TUDelft

Delft University of Technology

Mood granularity for design

Introducing a holistic typology of 20 mood states

Xue, Haian; Desmet, Pieter M.A.; Fokkinga, Steven F.

Important note
To cite this publication, please use the final published version (if applicable).
Please check the document version above.

Mood Granularity for Design:
Introducing a Holistic Typology of 20 Mood States

Haian Xue [1,*], Pieter M. A. Desmet [1], and Steven F. Fokkinga [1,2]

[1] Faculty of Industrial Design Engineering, Delft University of Technology, Delft, The Netherlands
[2] Emotion Studio, Rotterdam, The Netherlands

This paper introduces a holistic typology of 20 mood states that are presented with a componential approach, describing six aspects: *subjective feeling*, *perception*, *reaction*, *tendency*, *liking*, and *disliking*. In addition, each mood is illustrated with a short example narrative and a collection of four images. The typology was generated by combining the results of two studies. With a lexical analysis and researcher introspections, Study 1 examined 135 mood words, which resulted in an initial identification of mood states and corresponding verbal and pictorial descriptions. Study 2 validated and enriched these results with a phenomenological analysis of 159 introspective mood samples that were collected by a group of nine co-researchers in a two-week mood diary exercise. The mood typology provides a fine-grained overview and a vocabulary of user moods. Designers and design researchers can use these results as a foundation for systematic mood-focused design research, as a means to develop mood sensibility and granularity (i.e., the ability to distinguish between moods and the variety of mood manifestations), and as a tool to facilitate user interviews in empathy-based design processes.

Keywords – Empathy, Mood-focused Design, Mood Granularity, Mood Typology, Rich Description.

Relevance to Design Practice – Designers can use the holistic typology of 20 mood states to develop their mood granularity, to facilitate empathy building and to specify their design intentions in mood-focused design projects.

Introduction

From outfits that reveal one's moods by changing colour, to aeroplanes that soothe passengers by adapting their cabin ambience, design history includes ample examples of explorations that have been inspired by the dynamics of human mood. While designers have long been fascinated by the mood phenomenon, we are currently witnessing a revival of mood-focused design research. Fuelled by the emerging interest in design-supported subjective well-being and advancements in artificial intelligence and social robotics, the number of mood-focused design explorations is growing steadily, including design experiments that explore the possibilities of dynamically measuring, adapting to, or even influencing users' moods. While these experiments are inspiring and have contributed to the development of a mood-inspired design repertoire, Desmet (2015) observed that most of the published reports on mood-focused designs are based on implicit understandings of the mood phenomenon, which, in many cases, are unspecified and limited, and in some cases even incorrect. Although a thorough understanding of the mood phenomenon may not be a prerequisite for designers to explore or get inspired by it, caution is required when claims are made about the impact of design on people's mood. In fact, published validation studies that test the effects of mood-influencing technology are scarce, and those that have been published indicate that the effect of the currently available mood-influencing technology is very limited (see Calvo, Dinakar, Picard, & Maes, 2016). This limited success can be partly explained by a general lack of understanding of the mood phenomenon, as well as its changing mechanisms, influences, manifestations and differentiations.

An effective start to the development of descriptive theory is to break the phenomenon down into meaningful categories or dimensions, which often take the form of typologies (see Fawcett & Downs, 1986; Gregor, 2005). Building on this idea, we intended to develop a holistic mood typology for design that presents a set of fine-grained mood states with rich verbal and pictorial descriptions. Given this general purpose, the development focused on two objectives: 1) diversity and 2) richness. In terms of diversity, our aim was to provide a nuanced palette of mood states that presents a broad overview of the landscape of moods. Currently available mood typologies are remarkably unrefined, with the most elaborate one including eight basic mood types (see Desmet, 2015; Desmet, Romero, & Vastenburg, 2016). Because our experience suggests that real-life mood experiences are much

*Corresponding Author: H.Xue@tudelft.nl

more varied and fine-grained, the typology was developed with the purpose of better representing this variety. With respect to richness, our aim was to provide comprehensive portrayals, including descriptions of how different moods are experienced and influence perception and behaviour (e.g., of people who use products and digital media, customers, and front-line service employees). The resulting mood typology aims to open up some new opportunities for design research and practice. It can serve as a foundation for systematic mood-focused design research and facilitate mood-focused empathic communication during design processes. Moreover, designers (as well as students and researchers) can use it as a means for enhancing their general *mood granularity*[1], that is, their ability to recognise and make fine-grained differentiations between similar mood experiences and to articulate and communicate the multiple facets of the mood phenomenon.

In the sections that follow, we first describe the mood phenomenon, highlighting some differences between mood and emotion. We discuss the unique role that mood plays in human-design interaction and some design opportunities that an enhanced understanding of user mood may bring. We then introduce the mood typology that aims to service this purpose. After that, we report the two studies that were performed to develop the typology. In the final part of the paper, we discuss limitations and future research directions.

Human Mood and Its Unique Role in Human-Design Interaction

Mood and *emotion* are often used interchangeably in daily conversations, which is understandable because they do share some commonalities. For example, they are both felt as pleasant or unpleasant, and they involve bodily activation and expressions (Larsen, 2000). The substantial increase of knowledge about user emotions over the past two decades (e.g., Desmet, 2002, 2008, 2012; Fokkinga & Desmet, 2013; Hassenzahl et al., 2013; Jordan, 2000; Norman, 2004; Ozkaramanli, Desmet, & Özcan, 2016) may, to a certain extent, also inspire mood-focused design. However, knowledge about emotions cannot fully enable designers to adequately deal with the unique challenges of, nor leverage

Haian Xue is a postdoctoral researcher at Delft Institute of Positive Design, Faculty of Industrial Design Engineering, Delft University of Technology. His research interests include designing for experience and well-being from multiple perspectives (e.g., emotions, moods, culture, lifestyle and technology). Before joining TU Delft, he had worked as a design researcher and teacher at several design schools in Finland, the UK, and the USA.

Pieter Desmet is a professor of Design for Experience at the Faculty of Industrial Design Engineering at Delft University of Technology. His main research interests are in the fields of design, emotion, mood, and subjective well-being. He is a chairman of the International Design and Emotion Society, co-founder and partner of Emotion Studio, and founder of the Delft Institute of Positive Design.

Steven Fokkinga is a postdoctoral researcher on Design for Mood at the Faculty of Industrial Design Engineering at Delft University of Technology, The Netherlands. His research interests include emotion and mood theory, conceptual design, and emotional richness in user experience. Steven is a co-founder and managing partner of Emotion Studio, a Rotterdam-based research and innovation studio.

the opportunities in, mood-focused design because, besides their commonalities, mood and emotion are different affective phenomena. They differ in terms of manifestations, functions, and influences (e.g., Beedie, Terry, & Lane, 2005; Parkinson, Totterdell, Briner, & Reynolds, 1996; Watson & Clark, 1994), and therefore play different roles in human-design interactions.

Emotions are short-lived affective states that are focused on specific *objects* (e.g., an event, a product function, a design feature, a service, or a meaning association), and typically driven by the user's context-sensitive goals, needs, or values. By contrast, moods are mild, diffuse, pervasive feeling states that often last for hours or even days (Morris, 1989; Parkinson et al., 1996). Mood may not always be in the awareness, but it always presents as a continuous *background experience* underneath the ongoing specific events, while emotions are momentary *foreground experiences* that are superimposed over this affective background (Davidson, 1994; Dreyfus, 1991). Accordingly, a mood state is not directed at one single specific object, but rather at multiple objects (Siemer, 2005), or at the world or life as a whole (Frijda, 2009). That is to say, a person in a positive/negative mood tends to feel positive/negative about many events that are happening around them.

The function of the emotion system is to monitor the environment, signalling threats and opportunities to our well-being, and interrupting our ongoing thoughts and behaviours with emotion-specific action tendencies (e.g., to escape or to approach) that aim to neutralise the threat or capitalise on the opportunity (Frijda, 1994). The mood system, on the other hand, has a more inward focus, indicating how well we are generally being and becoming (Pribram, 1970). Moods "exist for the sake of signalling *states of the self* in terms of the physical, psychological, and social resources available to meet perceived environmental demands" (Morris, 1992, p. 256). Moreover, being in a mood state temporarily enhances our readiness or tendency to think and act in a particular way (e.g., Siemer, 2009). In this sense, mood also serves an important self-regulation function that automatically guides us to decide whether and how we should invest, protect, or replenish our resources in a given period of time (Nowlis & Nowlis, 1956; Thayer, 1989). For example, a person in a *cheerful* mood, which signals a resource surplus, is likely to be more optimistic and open to new opportunities and take risks, prefer active and spontaneous activities, and to more readily experience positive emotions towards multiple events happening around them. On the other hand, the same person in a *gloomy* mood, which signals a resource deficit, tends to see the negative aspects of life, ruminate, reflect, experience sadness and loneliness, and prefer to retreat from intensive activities and seek out physical and mental comfort from familiar things or environments (Desmet, Xue, & Fokkinga, 2019).

