Developing a collection of 80 mood-expressive images

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Abstract

This manuscript describes the development of a collection of 80 mood-expressive images to be included in a mood inspiration booklet. Four images were selected for each of 20 different mood states. Two main criteria guided the selection procedure: (1) each image clearly represents and illustrates the target mood, and (2) the images within a set of four do not overlap (i.e., each image should add explanatory power to the set), and the set shows diversity (i.e., expressions, behaviours, social interactions and environments). First, a broad collection of 200 images was selected from online image databases. A questionnaire study (N = 66) examined the degree to which each of the 200 images expresses/illustrates the target mood. The study indicated that 158 images were good representations of the mood target (i.e., they rated significantly higher than the scale midpoint). The final collection of 80 moods were selected from these representative images.

Introduction

The booklet "*Twenty moods: A holistic typology of human mood states*" (Desmet, Xue, & Fokkinga, 2020), provides an overview of 20 different human mood states. It was based on a recently published phenomenological study that examined real-life experienced moods (Xue, Desmet & Fokkinga, 2020). Each mood is described with six dimensions (feeling, perception, reaction, tendency, liking, and disliking).

Boon (2012) proposed that generic knowledge is most actionable to designers when it is conveyed on multiple levels of abstraction. Especially images can contribute to effective communication of knowledge and principles. As concrete representations of abstract ideas, images help people to intuitively relate to these ideas (Evans, 2008; Megehee & Woodside, 2010). The visual modality is by far most dominant learning mode because images are the basic communication medium of the brain (Gardner, 1993). Images are the springboards for extending our understanding, well beyond the parameters of verbal language (Pinker, 1997). Probably for this reason, almost all design method card sets use images as a means to illustrate principles (see e.g., Lucero & Arrasvuori, 2010; Yoon, Desmet & Pohlmeyer, 2013; Wölfel & Merritt, 2013).

For the mood typology, it was decided to add 80 illustrative images (four for each mood) to the typology booklet. The current manuscript describes the selection of these images. They 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 expresses/illustrates

the target mood, informing the final image selection. This report first discusses requirements for the image selection. Next, we report a questionnaire study (N= 66) that tested 200 candidate images. The last part describes the final image selection.

Image selection procedure
Following the recommendations of Yoon, Desmet, and Pohlmeyer (2013), we decided to select four images per mood. These authors proposed that such an image collection 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 represents and illustrates the target mood, and (2) each image adds explanatory power to the set of four (i.e., minimal overlap). In line with the second requirement, the set of four is intended to be diverse (i.e., include expressions, behaviours, social interactions and environments). Additional, more general requirements, were that the collection should reflect diversity (e.g. gender, age, and race), and that the images should not be offensive or express sensitive topics, such as religion or politics.

Step 1: Initial image collection
As a first step, the authors made an initial collection of 200 mood images (10 for each mood; see Appendix 1 for the overview). The collection was selected from 27 online image databases (Appendix 2). To formulate suitable search queries, a list of words was created for each mood that showed synonyms, associations, an manifestations (such as mood-specific reactions, perceptions, and tendencies). For example, the following search queries were used for the mood lethargic: sluggish, extinguished, drained, desolate, boring, procrastinate, passive, and listless.

Step 2: Questionnaire study to test image collection
To test the degree to which each of the 200 mood images represents and illustrates the target moods, a questionnaire study was conducted.

<u>Participants</u>
This study was done with 66 respondents (of which 41 were female). All respondents were students with Chinese nationality (age ranged between 21 and 35 with a mean of 24,1), studying in Beijing.

<u>Questionnaire</u>
The questionnaire consisted of 21 pages. The first page introduced the study, included a consent form and asked some general questions about age, gender, and nationality. The next 20 pages each presented a different mood (A3, landscape). The left side of the page provided the complete description of the target mood from the 20 moods booklet (see above). All texts were translated to Chinese by a professional translator and checked by a native Chinese mood researcher. The right side of the page showed the ten images. Respondents rated each image for the degree to which it is a good representation of the target mood (with a 7-point Likert scale, where 1 means "no representation" and 7 means "perfect representation").

