).

Moving between goal levels. Personal informatics researchers have argued for the need to connect short-term goals to long-term ones and intrinsic motivations for sustained engagement [29, 100]. To reflect on the value of the user's quantitative goal, customized miracle question or probing questions (e.g., [50]) can be asked. Furthermore, to convert a long-term qualitative goal into short-term actionable and trackable quantitative ones [66], tools such as goal breakdown, and well-formed outcomes can be used.

Realistic goals. Personal informatics research noted the intention-behavior gap, arising from resource constraints which can lead to relapses to previous habit when reality strikes instead of continuation of goal pursuit [56]. Although individuals may be limited by their ability to identify and assess constraints, self-assessment of the goal achievability is an important direction, which needs to be explicitly explored. To identify whether a goal is realistic and achievable, tools such as those for appraising the necessary goal resources can be beneficial, followed by estimating the likelihood of success of the goal in near future. Missing goal resources can be framed as a set as subgoals for accessing such resources, which users can work on. In case of unattainable resources, external support may be required, or otherwise, the goal can be revised or paused for later pursuit.

6.2 Extended Goal Exploration

Another key finding regards the temporal aspects of the goal identification and goal setting intervention, such as the sequence of tools, their frequency, and the duration of usage. Together, these aspects highlight the importance of the extended goal exploration through multi-sessions over 4 weeks.

Our findings indicate that goal identification and setting are not trivial. Indeed, as a metacognitive task [101], self-reflection is challenging; it requires emotional space, time, cognitive effort, and willingness to engage in [8, 11]. Prior work has highlighted the importance of supporting self-reflection at appropriate moments, and suitable contexts in one's daily routine [10, 19, 29]. We suggest that similar requirements are also relevant for supporting sustained engagement in goal-oriented work. Hence, we argue for the iterative, extended goal exploration, as described in our 4-week protocol.

In turn, this allows for extended goal identification, supporting users to reflect the main goals within each applicable life domain. As suggested by most of our participants, large value surveys need to be broken down into clusters so that goal identification can be distributed over time for reduced burden and deeper exploration. While it is possible that users may engage more with some life domains over others, we argue that users benefit by exploring each domain to identify their overall interests. For a reliable set of applicable life domains, established goal domain taxonomies can be used [20].

During extended goal setting, users need to prioritize goals from a larger set of identified goals, using several main criteria, such as goal urgency. Then, for each prioritized goal, goal setting involves aspects such as appraising goal resources, working on initial goal breakdown, or completing goal articulation. Over time, goal setting for all prioritized goals can be completed. As breaking down a complex qualitative goal may itself require several weeks [1], users' work towards this can benefit from being scaffolded. For instance, to support identifying actionable low-level goals, we can think of leveraging personal informatics systems that allow iterative hypothesis testing [8] and self-experimentation for end-users [46], or systems that offer low-level goal suggestions (e.g., healthy diet [33], emotional wellbeing [97]). We can also imagine the use of systems that support collaborative goal setting (e.g., expert guidance [98], parent-child collaboration [68], peer support [81]).

Another argument for extended goal exploration comes from prior work on longitudinal use of personal informatics systems showing that goals evolve over time as a result of goal engagement [30, 79]. Self-tracking of quantitative goals offers an accurate understanding of one's current state in relation to their target state. This can inform person's self-efficacy in goal achievement, thereby fine-tuning that goal (e.g., lowering target state [4]) or switching to a new goal (e.g., if accomplished or deemed unachievable). This suggests that goal progress may prompt users' reflection on goals at different levels of abstraction including both quantitative [10] and qualitative goals [79]. Moreover, for goals pursued over longer periods, changing life contexts, routines, and one's roles are known to impact these goals and their priorities [30]. Therefore, extended goal exploration protocols can support such challenging goal scenarios.

6.3 Implications for Design

Our findings inform four design guidelines for future technologies intended to support goal identification and goal setting.

6.3.1 Support identification of ambitious but realistic goals. Goal-oriented work is not trivial, especially for novice users. Activities such as exploration of ideal future self, or planning one's important goals is challenging both cognitively, i.e., attention and processing capacity [3] as multiple goals compete for resources [39], as well as emotionally, i.e., negative affect [37] and complex emotional trade-off due to goal conflict [59]. To address such challenges and support ambitious (meaningful and nontrivial), we can imagine interfaces providing prompts for deeper reflection. For instance, our practitioners suggested allowing time for such reflection: *'please take your time to mull these over'* and suspending premature judgment *'all goals are valid'*, or *'world is your oyster and no one is judging you'*. For this, we can draw from HCI research on reflection [12], slow technologies [67], as well as mindfulness [23] to better inform the design of future goal technologies. Moreover, to support identification of realistic goals and self-narratives, is important to ground this process into practical realities [56]. For instance, to help users adhere to realistic settings, we can leverage gentle prompts such as those suggested by practitioners *'it will be helpful to you if you are honest and practical'*. Thus goal technologies could balance the exploration of ambitious goals, balanced by reality checks pertaining to resource constraints such as time [95], or money [2], as well as other prioritized goals. For emotional challenges, we can also draw from growing HCI research on affect regulation [45, 86].

6.3.2 Structured and customizable support for goal-oriented work. Our findings indicate that all participants greatly valued easy to use tools, structured through accessible, simplified templates which do not add unnecessary cognitive load. This aligns with prior work [29] which cautions against overburdening users during goal setting processes. Our approach, informed by the IDEAS framework, focusing first on the experts' co-design of the intervention protocol [64] and the specific tools, was particularly useful. This approach allowed not just the specification of which tools are to be used, but also how, in terms of temporal aspects such as sequence, frequency, and duration. When translated into wireframes, these aspects become simplified to ensure usability and pre-use acceptability. Simplified formats, such as a breakdown of values survey and selective appraisal of goal criteria, are preferred over lengthy and complex original versions. Tools such as the miracle question can offer custom hints to probe different tenets of the future self. Similarly, clarifications of terminology (e.g., personal values or goal criteria) and offering references, such as during goal formulation can assist users in responding accurately.

