



PosiTec – How to Adopt a Positive, Need-Based Design Approach

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Abstract. In User Experience (UX) design many approaches emphasize that a positive UX can be promoted by addressing basic human needs. However, in practice UX design needs are scarcely considered. We believe that this is due to a lack of adequate methods and guidelines and present a methodological toolkit to support designers in adopting a need-centered design approach. The toolkit is a collection of innovative user research methods, combined in a guided process to make sure that user needs are taken into account in all steps of the human-centered design process. We propose Experience Interviews as a basis to extract and further interpret the user needs of the target group. The interpretation is realized with the Needs Profile method and fed into an ideation brainstorming. First design solutions of this brainstorming are evaluated and further developed using the co-creation tool UX Concept Exploration. The concrete application of the proposed methods is illustrated based on the example of designing a technical product to promote positive aging of older adults.

Keywords: User Experience · Need-based design · User needs
Experience Interviews · Needs profiles · User Experience Concept Exploration
Positive aging

1 Motivation for a Need-Based Design

User Experience (UX) has become an important factor in product design. The human-centered design process (DIN EN ISO 9241-210) [1] suggests to involve potential users in all design stages to develop products that promote a positive experience for their users (Fig. 1).

Although, so far, the UX community has not been successful in establishing one definition of UX, many approaches emphasize the close relationship between UX and basic human needs [2, 3]. They describe that positive UX can be promoted by designing products that satisfy human needs such as competence (i.e. to accept and master a challenge) or connectedness (feeling close to loved ones). A summary of the relationship between user needs, UX and product use is provided by the *UXellence®-Framework* [2]: Positive experiences with a product can be deliberately evoked by satisfying user needs,

which, in the long run, increases product bonding and the motivation to keep using the product. While this approach seems reasonable from a theoretical perspective, comprehensible, hands-on methods for integrating this need-based approach into the human-centered design process are still missing.

To design for positive experiences it is first necessary to identify those needs which are associated with the use of the product. However, it appears to be especially challenging to initially assess the users' needs, as the abstract concept of needs is often difficult to grasp and users find it hard to verbalize their needs. The same is true for the design team who finds it often difficult to take needs into account for their product design. This is mainly due to difficulties in developing an understanding of the abstract concept of needs as well as a lack of methodological guidance for systematically involving needs in the design process.

In this paper, we present a methodological toolkit to support designers in adopting a need-centered design process. The toolkit is a collection of innovative user research methods, combined in a guided process to make sure that user needs are taken into account in all steps of the human-centered design process. The goal is to arrive at design solutions that address relevant user needs of the target groups and can be tested with users. The concrete application of the proposed methods is illustrated based on the example of designing a product to promote positive aging of older adults.

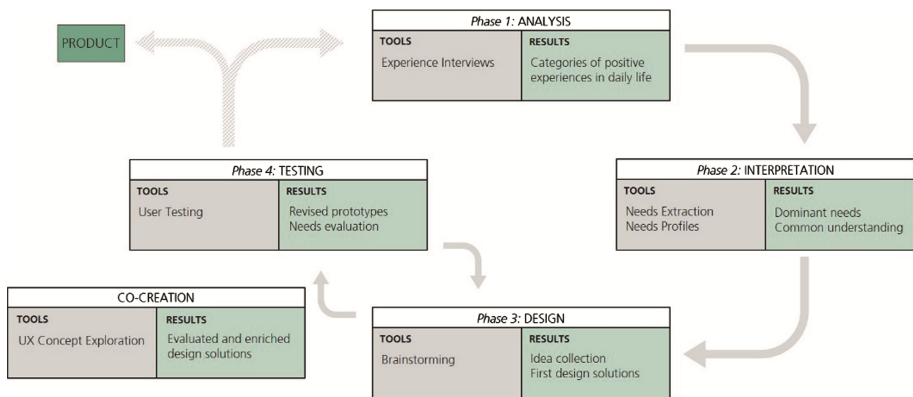


Fig. 1. Human-centered design process including the tools and results of the PosiTec toolbox for need-based design that is based on the phases of the human-centered design process (Analysis, Interpretation, Design and Testing). A co-creation phase is added to involve users in early design decisions.