<u>Procedure</u>

All respondents filled out the questionnaire individually. At the start of the study, a moderator introduced the aim of the study and explained the questionnaire. Next, in four consecutive days, participants filled out the questionnaire, four pages every day (two in the morning and two in the afternoon). The study was spread out over five days to avoid fatigue influences.

<u>Results</u>

Mean ratings were computed for all 200 images. A one-sample t-test (df = 65) was performed to determine which images rated higher than the scale mid-point. The test indicated that 158 images (79% of the complete collection) rated significantly higher than the midpoint, see Table 1. Table 2, gives an overview of the 20 images with highest scores for each mood.

<u>Conclusion</u>

The study indicated that about 79% of the 200 images were good representations of the target mood. For 18 moods six or more images rated significantly above the scale midpoint. For one mood (agitated), four images rated significantly above the scale midpoint, and for one mood (sentimental), this was only three images.

Step 3: Final image selection

The final selection was based on the original two main criteria: (1) each image clearly represents and illustrates the target mood, and that (2) the images within the collection do not overlap (i.e., each image should add explanatory power to the collection), and the collection shows diversity (i.e., expressions, behaviours, social interactions and environments). The data of the questionnaire study was used to meet the first criterion. In order to meet the second criterion, the first author used the following procedure:

- <u>Step A</u>: Collect the four images with highest ratings.
- <u>Step B</u>: Asses the diversity within the set of four. If two or more images are too similar, omit the one(s) with the lowest rating.
- <u>Step C</u> (in case Step B results in omitting one or more images): Look at the six images that were not selected in Step A. Only consider those that had a rating that was significantly higher than the scale midpoint. From those, select the image(s) that add(s) most diversity to the selection.

Table 1

Mean ratings, standard deviation, and significance for 200 mood images (significant images marked with *)