Our findings also indicated the value of supporting users' autonomy as a core ethics principle [9]. For this, we can support user defined life domains [20], or additional goal resources [42] for each domain (e.g., fitness, career). Such tool customizations could also support increased engagement.

6.3.3 Allow iterative goal revision. Goal setting is an ongoing, evolving process [1, 30, 34, 66] supported by constant reflection. Thus, users can benefit greatly from the support to revise their goals over time. For instance, the miracle question can be revisited after setting low-level goals, to confirm the set of identified goals, or to identify new ones. Similarly, any decided order of importance for the appraised goals can be allowed to be modified as user priorities can change over time [30]. Therefore, most outcomes of goal-oriented work can benefit from being open to revision and evolution over time.

6.3.4 Reduce reliance on quantitative tools. An interesting outcome is that many goal-oriented work tools tend to include numerical measures such as appraisal scores and Likert scale responses [31, 52] which participants dislike due to perceived over-metrification and reductionism. While some degree of numerification is necessary for goal setting [66], there is a clear preference toward open-ended questions that allow users freedom to report their answers. Therefore, future goal-oriented technologies could leverage tool templates which reduced numerical scales and prioritize open answers. Redundant ratings across tools can also be eliminated, and unnecessary complex measures, such as a goal conflict matrix, can strongly benefit from simpler forms.

To conclude, our findings indicate the cognitive burden of goal-oriented work, which our study participants mentioned as a potential challenge for engagement in goal-oriented work. The above design implications mitigate this in three ways. Firstly, system-provided assistance helps externalize cognitive effort, thereby reducing user burden. Secondly, simplifying or reducing the tool content lowers the time and effort required from the user. Lastly, by engaging in staged participation with revisions allowed, users can reflect by taking turns. Therefore, we recommend these guidelines to be applied in the design of future goal support technologies, particularly to support goal identification and qualitative goal setting.

6.4 Complimentary Role of Stakeholders in Participatory Design

Most research leveraging participatory design methods has involved users [28, 92], or designers [41], albeit with less emphasis on health experts, although such work has also grown [57, 99, 100]. Prior research has also reported several benefits of involving multiple stakeholders in co-design sessions, such as mutual learning

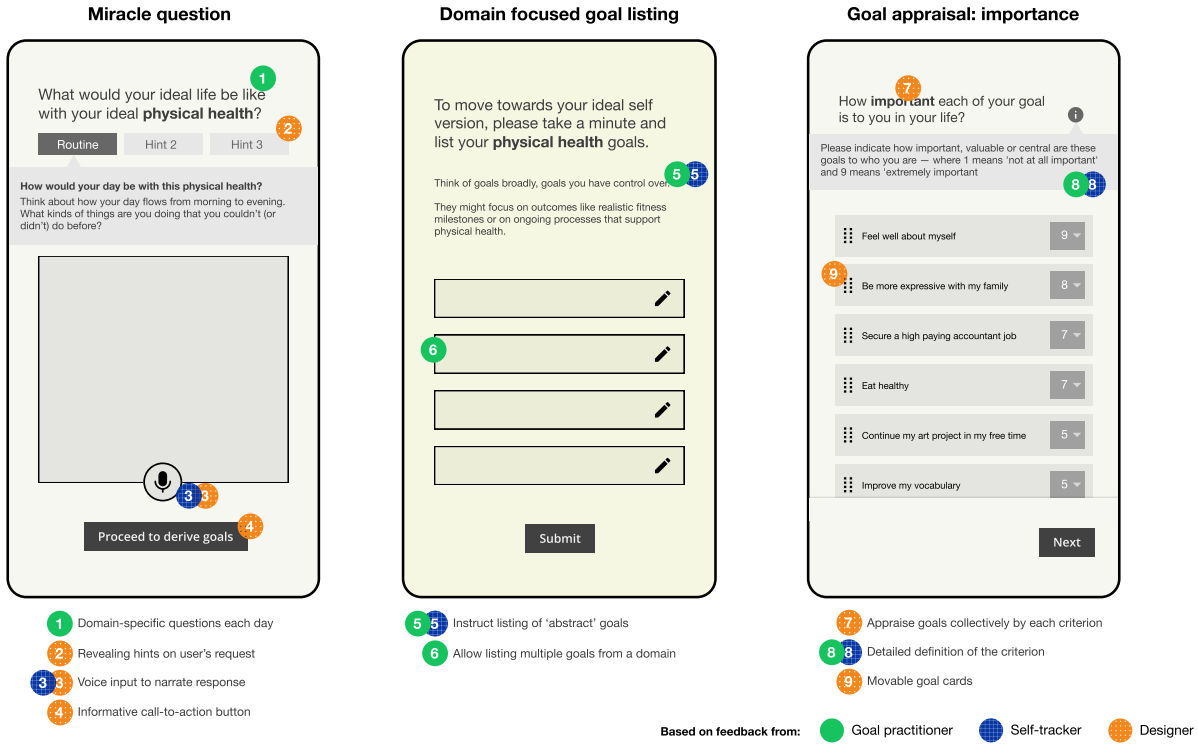

Figure 6: Final wireframes annotated with recommendations made by the three stakeholders (green: goal practitioners, blue: self-trackers, yellow: designers).

gathering user impressions on ideas [7], and validations [47]. Interestingly however, fewer studies reported participatory design with all three groups of stakeholders: experts, users, designers, despite their acknowledged distinct importance [77].

Our findings indicate specific contributions of each of these stakeholder groups. Practitioners acted as expert stakeholders contributing to the co-design of the intervention protocol, and their temporal aspects: sequence of tools to support goal identification and goal setting, and each tool's frequency and duration of use. Through this, we understood the purpose of each tool in the larger goal exploration process. Further, they also made valuable recommendations on formulating appropriate content (i.e., instructions for goal listing) on each tool, by reflecting on how an average user might engage, informed by their extended practice. Figure 6 illustrates sample of final wireframes with annotated contributions from each stakeholder group.

