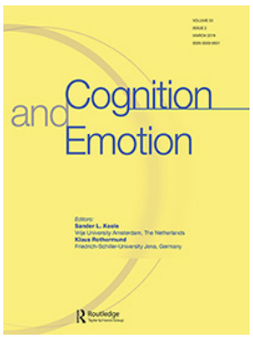

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Emotion differentiation dissected: between-category, within-category, and integral emotion differentiation, and their relation to well-being

Yasemin Erbas[a], Eva Ceulemans[a], Elisabeth S. Blanke[b], Laura Sels[a], Agneta Fischer[c] and Peter Kuppens [a]

[a]Department of Psychology, KU Leuven, Leuven, Belgium; [b]Institut für Psychologie, Humboldt-Universität zu Berlin, Berlin, Germany; [c]Department of Psychology, University of Amsterdam, Amsterdam, The Netherlands

ABSTRACT

Emotion differentiation, the ability to describe and label our own emotions in a differentiated and specific manner, has been repeatedly associated with well-being. However, it is unclear exactly what type of differentiation is most strongly related to well-being: the ability to make fine-grained distinctions between emotions that are relatively closely related (e.g. anger and irritation), the ability to make larger distinctions between very distinct emotions (e.g. anger and sadness), or the combination of both. To determine which type of differentiation is most predictive of well-being, we performed a comprehensive meta-analysis across six datasets. We examined the correlations between these three types of differentiation and several indicators of well-being (depression, emotional clarity, and self-esteem). Results showed that individuals differentiated most between very distinct emotions and least between more related emotions, and that an index computed across emotions from both the same and different emotion categories was most strongly associated with well-being indicators.

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Emotion differentiation; emotional granularity; emotion categories; emotion knowledge; well-being

How do you feel right now? Imagine asking this question to 10 different people during the same emotional event. Chances are high that you will get 10 different answers. One obvious reason for this is that people simply differ in the kind of emotions they experience in response to an event. However, there are also important differences in *how* people experience and label their emotions. One explanation that has been proposed for such different reporting of emotions is emotion differentiation, the ability to describe and label one's emotions in a differentiated and specific way.

Emotion differentiation

Emotion differentiation (ED; also termed emotional granularity) is the tendency to experience and label emotions with a high degree of complexity (Kashdan, Barrett, & McKnight, 2015). Individuals high in ED label their emotions in a differentiated, specific, and context-dependent way, whereas individuals low in ED tend to have less specific emotional experiences. For instance, while a high differentiator may report feeling sad on one occasion and feeling angry on a next occasion, a low differentiator may use these terms interchangeably and report feeling both sad and angry on different occasions across different contexts to refer to such undifferentiated feeling states.

Being able to differentiate between emotions, especially negative emotions, appears to be positively associated with emotional well-being (Barrett, Gross, Christensen, & Benvenuto, 2001). For instance, on the one hand, individuals with high levels of (negative) ED seem to engage less in maladaptive behaviours such as aggression and binge-drinking. On the other hand, affect related psychological disorders such as borderline personality disorder, major depressive disorder, and anxiety disorder, as well as schizophrenia and autism spectrum disorder have been associated

CONTACT Yasemin Erbas yasemin.erbas@kuleuven.be

with deficits in ED (see Kashdan et al., 2015; and Smidt & Suvak, 2015, for reviews). Furthermore, ED is also related to well-defined personality characteristics: high levels of negative ED are associated with lower levels of neuroticism, and higher levels of emotional clarity and self-esteem (Erbas, Ceulemans, Pe, Koval, & Kuppens, 2014). Finally, more recently, ED was also studied in the context of interpersonal relationships, and related positively to empathic accuracy, the ability to accurately judge the feelings of others (Erbas, Sels, Ceulemans, & Kuppens, 2016).

