Research article

How Do You Feel? A Simple Visual Tool for Assessing Emotional Well-Being

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Abstract

Objective: To provide adequate psychological and medical care, keeping track of the patients' emotional state is critically important and psychological diagnostic tools for monitoring emotional well-being are crucial in this process to help meeting children's and adolescents' psychological and medical needs. To date most instruments for evaluating emotions depend on the verbalization thereof, offer limited variability and are therefore rarely applicable to young patients who have not yet developed a differential concept of emotions. In the present study an image-based tool for assessing and categorizing emotional states in clinical and therapeutic settings was developed and evaluated. Methods: In a multistage developmental process, a set of emotional displays was designed for the 18 dominant emotions. Consequently, a convenience sample of 23 participants was asked to identify the depicted emotion, and categorize it as either positive, neutral, or negative. Results: On average participants identified 73 percent of emotions correctly and 80 percent were assigned to the correct categories. On an individual level, only three emotions were not identified above chance level, and 2 were not categorized correctly. Sex differences were found in the correct categorization in favor of female participant, while no sex differences were found in percentage of correct identification. Conclusion: Since all but 3 of the 18 emotions could be easily identified and classified by the participants, the results suggest that emotional displays are a promising novel approach to evaluating and tracking young patients' emotional state in therapeutic and scientific settings.

Key words: screening emotional well-being, age-appropriate communication, health literacy, pediatric psycho oncology, disease related emotions

Impact Statement

This study advances the idea of a visual tool for screening and tracking emotional states in therapeutic and clinical setting and thereby grounds for the development of a standardized means for evaluating young patients' emotional well-being in a sufficiently differentiated manner.

Institutional Review Board Statement

All subjects of this non-clinical sample participated anonymously and no personal data was collected, hence, since no participant is identifiable, no ethical approval was obtained for this study.

Medical interventions, such as surgical procedures or chemotherapy, can cause considerable mental distress in young patients which can lead to undesirable short and long-term mental health outcomes, such as post-traumatic stress disorder [1]. Furthermore, impaired psychological well-being can diminish medical compliance, which refers to the ability to cooperate with medical procedures [2]. Therefore, psychological diagnostic tools for monitoring emotional well-being are crucial to keep track of the patient's emotional state and help meeting children's and adolescents' psychological and medical needs.

The State-Trait Anxiety Inventory for Children [3] is a self-re-

port questionnaire for estimating the emotional state of children between 8 and 14 years of age, and consists of 40 items and takes approximately 15 minutes to complete [4]. The STAIC has a proven track record of favorable psychometric qualities [5] However, by design it only measures anxiety, while neither positive emotionality nor other negative emotions are not captured.

Li, et al. [6] developed the Children's Emotional Manifestation Scale (CEMS) to assess children's emotional state during stressful medical procedures. Medical professionals rate children's facial expression, vocalization, activity, interaction, and cooperation on a five-point scale; the facial expression scale also features pictograms of faces that each correspond with one of the five scores. While the CEMS exhibits promising psychometric properties, it is a purely observational questionnaire focused on identifying negative emotional responses to a clinical environment.

Dolidze, et al. [7] chose a different approach: they analyzed children's drawn self-portraits on various dimensions. A group of healthy children was used as a control group. From the differences between hospitalized and non-hospitalized children, the researchers drew inferences on the emotional well-being of the hospitalized group. While this approach captures interesting qualitative aspects of emotionality, the information gained using this technique may be ambiguous and hence difficult to interpret.

In recent years, the use of mobile phone applications for emotional monitoring and mood tracking has gained popularity; see Caldeira et al. [8] for a review of the most widely used applications on the market. This method has several advantages: individuals can report their emotional state in a non-artificial setting on their personal devices. Moreover, longitudinal trends in emotional well-being can be mapped beautifully using the data produced by most apps. When working with children, however, this approach has its caveats. Especially smaller children have not yet developed a differentiated concept of emotions and need professional guidance to verbalize their emotional state in dialogue

[9]. Moreover, while considering emotional developmental, it is likely that infants begin to learn emotion concepts much earlier than they can explicitly label facial configurations with emotion words and can be understood as process [10].