The second stakeholder group -self-trackers- provided input into the intervention protocol communicated through the digital format of wireframes for a web-based technology, with a focus on pre-use acceptability. By engaging self-trackers in co-design workshops and the sample of tasks with each tool, we learned about their perceived challenges. They also contributed to the wireframe co-design with their new and unique suggestions for mitigating these challenges.

Finally, the third stakeholder group - designers- provided input into the usability of the intervention's digital format through wireframes, and suggestions into how user interaction can be better supported. Their input was particularly useful to simplify the interface design (i.e., one question per page, for value survey), engaging interaction elements (e.g., sequential disclosure of hints (Figure 6 Annotation 2), or movable goal cards (Figure 6 A9)). The distinct contributions made by each stakeholder group complemented each other, leading to the richer final designs.

Our study involved the three stakeholder groups sequentially to first inform the protocol, and later to design its digital format. This was a valuable distinction. Future work can further explore the benefits of mixed stakeholder groups, where specific assumptions held by each group may become questioned and negotiated. The impact of the latter on the overall design suggestions can be evaluated in comparison to those from homogeneous groups like the ones in our study.

7 Limitations and Future Directions

We note three limitations of our work concerning target users, choice of technology, and temporal aspects of our co-design study. First, one of our stakeholder group consisted of self-trackers, recruited also based on criteria of being interested in broader goal exploration in one's life. Thus, our findings can be generalized to experienced self-trackers who are also interested in goals. Prior work has found that even relatively easy and appealing goal-related activities like goal tracking can be burdensome for new self-trackers [74]. Therefore, our findings may not apply to users who are new

to self-tracking, and more considerations might be required to keep them engaged in deep goal work. Our findings may also not apply to self-trackers who have no interest in identifying their own goals. This aligns with readiness to change model [73] the importance of users' readiness to change in order to reap the benefits of behavior change interventions.

Second, for the digital format of our intervention, we focused on web-based interface. This choice is grounded in the structured language based analogue tools commonly used in goal-oriented work. While web-based tools like Qualtrics could offer a basic technology towards a minimum viable product of intervention, future work can be extended to explore also other technology formats such as mobile apps or conversational agents, which can include additional features from notifications to dialogical experiences.

Third, our study did not explore the actual use of the final digitized intervention, to explore its impact on users' goal identification and goal setting. Future work is needed to explore the intervention efficacy and effectiveness.

8 Conclusion

Involving goal-oriented work practitioners, self-trackers, and designers, we co-designed a novel intervention for supporting self-trackers' qualitative goals. The intervention protocol focused on goal identification and goal setting, as well as on the pre-use acceptability, perceived usability of its digital format. Informed by the experts' practices, we advanced a multi-session, 4-week intervention with sequentially scheduled tools from goal-oriented work. We concluded with four design implications to support identification of ambitious but realistic goals, structured and customizable support for goal identification and setting, iterative goal revision, and reduced reliance on quantitative tools.

References

[1] Elena Agapie, Patricia A. Areán, Gary Hsieh, and Sean A. Munson. 2022. A Longitudinal Goal Setting Model for Addressing Complex Personal Problems in Mental Health. *Proc. ACM Hum.-Comput. Interact.* 6, CSCW2, Article 270 (Nov. 2022), 28 pages. doi:10.1145/3555160

[2] Mariam Alenazi and Corina Sas. 2025. Creating and managing transactions and budgets: analysis of marketplace descriptions and functionality review of budgeting apps. *Interacting with Computers* 37, 5 (2025), 381–396.

[3] Manikya Alister, Scott L Herbert, David K Sewell, Andrew Neal, and Timothy Ballard. 2024. The impact of cognitive resource constraints on goal prioritization. *Cognitive Psychology* 148 (2024), 101618.

[4] Deemah Alqahtani, Caroline Jay, and Markel Vigo. 2020. The Effect of Goal Moderation on the Achievement and Satisfaction of Physical Activity Goals. *Proc. ACM Interact. Mob. Wearable Ubiquitous Technol.* 4, 4, Article 116 (Dec. 2020), 18 pages. doi:10.1145/3432209

[5] Sarah Alsawy and Warren Mansell. 2013. How do people achieve and remain at a comfortable weight?: An interpretative phenomenological analysis. *Cognitive Behaviour Therapist* 6 (2013), e13. doi:10.1017/S1754470X13000184

[6] James T Austin and Jeffrey B Vancouver. 1996. Goal constructs in psychology: Structure, process, and content. *Psychological bulletin* 120, 3 (1996), 338.

[7] Amid Ayobi, Katarzyna Stawarz, Dmitri Katz, Paul Marshall, Taku Yamagata, Raul Santos-Rodriguez, Peter Flach, and Aisling Ann O'Kane. 2021. Co-Designing Personal Health? Multidisciplinary Benefits and Challenges in Informing Diabetes Self-Care Technologies. *Proc. ACM Hum.-Comput. Interact.* 5, CSCW2, Article 457 (Oct. 2021), 26 pages. doi:10.1145/3479601

[8] Eric P.S. Baumer. 2015. Reflective Informatics: Conceptual Dimensions for Designing Technologies of Reflection. In *Proceedings of the 33rd Annual ACM Conference on Human Factors in Computing Systems* (Seoul, Republic of Korea) *(CHI '15)*. Association for Computing Machinery, New York, NY, USA, 585–594. doi:10.1145/2702123.2702234

[9] Tom L Beauchamp. 2003. Methods and principles in biomedical ethics. *Journal of Medical ethics* 29, 5 (2003), 269–274.