2 Need-Based Design Approach and Toolkit

Our need-based design approach proposes concrete methods to involve user needs in every step of the human-centered design process (Fig. 1). It comprises a methodological toolkit to help the design team to better understand user needs and consider them in design decision during the different phases of product design. The proposed toolkit is sufficient to cover the phases of analysis, interpretation and design, but should ideally

be combined with other user research and design methods. We add a phase of co-creation after the first iteration of the design phase that extends the design phase but also offers an initial evaluation of the design ideas. This allows us, to involve users in early design decisions, thus ensuring that their needs are taken into account for all further design solutions. The testing phase is not included in the present paper.

2.1 Phase 1 – Analysis: Experience Interviews

In the analysis phase, we propose to conduct *Experience Interviews* to learn more about trigger events of positive experiences in everyday life and the underlying needs. An experience interview is a semi-structured interview during which the interviewee is asked to report a positive experience they had in the past two weeks in a certain context. The method was first proposed by Zeiner et al. [4] who investigated positive experiences in the work environment. It is important that the interviewees do not only reports the facts and setting of the positive experience, but also describe their emotions in detail. In addition, it can be assessed whether other people or technology were involved in the experience. We suggest Experience Interviews as a good starting point to identify potential sources and key events of positive experiences for your user group as well as to take an indirect approach to user needs assessment. They contain implicit information about underlying needs, but do not require the interviewee to explicitly reflect on them. The needs are deduced by the user researcher after the interview. The Experience Interviews can be conducted either face-to-face or as an online questionnaire.

2.2 Phase 2 – Interpretation: Needs Extraction and Needs Profiles

In the interpretation phase the underlying needs are extracted from the Experience Interviews. The needs extraction is based on the *UXellence®-Framework* [2] and carried out by closely examining the content of the experience reports and descriptions of the emotional experience. This is first done by each member of the design team individually. The results are then compared and discussed in the whole team. Although the needs are not explicitly mentioned in the interviews, each report can on average be related to two or three needs.

The extracted needs can then be used to fuel a need-centered design phase. Before developing the first design solutions, it is, however, important to fully understand the extracted needs with all their relevant aspects and characteristics, as user needs are sensitive to context and can be ambiguous. Therefore, it is crucial to develop a shared understanding within the design team. To do so, elements of the *Needs Profile* method was used [5]. To generate a common understanding and to highlight the relevant aspects of the needs, all team members together build a representation of each relevant need with Lego®-bricks (based on the metaphoric building approach of the Lego® Serious Play® method). Building the model requires them to exchange their point of views on the specific needs and thereby they arrive at an understanding of the need that incorporates a part of everybody's individual perspective. The process of building also promotes an intuitive understanding of the rather abstract needs and activates implicit knowledge [6, 7], which is relevant because a main part of the information about needs is stored

here [8, 9]. They then develop personified representations of the needs, the so-called *Needs Persona*, with the help of an *Empathy Map*. Needs Personas are personifications of the needs and vividly describe a representative of the user group who has an especially strong stamping of one of the needs [5, 10]. The characteristic actions, habits, quotes, thoughts and motivations are noted down on a revised Empathy Map template [5, 11, 12] along with the personal profile of the persona including a name, age, profession and hobbies. The personification of the needs makes the needs even easier to grasp and enhances the empathy for the user group within the design team. The personification of the needs can be used to deduce user requirements and inspire ideas for the initial prototype of the product to be developed.

2.3 Phase 3 – Design: Brainstorming

In the design phase ideas for an initial product concept are brainstormed, taking into account the Needs Personas. The core question of this brainstorming is which characteristics regarding functionality, interaction and visual design the product should have, in order to address the relevant user needs. Ideas are collected for each relevant needs and the three categories functionality, interaction and visual design independently in consecutive silent brainstorming session. The ideas are then clustered by the design team within the three categories. Similarities within the requirements across the needs can be interpreted as basic product features. Those requirements that differentiate the needs from each other can be marked as need-related features. A prototype of the product needs to incorporate all the basic product features and provide variants that take into account the need-related features.