In the present study, we aimed to develop a visual diagnostic tool that would enable pediatric patients to convey a wide range of positive, neutral, and negative emotions in a standardized fashion; furthermore, we intended the tool to produce data that would allow for quantitative longitudinal assessment of emotional states. Importantly, the tool should be suitable for both therapeutic and research purposes and be easily applicable in daily clinical routines. During development, we hypothesized that the visual emotion displays used in the tool would be interpreted as intended. Furthermore, we hypothesized that each emotional display would be reliably categorized into positive, neutral, and negative emotions.

Methods

Development of the tool

As a first step in creating the tool, the target population for the tool was defined as children in clinical pediatric settings between 6 and 14 years of age. In the decision which emotions to include, we drew on traditional emotion classification theories, such as the work done by Paul Ekman [11]; however, these theories often lack age-related aspects that are especially relevant to the clinical setting the tool would be designed for. Therefore, the selection of emotions was modified to account for these circumstances, addressing emotional experiences with medical- therapeutic measures; addressing negative and - in a resource-oriented sense – positive emotions [12,13]. During a multistage developmental process in dialogue with experts in psychosocial care of patients in pediatric oncological treatment, a list of 18 emotions was devised. Our primary goal was to compile a range of emotions that children are likely to experience while they are in clinical settings and that describe their reality in an intuitive way. Even though in pediatric patients, negative emotions might appear dominant at
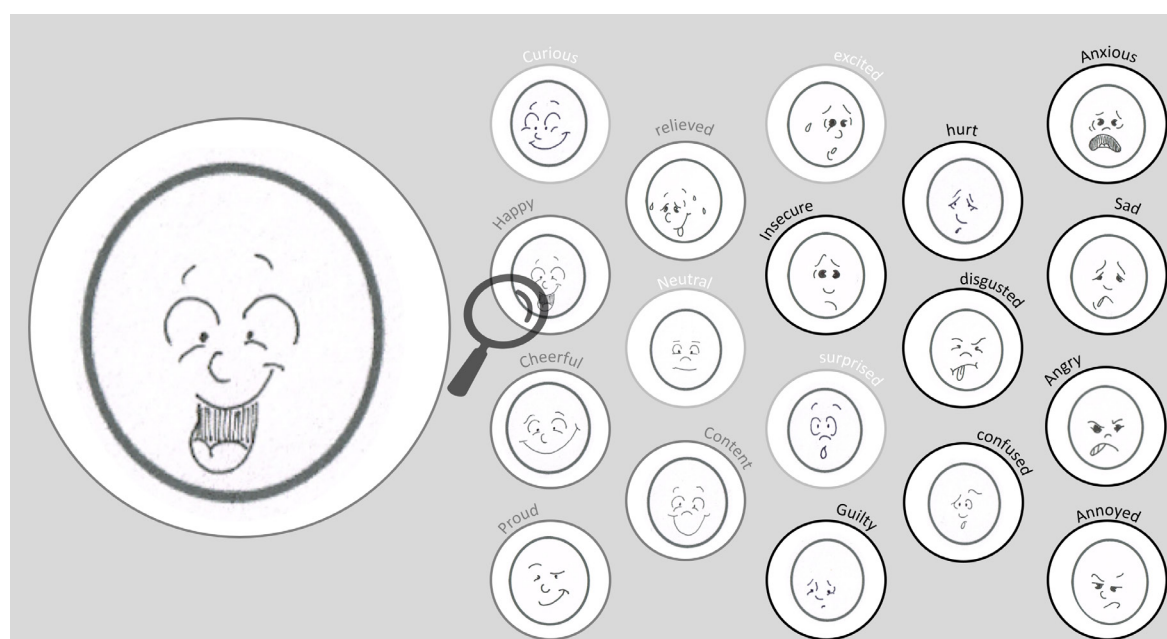