Because of the distinct manifestations, functions and influences of mood, its role in human-design interaction is different from that of emotions. A user may experience many different emotions *during* an interactive process, and these emotions are typically *fleeting* and *elicited* by specific events enabled by features, functions, or meaning associations of the designed system. For example, during my (the first author's)

first-time interaction with a new tablet and a drawing application on it, I was first *fascinated* by how realistic it simulated the pencil-paper drawing interaction; a minute later, *annoyed* and *frustrated* by the complex user interface; and finally *proud* when I made my first piece of artwork. Unlike user emotions, user mood is a *continuous* background experience that a user *brings into* an interaction, then *leaves with* after the interaction. In other words, there is always a *pre-interaction* mood state that the user is already in. This background experience influences what products or services one chooses to interact with in the first place (Djamasbi & Strong, 2008; Djamasbi, Strong, & Dishaw, 2010); in which style the interaction will likely occur (Venkatesh & Speier, 1999; Wensveen, Overbeeke, & Djajadiningrat, 2002); and what kind of information is likely to be noticed and processed during the interaction (Zhang & Jansen, 2009). Moreover, although the pre-interaction mood state is clearly not caused by a given human-design interaction, it unfolds over the interactive process towards a *post-interaction* mood state, which may be similar to or different from (in varying degrees) the pre-interaction one. For example, on a Saturday morning, I (the first author) woke up in a relaxed mood, which might be attributed to a combination of many factors (e.g., the sunny weather on a winter day, the end of a challenging but fruitful week of work, and several more). After breakfast, this mood continued and made me really want to enjoy my time and engage in some calm and simple activities. Thus, instead of working on a research project as I planned, I started doodling on my tablet. After one hour, when I had finished some freely expressed doodles, I felt a strong urge to draw more, but in a more careful and serious way. I became aware that my previously relaxed mood had transformed into a more productive one, in which I was more energetic and robust, mentally sharp, excited, and wanting to be more organised, concentrated, and constructive in the following activities that I would engage in.

A Barrier to the Advancement of Mood-Focused Design

One barrier that is preventing the design field from leveraging all opportunities of mood-informed design is the current *low-granular* understanding of the mood phenomenon. Compared to emotion, mood is more difficult to capture and communicate because of its pervasive and elusive nature. Consequently, moods are often communicated with general descriptions, such as *I feel good today,* or *I am not in the mood*. Real-life moods are much more differentiated than what the inexplicit *good or bad* accounts represent. Moods differ in terms of causes and influences on people's perceptions and behaviour. For example, while gloominess and grumpiness are both *bad* moods, they come with different feelings, and thought-action tendencies. Consequently, designing a product or service that intends to support a positive mood requires a clear description of the targeted mood state (e.g., relaxed, amiable, cheerful, or vigour) beyond the notion of simply *feeling good*. The low-granular understanding of the mood phenomenon has made it difficult for designers to explore opportunities of mood-focused design, and to communicate mood

experiences within the design team or between the designers and users. Likewise, the low-granularity has posed a threshold for design researchers to conduct systematic mood-focused design research. We propose that both design researchers and practitioners can benefit from a higher mood granularity.

A Holistic Mood Typology for Design

To contribute to the practice of mood-focused design, we developed a holistic typology of 20 human mood states. In this typology, seven are negative (i.e., Miserable, Gloomy, Lethargic, Grumpy, Agitated, Anxious, Stressed); nine are positive (i.e., Relaxed, Peaceful, Cheerful, Productive, Vigorous, Amiable, Dreamy, Giggly, Jubilant); and four are ambiguous (i.e., Sentimental, Serious, Boisterous, Rebellious). Each mood is described with six components (i.e., subjective feeling, perception, reaction, tendency, liking, and disliking), an example of how the mood can unfold in a real-life situation, and four illustrative images. The typology is available in the form of a booklet, titled *"Twenty moods: A holistic typology of human mood states"* (Desmet, Xue, & Fokkinga, 2020, see Figure 1 for a sample page). Because space does not allow us to include the booklet in this manuscript, it can be found online: https://diopd.org/mood-typology-booklet/. Note that, for clarity purposes, the mood descriptions in the booklet are archetypical, which means that they represent somewhat extreme manifestations of the mood types. While people can be in such strong moods, most real-life mood experiences are milder forms of the archetypes, manifesting as subtle background experiences. For example, the description of Miserable includes the following sentences: "You feel awful and powerless. You feel crushed, worthless, and almost unable to breathe." Real-life experiences of being in a miserable mood may involve parts and/or milder form of these feelings, such as feeling somewhat discouraged and inadequate.

We envision that this mood typology can be useful for design in two ways. First, it can serve as a foundation for mood-focused design research. For example, it can be taken as a starting point for developing new approaches to dynamic user profiling, and for developing a repertoire of systematic approaches to design for user mood-regulation. Second, in design practice, it can enable design teams to discuss the nuances of (target) users. In addition, when designing interactive systems, the typology can be used as a means to probe into (and envision) the user-preferred (embodied and cognitive) interaction styles. In the sections that follow, we report two studies that informed the mood typology development.

The Generative Process of the Holistic Mood Typology

Methods and Overview

The holistic mood typology was generated through two complementary studies. Study 1 was an initial exploration. We first employed a *lexical approach*[2], which is a method that takes natural language as a valuable source for creating typologies of

15. GLOOMY

FEELING
You feel sombre, down, or 'blue'. You see everything through a grey veil. You feel isolated. The weight of the world is pressing down on you.

PERCEPTION
The world seems dark, cold, joyless, and without colour. It seems as if your life is predominantly touched by sorrow and bad fortune. You do not expect things to improve.

REACTION
You react to people and events with little or no enthusiasm. When you do react, it is sluggishly and sadly.

TENDENCY
You tend to sit alone somewhere, hang your head and be quiet. If you feel really gloomy, you may cry. You are inclined to dwell upon the negative things in your life.

LIKING
You feel like retreating, isolating yourself from other people and other impulses. You want to 'cocoon'; curl up in a comfortable corner with something warm around you. You seek physical and mental comfort in familiar things.

DISLIKING
You do not feel like being active or outgoing. You shun other people, especially if they are cheerful. You dislike anything that is new or unfamiliar. You do not feel like working or doing other task-oriented activities.

EXAMPLE

Tom hasn't been performing very well at work for the last couple of months. On top of that, his financial situation could be better and his relationship isn't really flourishing. He wants to make a change in life, but he doesn't really know where to start. He should talk about it, but he doesn't have the energy to reach out. Today is a grey day and Tom is alone at home, staring out of the window.

Figure 1. An example mood page extracted from the holistic typology of human mood states.

affective phenomenon, and we identified 23 mood states. After that, *researcher introspection*[3] was used to further examine the nuances of these 23 mood states and generate rich descriptions of them. Researcher introspection is a method wherein the researcher serves as the self-observer whose personally experienced affective states, sensations and thoughts are examined to generate knowledge without involving any other participants (Xue & Desmet, 2019). Because of the dual role of researcher and participant, the researcher who practises this method is often addressed as a *researcher-introspector* (e.g., Gould, 1995; Woodside, 2004). Two main considerations motivated the use of this method. First, although everyone experiences mood, to generate rich yet focused data about mood requires a clear concept of this phenomenon and an understanding of how it differs from other affective phenomena. Second, given that mood experiences are pervasive, capturing their phenomenological qualities requires a self-observer who has a strong motivation and a well-developed ability to reflect on and articulate subjective experiences. We (i.e., the three authors and a professional designer with experience in mood-inspired design) acted as researcher-introspectors. Study 1 resulted in a provisional mood typology (version 1) with 18 mood states that were described verbally and pictorially.

Study 1 had some limitations. First, the dependability and confirmability in the results might be low because of the small number of researcher-introspectors. Second, because our introspections were mainly *retrospective* (i.e., relying on our memories of mood experiences), memory distortion might have influenced the results. We also discovered that since the typology version 1 was derived from the available mood lexicon, a mood typology that emerges from lived mood experiences would verify and enrich it. On the basis of these reflections, Study 2 was designed to be a systematic triangulation and enrichment of Study 1.

Study 2 was a *two-week mood diary* practice with the participation of eight carefully selected *co-researchers*[4] and the first author of this paper. To avoid the co-researchers being influenced, they were not informed about the results of Study 1 until the very end of the study. To minimise the influence of memory distortion, and to have a naturalistic understanding of various mood states, Study 2 captured *concurrent* mood experiences in *real-life settings*. As a trade-off, neutral moods that are almost never consciously felt and ambiguous moods without a clear valence were not of concern to Study 2. The co-research group generated 159 mood samples, which were analysed first by the authors and then collaboratively enriched and confirmed by the co-research group in two 2.5-hour co-analysis sessions. Through an inductive approach, Study 2 resulted in a mood typology (version 2) with 15 mood states and rich descriptions.

Eventually, by comparing and combining the two earlier versions, we created the mood typology and rich descriptions version 3, which is presented in the mood booklet that was introduced in the last section. The next sections report the detailed procedure and results of each step.