[10] Marit Bentvelzen, Jasmin Niess, and Paweł W. Woźniak. 2021. The Technology-Mediated Reflection Model: Barriers and Assistance in Data-Driven Reflection. In *Proceedings of the 2021 CHI Conference on Human Factors in Computing Systems* (Yokohama, Japan) *(CHI '21)*. Association for Computing Machinery, New York, NY, USA, Article 246, 12 pages. doi:10.1145/3411764.3445505

[11] Marit Bentvelzen, Paweł W. Woźniak, Pia S.F. Herbes, Evropi Stefanidi, and Jasmin Niess. 2022. Revisiting Reflection in HCI: Four Design Resources for Technologies that Support Reflection. *Proc. ACM Interact. Mob. Wearable Ubiquitous Technol.* 6, 1, Article 2 (March 2022), 27 pages. doi:10.1145/3517233

[12] Marit Bentvelzen, Paweł W Woźniak, Pia SF Herbes, Evropi Stefanidi, and Jasmin Niess. 2022. Revisiting reflection in hci: Four design resources for technologies that support reflection. *Proceedings of the ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies* 6, 1 (2022), 1–27.

[13] Andrew B.L. Berry, Catherine Y. Lim, Calvin A. Liang, Andrea L. Hartzler, Tad Hirsch, Dawn M. Ferguson, Zoë A. Bermet, and James D. Ralston. 2021. Supporting Collaborative Reflection on Personal Values and Health. *Proc. ACM Hum.-Comput. Interact.* 5, CSCW2, Article 299 (Oct. 2021), 39 pages. doi:10.1145/3476040

[14] Veronika Brandstätter and Marie Hennecke. 2018. Goals. In *Motivation and action*. Springer, Cham, Switzerland, 453–484.

[15] Nathalie Bressa, Jo Vermeulen, and Wesley Willett. 2022. Data Every Day: Designing and Living with Personal Situated Visualizations. In *Proceedings of the 2022 CHI Conference on Human Factors in Computing Systems* (New Orleans, LA, USA) *(CHI '22)*. Association for Computing Machinery, New York, NY, USA, Article 597, 18 pages. doi:10.1145/3491102.3517737

[16] Ryan Brotman, Winslow Burleson, Jodi Forlizzi, William Heywood, and Jisoo Lee. 2015. Building Change: Constructive Design of Smart Domestic Environments for Goal Achievement. In *Proceedings of the 33rd Annual ACM Conference on Human Factors in Computing Systems* (Seoul, Republic of Korea) *(CHI '15)*. Association for Computing Machinery, New York, NY, USA, 3083–3092. doi:10.1145/2702123.2702602

[17] Gabriela Cajamarca, Valeria Herskovic, Andrés Lucero, and Angeles Aldunate. 2022. A Co-Design Approach to Explore Health Data Representation for Older Adults in Chile and Ecuador. In *Proceedings of the 2022 ACM Designing Interactive Systems Conference* (Virtual Event, Australia) *(DIS '22)*. Association for Computing Machinery, New York, NY, USA, 1802–1817. doi:10.1145/3532106.3533558

[18] Beenish Moalla Chaudhry, Dipanwita Dasgupta, and Nitesh Chawla. 2022. Formative Evaluation of a Tablet Application to Support Goal-Oriented Care in Community-Dwelling Older Adults. *Proc. ACM Hum.-Comput. Interact.* 6, MHCI, Article 208 (Sept. 2022), 21 pages. doi:10.1145/3546743

[19] Yu-Peng Chen, Julia Woodward, Dinank Bista, Xuanpu Zhang, Ishvina Singh, Oluwatomisin Obajemu, Meena N. Shankar, Kathryn M. Ross, Jaime Ruiz, and Lisa Anthony. 2024. Investigating Contextual Notifications to Drive Self-Monitoring in mHealth Apps for Weight Maintenance. In *Proceedings of the 2024 CHI Conference on Human Factors in Computing Systems* (Honolulu, HI, USA) *(CHI '24)*. Association for Computing Machinery, New York, NY, USA, Article 993, 21 pages. doi:10.1145/3613904.3641993

[20] Ada S. Chulef, Stephen J. Read, and David A. Walsh. 2001. A hierarchical taxonomy of human goals. *Motivation and Emotion* 25, 3 (2001). doi:10.1023/A:1012225223418

[21] Christopher Clarke, Jingnan Xu, Ye Zhu, Karan Dharamshi, Harry McGill, Stephen Black, and Christof Lutteroth. 2023. FakeForward: Using Deepfake Technology for Feedforward Learning. In *Proceedings of the 2023 CHI Conference on Human Factors in Computing Systems* (Hamburg, Germany) *(CHI '23)*. Association for Computing Machinery, New York, NY, USA, Article 715, 17 pages. doi:10.1145/3544548.3581100

[22] Mick Cooper and Duncan Law. 2018. *Working with Goals in Psychotherapy and Counselling*. Oxford University Press. doi:10.1093/med-psych/9780198793687.001.0001

[23] Claudia Daudén Roquet, Corina Sas, and Dominic Potts. 2023. Exploring Anima: a brain–computer interface for peripheral materialization of mindfulness states during mandala coloring. *Human–Computer Interaction* 38, 5-6 (2023), 259–299.

[24] Trevor Day and Paul Tosey. 2011. Beyond SMART? A new framework for goal setting. *Curriculum Journal* 22, 4 (2011). doi:10.1080/09585176.2011.627213

[25] Edward L Deci and Richard M Ryan. 2000. The" what" and" why" of goal pursuits: Human needs and the self-determination of behavior. *Psychological inquiry* 11, 4 (2000), 227–268.

[26] George T Doran. 1981. There's a SMART way to write managements's goals and objectives. *Management review* 70, 11 (1981).

[27] Windy Dryden. 2018. Life coaching. In *Coaching for rational living: Theory, techniques and applications*. Springer, 213–228.

[28] Anthony Duffy, Nazanin Boroumandzad, Alfredo Lopez Sherman, Gregory Christie, Indira Riadi, and Sylvain Moreno. 2025. Examining challenges to co-design digital health interventions with end users: systematic review. *Journal of Medical Internet Research* 27 (2025), e50178.