According to the feelings as information perspective (Schwarz, 1990), individuals use their emotions as a source of information about the environment. Experiencing discrete emotions can provide specific information about the emotional situation, enabling the individual to react upon it in a more adaptive and effective way. Moreover, recent research on affect labelling shows that even the mere process of labeling one's emotional experiences is beneficial for emotional regulation (Kircanski, Lieberman, & Craske, 2012). As such, higher levels of ED may promote psychological and social well-being (Kashdan et al., 2015). According to Kashdan et al. (2015), emotion labels are linked to the emotion concepts that people use to conceptualise their affective experiences and to transform them into more refined, differentiated emotional experiences. They argue that when a person has only rudimentary emotion knowledge, affective input will be conceptualised in a relatively undifferentiated fashion, depriving that person of the contextualised knowledge that is required to deal with the situation at hand. However, when a person has elaborate emotion knowledge, then sensory inputs will be conceptualised in a targeted, situation specific way, and that person will have the contextualised knowledge that is required to effectively deal with the situation at hand.

In sum, numerous studies show that ED is thus associated with better psychological well-being. However, despite the increased prominence of the relationship between ED and emotion dysregulation or psychological disorders, the exact nature of ED is still unclear. One important question to answer is what level of specificity when categorising and labelling emotions is most strongly related to well-being. Is more differentiation between all types of emotions always good, or is there a certain degree of differentiation that is specifically associated with well-being, i.e. an optimal level of differentiation? In the current study, we aim to examine whether, in the context of well-being, it is better to differentiate between broader emotion categories, or between more similar emotion labels.

According to prototype theory (Rosch, 1978; Rosch & Mervis, 1975), there is a basic level of categorisation for objects, which offers the optimal trade-off for maximising an object's discriminability and specificity, with the least cognitive effort. For instance, when communicating your favorite food, *vegetable* (superordinate level) would be too broad, *calabrese broccoli* (the type of broccoli most often found in grocery stores; subordinate level) would be too specific and therefore confusing, while *broccoli* would be the optimal level. In terms of emotion differentiation, the optimal level of emotion differentiation or specificity is unknown. In the current study, we examine whether differentiation of more prototypical emotions (e.g. anger or sadness) or differentiation of more subordinate emotions (e.g. anger, irritation, rage, etc.), is more strongly associated with well-being.

In a study on emotion prototypes, Shaver, Schwartz, Kirson, and O'connor (1987) found evidence for three basic negative emotion categories: anger, fear, and sadness. People clustered other emotion words, such as irritation, disgust, disappointment and so on in one of these emotion categories on the basis of family resemblances. The ability to differentiate between anger and sadness, and to label emotions as such, could provide individuals with knowledge to effectively deal with a given situation. But what about differentiation between more closely related emotions such as anger and irritation? Does that provide even more useful information to deal with the situation at hand? Or does it perhaps distract the individual from what is going on and deploy him or her from cognitive resources, and as such have a counterproductive effect on emotion regulation and well-being?

Different levels of ED

To examine what level of ED is the most informative and important in the context of well-being, we distinguish between two types of ED: between-category differentiation and within-category differentiation. We use the basic emotion categories derived from research by Shaver et al. (1987), and a fourth category which has been identified as a separate category in other research, namely the shame/guilt category (Diener, Smith, & Fujita, 1995).

Between-category differentiation refers to the ability to make distinctions between emotions from different categories (i.e. emotions with the same valence that do not correlate strongly with each other on the between-person level, such as anger and sadness). *Within-category differentiation* refers to the ability to differentiate between emotions from the same emotion category (e.g. anger and irritation) and reflects the ability to make more fine-grained distinctions between emotions that are relatively closely related to each other. Additionally, we will examine a third index, which will be referred to as *integral differentiation*. The integral index considers differentiation across all emotions without taking into account their category membership, and thus integrates an individual's global as well as fine-grained differentiation abilities into one index.

With regard to between-category differentiation, we expect higher levels to relate to better well-being. Discrete emotions provide valuable information when we judge and evaluate what is happening around us. Moreover, they guide us on how to respond to an emotional event and what to do to increase or decrease the experienced emotion (Barrett et al., 2001; Frijda, 1986; Gross, 2015). From this viewpoint, the ability to perceive differences between emotions that convey very different information (such as anger and sadness), is considered to be very adaptive in the light of psychological well-being (Gross, 2015). Therefore, we primarily expect between-category differentiation to be important in this context.