Study 1: *Initial Exploration*

Procedure

We started Study 1 with an open mood vocabulary collection (Step 1.1) that gathered an over-inclusive list of 277 affective words that may be used to name or describe moods. The sources were publications from four disciplines in which mood words had been a dedicated study (i.e., psychology, musicology, language technology, and English literature education; see Appendix 1 for details). To exclude words that do not describe moods, each of us evaluated the 277 items (Step 1.2). The filtering criteria
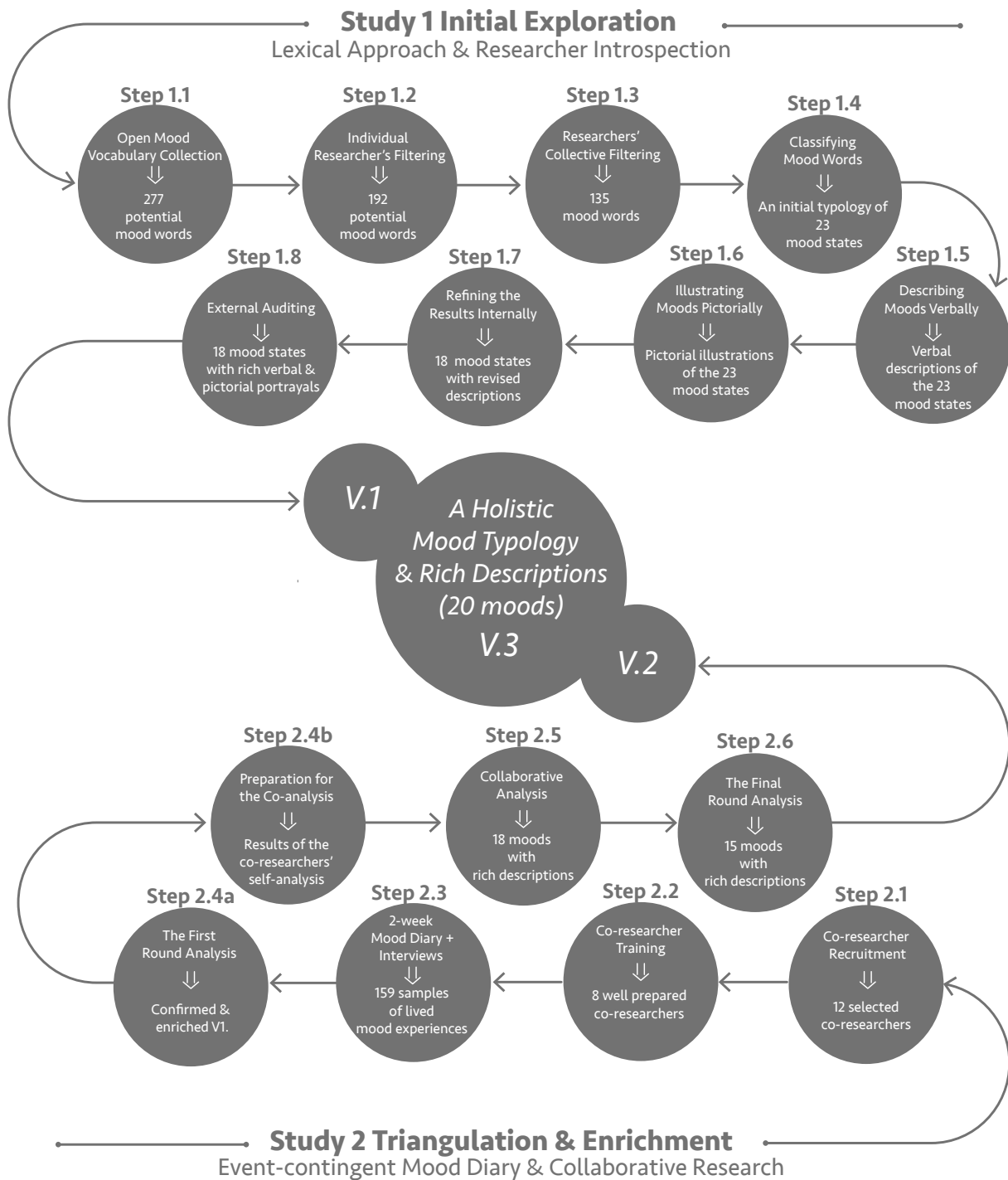
Study 1 Initial Exploration
Lexical Approach & Researcher Introspection

Step 1.1
Open Mood
Vocabulary Collection
⇩
277
potential
mood words

Step 1.2
Individual
Researcher's Filtering
⇩
192
potential
mood words

Step 1.3
Researchers'
Collective Filtering
⇩
135
mood words

Step 1.4
Classifying
Mood Words
⇩
An initial typology of
23
mood states

Step 1.5
Describing
Moods Verbally
⇩
Verbal
descriptions of
the 23
mood states

Step 1.6
Illustrating
Moods Pictorially
⇩
Pictorial illustrations
of the 23
mood states

Step 1.7
Refining the
Results Internally
⇩
18 mood states
with revised
descriptions

Step 1.8
External Auditing
⇩
18 mood states
with rich verbal &
pictorial portrayals

V.1

*A Holistic
Mood Typology
& Rich Descriptions
(20 moods)*

V.3

V.2

Step 2.4b
Preparation for
the Co-analysis
⇩
Results of the
co-researchers'
self-analysis

Step 2.5
Collaborative
Analysis
⇩
18 moods
with
rich descriptions

Step 2.6
The Final
Round Analysis
⇩
15 moods
with
rich descriptions

Step 2.4a
The First
Round Analysis
⇩
Confirmed &
enriched V1.

Step 2.3
2-week
Mood Diary +
Interviews
⇩
159 samples
of lived
mood experiences

Step 2.2
Co-researcher
Training
⇩
8 well prepared
co-researchers

Step 2.1
Co-researcher
Recruitment
⇩
12 selected
co-researchers

Study 2 Triangulation & Enrichment
Event-contingent Mood Diary & Collaborative Research

Figure 2. A procedure overview of the two studies.

were based on broadly accepted definitions of mood and the distinctions between mood and other affective phenomena that were discussed in the introduction of this paper. In the filtering, 85 words that describe emotions (e.g., amused, surprised, jealous, embarrassed) or personal traits (e.g., artistic, nerdy, geeky) were omitted. Subsequently, we worked together for the final filtration (Step 1.3). First, words that appeared in more than one inflected form (e.g., relaxed, relaxation, relaxedness) were lemmatised to their most commonly used adjective form (e.g., relaxed). Then,

supported by definitions and example sentences and paragraphs drawn from dictionaries and literary works, we debated on the words that at least one of us questioned, which resulted in the final selection of 135 mood words. Then (Step 1.4), the 135 mood words were categorised according to their meanings, which resulted in an initial typology of 23 distinct mood states (Table 1). This initial typology served as a concrete yet provisional action framework that was kept open for continuous evolution during the remaining research process.

Table 1. The result of Step 1.4: A provisional mood typology with 23 distinct mood states.

Valence	Mood States (*N* = 23)	Mood Words (*N* = 135)
Positive	Amiable	Amiable, sympathetic, tender
	Cheerful	Cheerful, chipper, gay, joyous, light-hearted, merry, sprightly
	Energetic	Bouncy, energetic, excited, exhilarated, passionate, peppy, vivacious
	Giggly	Ditzy, giddy, giggly, humorous, playful, quirky, rollicking, silly, whimsical
	Jubilant	Ecstatic, elated, enlightened, jubilant, liberating, lyrical, triumphant
	Peaceful	Calm, content, peaceful, placid, serene, still, tranquil
	Dreamy	Contemplative, dreamy, musing, quixotic, thoughtful
	Relaxed	Lazy, leisurely, mellow, relaxed
	Vigorous	Confident, determined, empowered, fiery, martial, vigorous
Negative	Aggressive	Aggressive, hostile
	Agitated	Aggravated, agitated, irritated
	Dreary	Barren, blah, bored, desolate, dreary, inanimate
	Gloomy	Blue, brooding, cheerless, dark, dispirited, doleful, dour, down, gloomy, glum, heavy, long-faced, low, low-spirted, sad, sombre, sour, sullen
	Grumpy	Cranky, cynical, discontented, glowering, grumpy, morose, plaintive
	Listless	Apathetic, drained, lethargic, listless, numb, sluggish
	Miserable	Abject, dejected, depressed, hapless, miserable, misfortunate, pathetic, piteous, suffering, unhappy, wretched
	Nervous	Anxious, apprehensive, nervous, stressed, tense
	Pensive	Pensive, ponderous
Ambiguous	Boisterous	Boisterous, impetuous, rowdy
	Rebellious	Devious, mischievous, naughty
	Restless	Distracted, hyper, jittery, restless, rushed
	Sentimental	Autumnal, bitter-sweet, melancholic, nostalgic, poignant, sentimental, wistful
	Serious	Serious, solemn

Step 1.5 Describing Moods Verbally: This step consisted of five (3 to 5-hour) workshops that took place over five consecutive weeks, during which we collaboratively recollected, shared, and examined our mood experiences to generate a verbal description for each of the identified mood states. Given the elusiveness and diffuseness of mood, we developed a componential approach for holistically and impressionistically portraying each mood from six different aspects (Table 2). The first two components (i.e., subjective feeling and perception) focus on subjective experiences. The last four components (i.e., reaction, tendency, liking, and disliking) can be seen generally as thought/action tendencies stimulated by mood. More specifically, *Reaction* and *Tendency* focus on the mood-stimulated reactive and active involuntarily behaviours, respectively. *Liking* and *Disliking* depict the mood-stimulated preferences from both positive and negative perspectives.

In the five workshops, we took the following steps to create a description for each mood. **1) Recollection** (5-10 minutes): We each searched for and mentally relived our own previous experiences of the mood. **2) Externalisation** (10 minutes): Under the guidance of the componential structure, each of us wrote down a description of the mood. **3) Exchange and Debate** (20-30 minutes): We read out loud and discussed the self-written mood descriptions to seek confirmation, rejection and improvement. **4) Conclusion** (5 minutes): We generated a mutually recognisable description for the mood collaboratively.

Step 1.6 Illustrating Moods Visually: We decided to include 80 illustrative images in the booklet because images have been found to contribute to the effective communication of subjective experiences (Evans, 2008; Megehee & Woodside, 2010). Following the recommendations of Yoon, Desmet, and Pohlmeyer (2016), we decided to select four images per mood. These authors proposed that this can convey various aspects of an experience, which reduces ambiguity. It offers the possibility to combine images that are more direct or literal (e.g., human facial or bodily expressions) with images that are more abstract or metaphorical (e.g., objects and natural landscapes). The main requirements for selecting images were: 1) each image clearly

Table 2. The six components of mood description.