2.4 Phase 4 – Co-creation: User Experience Concept Exploration

It is advisable to also involve users in the design process, especially regarding the need-related features. We therefore propose to include a period of co-creation that can be regarded as a transition from design to testing phase. Thus, through different design stages it can be assured that the product really addresses the needs of the target group. We propose to use of the method of *User Experience Concept Exploration* [2] that enables users to evaluate ideas developed by the design team and create their own design solution in a real-life context of use. Over a week, participants are asked to carry out daily tasks during which they reflect on how they can integrate the product into their daily routines and add new aspects that enrich their positive experience with the product.

The method comprises three phases: an initial workshop to present the product concept based on the results of the ideation, five days of individual tasks to come up with new ideas for the product be completed by the participants and a closing workshop. The workshops can be conducted individually or in groups of participants to promote the heterogeneity of the co-creation process. In the initial workshop participants are introduced to the product idea and asked to elaborate on it by building their own representation of the product which also serves as a remembrance token for the following phase, during which it should remind participants to carry out their daily individual task.

When the week is over, the task results of all participants are gathered together and compared. In the closing workshop participants are confronted with a summary of their own as well as other participants' ideas and evaluate and discuss them together.

The results from User Experience Concept Exploration and the brainstorming within the design team are combined to create a first testable design solution for the product which can then be evaluated together with users in the testing phase.

3 Practical Example: Need-Based Design of a Virtual Companion to Promote Positive Aging

We applied the need-based design approach and methodological toolkit in a project aimed at designing a product that promotes positive aging. This example shows how the proposed methods can be used in practice and how they add up to arrive at novel, need-related design solutions.

As the world population is growing older with prognosis that the number of adults aged 60 or above will more than double by 2050 [13], the question of how people can maintain independence and self-determination as long as possible becomes more important. Technology can provide solutions to support people in remaining active and pursuing an independent life style [14]. However, there is a strong focus on developing technical products to reduce negative implications of aging such as health issues and social isolation. Little emphasis has been put on positive aspects of aging and how to promote the overall well-being and flourishing of older adults as they age, as proposed by the *positive design* approach.

It has been shown that the experience of positive emotions can broaden peoples' minds and resourcefulness, which makes them more resilient and better at coping with negative situations [15]. Levy et al. [16] support the assumption that older adults would benefit strongly from a boost of positive emotions in their lives with their study about the relationship between positive self-perception and aging. They discovered that people with a positive perception of themselves lived on average 7.5 years longer than those with a less positive perception. The present project is thus aimed at developing a technical product that promotes *positive aging* which we define as "a process of growing older which is predominantly characterized by the experience of positive emotions and a high level of overall well-being" [17].

It needs to be considered that older adults are a heterogeneous target group with differing abilities and affinity towards technology [18]. They are not naturally inclined to accept additional technical products in their private homes, so it is important to address the users' specific capabilities, desires and necessities to provide a real benefit for them [19]. To do so, it is crucial to involve the users in the development process as much as possible and especially consider their needs, which is why we decided to take a need-based design approach.

3.1 Phase 1 – Analysis: User Study with Experience Interviews

Experience Interviews were conducted to identify aspects of daily life that are experienced as positive by older adults and then deduce the need which guide the design of the product to be developed.

Participants and Procedure. The Experience Interviews were carried out both face-to-face and through an online survey. 63 older adults took part in the study (25 females, 29 online). In accordance with the definition of the World Health Organization we defined older adults as adults with a minimum age of 60 years [20]. This is also the retirement age in most European countries. Participants were between 60 and 95 years old ($M = 70.88$, $SD = 9.14$). The majority of participants was retired (74.6%). 12.7% (8 participants) had full-time jobs, 11.1% (7 participants) were working part-time and 1.6% (1 participant) were unemployed. The professional background was very diverse, ranging from engineering over teaching and therapeutic professions to sales.

Before the interview started, participants gave their informed consent. The interview was semi-structured and the main part of the interview was the experience report for which participants were asked to describe a positive experience they had in the past two weeks, including their emotions during the experience and the involvement of other people and technical products/technology.