Figure 1. The drawings are monochromatic to avoid skin color as a potentially confounding factor.
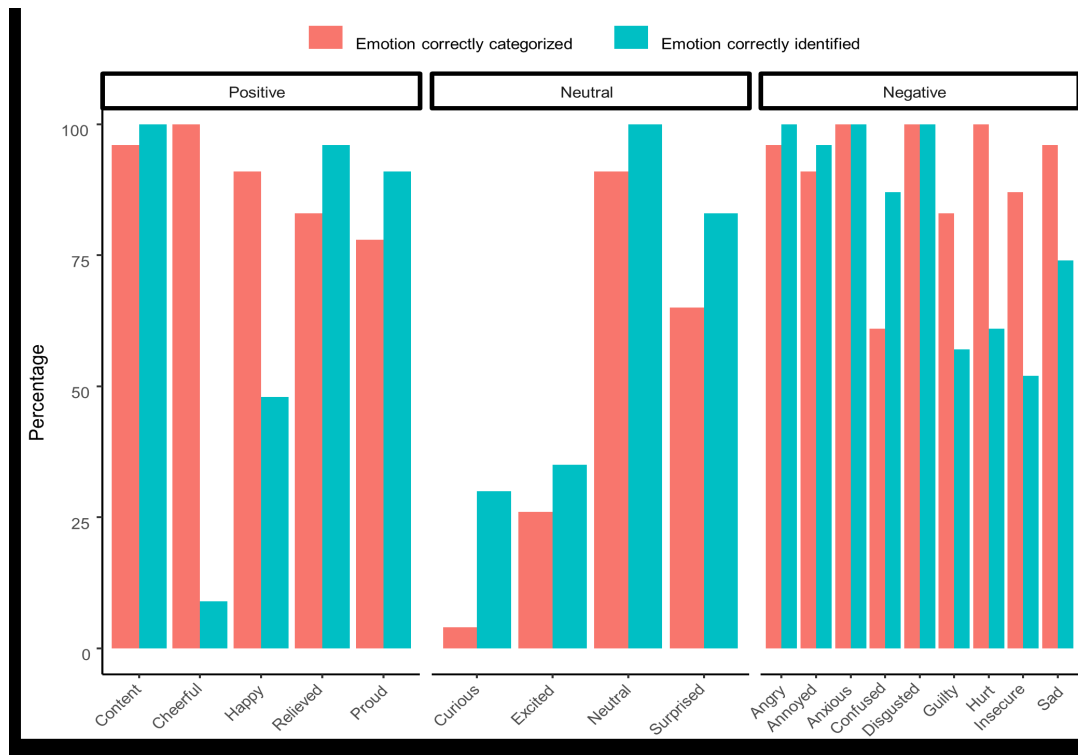
Figure 2. Evaluation results for emotional displays

Table 1. Evaluation results for emotional displays

Emotion	emotion identified correctly[a]	emotion categorized correctly[b]	category
content	100% (p = .00)	96% (p = .00)	positive
cheerful	9% (p = .96)	100% (p = .00)	positive
happy	48% (p = .00)	91% (p = .00)	positive
relieved	96% (p = .00)	83% (p = .00)	positive
proud	91% (p = .00)	78% (p = .00)	positive
curious	**30% (p = .16)**	**4% (p = .99)**	neutral
excited	**35% (p = .07)**	**26% (p = .82)**	neutral
neutral	100% (p = .00)	91% (p = .00)	neutral
surprised	83% (p = .00)	65% (p = .00)	neutral
angry	100% (p = .00)	96% (p = .00)	negative
annoyed	96% (p = .00)	91% (p = .00)	negative
anxious	100% (p = .00)	100% (p = .00)	negative
confused	87% (p = .00)	61% (p = .01)	negative
disgusted	100% (p = .00)	100% (p = .00)	negative
guilty	57% (p = .00)	83% (p = .00)	negative
hurt	61% (p = .00)	100% (p = .00)	negative
insecure	52% (p = .00)	87% (p = .00)	negative
sad	74% (p = .00)	96% (p = .00)	negative