Mood	Image	Mean	Standard Deviation	Sign. (2-tailed)	Mood	Image	Mean	Standard Deviation	Sign. (2-tailed)
Miserable	mis01*	5,86	1,344	,000	Rebellious	reb01*	4,83	1,551	,000
	mis02	4,14	1,592	,482		reb02*	5,25	1,367	,000
	mis03	3,75	1,799	,271		reb03*	5,06	1,390	,000
	mis04*	5,38	1,291	,000		reb04*	4,66	1,764	,004
	mis05	3,84	1,619	,439		reb05	4,19	1,768	,396
	mis06	4,28	1,431	,121		reb06*	4,57	1,711	,010
	mis07*	5,68	1,512	,000		reb07	4,06	1,658	,760
	mis08*	4,72	1,578	,001		reb08*	5,84	1,462	,000
	mis09*	5,92	1,126	,000		reb09*	5,17	1,819	,000
	mis10*	4,94	1,531	,000		reb10	4,43	1,873	,074
Sentimental	sen01	4,23	1,815	,305	Vigorous	vig01*	4,98	1,638	,000
	sen02	2,57	1,457	,000		vig02*	4,48	1,574	,017
	sen03	3,05	1,547	,000		vig03*	4,80	1,493	,000
	sen04	2,08	1,291	,000		vig04*	4,98	1,657	,000
	sen05*	5,77	1,170	,000		vig05	4,21	1,677	,332
	sen06	3,63	1,795	,100		vig06*	6,30	1,019	,000
	sen07	3,92	1,684	,712		vig07*	5,97	1,234	,000
	sen08*	4,60	1,647	,005		vig08	4,20	1,416	,256
	sen09*	4,46	1,838	,047		vig09*	4,38	1,496	,049
	sen10	4,25	1,837	,284		vig10*	5,47	1,613	,000
Gloomy	glo01*	4,98	1,558	,000	Giggly	gig01*	5,22	1,313	,000
	glo02*	4,55	1,415	,002		gig02*	5,57	1,292	,000
	glo03*	5,92	1,163	,000		gig03*	6,00	1,191	,000
	glo04*	4,67	1,369	,000		gig04*	5,68	1,384	,000
	glo05*	4,91	1,318	,000		gig05*	4,60	1,765	,009
	glo06*	5,02	1,420	,000		gig06*	4,86	1,469	,000
	glo07	4,19	1,687	,370		gig07*	4,70	1,633	,001
	glo08*	4,57	1,425	,002		gig08*	6,24	,979	,000
	glo09*	5,78	1,244	,000		gig09*	5,73	1,334	,000
	glo10*	5,40	1,529	,000		gig10*	5,59	1,410	,000
Lethargic	let01	3,11	1,738	,000	Amiable	ami01*	6,05	1,113	,000
	let02*	5,08	1,324	,000		ami02*	5,81	1,203	,000
	let03*	5,06	1,648	,000		ami03*	6,16	1,194	,000
	leg04*	6,05	1,316	,000		ami04*	6,17	1,071	,000
	let05*	4,91	1,684	,000		ami05*	6,32	,858	,000
	let06*	5,91	1,208	,000		ami06*	5,67	1,308	,000
	let07*	5,23	1,703	,000		ami07*	5,35	1,095	,000
	let08*	5,26	1,326	,000		ami08*	5,43	1,411	,000
	let09*	4,80	1,438	,000		ami09*	5,46	1,293	,000
	let10*	5,48	1,213	,000		ami10*	5,76	1,241	,000
Grumpy	gru01	2,92	1,712	,000	Cheerful	che01*	5,79	1,175	,000
	gru02*	5,17	1,330	,000		che02*	5,40	1,442	,000
	gru03*	5,21	1,319	,000		che03*	6,05	,982	,000
	gru04*	4,66	1,417	,000		che04*	5,56	1,410	,000
	gru05	3,23	1,721	,001		che05*	4,65	1,269	,000
	gru06*	5,65	1,165	,000		che06*	5,87	1,094	,000
	gru07*	5,71	1,092	,000		che07*	5,81	1,157	,000
	gru08*	5,42	1,266	,000		che08*	5,77	1,273	,000
	gru09*	5,02	1,305	,000		che09*	5,73	1,162	,000
	gru10*	4,62	1,752	,005		che10*	6,26	1,100	,000

Table 1 (continued)

Mean ratings, standard deviation, and significance for 100 mood images (significant images marked with *)