Components	Rationale
1. Subjective Feeling	Moods are experiential; they are felt or sensed in some way. These experiences include both mental feelings (e.g., mentally sharp and energetic, difficult to focus and think), and bodily experiences (e.g., bodily warmth, headache, muscle tension, see Larsen, 2000).
2. Perception (of the world or life as a whole)	One's mood influences how one globally perceives and evaluates the oneself, the world or life as a whole (e.g., Brown & Mankowski, 1993; Dreyfus, 1991; Frijda, 1994). These mood-influenced perceptions are typically expressed with metaphors (e.g., life is like a sunny meadow, an amusement park, or a barren desert).
3. Reaction (towards people and events)	Moods stimulate distinct reactions in social interactions by priming particular evaluations and inferences. (Forgas, 1998, 2017; Parkinson et al., 1996). For example, when responding to a request of a colleague our mood will influence whether we react reluctantly, adversely, or defensively, or perhaps cordially, confidently, patiently, and cooperatively.
4. Tendency (to involuntarily behave)	Moods urge a person to behave in certain ways. They often influence, for instance, the ways in which one moves the body (e.g., *abruptly* or *slowly*), stimulate automatic simple gestures (e.g., *nail biting*, *leg shaking*, or *smiling*), and influence overall conduct (e.g., *tending to take risks* or *acting distractedly*).
5. Liking	Our mood determines what we are *in the mood for*. Some activities suddenly become more attractive when we change from one mood to another. This component can be expressed in terms of concrete activities (e.g., *I feel like reading*) or in terms of qualities of features of activities (e.g., *I feel like spending time with people*).
6. Disliking	Being in a mood also can make certain activities particularly unattractive. Similar to the *liking* component, this can be described in terns if concrete activities (e.g., *I don't feel like reading*) or in terms of particular qualities of features of activities (e.g., *I don't feel like doing task-oriented activities*).

represented and illustrated the target mood, and 2) each image in a set of four added explanatory power to the set (i.e., minimise overlap). Images were selected with a two-staged procedure. First, 200 images were collected from online image databases. Next, a questionnaire study ($N = 66$) examined the degree to which each of the 200 images expressed/illustrated the target mood, informing the final image selection. The full procedure and questionnaire study were reported by Desmet and Xue (2020).

Step 1.7 Refining the Results Internally: Our introspective mood-describing process also promoted a more detailed examination and nuanced comparison of the 23 mood states, which urged us to constantly question and adjust the initial mood typology. For some very similar moods, their descriptions emerged as being too homogeneous to be considered as two unique types (i.e., aggressive and agitated; cheerful and jubilant). In addition, some were also found to be representing certain aspects (e.g., felt energy level, action tendency, and perception of the world) across all or many moods (e.g., energetic, restless, pensive, dreary). Consequently, we merged some very similar mood states and reduced the number of identified mood states to 18.

Step 1.8 External Auditing: As a final step in the process, two 2-hour auditing workshops were organised with an English language expert. As a native speaker, English teacher, and professional poetry translator, she contributed her sensitivity to affective experiences and nuances in English wording. To prepare for the workshops, she studied the results of Study 1. In the workshops, she reviewed the results in terms of recognisability and linguistic consistency, providing several suggestions for improving the descriptions.

Results:
Mood Typology and Rich Descriptions Version 1

Study 1 generated an initial typology of 18 mood states. Given its provisional status and large amount of information, we only introduce the overall structure (Table 3). To further develop and refine the typology, Study 2 collected real-life mood samples with a larger group of co-researchers.

Study 2: Triangulation and Enrichment

Procedure

Step 2.1 Co-researcher Recruitment: The co-researcher selection process started with an open call at Delft University through emails and posters, and was guided by three criteria: 1) a strong motivation to know about moods; 2) a good awareness of affective experiences; 3) an ability to communicate fluently in English and being comfortable with sharing introspective insights. In addition, the ability to participate with a spouse/partner (who also meets the above-mentioned criteria) was seen as a positive because it would add potential benefits of mutual observations. We also ensured that all co-researchers were mature digital device users and self-equipped with a computer and a smartphone. Interested individuals were first invited to answer an online questionnaire that assessed motivation, sensitivity towards felt affective experiences, and English language skills. The participation criteria were further evaluated with face-to-face conversations during the pre-study workshop (Step 2.2). In total, 12 individuals were selected, of whom eight (seven Master students and one

Table 3. A mood provisional typology (version 1) based on the results of Study 1.

Negative (*N* = 7)	Miserable, Gloomy, Lethargic, Grumpy, Agitated, Anxious, Stressed
Positive (*N* = 7)	Cheerful, Relaxed, Vigorous, Friendly, Giggly, Peaceful, Dreamy
Ambiguous (*N* = 4)	Sentimental, Serious, Boisterous, Rebellious

PhD candidate) completed the study and generated usable data (Table 4). The co-researchers contributed on a voluntary basis, and each received a 50-euro compensation at the end of Study 2. During the study process, the first author of this paper took the dual role of a researcher-introspector, and the other authors played a more objective role as auditor.

Step 2.2 Co-researcher Training: All co-researchers participated in a 2.5-hour pre-study training workshop, which served several preparatory functions. First, it was used to evaluate the qualification for participation. Second, it served as an ice-breaking session, through which co-researchers got to know each other. Third, it clarified the concept of mood and synchronised a shared group understanding. Co-researchers were invited to recall and share discuss personal mood experiences, and we provided a theoretical summary, concrete examples and illustrative mood metaphors. Finally, it introduced the study procedure, familiarised the co-researchers with the online mood reporting tool (see Appendix 2), and resolved any remaining doubts, questions, and concerns about what the role of co-researcher entailed in this study.

Step 2.3 Two-week Mood Diary and Intermediate Interviews: We designed an event-contingent[5] protocol for the diary practice. The co-researchers were guided to pay attention to their moods every now and then, and whenever they noticed that they were in a positive (i.e., better than a neutral state) or a negative (i.e., worse than a neutral state) mood. They reported moods in two steps. First, they recorded *memory cues* by taking photos, videos, or making voice or written memos. To avoid privacy-related sensitivities, they were not asked to submit these memory cues; the purpose was to help them to remember details of the mood experience. The second step was to reflect on the mood and report it online. For this, they answered 15 questions, out of which 12 were open-ended (see Appendix 2). Ideally, this should be done immediately after the mood was noticed. However, given that a mood experience might last hours or even days without a clear onset and end, the co-researchers were given the freedom to decide at which stage of the mood to make their report. In addition, we expected that in some cases, it would be difficult or impractical to report the mood immediately (e.g., when in a meeting). Thus, co-researchers reported the mood as soon as they could, but at least within 30 hours after noticing the mood.

On the fourth and fifth day of the mood diary period, every co-researcher participated in a short individual interview (15-20 minutes). The interviews gave them the opportunity to give feedback, discuss experienced practical difficulties and receive further assistance. For example, several co-researchers expressed difficulties in detecting mood-related bodily sensations. To support them, we suggested to try mindfulness-related body scan techniques (e.g., Mirams, Poliakoff, Brown, & Lloyd, 2013). Other feedback was that several co-researchers found it difficult to report at least two mood samples every day. In response to this, we relaxed the target, assuring them that we valued authenticity over quantity.

Step 2.4a The First Round of Data Analysis: The first round of data analysis started immediately after the conclusion of the mood diary period. The mood diaries yielded 159 introspective mood samples, out of which 13 were contributed by the researcher-introspector. Among the samples, 38.4% ($N = 61$) and 61.6% ($N = 98$) were reported as negative and positive experiences, respectively. Over half of the mood samples ($N = 81$) were reported while the moods were experienced, the other half ($N = 77$) were reported after experiencing the moods.

For our first round of data analysis, we used a qualitative content analysis method. First, every mood sample was read twice for gaining a deep impression of these samples as particular instances of mood states. Then the mood samples were read a third time as each co-researcher's chronological diary. The repetitive data immersion provided us with an overview of the mood samples as dynamic and interrelated experiential processes of the different individuals over the two-week period. In the next stage, the data were examined word by word. Meanwhile, interesting keywords and expressions that captured recurrent meanings and concepts were highlighted. Primary findings, thoughts and insights were also recorded as side notes. Finally, cross-sample commonalities, potential mood categories and descriptive structures started to emerge. Throughout the analytical process, the examination occurred at two levels. First, at a macro level, each mood sample was treated as a holistic mood vignette. We attached one or more labels that could best represent the mood sample as a whole contextually, experientially, and conceptually. The purpose of this level of analysis was to initially categorise similar particular mood samples into a number of homogeneous

Table 4. Demographic information about the eight co-researchers.

Co-researcher Number	Gender	Age	Mother Tongue	Note
CR01	Male	26	Dutch	
CR02	Female	25	Dutch	
CR04	Female	27	German	Partner/Spouse of CR08
CR05	Female	23	Chinese	
CR06	Female	26	Turkish	
CR07	Male	24	Dutch	
CR08	Female	31	German	
CR12	Female	26	Finnish	

mood states. Second, at a micro level, we singled out contextual information, frequently appearing adjectives and expressions, and evocative metaphors that the co-researchers used to describe these emerging mood states. The purpose of the micro-level analysis was to create rich and broadly recognisable mood descriptions for mood communication between laypeople. Therefore, counting the frequency of concepts and uniting similar concepts into abstract highest-level themes were one consideration, but not the only. Some expressions that appeared only once in one co-researcher's report were also picked out because of their poetic vividness and deep interpersonal resonance.

The first round of data analysis offered an abundance of vivid textual descriptions of each mood that could be integrated into the mood portrayals that we developed in Study 1. Moreover, according to our interpretations, it also resulted in a mood typology that clearly confirmed the mood typology version 1. We did not identify any new mood state in the first round of data analysis. To confirm the results with the co-researcher group, all the co-researchers were involved in two following collaborative analysis sessions (Step 2.5).

Step 2.4b Preparation for the Collaborative Analysis: In parallel with Step 2.4a, we also guided the co-researchers to carefully prepare themselves for the upcoming co-analysis sessions. On the day that the mood diary ended, we invited all the co-researchers to have a meeting, in which we provided them with their own mood samples in printed form and introduced two preparatory tasks that everyone needed to complete before the co-analysis sessions: 1) to thoroughly review their own mood samples; 2) to identify a variety of mood states by categorising their own mood samples, and provisionally name or describe them in their own words.

Step 2.5 Collaborative Analysis: A week after the mood diary practice ended, the group of co-researchers jointly made a co-analysis effort with three objectives: 1) to collaboratively identify a set of mood states from the 159 introspective mood samples; 2) to reach a consensus on the interpretation and description of each mood state; 3) to reflect upon the results of Study 1. Considering the length and intensity of the co-analysis process, it was separated into two 2.5-hour sessions focusing on the negative moods (in the morning) and positive moods (in the afternoon) respectively, with a 1.5-hour lunch break in between. Despite different foci, the two sessions both integrated a concept-mapping procedure and followed the same steps outlined below.