Note. Items with p-values greater that 0.05 are shown in bold.

a. One-tailed binomial test with a baseline probability of 20 percent (multiple choice with 5 options)
b. One-tailed binomial test with a baseline probability of 33 percent (multiple choice with 3 options)

times we aimed to overemphasize neither positive nor negative emotionality and to remain resource-oriented.

Since the target population includes children at a very young age, visual representations of emotions were required. Since, emoji are currently the arguably best-known device for the nonverbal communication of emotions, efforts have been made to standardize them as a system [14]. Paradoxically, however, the ubiquity of emoji can also be a major disadvantage: almost every child knows emoji and might have previously formed unique interpretations. Many emoji have been shown to be quite ambiguous in their reading [15]. Therefore, instead of using emoji, we chose to commission a child's book artist and clinical psychologist to draw visual representations of the 18 emotions.

Validation

To make sure the visual emotion displays were interpreted as intended, we conducted a survey. Respondents were recruited via e-mail. We chose to only include adult participants, because due to the large variance in emotional maturity over the developmental trajectory, children and adolescents may be unable to differentiate the wide range of emotions presented in the displays without professional guidance [9].

The e-mail that was sent to all participants contained a hyperlink to the online survey. On the start page, subjects were given basic information about the study. Subsequently, participants were asked to look at each of the emotion drawings before being asked which emotion was displayed in the image. They could choose one out of five different emotions which, except for the correct one, were randomly picked out of the 18 emotions. We decided to use multiple-choice responses instead of verbal responses because in practical application, the emotional displays are always presented with a verbal description, and hence never have to be interpreted freely. Thereafter, each subject was asked to categorize the emotional display as either a positive, neutral or a negative emotion. Each participant rated each of the

18 displays. The order of presentation was randomized for each participant.

Results

Sample

The recruited subjects are best characterized as a convenience sample. To determine the required sample size, we conducted a a-priori power analysis for a one-tailed generic binomial test. The baseline probability was set to 0.2, as participants were presented five emotions and were asked to choose the correct one. The analysis yielded a minimum sample size of 18 participants (1-beta = 0.8, alpha = .05). 23 participants completed the survey, 13 of which were female (57 %). Mean age was 29.74 years (SD = 7.59); the youngest participant was 22 years old, the oldest 55 years old. 7 of the participants were university students; 4 of them studied psychology. Among the remaining 16 participants, there were four nurses, two psychologists, one medical doctor, one social worker, one musician, one life coach, one retail worker, and one consultant; the remainder of participants did not disclose their professions.

Identification of emotions

On average, 73 percent of emotions were identified correctly, while 80 percent of emotions were assigned to the correct categories. On an individual level, only three out of 18 emotions were not identified above chance level: cheerful, excited, and curious; see Figure 2 and Table 1 in supplement for detailed results. Curious and excited were also the only emotions that participants were unable to categorize above chance level, while most subjects correctly identified cheerful it as a positive emotion. We found no sex differences in the percentage of correctly identified emotions ($T = 0.73$ df $= 21$, p $= .47$, d $= 0.31$), but a significant sex difference in correct categorizations of emotions ($T = 2.24$, df $= 21$, p $= .04$, d $= 0.94$). These results indicate that male and female participants did not categorize emotions in the same way.