[29] Tina Ekhtiar, Armağan Karahanoğlu, Rúben Gouveia, and Geke Ludden. 2023. Goals for Goal Setting: A Scoping Review on Personal Informatics. In *Proceedings*

of the 2023 ACM Designing Interactive Systems Conference (Pittsburgh, PA, USA) *(DIS '23)*. Association for Computing Machinery, New York, NY, USA, 2625–2641. doi:10.1145/3563657.3596087

[30] Tina Ekhtiar, Armağan Karahanoğlu, Ruben Gouveia, and Geke D.S. Ludden. 2025. Changing Health Goals with Personal Informatics. In *Proceedings of the 2025 ACM Designing Interactive Systems Conference (DIS '25)*. Association for Computing Machinery, New York, NY, USA, 2867–2883. doi:10.1145/3715336.3735813

[31] Robert A Emmons. 2003. *The psychology of ultimate concerns: Motivation and spirituality in personality*. Guilford Press.

[32] Daniel A. Epstein, Clara Caldeira, Mayara Costa Figueiredo, Xi Lu, Lucas M. Silva, Lucretia Williams, Jong Ho Lee, Qingyang Li, Simran Ahuja, Qiuer Chen, Payam Dowlatyari, Craig Hilby, Sazeda Sultana, Elizabeth V. Eikey, and Yunan Chen. 2020. Mapping and Taking Stock of the Personal Informatics Literature. *Proc. ACM Interact. Mob. Wearable Ubiquitous Technol.* 4, 4, Article 126 (Dec. 2020), 38 pages. doi:10.1145/3432231

[33] Daniel A. Epstein, Felicia Cordeiro, James Fogarty, Gary Hsieh, and Sean A. Munson. 2016. Crumbs: Lightweight Daily Food Challenges to Promote Engagement and Mindfulness. In *Proceedings of the 2016 CHI Conference on Human Factors in Computing Systems* (San Jose, California, USA) *(CHI '16)*. Association for Computing Machinery, New York, NY, USA, 5632–5644. doi:10.1145/2858036.2858044

[34] Daniel A. Epstein, An Ping, James Fogarty, and Sean A. Munson. 2015. A lived informatics model of personal informatics. In *Proceedings of the 2015 ACM International Joint Conference on Pervasive and Ubiquitous Computing* (Osaka, Japan) *(UbiComp '15)*. Association for Computing Machinery, New York, NY, USA, 731–742. doi:10.1145/2750858.2804250

[35] Cathy Mengying Fang, Phoebe Chua, Samantha W. T. Chan, Joanne Leong, Andria Bao, and Pattie Maes. 2025. Leveraging AI-Generated Emotional Self-Voice to Nudge People towards their Ideal Selves. In *Proceedings of the 2025 CHI Conference on Human Factors in Computing Systems (CHI '25)*. Association for Computing Machinery, New York, NY, USA, Article 58, 20 pages. doi:10.1145/3706598.3713359

[36] Jaimie Lee Freeman and Amanda Nicole Curtis. 2023. Putting the Self in Self-Tracking: The Value of a Co-Designed 'How Might You' Self-Tracking Guide for Teenagers. In *Proceedings of the 2023 CHI Conference on Human Factors in Computing Systems* (Hamburg, Germany) *(CHI '23)*. Association for Computing Machinery, New York, NY, USA, Article 340, 16 pages. doi:10.1145/3544548.3580938

[37] Alexandra M Freund and Martin J Tomasik. 2021. Managing conflicting goals through prioritization? The role of age and relative goal importance. *Plos one* 16, 2 (2021), e0247047.

[38] Susanne Friese, Jacks Soratto, and Denise Pires. 2018. Carrying out a computer-aided thematic content analysis with ATLAS.ti. (2018).

[39] Jacob S Gray, Daniel J Ozer, and Robert Rosenthal. 2017. Goal conflict and psychological well-being: A meta-analysis. *Journal of Research in Personality* 66 (2017), 27–37.

[40] Rebecca Gulotta, Jodi Forlizzi, Rayoung Yang, and Mark Wah Newman. 2016. Fostering Engagement with Personal Informatics Systems. In *Proceedings of the 2016 ACM Conference on Designing Interactive Systems* (Brisbane, QLD, Australia) *(DIS '16)*. Association for Computing Machinery, New York, NY, USA, 286–300. doi:10.1145/2901790.2901803

[41] Kim Halskov and Nicolai Brodersen Hansen. 2015. The diversity of participatory design research practice at PDC 2002–2012. *International journal of human-computer studies* 74 (2015), 81–92.

[42] Stevan E. Hobfoll. 1989. Conservation of Resources: A New Attempt at Conceptualizing Stress. *American Psychologist* 44, 3 (1989). doi:10.1037/0003-066X.44.3.513

[43] Hsiu Fang Hsieh and Sarah E. Shannon. 2005. Three approaches to qualitative content analysis. *Qualitative Health Research* 15, 9 (11 2005), 1277–1288. doi:10.1177/1049732305276687

[44] Jenna Jacob, Lori Wozney, Hanne Weie Oddli, Charlie Duncan, Jill Chorney, Debbie Emberly, Duncan Law, Sharon Clark, Sofie Heien, Leah Boulos, and Mick Cooper. 2025. Goal-oriented practices in youth mental health and wellbeing settings: A scoping review and thematic analysis of empirical evidence. *Psychology and Psychotherapy: Theory, Research and Practice* 98, 2 (2025), 431–477. doi:10.1111/papt.12564

[45] Chen Ji, Corina Sas, and Katherine Isbister. 2026. TouchEmotion: An Augmented Reality Interface Leveraging Metaphorical Emotional Trajectories for Emotion Regulation. *ACM Trans. Comput.-Hum. Interact.* 33, 2, Article 16 (April 2026), 37 pages. doi:10.1145/3777896