Agitated	agi01	3,55	1,649	,033	Relaxed	rel01*	5,83	1,203	,000
	agi02	3,82	1,727	,395		rel02*	6,27	,930	,000
	agi03*	5,11	1,223	,000		rel03*	5,45	1,224	,000
	agi04	4,35	1,832	,124		rel04*	5,05	1,327	,000
	agi05	3,98	1,376	,929		rel05*	5,91	1,191	,000
	agi06*	4,92	1,450	,000		rel06*	5,98	1,148	,000
	agi07*	4,73	1,354	,000		rel07	3,97	1,727	,885
	agi08	4,21	1,524	,262		rel08*	5,50	1,168	,000
	agi09*	4,42	1,520	,031		rel09*	5,25	1,182	,000
	agi10	4,11	2,156	,691		rel10*	6,13	1,016	,000
Anxious	anx01	3,71	1,928	,229	Dreamy	dre01	3,94	1,670	,766
	anx02	4,08	1,676	,715		dre02*	5,02	1,561	,000
	anx03*	4,66	1,513	,001		dre03*	4,86	1,622	,000
	anx04	4,33	1,533	,082		dre04*	4,88	1,558	,000
	anx05*	5,58	1,337	,000		dre05*	4,86	1,552	,000
	anx06*	5,78	1,152	,000		dre06*	5,50	1,425	,000
	anx07	4,11	1,254	,495		dre07*	4,55	1,799	,018
	anx08*	5,21	1,157	,000		dre08*	5,31	1,572	,000
	anx09*	4,97	1,691	,000		dre09*	5,30	1,814	,000
	anx10*	5,41	1,312	,000		dre10*	5,52	1,403	,000
	stre01*	4,83	1,545	,000		pea01*	5,00	1,545	,000
Stressed	stre02	3,83	1,768	,447	peaceful	pea02*	4,86	1,851	,000
	stre03	4,43	1,845	,064		pea03*	5,39	1,107	,000
	stre04	4,24	1,873	,297		pea04*	5,59	1,342	,000
	stre05*	4,82	1,609	,000		pea05*	6,05	1,211	,000
	stre06*	4,53	1,638	,011		pea06*	4,81	1,258	,000
	stre07*	5,27	1,463	,000		pea07	4,22	1,695	,306
	stre08*	4,61	1,568	,003		pea08*	5,13	1,291	,000
	stre09*	5,14	1,587	,000		pea09*	6,23	,988	,000
	stre10*	6,05	1,169	,000		pea10*	5,72	1,278	,000
Serious	ser01	2,32	1,531	,000	Productive	pro01*	5,75	1,260	,000
	ser02	4,06	1,466	,738		pro02*	5,11	1,274	,000
	ser03*	5,70	1,109	,000		pro03*	6,27	,987	,000
	ser04*	6,46	1,032	,000		pro04	3,61	1,658	,064
	ser05*	4,60	1,529	,002		pro05*	5,98	1,188	,000
	ser06*	5,60	1,285	,000		pro06*	6,03	1,054	,000
	ser07*	5,00	1,559	,000		pro07	4,36	1,703	,096
	ser08*	4,52	1,361	,003		pro08	3,80	1,555	,300
	ser09*	5,70	1,289	,000		pro09*	5,59	1,354	,000
	ser10	4,09	1,716	,668		pro10*	5,31	1,022	,000
Boisterous	boi01*	5,30	1,569	,000	jublinant	jub01*	5,25	1,345	,000
	boi02*	6,22	1,317	,000		jub02*	6,06	1,203	,000
	boi03*	4,58	1,638	,005		jub03*	6,05	1,240	,000
	boi04*	6,14	1,321	,000		jub04*	6,06	1,246	,000
	boi05*	5,02	1,409	,000		jub05*	5,19	1,480	,000
	boi06*	6,51	1,276	,000		jub06*	5,75	1,098	,000
	boi07*	4,69	1,590	,001		jub07*	5,98	1,279	,000
	boi08*	5,02	1,397	,000		jub08*	6,09	1,165	,000
	boi09*	5,60	1,401	,000		jub09*	6,39	1,018	,000
	boi10*	6,38	1,155	,000		jub10*	6,31	1,296	,000

Table 2

Best rated image for each of the 20 moods

Mood	Best image	Mood	Best image
Jubilant		Vigorous	
Amiable		Dreamy	
Cheerful		Miserable	
Boisterous		Rebellious	
Relaxed		Serious	
Giggly		Anxious	
Peaceful		Stressed	
Productive		Grumpy	
Lethargic		Agitated	
Gloomy		Sentimental	

For the following seven moods, it was decided to select the four images with the highest ratings (i.e., step B did not give reason to adjust the selection). Below we will discuss the selection for each of the other 13 moods.