A within-subjects ANOVA yielded no differences between emotion categories regarding the percentage of correctly identified emotions ($F_{2, 63} = 0.58$, p $= .57$, $\eta_p^2 = .02$). A second within-subjects ANOVA yielded a statistically significant difference in the percentage of correctly categorized emotions between emotion categories ($F_{2, 63} = 11.51$, p $= .00$, $\eta_p^2 = .27$). However, due to the relatively small sample size, the T-tests and ANOVA's suffer from insufficient statistical power and therefore only limited inferences can be drawn.

Discussion

Our primary goal in the current study was to develop and evaluate a tool for nonverbal communication of a wide range of emotions for children in clinical and therapeutic settings. The resulting set of 18 emotional displays covers a broad spectrum, ranging from positive emotions, such as cheerfulness, to negative emotions, such as disgust. Evaluation of the displays' interpretive clarity yielded promising results: 15 of the 18 emotions were identified above chance level; on average, participants interpreted 72 percent of the emotional valence as intended. Most of the displays were identified with ease, 5 of them even showed an identification rate of 100 per cent. Nevertheless, participants had difficulties identifying the cheerful, curious, and excited draw-

ings; the former exhibited a particularly low identification rate. By design, the multiple-choice responses did not provide us with further information on why these items exhibited lower success rates compared to the remaining emotional displays. Nevertheless, the results give insight in issues on discriminating positive emotions.

To facilitate the tracking of patients' emotional state over time, we evaluated whether participants were able to categorize the displayed emotions into positive, neutral, and negative emotions. On average, participants showed a success rate of 80 per cent; 16 out of 18 emotions were categorized correctly above chance level. Again, curious and excited posed difficulties for the participants. We found a significant sex difference in the categorization of emotions; the interpretation of this finding is unclear, however, and warrants further inquiry. Positive, neutral, and negative emotions showed significantly different rates with regards to emotion identification or classification. Participants seemingly had greater difficulty in assigning emotions to the neutral category, compared to positive and negative emotions.

In conclusion, the emotional displays showed promising results: participants had no problems with most visualizations, while some items may need to be revised and re-evaluated in the future.

In its current form, the tool is suitable for standardized administration in both therapeutic and research purposes. Printed in A3 and laminated the set of displays can be presented to young patients, and standardized questions can be used to evaluate which display the patient would chose to represent their current emotional state, or their feelings related to a hypothetical or past situation – verbally, visually and supports mental representation of emotional concepts with a considerable variability. It therefore meets developmental aspects of emotional concepts: a child becomes capable of experiencing and perceiving emotion in a meaningful way only with necessary guidance and support [10].

Based on this information, professionals can react to their patients' feelings more appropriately and the tool can facilitate the reflection on and processing of emotions. Furthermore, following informed consent, the selected emotions may be recorded in anonymous fashion and used for scientific purposes, yielding valuable insights into young patients' feelings related to medical interventions.

Some limitations were encountered during this study. The sample was restricted to adults; children were not included because on average they lack the ability to differentiate a wide range of emotions [9]. Moreover, there is evidence for age-related differences in suggestibility in children associated with particularly susceptible to misleading or rather highly influenced suggestions [15]. Similarly, no hospitalized children were involved in the current sample. Thus, future work will be necessary to study children's, and more specifically hospitalized children's response to the emotional displays. Another promising approach would be to establish norm samples of both healthy and hospitalized children's responses to allow for comparisons between the groups.

We hypothesized that participants would be able to categorize emotions according to positive, neutral, or negative valence; for most items, this hypothesis was confirmed. However, additional

work is necessary to determine whether this structure holds up in a confirmatory factor analysis.

Conclusion

In the present study, we developed and evaluated a tool for the assessment and longitudinal tracking of children's emotional state in a therapeutic or clinical context. Most emotions were easily recognized and correctly categorized into positive, neutral and negative emotions. The emotional displays are a promising novel approach in pediatric psychology that can be used for both therapeutic as well as scientific purposes.

Conflict of Interest

The authors have declared no conflict of interest.

Acknowledgement

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