1. *Preparation (approx. 10 minutes):* The co-researchers reviewed their own mood classifications and descriptions again, and made a summary *mood sticky note* (MSN) for each mood state identified. On each MSN, the co-researcher number, the mood's provisional name and the relevant mood sample numbers were specified.

2. *Setting up the Stage (approx. 15 minutes):* The co-researcher who recognised the highest quantity of mood states was invited to set up the stage by placing all her MSNs on a large piece of paper with an approximately even distance in between, and to read out loud the descriptions that she gave for these moods.

3. *Free Discussion and Initial Clustering (approx. 25 minutes):* Taking the stage as an initial spectrum of moods, the remaining co-researchers placed their MSNs at the best matching spots, according to the similarities in the mood descriptions and experiential qualities, *not the provisional mood names* that they gave. Free communication was encouraged for making their clustering decisions and adding new mood clusters if necessary. When the initial mood clusters were made, they were numbered (e.g., Neg 1, 2, 3 ... or Pos 1, 2, 3…), not named, in order to keep the whole group concentrating on the descriptions, rather than finding perfect names for these moods.

Figure 3. The co-analysis session.

4. *Collaborative Re-clustering and Describing (approx. 80 minutes):* Under the guidance of the moderator, the group went through the mood clusters one by one. Each co-researcher read out loud his/her descriptions of these moods. While listening, the other co-researchers were guided to constantly reflect on the following questions: Have I ever experienced this mood? Can I imagine experiencing this mood someday in the future? Do I agree with the details in the mood description? If I have my MSN in this cluster, do others' descriptions confirm that it really belongs to the category? After the mood description reading, a group discussion for the particular mood cluster followed, during which some co-researchers confirmed their original clustering decisions, some changed, and some proposed making new mood clusters.

5. *Reviewing the Results of Study 1 (approx. 30 minutes):* As the very last activity on the agenda, all co-researchers were invited to review the outcome of Study 1. All co-researchers were able to recognise all 18 mood states that we identified and described in Study 1, including those ambiguous moods that were not included in the scope of Study 2. At the same time, with the fresh memories of the co-analysis sessions, the co-researchers suggested that three mood states (i.e., Pos 5a, Pos 7b, and Pos 8) were missing in the version 1.

Step 2.6 The Final Round of Data Analysis: The co-researcher group's collective analytical effort generated a categorisation of eight negative and ten positive moods (see

Table 5 for an overview of the results). However, three mood states (i.e., *Neg 6*, *Pos 1*, and *Pos 4*) were identified with a relatively low level of consensus. A closer scrutiny convinced us to remove the three mood states. First, *Neg 6* was identified based on only one mood sample (named *lonely* by the reporting co-researcher). Even though the reporting co-researcher insisted the mood sample could stand alone as a distinct state, her description for it was consistent with what others gave for the samples clustered in *Neg 4* (named *gloomy* by the authors). Feeling *lonely* or *isolated* was frequently reported as one aspect of a gloomy mood. We therefore merged Neg 6 into Neg 4 to form what we call a *gloomy* mood in the typology. Second, *Pos 1* was originally represented by a cluster of four mood samples. The descriptions given by the reporting co-researchers were very close to mood *Pos 2* (named *relaxed* by the authors). The main difference between Pos 1 and Pos 2 was in the situation. The contextual information of the samples in Pos 1 showed that the reporting co-researchers were forced to engage in some *mood-incongruent activities* (e.g., urged by the partner to continue work on her paper when she was already in a relaxed mood), which caused these mood experiences to be perceived as *in between positive and negative* or *transitional*. But, in terms of the essence of Pos 1 and Pos 2, they were close enough to be seen as one mood. Third, *Pos 4* contained three

mood samples from two co-researchers who named it *lively* and *optimistic* respectively. We argued that Pos 4 was a mixture of *Pos 3* (named *cheerful* by the authors), *Pos 5a* (named *productive* by the authors), and *Pos 5b* (named *vigorous* by the authors), according to the descriptions. These three moods share many commonalities, especially in subjective feeling and perception (e.g., positive valence, felt high energy, certainty, sense of control and optimism). They are all possibly derived from similar antecedent moods and situations (e.g., after being in a relaxed mood and situation where previous fatigue, stress or anxiety is eliminated). Thus, precisely differentiating these mood states in the dynamic unfolding of real-life mood experience is difficult.

Results:
Mood Typology and Rich Descriptions Version 2

At the end of Study 2, the three rounds of data analysis (i.e., Steps 2.4, 2.5, and 2.6) resulted in the mood typology and rich descriptions version 2, which contained *seven negative* and *eight positive* mood states that inductively emerged from the data. Given the large amount of text, we only enclose an extraction of raw data and our interpretations of the most reported mood state (i.e., relaxed, 30 samples) in Appendix 3.

Table 5. An overview of the results of Steps 2.4b, 2.5, and 2.6.

Mood Number (given in Step 2.5)	Provisional Mood Names (given by co-researchers in Step 2.4b)	Quantity of Mood Samples (on the mood maps created in Step 2.5)	Quantity of Mood Samples (after Step 2.6)	Mood Name (given by the authors at the end of Step 2.6)
Neg 1	decadence, defeated, drained, sadness, upset, stressed/miserable	5	8	Miserable
Neg 2	anxious, chaotic, unproductive, discontent, frustrated, anxiety, distressed	15	18	Anxious
Neg 3	cheerless, listless, powerless, reckless, miserable, fatigue	13	13	Lethargic
Neg 4	self-doubt, apprehensive	7	8	Gloomy
Neg 5	grumpy, annoyed	4	5	Grumpy
Neg 6	lonely	1	0	N/A
Neg 7	tense, stressed, unproductive stress, rushed	15	6	Stressed
Neg 8	agitated, irritable	1	3	Agitated
Pos 1	on the edge of (feeling) positive, distressed yet peaceful, rising trust	4	0	N/A
Pos 2	relaxed, carefree, calm, relief	28	30	Relaxed
Pos 3	cheerful, chipper, positive excitement	22	25	Cheerful
Pos 4	lively, optimistic	3	0	N/A
Pos 5a	active, hunger for work, flow, productive, determined, motivated, in control	24	24	Productive
Pos 5b	energetic, determined, passionate, ethicistic, explosive	5	5	Vigorous
Pos 6	giggly	4	4	Giggly
Pos 7a	amiable	4	4	Friendly
Pos 7b	loving	3	4	Romantic
Pos 8	euphoria	1	2	Jubilant

Mood Typology and Rich Descriptions Version 3

The published holistic mood typology and descriptions (version 3) was generated on the basis of a systematic comparison, combination and refinement of the first two versions. Version 2 contained three mood states (i.e., *productive*, *romantic*, and *jubilant*) that were not included in the version 1. On the other hand, two identified in version 1 (i.e., *dreamy* and *peaceful*) were not represented by any mood samples, although some samples under *relaxed* manifested some qualities of these two moods. In version 3, *productive* and *jubilant* were added; *romantic* was merged with *friendly* to represent a broader mood concept *amiable*. In terms of the descriptions, some vivid mood expressions appeared in the mood diary were integrated in the version 3. In addition, because of the following two insights gained from Study 2, we created and included a narrative (based on the mood diary data) that shows a *typical situation* and *mood dynamics* for the description of each mood, without claiming a simple causal relationship between the mood, situation, and activities.

First, in many cases, we did not find a clear and simple causal relationship between the mood, situation, and activities, but rather an interdependent and mutually influential relationship between these factors. For example, a relaxed mood typically appears when, or is associated with, engaging in relaxing activities (e.g., sunbathing, casual reading, listening to soft jazz music), but it is undefinable whether it is the mood that causes the congruent situation and activities or the other way around. Nevertheless, information on the typical situations in which different moods occur enriches the mood descriptions and may better facilitate mood-focused design communication and ideation. Second, real-life mood experiences are complex and dynamic processes, although we primarily view them as discrete affective states in these two studies. The naturalistic mood samples collected in Study 2 revealed the dynamic characteristic of mood experience. For instance, as we found through the chronological analysis, a stressed mood often gradually becomes an anxious mood, if the situation evolves not as well as expected, and makes the near future seem increasingly uncertain and threatening. Consequently, although it is not difficult to conceptually differentiate between the moods of being *stressed* and *anxious*, these two moods were frequently mixed by the co-researchers in their reports. Moreover, both stressed and anxious moods may further transform into other negative moods, such as *agitated* (high felt energy, in a social situation) or *gloomy* (low felt energy, in an isolated situation). Similarly, a report of a relaxed mood was often made by the co-researchers after being in a demanding situation where a stressed, anxious, productive, or vigorous mood previously occurred. It is arguable that a relaxed mood requires an earlier demanding situation to be an antecedent. A relaxed mood may continue to bring about a more tranquil (e.g., often during the evening) or more positively energetic (e.g., when the weather is mild and sunny) state if it is not disrupted by any unexpected intensive emotional event. In addition, it seems that a mood experience can often contain several mood states. The co-researchers discussed whether being in a relaxed mood could be seen as an antecedent or as the basis of a dreamy, friendly or romantic mood. Consequently,

some mood samples were originally recognised and reported as *relaxed*, but the descriptions of them clearly showed essences of a *dreamy* (e.g., thinking of things far removed from one's immediate reality), *friendly* (e.g., being empathic and caring) or *romantic* (e.g., paying special attention to, staying close to and seeking out physical intimacy with a romantic partner) mood.

Table 6. A comparison between the three versions of mood typology.