[46] Ravi Karkar, Jessica Schroeder, Daniel A. Epstein, Laura R. Pina, Jeffrey Scofield, James Fogarty, Julie A. Kientz, Sean A. Munson, Roger Vilardaga, and Jasmine Zia. 2017. TummyTrials: A Feasibility Study of Using Self-Experimentation to Detect Individualized Food Triggers. In *Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems* (Denver, Colorado, USA) *(CHI '17)*. Association for Computing Machinery, New York, NY, USA, 6850–6863. doi:10.1145/3025453.3025480

[47] Sung-In Kim, Eunkyung Jo, Myeonghan Ryu, Inha Cha, Young-Ho Kim, Heejung Yoo, and Hwajung Hong. 2019. Toward Becoming a Better Self: Understanding Self-Tracking Experiences of Adolescents with Autism Spectrum Disorder Using Custom Trackers. In *Proceedings of the 13th EAI International Conference on Pervasive Computing Technologies for Healthcare* (Trento, Italy) *(PervasiveHealth'19)*. Association for Computing Machinery, New York, NY, USA, 169–178. doi:10.1145/3329189.3329209

[48] Susan Presby Kodish. 2002. Rational emotive behavior coaching. *Journal of Rational - Emotive and Cognitive - Behavior Therapy* 20, 3-4 (2002). doi:10.1023/a:1021116511125

[49] Jonathan Lazar, Caitlin Woglom, Jeanhee Chung, Alison Schwartz, Yichuan Grace Hsieh, Richard Moore, Drew Crowley, and Brian Skotko. 2018. Co-design process of a smart phone app to help people with down syndrome manage their nutritional habits. *J. Usability Studies* 13, 2 (Feb. 2018), 73–93.

[50] Min Kyung Lee, Junsung Kim, Jodi Forlizzi, and Sara Kiesler. 2015. Personalization revisited: a reflective approach helps people better personalize health services and motivates them to increase physical activity. In *Proceedings of the 2015 ACM International Joint Conference on Pervasive and Ubiquitous Computing* (Osaka, Japan) *(UbiComp '15)*. Association for Computing Machinery, New York, NY, USA, 743–754. doi:10.1145/2750858.2807552

[51] Brian R. Little. 2017. Prompt and circumstance: the generative contexts of personal projects analysis. In *Personal Project Pursuit: Goals, Action, and Human Flourishing*. doi:10.4324/9781315089928-1

[52] Brian R. Little, Katariina Salmela-Aro, and Susan D. Phillips. 2017. *Personal project pursuit: Goals, action, and human flourishing*. Taylor & Francis. 484 pages. doi:10.4324/9781315089928

[53] Edwin A Locke and Gary P Latham. 2002. Building a practically useful theory of goal setting and task motivation: A 35-year odyssey. *American psychologist* 57, 9 (2002), 705.

[54] Sruzan Lolla and Corina Sas. 2023. Evaluating Mobile Apps Targeting Personal Goals. In *Extended Abstracts of the 2023 CHI Conference on Human Factors in Computing Systems* (Hamburg, Germany) *(CHI EA '23)*. Association for Computing Machinery, New York, NY, USA, Article 106, 7 pages. doi:10.1145/3544549.3585725

[55] Sruzan Lolla and Corina Sas. 2025. Practitioners' Insights on Integrating Goal Setting Tools in Personal Informatics. In *Proceedings of the 38th International BCS Human-Computer Interaction Conference* (Cardiff University, UK) *(BCS HCI '25)*. BCS Learning & Development Ltd, Swindon, GBR, 570–576. doi:10.14236/ewic/BCSHCI2025.63

[56] Yuhan Luo, Xinning Gui, Xianghua(Sharon) Ding, Xi Zheng, Rie Helene (Lindy) Hernandez, Zhuoyang Li, and Qiurong Song. 2025. Reflecting Upon The Unintended Consequences of Personal Informatics Systems: A Systematic Review of Empirical Studies. In *Proceedings of the 2025 ACM Designing Interactive Systems Conference (DIS '25)*. Association for Computing Machinery, New York, NY, USA, 2847–2866. doi:10.1145/3715336.3735746

[57] Yuhan Luo, Peiyi Liu, and Eun Kyoung Choe. 2019. Co-Designing Food Trackers with Dietitians: Identifying Design Opportunities for Food Tracker Customization. In *Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems* (Glasgow, Scotland Uk) *(CHI '19)*. Association for Computing Machinery, New York, NY, USA, 1–13. doi:10.1145/3290605.3300822

[58] Sarah Martindale, Ben Bedwell, Robert Phillips, and Micaella Pedros. 2017. "Proof in the Pudding": Designing IoT Plants to Promote Wellbeing. In *Proceedings of the 2017 Conference on Designing Interactive Systems* (Edinburgh, United Kingdom) *(DIS '17)*. Association for Computing Machinery, New York, NY, USA, 529–540. doi:10.1145/3064663.3064743

[59] Zita Mayer and Alexandra M Freund. 2022. Better off without? Benefits and costs of resolving goal conflict through goal shelving and goal disengagement. *Motivation and Emotion* 46, 6 (2022), 790–805.

[60] Robert E. McGrath and Norah Wallace. 2021. Cross-Validation of the VIA Inventory of Strengths-Revised and its Short Forms. *Journal of Personality Assessment* 103, 1 (2021). doi:10.1080/00223891.2019.1705465

[61] Alfred Homere Ngandam Mfondoum, Mesmin Tchindjang, Jean Velery Mefire Mfondoum, and Isabelle Makouet. 2019. Eisenhower matrix * Saaty AHP = Strong actions prioritization? Theoretical literature and lessons drawn from empirical evidences. *IATESD Journal for Advanced Research in Applied Sciences* 6, 2 (2019).

[62] Marina Milyavskaya, Isabelle Leduc-Cummings, Kendra Carnrite, Carter Richards, and Jasmin Yee. 2022. A Goal by Any Other Name: Effects of Different Goal Elicitation Methods on Goal Pursuit. *Personality Science* 3, 1 (2022), e7975. arXiv:https://journals.sagepub.com/doi/pdf/10.5964/ps.7975 doi:10.5964/ps.7975

[63] Miro. n.d.. Miro: Online whiteboard software. https://miro.com. Accessed: 2025-08-26.