<u>Agitated</u>	Image 7 was not included in the set because it overlapped with image 6 (which was included). Image 4 was included in the set, even though the rating was not significant. The reason was that while it was not the strongest representation of agitation, it does add diversity to the set. From the three more abstract representations (image 2, 4, and 10), this image had the highest rating (4.35).
<u>Amiable</u>	The highest-rated images were selected, except for 1 ensure diversity (like 3, it shows two individuals). Instead, image 10 was included because it shows a group of people.
<u>Boisterous</u>	Images 1 and 8 were included in the set instead of images 10 and 3 to ensure diversity (not only groups white males).
<u>Giggly</u>	The first three highest-rated images were included in the set. Image 2 was included (instead of 4) to increase the diversity.
<u>Grumpy</u>	Images 2, 3, and 5 were included to increase diversity. Image 5 did not rated low in the study, but it was still selected because all other images show grumpy facial expressions.
<u>Jubilant</u>	Images 2, 3, and 5 were included to increase diversity.
<u>Lethargic</u>	Image 10 was not included to increase diversity. Other than that, the four highest-rated images were included in the set.
<u>Miserable</u>	The first highest-rated images were included in the set. Image 7 and 4 were not included because (on second thought) we envisioned that they may be disturbing or offensive to some people. Image 2 was included in the set, even though the rating was not significant. The reason was that while it was not the strongest representation of miserable, it does add diversity to the set.
<u>Peaceful</u>	The highest-rated images were selected, except for 5 and 10 to ensure diversity (like 1, they show individuals in a meditation pose)
<u>Productive</u>	The highest-rated images were selected, except for 1, 5, and 6 to ensure diversity (like 3, they all show individuals at work)
<u>Rebellious</u>	The highest-rated images were selected, except that image 4 was selected instead of 1 and 3 to ensure diversity.
<u>Stressed</u>	The four highest-rated images were selected, except for 5 and 7 to ensure diversity
<u>Vigorous</u>	The four highest-rated images were selected, except for 1 because (on second thought) this image may be seen as offensive to some people.

The final selection can be found in Appendix 1.

Discussion

While the results of the questionnaire study were able to guide the image selection for the first criterion (i.e., that an image should be a good representative of the target mood), it did not help us for the second criterion (i.e., that the images within a set should be diverse). This criterion is more difficult to operationalize in a questionnaire study because (a) diversity can mean many different things (i.e., topic, abstraction, demographics, and etcetera) and (b) it can only be judged holistically as a quality of the set, not as a quality of separate images. For that reason, we made the final selection not only on the basis of the questionnaire study but also on the basis of our own judgement. In some cases, we allowed the second criterion to overrule the first, in order to include some more abstract or symbolic mood representations (like an image of a cactus for grumpy, and an image of a thunderbolt for agitated, and a dry desert for miserable). As can be seen from the data, the more symbolic photos rated always lower than the photos of expressive people. Even so, while an photo of a person with a grumpy expression may be a better representation of grumpiness than an photo of a cactus, we believe that a combination of an photo of a person with a grumpy expression and an photo of a cactus is more complete as a representation of the grumpy mood than two photos of people with a grumpy expression.

There have been some limitations to our approach. The main is that while a high number of participants filled out the questionnaire, all of them came from the same country and culture (China). A more diverse sample would have been preferred because photo interpretation may be influenced by culture. At the same time, the results made sense to the first author who is European, which at least indicates that the results are not strongly cultural biased. Moreover, we believe that the approach was sufficiently rigorous given the application purpose of the image selection: To be added as illustrations to extensive mood descriptions (and not to be recognized as stand-alones). A suitable next step in the development of the set would be to validate the sets, and to see if they have discriminative power, that is, if the sets express unique moods without mutual overlap.

Several typologies of subjective experiences have been published by design researchers. Examples are 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). These typologies can serves as human-centric knowledge foundations for experience-focused design research and practice. As was mentioned in the introduction, images can add value to these typologies by making them understandable to a broad audience. The three-step approach that was developed for the current image selection may serve as a basis for selecting images for similar experience-typologies, and can be refined and standardized to ensure high-quality illustrated experience typologies.