With regard to within-category differentiation, it seems that the ability to perceive differences between relatively more similar emotions such as anger and irritation, requires even more advanced differentiation skills. The ability to experience and label such emotions independently in different contexts, could mean that emotional responses are even more fine-tuned and nuanced than with between-category differentiation, which consequently could result in even more adaptive emotional responses and regulation. If this is the case, then we would expect within-category differentiation to also relate to well-being.

However, the opposite, that too specific categorisation is detrimental for well-being, is also possible. The more obvious the differences between objects are, the easier it is to differentiate between them. As a consequence, differentiating between emotions that are more similar will require relatively more effort. When too much effort is put in the categorisation of emotions, this could perhaps distract the individual from the most important features of the context. Rather than quickly categorising and effectively dealing with the emotion, the individual could dwell too much on his or her feelings. Furthermore, such a specific way of categorising could result in emotions that do not have very clear, distinguishable components, and for which it is less clear how to regulate them (e.g. anger vs. irritation). As such, one can expect within-category differentiation to be negatively related to well-being.

On the other hand, it is also possible that within-category differentiation is simply not related to well-being. Similar emotions such as anger and irritation may have similar consequences in the sense that they are regulated in a similar way. Therefore, differentiating between such similar emotions may thus not have any additional value.

Finally, if within- and between-category differentiation tap into different processes that are both important for well-being, then integral differentiation, which is the combination of both, may be most strongly related to well-being, simply because it contains all relevant emotion information. However, if only between-category or within-category differentiation is related to well-being, but the other is not, it is also still possible that the integral index has the strongest associations with the well-being indicators because it contains more information which can make it a more reliable measure.

In sum, the present research aims to examine whether different types of differentiation are differentially related to well-being. Dissecting ED in such a way is important for a number of reasons. First, theoretically, it allows us to investigate whether individuals actually have the ability to differentiate between related emotions, or whether only differences between distinct emotions are perceived. Second, we explore whether such a distinction in different levels of ED is meaningful (i.e. whether within- and between-category differentiation are distinct, or similar constructs). If one type of ED appears to relate to well-being and the other does not, then this would be valuable information for future research. Third, it specifies exactly what kind of ED is relevant for well-being. Most authors seem to have implicitly assumed that distinguishing between broader categories is what is at play in the findings obtained with ED, but this has in fact never been substantiated. Finally, in more applied terms, identifying the type of differentiation at play in psychological disorders can

help to pinpoint the type of emotion knowledge (broad or fine-grained) that should be targeted in interventions. Because no research to date has differentiated between qualitatively different types of ED, this research question is explorative.

The current study

In the current study, we aim to test how different types of ED, more specifically between-category, within-category, and integral ED, are related to well-being. Most research examining ED makes use of experience sampling methods (e.g. Barrett et al., 2001; Demiralp et al., 2012), which typically involves only a limited number of emotion terms to avoid participant overload, but this method does not allow studying the current research question. In order to be able to examine between- and within-category differentiation, we need to assess a variety of emotions, belonging to different emotion categories (i.e. emotions that are relatively unrelated), as well as to the same emotion category (i.e. emotions that are relatively strongly related). Recently, we developed an ED task[1] that allows assessing ED in a lab setting using standardised stimuli (Erbas et al., 2014). Unlike typical experience sampling studies, this task involves a large number of emotion words that were purposefully selected to reflect both larger emotion categories as well as finer distinctions within categories. In particular, negatively valenced emotion words were chosen from Diener et al. (1995), because their array of negative emotions aims to capture the broad emotion categories of anger, sadness, fear, and shame, as well as finer or more subtle distinctions within each of these categories.