[64] Sarah Ann Mummah, Thomas N Robinson, Abby C King, Christopher D Gardner, and Stephen Sutton. 2016. IDEAS (Integrate, Design, Assess, and Share): a framework and toolkit of strategies for the development of more effective digital interventions to change health behavior. *Journal of medical Internet research* 18, 12 (2016), e317.

[65] Camille Nadal, Corina Sas, and Gavin Doherty. 2020. Technology acceptance in mobile health: scoping review of definitions, models, and measurement. *Journal of medical Internet research* 22, 7 (2020), e17256.

[66] Jasmin Niess and Paweł W. Woźniak. 2018. Supporting Meaningful Personal Fitness: the Tracker Goal Evolution Model. In *Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems* (Montreal QC, Canada) *(CHI '18)*. Association for Computing Machinery, New York, NY, USA, 1–12. doi:10.1145/3173574.3173745

[67] William Odom, Richard Banks, Abigail Durrant, David Kirk, and James Pierce. 2012. Slow technology: critical reflection and future directions. In *Proceedings of the Designing Interactive Systems Conference*. 816–817.

[68] Iþil Oygür, Zhaoyuan Su, Daniel A. Epstein, and Yunan Chen. 2021. The Lived Experience of Child-Owned Wearables: Comparing Children's and Parents' Perspectives on Activity Tracking. In *Proceedings of the 2021 CHI Conference on Human Factors in Computing Systems* (Yokohama, Japan) *(CHI '21)*. Association for Computing Machinery, New York, NY, USA, Article 480, 12 pages. doi:10.1145/3411764.3445376

[69] Sachin R. Pendse, Naveena Karusala, Divya Siddarth, Pattie Gonsalves, Seema Mehrotra, John A. Naslund, Mamta Sood, Neha Kumar, and Amit Sharma. 2019. Mental health in the global south: challenges and opportunities in HCI for development. In *Proceedings of the 2nd ACM SIGCAS Conference on Computing and Sustainable Societies* (Accra, Ghana) *(COMPASS '19)*. Association for Computing Machinery, New York, NY, USA, 22–36. doi:10.1145/3314344.3332483

[70] Christopher Peterson and Martin E.P. Seligman. 2003. Character strengths before and after September 11. *Psychological Science* 14, 4 (2003). doi:10.1111/1467-9280.24482

[71] Kyrill Potapov and Paul Marshall. 2020. LifeMosaic: co-design of a personal informatics tool for youth. In *Proceedings of the Interaction Design and Children Conference* (London, United Kingdom) *(IDC '20)*. Association for Computing Machinery, New York, NY, USA, 519–531. doi:10.1145/3392063.3394429

[72] Linda Price, Irum Rauf, Daniel Gooch, Dmitri Katz, Oliver Pearce, and Blaine Price. 2024. Children's perspectives on pain-logging: Insights from a Co-Design Approach. In *Proceedings of the 2024 ACM Designing Interactive Systems Conference* (Copenhagen, Denmark) *(DIS '24)*. Association for Computing Machinery, New York, NY, USA, 1306–1318. doi:10.1145/3643834.3661597

[73] James O. Prochaska and Carlo C. DiClemente. 1983. Stages and processes of self-change of smoking: Toward an integrative model of change. *Journal of Consulting and Clinical Psychology* 51, 3 (1983). doi:10.1037/0022-006X.51.3.390

[74] Amon Rapp and Federica Cena. 2016. Personal informatics for everyday life: How users without prior self-tracking experience engage with personal data. *International Journal of Human-Computer Studies* 94 (2016), 1–17. doi:10.1016/j.ijhcs.2016.05.006

[75] Johnny Saldaña. 2021. *The Coding Manual for Qualitative Researchers* (5th ed.). SAGE Publications, London.

[76] Elizabeth B.N. Sanders and Pieter Jan Stappers. 2014. Probes, toolkits and prototypes: Three approaches to making in codesigning. *CoDesign* 10 (2014). Issue 1. doi:10.1080/15710882.2014.888183

[77] Elizabeth B.-N. Sanders and Pieter Jan Stappers. 2008. Co-creation and the new landscapes of design. *CoDesign* 4, 1 (2008), 5–18. doi:10.1080/15710880701875068

[78] Zachary Schmitt and Svetlana Yarosh. 2018. Participatory design of technologies to support recovery from substance use disorders. *Proceedings of the ACM on Human-Computer Interaction* 2 (2018). Issue CSCW. doi:10.1145/3274425

[79] Yasaman S. Sefidgar, Carla L. Castillo, Shaan Chopra, Liwei Jiang, Tae Jones, Anant Mittal, Hyeyoung Ryu, Jessica Schroeder, Allison Cole, Natalia Murinova, Sean A. Munson, and James Fogarty. 2024. MigraineTracker: Examining Patient Experiences with Goal-Directed Self-Tracking for a Chronic Health Condition. In *Proceedings of the 2024 CHI Conference on Human Factors in Computing Systems* (Honolulu, HI, USA) *(CHI '24)*. Association for Computing Machinery, New York, NY, USA, Article 129, 19 pages. doi:10.1145/3613904.3642075

[80] Yukari Seko and Parky Lau. 2022. Solution-focused approach in higher education: a scoping review. *Higher Education Research and Development* 41, 5 (2022). doi:10.1080/07294360.2021.1920893

[81] Raj Sanjay Shah, Faye Holt, Shirley Anugrah Hayati, Aastha Agarwal, Yi-Chia Wang, Robert E. Kraut, and Diyi Yang. 2022. Modeling Motivational Interviewing Strategies on an Online Peer-to-Peer Counseling Platform. *Proc. ACM Hum.-Comput. Interact.* 6, CSCW2, Article 527 (Nov. 2022), 24 pages. doi:10.1145/3555640

[82] Kennon M Sheldon and Andrew J Elliot. 1999. Goal striving, need satisfaction, and longitudinal well-being: the self-concordance model. *Journal of personality and social psychology* 76, 3 (1999), 482.