Results. The face-to-face interviews were transcribed and analyzed together with the data of the online survey. In total, we received 81 experience reports, as some participants reported more than one experience. All experience reports were read by all member of the design team and then clustered into experience categories (as proposed by Zeiner et al. [4]) that summarize key aspects of positive experiences in older adults' daily lives.

The experience reports were very diverse describing situation from different areas of daily life or special events. The clustering of the experience reports resulted in 18 experience categories which could be further grouped into three superior experience themes: people-oriented experiences, self-oriented experiences and goal-oriented experiences. Some experiences were very detailed and could be related to more than one experience category. Those were split up into smaller segments and then categorized based on the most prominent aspect.

88% of the described experiences were related to other people: 62% family members, 15% friends and 23% other people such as former students or colleagues. Only a small amount of experiences was experienced by the participant alone (12%). In 44% of the experience reports other people were named as the cause of the positive experience. Given the social nature of humans [21] those results do not come as surprise. They are also in accordance with the study by Zeiner et al. [4] who found that around 80% of positive experience in the work environment are related to other people.

Technology was less frequently mentioned in the experience reports. 28% of the experiences involved technical products or internet services, especially mobile phones and computers. This was to be expected as older adults are generally considered as having a rather low affinity for technology. Still, even in the work environment similar results were obtained. Although the general use and availability of technical products is high in this context, technology was only mentioned on 36% of the experience reports.

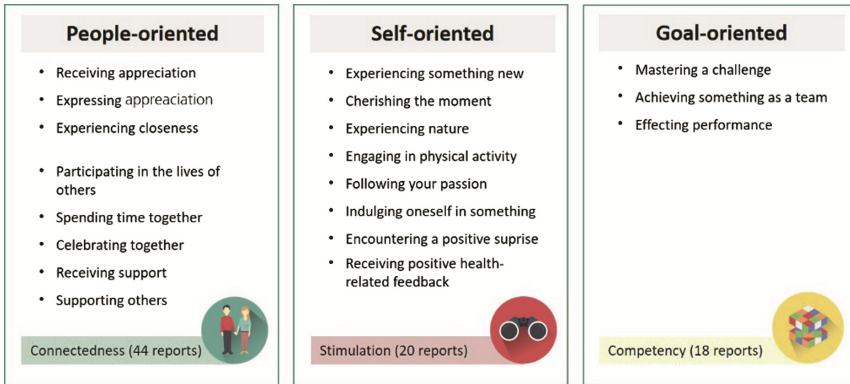


Fig. 2. Overview of experience themes, categories and related needs.

It could hence be concluded that technology is generally only weakly associated with positive experiences. One goal of a need-based design approach should therefore be to make sure that the use of technical products which are helpful or necessary for older adults is as comfortable and enjoyable for them as possible and to promote positive experiences with technical products.

3.2 Phase 2 – Interpretation: Needs Extraction and Needs Profiles

Procedure. The interpretation of the results of the experience interviews consisted of two steps: First, we examined the experience reports with regard to the underlying needs. Each member of the design team matched each experience report with the underlying needs. The results were then merged in a round of discussion with the whole team. Most experience reports were related to two or three needs. There were only few experiences that could only be linked to one single need. After the needs extraction, the Needs Profile-method [5] was used to explore the three needs that were mentioned most in detail.

Needs Extraction Results. The experience reports could be related to eight of the needs included on the UXellence® framework. Only the needs collecting the meaningful and competition could not be associated with any experience report. The following needs were found to be most intensively expressed: connectedness (44 experience reports), stimulation (20 reports) and competence (18 reports). We discovered a close connection between these needs and the experience themes derived from the Experience Interviews (Fig. 2).

Having a strong need for connectedness means being very satisfied when spending time with and being liked by people you like. *Connectedness* is hence strongly associated with people-centered experiences. Someone with a strong need for stimulation finds fulfillment in experiencing and trying out new things. *Stimulation* is therefore mainly underlying self-oriented experiences. People with a strong need for *competence* enjoy facing and mastering a challenge. It can thus predominantly be found in the goal-oriented experience reports.