It is important to note however, that by referring to some emotions as belonging to the same category, we by no means imply that these emotions are considered to be the same. Research on the structure of emotions shows that some emotions are, on the between-person level, more closely correlated (e.g. anger and irritation) than other emotions (e.g. anger and sadness). For instance, when conducting a factor analysis, those more closely related emotions would load on the same factor (e.g. Diener et al., 1995). These emotions are referred to as "belonging to the same category", and the name of the category is the most prototypical description of the emotion labels in that category (Diener et al., 1995).

Finally, the choice to include only negatively valenced emotions was based on previous studies on ED demonstrating that mainly the differentiation of negative and not positive emotions is related to psychological well-being, likely because an inability to recognise and regulate negative emotions will have much larger consequences and will be more costly (Barrett et al., 2001; Demiralp et al., 2012; Kashdan, Ferssizidis, Collins, & Muraven, 2010; Pond et al., 2012).

We use data from six different studies that included this task. The data were collected by labs in Leuven, Belgium, and Amsterdam, the Netherlands. The included studies all contain a diverse range of well-being indicators (see below). For the present purpose, we selected those indicators that have previously been used to chart a nomological network for ED (see Erbas et al., 2014), and that have been included in at least two of the reported datasets. By means of a comprehensive meta-analysis, we will examine how these well-being variables relate to the three ED indices in order to pinpoint the exact quality of ED that is most relevant for well-being.

Method

Participants

The current study reanalysed six datasets that have been collected throughout the past years for different purposes, but all include data from the same ED task. The total sample consisted of 1074 individuals, of which 30.1% were male. Below, there is a more elaborate description per dataset. A summary of the characteristics of the datasets is presented in Table 1.

Dataset 1. Participants were 170 (32 male) undergraduate students at the KU Leuven, with a mean age of 18.42 years ($SD = 1.13$), of which 94.7% had a Belgian background. They received course credits for participation, and sample size was determined by the number of students participating in this course. No participants were excluded from analyses. The study included the measures reported here, as well as the Need for Affect questionnaire (Maio & Esses, 2001). Results from this dataset are published in Erbas et al. (2014). The ED lab task was completed individually on paper during collective testing sessions.

Dataset 2. The participants in this dataset are from the typically developing (TD) group in a study on ED in individuals with autism spectrum disorders (ASD). The TD group originally consisted of 26 participants matched to the ASD group with respect to education level, gender, and age. These participants were

Table 1. Characteristics of the datasets.

	Study					
	1	2	3	4	5	6
Study characteristics						
N	170	18	167	399	142	178
Percentage males	18.8%	66.7%	17.8%	29.8%	50%	29.8%
Mean (*SD*) age	18 (1.13)	17 (0.78)	19 (3.10)	19 (2.63)	23 (3.39)	19 (1.00)
Data collection method	Collective, on paper	Collective, on paper	Collective, computer	Individually, computer	Individually, computer	Individually, computer
Reimbursement method	Course credit	none	Course credit	Course credit	Cinema tickets	Money
Dataset published in:	Erbas et al., 2014	Erbas et al., 2013	x	x	x	x
Included measures	ED, NA, TAS-DIF, CES-D	ED, NA, TAS-DIF, CES-D, RSE	ED, NA	ED, NA	ED, NA, CES-D	ED, NA, TAS-DIF, CES-D, RSE
Location of data collection	Belgium	Belgium	Belgium	The Netherlands	Belgium	Belgium

Note: "x" = not applicable or not included in study. ED = emotion differentiation, NA = mean negative affect, TAS-DIF – Toronto Alexithymia Scale – Difficulty Identifying Feelings, CES-D = Center for Epidemiologic Studies Depression scale, RSE = Rosenberg Self-esteem scale.

recruited from two secondary schools located in the same region and of the same educational level as the ASD department. Of these 26 participants, eight participants were not native Dutch speakers. To keep both groups as equal as possible on variables other than clinical diagnosis, these eight participants were excluded from further analyses. The remaining participants were 12 male and six female adolescents with a mean age of 16.56 years ($SD = .78$). Results from this dataset are published in Erbas, Ceulemans, Boonen, Noens, & Kuppens (2013). The ED lab task was completed individually on paper, during collective testing sessions. Apart from the measures reported here, the study also included an emotional card sorting task (Erbas et al., 2013).