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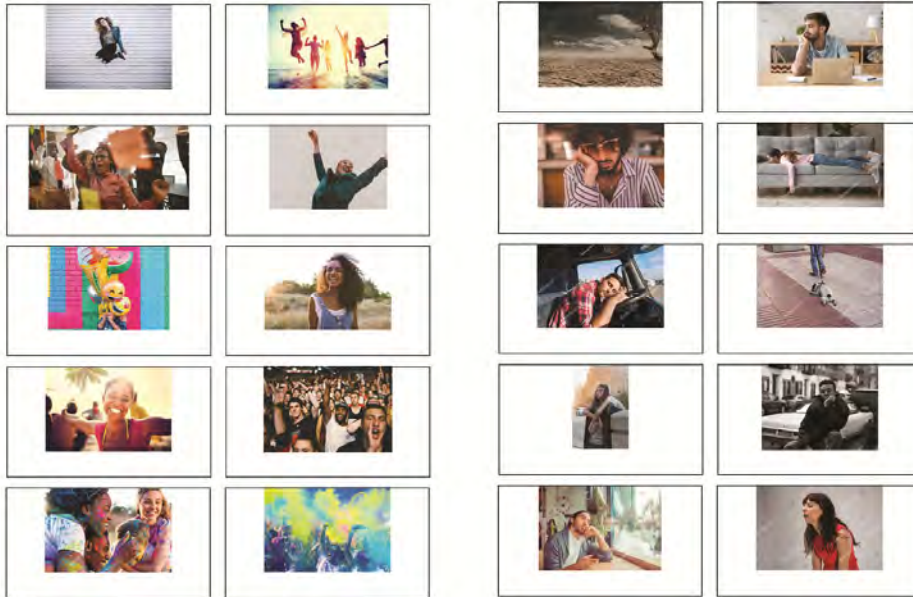
Giggly (selected: 2, 3, 8, 9) – Serious (selected: 1, 3, 4, 6) – Grumpy (selected: 2, 3, 5, 7)

Amiable (selected: 3, 4, 5, 10) – Boisterous (selected: 1, 4, 6, 7) – Agitated (selected: 3, 4, 6, 9)

Cheerful (selected: 3, 6, 7, 10) – Rebellious (selected: 2, 4, 8, 9) – Anxious (selected: 5, 6, 8, 10)

Dreamy (selected: 6, 8, 9, 10) – Miserable (selected: 1, 2, 9, 10) – Relaxed (selected: 2, 5, 6, 10)
Peaceful (selected: 3, 4, 8, 9) – Sentimental (selected: 5, 8, 9, 10) – Vigorous (selected: 4, 6, 7, 10)
Productive (selected: 2, 3, 9, 10) – Gloomy (selected: 3, 6, 9, 10) – Stressed (selected: 1, 8, 9, 10)

Jubilant (selected: 2, 3, 5, 9) – Lethargic (selected: 4, 6, 7, 8)

Image numbers in the overview:

Image 1	Image 2
Image 3	Image 4
Image 5	Image 6
Image 7	Image 8
Image 9	Image 10

Appendix 2: Sources for the collection of mood-depicting images

Source	URL
Behold.cc	http://www.behold.cc/
Dreamstime	https://www.dreamstime.com
Freeimages	https://www.freeimages.com/
Getrefe	http://getrefe.com/
Getty Images	http://www.gettyimages.nl/
Google Images	https://images.google.com/
Gratisography	https://gratisography.com/
Iso Republic	https://isorepublic.com/
iStock	https://www.istockphoto.com
Jay Mantri	http://jaymantri.com/
Kamboopics	https://kaboompics.com
Little Visuals	http://littlevisuals.co/
Makerbook	http://makerbook.net/stock-photos/
Morguefile	https://morguefile.com/
New Old Stock	https://nos.twnsnd.co/
Pexels	https://www.pexels.com/
PicFindr	http://www.picfindr.com/
Picjumbo	https://picjumbo.com/
Picography	https://picography.co/
Pinterest	https://pinterest.com/
Pixabay	https://pixabay.com/
Public domain archive	http://publicdomainarchive.com/
Shutterstock	https://www.shutterstock.com
Stocksnap.io	https://stocksnap.io/
Superfamous Images	http://superfamous.com/Images
Totallycoolpix	https://totallycoolpix.com/
Unsplash	https://unsplash.com/
Freepik	https://www.freepik.com/