Two experience reports could not be related to any need. Although they clearly describes self-oriented experiences (tasting fresh cassis fruits from the garden, observing a deer in the forest), the positive emotions were mainly created by the mindful perception of the situation. The participants themselves were not involved in active interaction with the environment and needs underlying such rather passive activities are not included in the UXellence® framework.

Needs Profiles Results. In a first step, the team built one Lego model for each needs in which they visualized the most important aspects of the respective need. As an example, Fig. 3 shows a picture of the model that was built for the need *stimulation*. The model associates the need for stimulation with the following aspects: a constant search for new trends and adventures (1); the wish to explore and engage in various activities (2), the desire to meet new people (3); the urge to try something new every day (4); the willingness to takes new paths, discovers unknown lands (5), the attempt to leave boring stuff behind (6), and a certain restlessness, being always on the move (7).

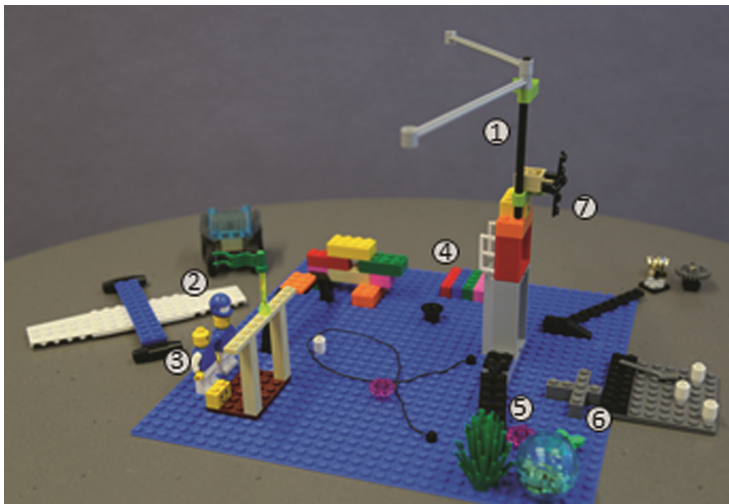


Fig. 3. Lego® model to characterize the need for stimulation together in the design team [5].

To make the established shared understanding of the needs even more concrete, three Needs Personas were developed in a second step: Luna Love (*connectedness*), Carl Clever (*competence*) and Nancy New (*stimulation*). Figure 4 presents the empathy map for Nancy New. In short, she is characterized as a very active, curious older lady, a former travel agent at the age of 76. She is constantly on the search for new ideas and activities and, for that purpose, uses apps like Pinterest or Tripadvisor on the smartphone that she received as a gift from her family. She also enjoys travelling to different places, trips into nature and photography. She likes to take part in the cultural events of her town and recently joined a club which organizes meeting and trips to get to know new people. Nancy lives the spirit that you are never too old for adventures.



Fig. 4. Empathy Map for the persona Nancy New, an older lady with a strong need for stimulation [5].

3.3 Phase 3 – Design: Brainstorming

Procedure. Based on the personas the design team proceeded to the design phase where we developed first ideas for a product that takes into account the needs of connectedness, stimulation and competence to promote positive aging. Ideas were collected for the functionalities, interaction strategies and visual design of the product in a silent brainstorming and then clustered according to the three categories and needs.

Results. The results clearly showed that each need poses individual requirements upon the product design, which becomes most obvious for the functionalities. The need-specific functionalities voted by the design team as most interesting for a need-base design were:

- for *connectedness*: sharing pictures and experiences, shared calendars, documentation of shared experiences, helping others
- for *stimulation*: self-orientation: physical activity, suggestions for new things and events, discovery trip
- for *competence*: planning projects, further education.

In addition, the following general requirements and basic features were defined: The product should be portable or mobile, so that it can be used both inside and outside the home. It should be a haptic product that users can manipulate and not just a virtual representation. The product should be intuitive to use with no expert knowledge required

for set-up, usage and maintenance. Taking into account the strong need for connectedness in the target group, the product should enable a natural interaction and support the user in developing a relationship with it, in order to increase acceptability. This might best be realized by giving the product some kind of personality or personified representation. Last, it should be assured that the user maintains control over the product at all times.