	Version 1 (18 Moods)	Version 2 (15 Moods)	Version 3 (20 Moods)
Negative	Miserable	Miserable	Miserable
	Anxious	Anxious	Anxious
	Lethargic	Lethargic	Lethargic
	Gloomy	Gloomy	Gloomy
	Grumpy	Grumpy	Grumpy
	Stressed	Stressed	Stressed
	Agitated	Agitated	Agitated
Positive	Relaxed	Relaxed	Relaxed
	Peaceful	-	Peaceful
	Cheerful	Cheerful	Cheerful
	-	Productive	Productive
	Vigorous	Vigorous	Vigorous
	Friendly	Friendly	Amiable (Friendly + Romantic)
	-	Romantic	-
	Dreamy	-	Dreamy
	Giggly	Giggly	Giggly
	-	Jubilant	Jubilant
Ambiguous	Sentimental	-	Sentimental
	Serious	-	Serious
	Boisterous	-	Boisterous
	Rebellious	-	Rebellious

Conclusion and Discussion

This manuscript introduces a fine-grained typology of 20 mood states, represented by holistic (pictorial and verbal) descriptions, developed through two studies with a top-down and a bottom-up approach, respectively. The typology contributes to the growing catalogue of design-relevant typologies of human experience, including typologies of product pleasures (Jordan, 2000), positive emotions (Desmet, 2012), mixed emotions (Ozkaramanli et al., 2016), rich experiences (Fokkinga & Desmet, 2013), and fundamental needs (Hassenzahl et al., 2013). It serves as a human-centric knowledge foundation for mood-focused design research and practice, which will ideally support this emerging

domain that is currently dominated by technology-driven and intuition-based design approaches. Design researchers may use the typology as a resource for the further exploration of detailed mood-stimulated user thoughts, behaviours, and preferences (e.g., Desmet et al., 2019). It is important because, in some cases, to understand the target users through their *pre-interaction* mood states may be more effective than through conventional static user profiling methods (e.g., persona). For example, in a hospital environment, many patients who are waiting for the test results or their turn for important medical treatments tend to experience anxious moods despite their diverse cultural and educational backgrounds, personal traits, values and beliefs. Thus, when designing an interactive system for this group of people, to gain an understanding of what effects that this frequently experienced (pre-interaction) mood has on their general feelings (e.g., alter, vulnerable and lack of sense of control), cognitive style (e.g. narrowed focus), behaviours (e.g., act impatiently), and preferences (e.g., prefer familiar things and activities; have little interest in exciting and novel things) would be more inspirational and effective for the design ideation than trying to depict a representative user profile based on some general demographic information. Designers may use this typology to enhance their mood granularity, and unique design innovations may be derived from being able to specify an intended contrast between the *pre-interaction* and *post-interaction* user mood states in the early phase of the design project. For example, although the interactions with everyday products and services have mood changing or regulating effects, few have been systematically designed with mood-regulation as a deliberated intention. What if we can design a chair, an environment or a service that allows the user to transform from a *lethargic* mood to a *giggly* one by interacting with it? Such a clearly defined contrast between the pre-interaction and post-interaction user mood states would help designers to envision and create deliberate mood-influencing interactive systems.

We are well aware that these two studies introduce some *methodological mistiness*, for example our exploration was limited by English language without including mood types that may be common in other languages; we embraced the wholeness of the phenomenon of study and valued breadth and depth over focus; some research steps were too onerous to be reported in detail. Nonetheless, the triangulation of the two studies proved to be effective for developing a grounded typology. At the same time, we do not consider the results to be an ultimate mood typology, but prefer to see it as a continuously evolving system, an open-source collaborative platform that welcomes criticism, feedback, further introspections, reflections, and enrichment. To support and stimulate further development, the booklet is available as an open-access publication. In addition, we will introduce it to Master and PhD students in our own institute, to be used in their mood-focused design projects, and systematically collect feedback. We expect that this will result in gradually increasing the granularity of the mood descriptions. By continuously reporting updates on how the typology evolves, it can also serve as a general source of inspiration for other dynamic phenomenological inquiries.

In the two reported studies, we examined the mood phenomenon as a variety of discrete mood states, yet we acknowledge there are more ways to conceptualise and investigate mood experiences. For instance, Parkinson and colleagues (1996) argue that emotions are *acute or phasic* experiences, whereas moods are *chronic or tonic* experiences, because moods do not have a clear moment of onset, but gradually and continuously change from one state to another. We have noticed this in these two studies and believe that it is necessary to gain a better understanding of the continuous dynamic unfolding of the mood experience, which will enhance the knowledge foundation and inspire more design strategies and methods for mood-focused design.

Finally, a systematic approach to mood-focused design can be a chance to start a new approach to design for experience and well-being. The design for emotion approach has primarily focused on the elicitation of desirable emotions during the human-design interaction process. To design for mood, *regulation* is as important as *elicitation*. In this sense, the design effort may focus on encouraging the users to take a more active role in their affective experiences, increasing their self-awareness of the changing moods and helping them master these background affective experiences for serving the best purposes that they value.

Acknowledgements

Endnotes

1. The concept of mood granularity is similar to emotional granularity, which was developed by Barrett (2004). Recent research has suggested that a designer's high emotional granularity, which offers benefits such as enhanced empathy with the users, is a valuable skill for human-centred design (Yoon, Pohlmeyer, & Desmet, 2016). Design-relevant emotion typologies have been shown to be an effective means for increasing the emotional granularity of designers (Desmet, 2012; Yoon, 2018).

2. The lexical approach is based on the premise that subjective phenomena that are salient and socially relevant have become encoded in our natural language (e.g., John, Angleitner, & Ostendorf, 1988; Renner, 2003).

3. Holbrook (1997) considers researcher introspection the ultimate form of participant observation in which the researcher directly experiences and *becomes* the phenomenon under investigation. Our introspections in

this study were more metacognitive (i.e., focusing on the cognitive, affective, and sensational qualities) than narrative (i.e., focusing on the personal storytelling). Nevertheless, both aspects were integrated in the research process, because during the workshops, we shared a large number of personal life episodes in which various moods were experienced to illustrate and make sense of them. See Gould (2006, 2008) for more discussions on the differences between metacognitive introspection and narrative introspection.

4. Study 2 required the participants to be highly motivated, active and engaged, and they were not only expected to generate data but also to act as co-analysts in the later phase of the study. This was a very different mode of research participation to merely passively answering questions asked by the researcher. Therefore, we treated and addressed the participants as *co-researchers* throughout the process of Study 2, which better facilitated the research process by offering everyone a more equal position, a sense of ownership and a secure collaborative knowledge-creating atmosphere.

5. An event-contingent protocol requires the participant to record or report every time a predefined event has happened. In contrast, interval-contingent diaries survey what has happened since the last interval, and signal-contingent diaries focus on the participant's experiences at the very moments of receiving signals. Interval-contingent and signal-contingent designs have some special advantages in investigating individuals' ongoing changes in experiences within a certain period. Consequently, they are mostly used to measure individuals' daily levels of mood and hourly experiential variations and fluctuations on specific occasions (Bolger, Davis, & Rafaeli, 2003). Because the objectives of the current studies were to identify and describe a variety of discrete mood states, we deliberately endeavoured to capture lived mood experiences as specific experiential events and employed an event-contingent protocol, although we recognised the dynamics unfolding as an important characteristic of the mood phenomenon.

References

1. Barrett, L. F. (2004). Feelings or words? Understanding the content in self-report ratings of experienced emotion. *Journal of Personality and Social Psychology, 87*(2), 266-281. https://doi.org/10.1037/0022-3514.87.2.266

2. Beedie, C., Terry, P., & Lane, A. (2005). Distinctions between emotion and mood. *Cognition and Emotion, 19*(6), 847-878.

3. Bolger, N., Davis, A., & Rafaeli, E. (2003). Diary methods: Capturing life as it is lived. *Annual Review of Psychology, 54*(1), 579-616. https://doi.org/10.1146/annurev.psych.54.101601.145030

4. Brown, J. D., & Mankowski, T. A. (1993). Self-esteem, mood, and self-evaluation: Changes in mood and the way you see you. *Journal of Personality and Social Psychology, 64*(3), 421-430.

5. Calvo, R. A., Dinakar, K., Picard, R., & Maes, P. (2016). Computing in mental health. In *Proceedings of the Conference on Human Factors in Computing Systems* (Ext. Abs., pp. 3438-3445). New York, NY: ACM.

6. Davidson, R. J. (1994). On emotion, mood, and related affective constructs. In P. Ekman & R. J. Davidson (Eds.), *The nature of emotion: Fundamental questions* (pp. 51-55). New York, NY: Oxford University Press.

7. Desmet, P. M. A. (2002). *Designing emotions* (Doctoral dissertation). Delft, The Netherlands: Delft University of Technology.

8. Desmet, P. M. A. (2008). Product emotion. In H. N. J. Schifferstein & P. Hekkert (Eds.), *Product experience* (pp. 379-397). Amsterdam, The Netherlands: Elsevier.

9. Desmet, P. M. A. (2012). Faces of product pleasure: 25 positive emotions in human-product interactions. *International Journal of Design, 6*(2), 1-29.

10. Desmet, P. M. A. (2015). Design for mood: Twenty activity-based opportunities to design for mood regulation. *International Journal of Design, 9*(2), 1-19.

11. Desmet, P. M. A., Romero, N., & Vastenburg, M. H. (2016). Mood measurement with Pick-A-Mood: Review of current methods and design of a pictorial self-report scale. *Journal of Design Research, 14*(3), 241-279.

12. Desmet, P. M. A., & Xue, H. (2020). *Developing a collection of 80 mood-expressive images.* Retrieved from https://diopd.org/wp-content/uploads/2020/03/mood-booklet-image-validation-study-report.pdf

13. Desmet, P. M. A., Xue, H., & Fokkinga, S. F. (2019). The same person is never the same: Introducing mood-stimulated thought/action tendencies for user-centered design. *She Ji: The Journal of Design, Economics, and Innovation, 5*(3), 167-187. https://doi.org/10.1016/j.sheji.2019.07.001

14. Desmet, P. M. A., Xue, H., & Fokkinga, S. F. (2020). *Twenty moods: A holistic typology of human mood states.* Delft, The Netherlands: Delft University of Technology.