[83] Lucas M. Silva, Xi Lu, Emily X. Liang, and Daniel A. Epstein. 2025. Foody Talk: Exploring Opportunities for Conversational Food Journaling. In *Proceedings of the 2025 CHI Conference on Human Factors in Computing Systems (CHI '25)*. Association for Computing Machinery, New York, NY, USA, Article 1183, 19 pages. doi:10.1145/3706598.3713875

[84] Herbert A Simon. 1955. A behavioral model of rational choice. *The quarterly journal of economics* (1955), 99–118.

[85] Peter Slattery, Alexander K. Saeri, and Peter Bragge. 2020. Research co-design in health: A rapid overview of reviews. Issue 1. doi:10.1186/s12961-020-0528-9

[86] Petr Slovak, Alissa Antle, Nikki Theofanopoulou, Claudia Daudén Roquet, James Gross, and Katherine Isbister. 2023. Designing for emotion regulation interventions: an agenda for HCI theory and research. *ACM Transactions on Computer-Human Interaction* 30, 1 (2023), 1–51.

[87] Marc Steen. 2013. Co-design as a process of joint inquiry and imagination. *Design Issues* 29 (2013). Issue 2. doi:10.1162/DESI_a_00207

[88] Tom Strong and Nathan R. Pyle. 2009. Constructing a conversational "miracle": Examining the "miracle question" as it is used in therapeutic dialogue. *Journal of Constructivist Psychology* 22, 4 (2009). doi:10.1080/10720530903114001

[89] Christian Swann, Patricia C Jackman, Alex Lawrence, Rebecca M Hawkins, Scott G Goddard, Ollie Williamson, Matthew J Schweickle, Stewart A Vella, Simon Rosenbaum, and Panteleimon Ekkekakis. 2023. The (over) use of SMART goals for physical activity promotion: A narrative review and critique. *Health psychology review* 17, 2 (2023), 211–226.

[90] Casandra Timar-Anton, Oana Negru-Subtirica, and Adrian Opre. 2021. The Development and Testing of a Mobile Self-Tracking App to Strengthen Identity Commitments through Personal Goals. *International Journal of Human Computer Studies* 151 (2021). doi:10.1016/j.ijhcs.2021.102642

[91] Merete Tonnesen, Claus Vinther Nielsen, and Rikke Sand Andersen. 2022. Moving goals. Goal-work in Parkinson's disease rehabilitation. *Frontiers in Rehabilitation Sciences* 3 (2022). doi:10.3389/fresc.2022.819862

[92] Peter Wacnik, Shanna R Daly, and Aditi Verma. 2025. Participatory design: a systematic review and insights for future practice. *Design Science* 11 (2025), e21.

[93] Marlene Wadsworth and Donald H. Ford. 1983. Assessment of personal goal hierarchies. *Journal of Counseling Psychology* 30, 4 (1983). doi:10.1037/0022-0167.30.4.514

[94] Qing Wang, Yi Ling Lai, Xiaobo Xu, and Almuth McDowall. 2022. The effectiveness of workplace coaching: a meta-analysis of contemporary psychologically informed coaching approaches. doi:10.1108/JWAM-04-2021-0030

[95] Mikael Wiberg and Erik Stolterman. 2021. Time and temporality in HCI research. *Interacting with Computers* 33, 3 (2021), 250–270.

[96] Angie Zhang, Alexander Boltz, Jonathan Lynn, Chun-Wei Wang, and Min Kyung Lee. 2023. Stakeholder-Centered AI Design: Co-Designing Worker Tools with Gig Workers through Data Probes. In *Proceedings of the 2023 CHI Conference on Human Factors in Computing Systems* (Hamburg, Germany) *(CHI '23)*. Association for Computing Machinery, New York, NY, USA, Article 859, 19 pages. doi:10.1145/3544548.3581354

[97] Renwen Zhang, Kathryn E. Ringland, Melina Paan, David C. Mohr, and Madhu Reddy. 2021. Designing for Emotional Well-being: Integrating Persuasion and Customization into Mental Health Technologies. In *Proceedings of the 2021 CHI Conference on Human Factors in Computing Systems* (Yokohama, Japan) *(CHI '21)*. Association for Computing Machinery, New York, NY, USA, Article 542, 13 pages. doi:10.1145/3411764.3445771

[98] Yiran Zhao, Yoojung Kim, Calvin Apodaca, Regina Casanova-Perez, Shefali Haldar, Sonali R. Mishra, Julia C. Dunbar, Ari Pollack, and Wanda Pratt. 2021. Supporting Goal-Based Collaboration for Hospitalized Children. *Proc. ACM Hum.-Comput. Interact.* 5, CSCW1, Article 164 (April 2021), 22 pages. doi:10.1145/3449238

[99] Haining Zhu, Joanna Colgan, Madhu Reddy, and Eun Kyoung Choe. 2016. Sharing Patient-Generated Data in Clinical Practices: An Interview Study. *AMIA ... Annual Symposium proceedings. AMIA Symposium* 2016 (2016), 1303–1312.

[100] Jun Zhu, Sruzan Lolla, Meeshu Agnihotri, Sahar Asgari Tappeh, Lala Guluzade, Elena Agapie, and Corina Sas. 2025. A Systematic Review and Meta-Analysis of Research on Goals for Behavior Change. In *Proceedings of the 2025 CHI Conference on Human Factors in Computing Systems (CHI '25)*. Association for Computing Machinery, New York, NY, USA, Article 375, 25 pages. doi:10.1145/3706598.3714072

[101] Barry J. Zimmerman. 2002. Becoming a Self-Regulated Learner: An Overview. *Theory Into Practice* 41, 2 (2002), 64–70. doi:10.1207/s15430421tip4102_2