Considering these requirements we came up with the concept of a virtual personalized, personified companion for older adults that promotes positive experiences by offering a customized set of functionalities that is tailored to the user's needs. It also encourages the user to carry out activities that help them maintain a healthy and independent living to, in the long run, contribute to positive aging. The functionalities and requirements named above could be transformed into a first low-fidelity prototype right away. However, we decided to not specify the design of companion further to leave more space for participants' input during the follow-up co-creation phase.

3.4 Phase 4 – Co-creation: User Study with UX Concept Exploration

A User Experience Concept Exploration [2] study was conducted in order to evaluate and extend the idea of a virtual companion together with older adults. The functionalities and requirements that resulted from the design phase were used as a basis for the study.

Participants and Procedure. Four participants from the initial Experience Interviews (2 females, mean age: 65.75 years) were asked to evaluate the developed solutions based on User Experience Concept Exploration. In the initial workshop we explained the participants the general idea of the companion and the main insights of the ideation phase. They were then asked to build their own personal companion with Play Doh®. An example is depicted in Fig. 5. On the one hand, this self-build representation of the companion serves as a remembrance token for the following phase, during which it should remind participants to carry out their daily individual task. On the other hand, the task of building the companion already provides first requirements regarding the technical features and interaction strategies of the companion. Participants were then asked to come up with an everyday situation during which the companion provides them with a positive experience and to visualize this situation with an assorted Lego® Serious Play® set (see Fig. 5). This was the same task that participants were to carry out on a daily basis in the subsequent phase. After participants described their Lego model and the situation of positive experience, we explained the needs of the UXellence framework to them and asked them to select the underlying needs for the described situation. At the end of the workshop participants received an instruction card that contained a detailed description of the daily tasks as well as the main insights from the ideation to inspire participants.

For the five days of individual tasks, participants took the Play Doh® model of their personal companion home together with the instruction card that guided them to reflect on how the proposed companion could enrich their daily life. Every day, participants sent their results to our design team via a private Whatsapp chat where they could also ask questions or advice if needed. The concrete instruction included the following steps:

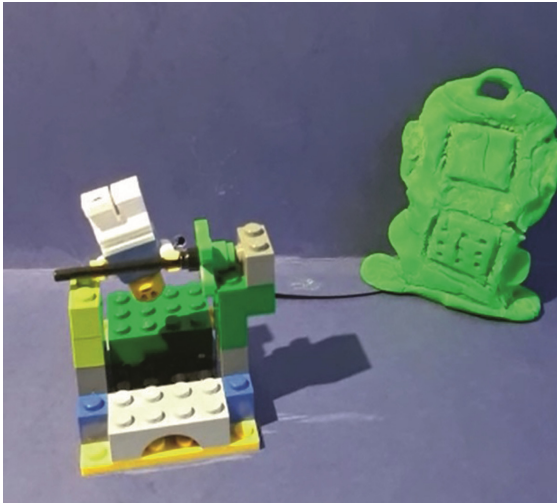


Fig. 5. Example of Play Doh® model of the personal companion and positive experience visualized in a Lego® model: the companion encourages the participant to master the challenge of the difficult physical exercise.

Report your current mood, build the Lego model of a positive experience with the companion, take a video of the model and describe it, describe how you would improve your initial version of the companion, select the related need(s) and report the added value of the described new functionality.

The task results of all participants were gathered together and compared. In the closing workshop participants first received a summary of their *week with their personal companion* including the situations of positive experiences they came up with. They were then presented with the whole set of ideas taken from all participants and asked to mark their favorite three ideas of the other participants. We also showed them the initial Play Doh® models of the other participants and had them elaborate on which technical aspects and interaction strategies would add benefit to their own present idea of the companion.

Results. To analyze participants' results, we drew up an overview of the described situations and related need for each participants. Then we clustered those situations that were rather similar across all participants. We also checked whether participants' selected needs for each situation were in accordance with our understanding of the needs based on the UXellence®-Framework [2]. Afterwards we quantitatively assessed how often the different needs were mentioned. This overview of the results was supplemented by the ideas generated during the closing workshop.