15. Djamasbi, S., & Strong, D. M. (2008). The effect of positive mood on intention to use computerized decision aids. *Information & Management, 45*(1), 43-51. https://doi.org/10.1016/j.im.2007.10.002

16. Djamasbi, S., Strong, D. M., & Dishaw, M. (2010). Affect and acceptance: Examining the effects of positive mood on the technology acceptance model. *Decision Support Systems, 48*(2), 383-394. https://doi.org/10.1016/j.dss.2009.10.002

17. Dreyfus, H. L. (1991). *Being-in-the-world: A commentary on Heidegger's 'Being and Time,' división I.* Cambridge, MA: MIT Press.

18. Evans, J. S. B. T. (2008). Dual-processing accounts of reasoning, judgment, and social cognition. *Annual Review of Psychology, 59,* 255-278.

19. Fawcett, J., & Downs, F. S. (1986). *The relationship of theory and research.* Norwalk, CN: Appleton-Century-Crofts.

20. Fokkinga, S. F., & Desmet, P. M. A. (2013). Ten ways to design for disgust, sadness, and other enjoyments: A design approach to enrich product experiences with negative emotions. *International Journal of Design, 7*(1), 19-36.

21. Forgas, J. P. (1998). Asking nicely? The effects of mood on responding to more or less polite requests. *Personality and Social Psychology Bulletin, 24*(2), 173-185. https://doi.org/10.1177/0146167298242006

22. Forgas, J. P. (2017). Mood effects on cognition: Affective influences on the content and process of information processing and behavior. In M. Jeon (Ed.), *Emotions and affect in human factors and human-computer Interaction* (pp. 89-122). New York, NY: Academic. http://dx.doi.org/10.1016/B978-0-12-801851-4.00003-3

23. Frijda, N. H. (1994). Varieties of affect: Emotions and episodes, moods, and sentiments. In P. Ekman & R. J. Davidson (Eds.), *The nature of emotion: Fundamental questions* (pp. 59-67). New York, NY: Oxford University Press.

24. Frijda, N. H. (2009). Mood. In D. Sander & K. R. Scherer (Eds.), *Oxford companion to emotion and the affective sciences* (pp. 258-259). New York, NY: Oxford University Press.

25. Gould, S. J. (1995). Researcher introspection as a method in consumer research: Applications, issues, and implications. *Journal of Consumer Research, 21*(4), 719-722. https://doi.org/10.1086/209430

26. Gould, S. J. (2006). Unpacking the many faces of introspective consciousness: A metacognitive-poststructuralist exercise. In R. W. Belk (Ed.), *Handbook of qualitative research methods in marketing* (pp. 186-197). Cheltenham, UK: Edward Elgar Publishing.

27. Gould, S. J. (2008). An introspective genealogy of my introspective genealogy. *Marketing Theory, 8*(4), 407-424. http://dx.doi.org/10.1177/1470593108096543

28. Gregor, S. (2005). The struggle towards an understanding of theory in information systems. In D. N. Hart & S. D. Gregor (Eds.), *Information systems foundations: Constructing and criticising* (pp. 3-12). Canberra, Australia: ANU Press.

29. Hassenzahl, M., Eckoldt, K., Diefenbach, S., Laschke, M., Lenz, E., & Kim, J. (2013). Designing moments of meaning and pleasure: Experience design and happiness. *International Journal of Design, 7*(3), 21-31.

30. Holbrook, M. B. (1997). Romanticism, introspection, and the roots of experiential consumption: Morris the epicurean. *Consumption, Markets and Culture, 1*(2), 97-163.

31. John, O. P., Angleitner, A., & Ostendorf, F. (1988). The lexical approach to personality: A historical review of trait taxonomic research. *European Journal of Personality, 2*(3), 171-203.

32. Jordan, P. W. (2000). *Designing pleasurable products an introduction to the new human factors.* London, UK: Taylor & Francis.

33. Larsen, R. J. (2000). Toward a science of mood regulation. *Psychological Inquiry, 11*(3), 129-141.

34. Megehee, C. M., & Woodside, A. G. (2010). Creating visual narrative art for decoding stories that consumers and brands tell. *Psychology & Marketing, 27*(6), 603-622.

35. Mirams, L., Poliakoff, E., Brown, R. J., & Lloyd, D. M. (2013). Brief body-scan meditation practice improves somatosensory perceptual decision making. *Consciousness and Cognition, 22*(1), 348-359. https://doi.org/10.1016/j.concog.2012.07.009

36. Morris, W. N. (1989). *Mood: The frame of mind.* New York, NY: Springer-Verlag.

37. Morris, W. N. (1992). A functional analysis of the role of mood in affective systems. In M. S. Clark (Ed.), *Review of personality and social psychology* (Vol. 13. Emotion, pp. 256-293). Thousand Oaks, CA: Sage Publications.

38. Norman, D. A. (2004). *Emotional design: Why we love (or hate) everyday things.* New York, NY: Basic Books.

39. Nowlis, V., & Nowlis, H. H. (1956). The description and analysis of mood. *Annals of the New York Academy of Sciences, 65*(4), 345-355. https://doi.org/10.1111/j.1749-6632.1956.tb49644.x

40. Ozkaramanli, D., Desmet, P. M. A., & Özcan, E. (2016). Beyond resolving dilemmas: Three design directions for addressing intrapersonal concern conflicts. *Design Issues, 32*(3), 78-91. https://doi.org/10.1162/DESI_a_00401

41. Parkinson, B., Totterdell, P., Briner, R. B., & Reynolds, S. (1996). *Changing moods: The psychology of mood and mood regulation.* London, UK: Longman.

42. Pribram, K. H. (1970). Feelings as monitors. In M. B. Arnold (Ed.), *Feelings and emotions: The Loyola Symposium* (pp. 41-53). New York, NY: Academic Press.

43. Renner, W. (2003). Human values: A lexical perspective. *Personality and Individual Differences, 34*(1), 127-141. https://doi.org/10.1016/S0191-8869(02)00037-5

44. Siemer, M. (2005). Moods as multiple-object directed and as objectless affective states: An examination of the dispositional theory of moods. *Cognition and Emotion, 19*(6), 815-845. https://doi.org/10.1080/02699930541000048

45. Siemer, M. (2009). Mood experience: Implications of a dispositional theory of moods. *Emotion Review, 1*(3), 256-263. https://doi.org/10.1177/1754073909103594

46. Thayer, R. E. (1989). *The biopsychology of mood and arousal.* New York, NY: Oxford University Press.

47. Venkatesh, V., & Speier, C. (1999). Computer technology training in the workplace: A longitudinal investigation of the effect of mood. *Organizational Behavior and Human Decision Processes, 79*(1), 1-28.

48. Watson, D., & Clark, L. A. (1994). Emotions, moods, traits, and temperaments: Conceptual distinctions and empirical findings. In P. Ekman & R. J. Davidson (Eds.), *The nature of emotion: Fundamental questions* (pp. 89-93). New York, NY: Oxford University Press.

49. Wensveen, S., Overbeeke, K., & Djajadiningrat, T. (2002). Push me, shove me and I show you how you feel: Recognising mood from emotionally rich interaction. In *Proceedings of the 4th Conference on Designing Interactive Systems* (pp. 335-340). New York, NY: ACM.

50. Woodside, A. G. (2004). Advancing from subjective to confirmatory personal introspection in consumer research. *Psychology & Marketing, 21*(12), 987-1010. https://doi.org/10.1002/mar.20034

51. Xue, H., & Desmet, P. M. A. (2019). Researcher introspection for experience-driven design research. *Design Studies, 63,* 37-64. https://doi.org/10.1016/j.destud.2019.03.001

52. Yoon, J. (2018). *Escaping the emotional blur: Design tools for facilitating positive emotional granularity* (Doctoral dissertation). Delft University of Technology, Delft, the Netherlands.

53. Yoon, J., Desmet, P. M. A., & Pohlmeyer, A. E. (2016). Developing usage guidelines for a card-based design tool: A case of the positive emotional granularity cards. *Archives of Design Research, 29*(4), 5-18.

54. Yoon, J., Pohlmeyer, A. E., & Desmet, P. M. A. (2016). When 'feeling good' is not good enough: Seven key opportunities for emotional granularity in product development. *International Journal of Design, 10*(3), 1-15.

55. Zhang, M., & Jansen, B. J. (2009). Influences of mood on information seeking behavior. In *Proceedings of the 27th International Conference on Human Factors in Computing Systems* (pp. 3395-3400). New York, NY: ACM.

Appendix

Appendix 1: *Sources for the collection of mood words*

1. Espierspectives (2010). *List of tone and mood words.* Retrieved from https://espierspectives.wordpress.com/2010/09/26/list-of-tone-and-mood-words/
2. Feldman, L. A. (1995). Variations in the circumplex structure of mood. *Personality and Social Psychology Bulletin, 21(*8), 806-817.
3. Laurier, C., Sordo, M., Serra, J., & Herrera, P. (2009). *Music mood representations from social tags.* Retrieved from https://pdfs.semanticscholar.org/95f4/7cde473fe6c8591d3bf7f73c27adbff9db8e.pdf
4. Nguyen, T. (2010). Mood patterns and affective lexicon access in weblogs. In *Proceedings of the ACL 2010 Student Research Workshop* (pp. 43-48). Stroudsburg, PA: Association for Computational Linguistics.
5. Valitutti, A., Strapparava, C., & Stock, O. (2004). Developing affective lexical resources. *PsychNology Journal, 2*(1), 61-83.
6. Yik, M., Russell, J. A., & Steiger, J. H. (2011). A 12-point circumplex structure of core affect. *Emotion, 11*(4), 705-731.

Appendix 2: *Mood diary (Online mood reporting tool/questionnaire)*

Instructions

When you feel and notice a positive (i.e., a mood that is clearly better than neutral) or negative (i.e., a mood that is clearly worse than neutral), please record the situation and report the mood by completing the following two tasks:

Task 1. Collect Memory Cues/Record the Situation: take some photos and videos to record the environment and situation (keep them for yourself, no need to hand in).