Dataset 3. Participants were 167 undergraduate students at the KU Leuven (30 male) with a mean age of 19 years ($SD = 3.10$) who received course credits for participation, and sample size was determined by the number of students participating in this course. No participants were excluded from analyses. Results from this dataset are not published in journal articles. The ED lab task was collected individually on a computer, during collective testing sessions. In this study, we attempted to manipulate individuals' level of ED by priming self-schemas relating to successful emotional competency, which previously had shown to increase emotional intelligence (Schutte & Malouff, 2012). Participants were divided into five conditions (a 2 [successful vs. unsuccessful] by 2 [emotion vs. school performance] factorial design, and an additional control condition in which participants wrote about their previous day). Because post hoc comparisons of the ICCs between the different conditions revealed no difference between groups (all p-values > .55), we concluded that the manipulation was unsuccessful. As such, the current analyses do not take the different conditions into account. Apart from the measures reported here, the study also included measures to assess the participants' current affective states, emotion regulation skills, and life satisfaction.

Dataset 4. Participants were 399 (127 male, 28 no gender indicated) undergraduate students at the University of Amsterdam, with a mean age of 19 years ($SD = 2.63$), of which 77% reported that Dutch was their only mother tongue, 11.3% reported also having another mother tongue, 4.5% reported having a different mother tongue, and 7.3% did not answer to the question, resulting in missing values. They received course credits for participation, and sample size was determined by the number of students participating in this course. No participants were excluded from analyses. The study included the measures reported here, as well as many other measures as the study was part of a mass testing session that are not related to the current research question. Results from this dataset are not published in journal articles. The ED lab task was collected individually on a computer, during collective testing sessions.

Dataset 5. Seventy one heterosexual Belgian couples with a mean age of 23 ($SD = 3.39$) were recruited through ads on social media or via email (if they had participated in a study of the KU Leuven university in the past). The study included filling in multiple questionnaires and conducting the ED lab tasks individually on a computer, as well as an experiment not relevant to this paper. Each couple received two

cinema tickets (each worth 10.25 euros) for taking part in the study. None of the 142 participants were excluded from analyses. Results from this dataset are not published in journal articles. The ED lab task was completed individually on a computer, in single cubicles.[2]

Dataset 6. This dataset is from the third wave of a three-wave longitudinal measurement-burst study. Two hundred and two participants were recruited who were about to start their first year at university, and varied in terms of emotional well-being. Potential participants were recruited through online and paper advertisements, and were directed to a website where they completed the Center for Epidemiologic Studies Depression Scale (CES-D; Radloff, 1977), which was used as a prescreening tool for emotional well-being. Initially, 686 students completed the CES-D prescreening questionnaire. A stratified sampling approach (Ingram & Siegle, 2009) was used to select an equal number of participants from each quartile of the CES-D distribution to participate in the study. Using this approach, 180 participants with a relatively broad range of CES-D prescreening scores were recruited. 22 additional participants were enrolled after the study had already started and therefore did not complete the prescreening questionnaire. 202 Participants took part in the first wave of the study, and due to attrition over the course of the year, 177 participants (79 male, mean age = 19.28, *SD* = 1.00) took part in the third wave of the study. Participants received €60 per wave for completing all measures, and an additional €60 for completing all three waves. The study included the measures reported here, as well as numerous other measures (e.g. 1 week of experience sampling, cognitive tasks, clinical interviews, and a large array of self-report questionnaires to measure constructs such as life satisfaction, rumination, daily life stress). Parts of the larger longitudinal project are published in several journal articles (e.g. Bastian, Koval, Erbas, Houben, Pe, & Kuppens, 2015; Koval, Brose, Pe, Houben, Erbas, Champagne, & Kuppens, 2015). The ED lab task was completed individually on a computer, in single cubicles.