Participants came up with diverse situations during which they could benefit from their virtual companion. During the closing workshop the following activities were, with three votes each, rated as most promising by the participants:

- Storing memories to share with family members later on,
- motivating and facilitating physical exercising at home,
- support in mastering challenges,
- and taking over organizational household tasks.

These activities further detail and extend the functionalities of the coach developed during the ideation workshop. It became clear that participants saw great potential in the motivational character of the companion to promote positive experiences. They were less interested in letting the companion carry out things for them like a slave. On the contrary, they were rather intrigued by the idea that the companion would help them accomplish things that they struggled with or were hesitant to do on their own.

The needs that appeared most often in the described situations were, with nine mentionings each, *self-expression* and *security*, closely followed by *physical wellbeing* (8 mentionings) and *stimulation* (7 mentionings). With three and four mentionings, respectively, *connectedness* and *competence* were only of minor interest for the participants. These findings suggest that the situations in daily life which are self-oriented and connected with *stimulation* and *self-expression* are the ones where participants saw the most potential for promoting more positive experiences through a virtual companion.

Security appeared in about 30% of the described situations, in contrast to the Experience Interviews (analysis phase), in which it was only mentioned once. Still, in the described situations, *security* was mainly understood as a feeling of self-confidence which was caused by the motivating nature of the companion. This finding is hence well in line with the focus on self-orientation we uncovered in the described situations.

While *connectedness* was the most prominent need in the Experience Interviews, it nearly disappeared in UX Concept Exploration. This might be explained by the fact that three out of four participants were living together with their partners. All participants had regular contact with friends and family and therefore might have a needs profile which is more self- and less people-oriented. It should be noted that the relationship status, social network and living situation might be important factors to take into account when conducting UX Concept Exploration. Moreover, *competence* was mentioned rather often by one particular participant, but not by the others, which is why it scored rather low. These inter-individual differences highlight the need for individualizing the companion and tailoring it to the user's specific needs profile.

To sum up, the data obtained in the co-creation phase suggests to focus the functionality of the companion on facilitating and motivating self-oriented activities related to *stimulation* and *self-expression*. It also yields some extensions to the requirements we defined during the ideation phase which help us to narrow the requirements down to more concrete design guidelines (see Table 1). The data also shows that all suggested requirements were confirmed by participants' comments during the individual tasks and closing workshop. The results of the UX Concept Exploration study serve as input for the next design phase.

Table 1. Requirements derived from ideation, verified by participants during UX Concept Exploration.

Initial requirements retrieved from ideation	Extensions during UX Concept Exploration	Verifications during UX Concept Exploration
Promotion of positive experiences	Should be realized through motivational character of companion	Usefulness of companion was confirmed by all participants
Portability/Mobility	It should be possible to carry companion around	Confirmed by 3/4 participants
Haptic product	Companion's appearance should be a physical one and customizable	All participants imagined a haptic representation of companion
Intuitive use	Interaction with Companion should be realized by voice control (most natural interaction) and possibly extended by light signals	Perceived as a given by all participants. Voice control was perceived as the most natural way of communication
Personality	Companion should be motivating and rather active, approaching user with new ideas and suggestions	3/4 participants gave their companion a name and/or a motivating attitude
User is in control	–	All participants want to decide themselves when to use the companion and when to shut it down

4 Conclusion and Future Work

The practical example shows that the proposed methodological toolkit can aid designers to adopt a need-based approach in UX design. The Experience Interviews proved to be a good starting point to uncover underlying needs with little effort for both, interviewee and user researcher. Through the interpretation and design phases interesting, need-related solutions could be developed that were appropriate for a consecutive co-creation phase. The User Concept Exploration study served its purpose of both, verifying existing ideas and extending them with new design aspects and features.

More work needs to be done to provide guidance for designers to develop products that address multiple needs at the same time. It is also planned to extend the need-based design approach with methods for the testing phase, so that the full human-centered design process can be covered.

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