Task 2. Record/Report the Mood Experience

- Following the guidance of this online mood diary, look into your own mind and body under the mood you are experiencing.
- Preferably, please report the mood directly while introspecting;
- If immediate report is not possible, please jot down some keywords, and do the above two steps as soon as you can, and no later than 12 p.m. the next day. In this case, please do use the memory cues of the mood to relive the mood again before you report.
- Please report 2 moods per day at least, though you are encouraged to report more.

Mood diary (online mood reporting tool/questionnaire)

Sections (*N* = 3)	Questions (*N* = 15)
Facts	1. Your Co-researcher Number 2. Are you experiencing the mood that you are about to report right now? • Yes. (Excellent! This is an ideal situation) • No, but less than 30 hours ago. (Please go through the memory cues and relive the mood before you continue) • If the mood occurred over 30 hours ago, please report another time.
General Description	3. This mood is … • Positive • Negative 4. Please use 1-3 adjectives to generally describe the mood you are/were experiencing.
The Situation	5. Time/duration & Location 6. I am/was with ... (whom) 7. What I am/was doing is/was ... (event/activity)
Detailed Description *(Please use your own words to complete the following paragraphs. There are no right or wrong answers, what we would like to know is how you feel, think and behave when you are in this mood.)*	8. My energy level is/was … 9. The feeling is/was like … (bodily & mental feeling) 10. The world or my life seems/seemed to be … 11. If I don't/didn't regulate myself, I tend/tended to respond to whoever/whatever comes/came to me as… 12. I tend/tended to act ... (only direct, simple actions; e.g., sitting straight or reclining on something; people around you may notice your behaviours, also ask them if you can.) 13. What I feel/felt like doing is/was … 14. I don't/didn't feel like ... 15. Anything else about this mood?

Appendix 3: *One example of the results of study 2*

Relaxed (Total Sample N = 30)

	Examples from Raw Data (the mood samples)	Authors' Interpretation
General Description (in 1-3 adjectives)	Relaxed (13), calm (5), happy (5), peaceful (4), content (4), lighthearted (2), serene, at ease, tranquil, empty mind, slack off, loose, laidback, relieved, carefree, leisurely, lazy, a little self-indulgent, unfocused, mellow, bright, chill, amiable, optimistic, cheerful, energetic, peppy, motivated, encouraged, hopeful, confident, curious, full of expectation	Relaxed
Typical Situation	CR1: Shopping, managing cooking for 20 people [his housemates and friends] with 5 people, going to other people's places, eating, drinking, going to a café. CR2: Watching rugby, going out for dinner and drinks [with her parents and boyfriend] … Making and having a dinner, talking and relaxing with my partner. CR6: We [the CR6 and some of her friends] had a really nice lunch together and there was a very positive vibe. Then, on my way back home from the train station, the sun was shining, people were out. The scene was very vivid. We went to my friend's place where she prepared us very delicious food and we chatted for a couple of hours. CR7: Relaxing, sitting on the coach, hanging out with brother and nephew. CR8: Being at home, eating, working, calling my mother, watching a film [with her partner]. CR12: Basking in the sunshine [with her husband].	This mood is often associated with a perceived certain and secure situation (e.g., being at home or other leisure places that one feels familiar and safe; alone or with loved/liked ones). It is often associated with activities such as bath, sunbath, casual reading, soft jazz music listening, brunch, dinner, having a glass of wine, etc. It may also manifest as a rewarding feeling after doing sports.
Feeling (felt energy, physical, and mental feelings)	**My energy level is …** CR1: Relaxed, normal, content CR2: Low, but in a relaxed way. Sleepy, but due to relaxation. CR4: Low/medium CR6: Medium, let's say 55% CR8: After having a negative mood in the past two days (tense and stressful) with a negative and not productive high energy level, it turned into a positive energy level (70%). CR12: Medium low CR13: 80%, didn't sleep well last night, woke up at 5:30. But, it's a relaxing and sunny day, I was at ease.	You are more likely to have low or medium energy in a positive way (i.e., little tension).
	Physical, I feel/felt … CR2: … very at ease. My body was tired, but in a relaxing way. Like nothing was expected of me, I could just be present physically, but did not have to put energy in my posture or in the conversations. CR4: … after sport, tired in the body but in a good way. CR5: … like laying some burdens down after a long day… I think I am getting my energy back and ready for starting something else … It's the feeling after few yoga exercises…the body felt lighter, a bit tired but in a relaxed way. CR6: … comfortable on the couch, finally feeling like I deserve a bit of free time. CR8: … relaxed, warm feeling in the whole body. CR12: … light and relaxed after getting back home from a massage.	You feel warm, at ease, light, comfortable, satisfied, a bit lazy and tired but in a positive and healthy way.
	Mentally, I feel/felt … CR1: … in control, steady. CR4: … pressure is finally taken off, my body being free again. CR5: … like I escaped from reality and didn't realise that (at that moment) either, quite relaxed. CR6: … very fresh and clear although I had a slight head ache towards the end of the night. CR8: … hopeful … happy (because of the weekend). CR12: … optimistic and satisfied for the progress I was making. Satisfied and full; uplifted and mellow.	You feel some long-lasting burdens or tensions are removed. You feel hopeful, optimistic and free from troubles again and ready to let your mind to be empty or meander. You mind is clear in spite of the tiredness in body.
Perception (of the world and life as a whole)	**The world or my life seems/seemed to be…** CR1: …under my control. CR2: …sunny and easy…the beginning or start of a new time. CR4 ...good. I can tackle stuff again tomorrow. CR5: …brighter and fresher. I think because I could finally widely open the window, clean my room, let more air come in. Instead of sleeping in bed, constantly taking medicines and checking the thermometer. CR6: …sunny, bright, lively. This keeps me relaxed. Children playing outside, I hear their giggles. The smell of manure in the air reminds me of summer. CR8: My life seems to be getting coordinated again; people seem to be nicer to me; the whole world seems to be brighter. CR12: [My life] is going somewhere.	The world seems to be harmonious, quieter, lighter, fresher and brighter compared to before, and you are optimistic about your life and future again. The world is treating you kindly and offering you with freedom and opportunities again. Nothing in your life at this moment requires serious immediate response, everything is under control and going well.

	Examples from Raw Data (the mood samples)	Authors' Interpretation
Reaction	**I react/reacted to people or events…** CR1: Listen to others' opinions and trying to take out the good parts that they came up with. CR2: I would be very quiet. I felt so relaxed and thus not really talkative, so I had to remind myself of talking every now and then. CR4: I'm available for other people's problems, happy to chat, have energy to do something positive. CR6: I would be a bit goofy but very friendly. I would ask thoughtful questions and would be open to help people around me … Smile all the time, look around and observe my environment, being really in the moment if I didn't need to work on my project. CR8: …I tend to ask questions and talk to people CR12: Positively, although after a poor sleep last night I don't bother to pick up a conversation with anyone.	When you just entre this mood, you tend to react to people or events friendly, positively, and slowly with smile, but not seek for too intensive social interaction that may interrupt this mood. You tend to invite loved ones to join and share this mood.
Tendency	**I tend/tended to (act or behave) …** CR2: … be slow…I was very mellow … be calm, relaxed, slow with my body posture and also with my way of speaking. CR4: …take breaks, be nice to myself and allow some slack. CR6: I was moving slowly, without any rush. I was very patient while dealing with lots of cables when I was trying to set the projector and connect it to my laptop. Normally I am a bit impatient with these kind of technology related things. CR7: [I'm] sitting bend over, lying down on the couch. CR8: … be more open, talk to people more than usually, act with more self-confidence. CR8: … touch my hair, feel how soft it is. CR12: … laugh at jokes, chat about the day, talk more than usually, be agreeable; … sit toward sunshine with eyes closed.	You tend to keep yourself in a comfortable (flat) posture in a sofa or bed; gently touch your hair and forehead and open your arms; stay still or move slowly and be quiet. If you are in a social condition, you tend to be more talkative, patient, and tolerant.
Liking	**I want to …** CR2: … sleep, lay on the couch, read a book, watch a movie. CR5: …curl up on my big armchair with some tea and watch a funny movie. CR5: Half of myself want to go home and sleep, the other half want to stay at the party and just see the other people being stupid and have fun. CR6: … be in my grandmother's farm and lay on the grass, inhale the smell of flowers and have deep conversations with my partner. CR6: … enjoy the moment of not thinking of anything. CR7: … relax, not really do anything. CR8: … have a walk outside as it is the first warm day this year; take some time for myself. CR12: … be present in the moment and enjoy the early spring feeling.	You want to enjoy the moment and the beautiful things (e.g., sunshine, the smell of flowers) in your life. You want to stay still, quiet, or talk with loved ones, take a nap, read a book, watch a film just for fun, or enjoy a glass of wine. When you are energised, you may want to go out for fun.
Disliking	**I don't want to …** CR1: … stress about anything, work on my report. CR4: … work on my report, physical activity/work. CR5: … go outside to hang out with people. I preferred some me-time. CR6: … sit in front of the computer the whole day. CR7: … go out in the cold weather, do anything physically active. CR8: … work (however I should and I will work during the train ride) CR12: … clean the dishes CR12: …think about job and school applications; deal with tax and residence related bureaucracy, book a time for a dentist.	You do not want to be engaged in any perceived demanding (e.g., work) or boring activities; think of your to-do list or challenges to come; meet and talk too much to strangers.

Researchers' Observation on the Dynamics of This Mood

This mood typically requires a demanding situation which may be associated with some high-arousal moods (e.g., stressed, anxious, productive, or vigorous) to be an antecedent. It is likely to further transform into a more tranquil (e.g., often during the evening) or more positively energetic (e.g., cheerful) states if it is not disrupted by any unexpected intensive emotional event.