Materials

Emotion differentiation

In the ED task, participants were asked to rate their emotional responses to a set of standardised emotional stimuli on 7-point Likert scales (ranging from 1 = *not at all*, to 7 = *very much*). The task originally included 20 emotion words of which 16 emotion words represent the four negative discrete emotion categories proposed by Diener et al. (1995; FEAR: fear, worry, anxiety, nervousness; ANGER: anger, irritation, disgust, rage; SHAME: shame, guilt, regret, embarrassment; SADNESS: sadness, loneliness, unhappiness, and depression), which are considered to reflect a good representation of the range of negative emotions. While four other emotion words (jealous, envious, and two Dutch words for inferior) were initially added to the task, we decided to only include the emotions suggested by Diener et al. (1995) in the current analyses because they can be grouped together into the abovementioned four emotion categories according to their suggested structure, with each category having an equal number of emotions. The standardised emotional stimuli consisted of a selection of 20 emotion pictures taken from the International Affective Picture System (IAPS; Lang, Bradley, & Cuthbert, 1995) and were selected to match the emotion words so that typically each emotion word would be rated at least once, which should result in enough variance in the data to allow to compute the ED indices (see below).

In this task, participants were presented with a picture on a computer screen (with the exception of datasets 1 and 2, in which participants completed the task during collective testing sessions on paper, and the stimuli were presented on a large screen), and asked to rate how the picture made them feel. Specifically, the pictures were presented on a screen, and below the picture it said "this picture makes me feel … ", followed by the emotion labels and their rating scales. Once all emotion labels were rated, the next picture appeared on the screen. The pictures were shown in fixed order, but the order of the labels was completely randomised, meaning that within as well as between participants, the order of the labels was different for each picture.

At the start of the task, participants read general instructions, followed by a practice picture, which was a neutral picture that had to be rated on the 20 emotion labels. During this time, participants could ask the experiment questions. After rating the practice picture, they could start the task if everything was clear. Completing the task took approximately 20 min. Afterwards, participants were either thanked and briefed, or asked to continue with other tasks.

In line with earlier research (e.g. Demiralp et al., 2012), ED indices were computed for each participant

by calculating the intra-class correlation (ICC) measuring consistency (Shrout & Fleiss, 1979) between emotions across the different stimuli. The integral ED index was computed by calculating the ICC across all emotion words. To derive the between-category differentiation index, we first averaged the emotion ratings per emotion category, and then calculated an ICC across these means. The between-category differentiation index thus reflects how much someone differentiates between emotions that belong to different emotion categories. Finally, to compute an index for within-category differentiation, we calculated ICCs across the emotions within each emotion category, and averaged these ICCs across categories. The within-category differentiation index thus represents how much someone differentiates on average between emotions that pertain to the same emotion category. It should be noted that for all three ED indices higher means represent lower ED. Because correlations are typically not normally distributed, in line with previous research on ED, all ICCs were Fischer *Z*-transformed before further analyses were performed (Barrett et al., 2001). Finally, the indices were multiplied by −1, so that a higher value indicates higher levels of differentiation.

For several reasons, not all three ED indices could be derived for all participants. As such, different analyses contain different numbers of participants. Most of these missing cases (especially when computing the between-category index) resulted from negative ICC values, which is problematic because the ICC is a reliability measure that should, theoretically, vary between zero and one (Shrout & Fleiss, 1979). As such, interpreting the negative values is not possible (Giraudeau, 1996). Therefore, these values were indicated as missing.[3] This resulted in 7.5% missing values for the integral index, 42.6% missing values for the between-category index, and 16.5% missing values for the within-category index.

Mean negative affect

There is some evidence that negative emotionality is conflated with the level of ED, and the question is whether this relationship is different for the different ED indices proposed here. For this reason, it is important to assess how the different ED indices relate to mean NA. Therefore, besides computing the ED indices, the ED task was also used to compute an index for mean negative affect (NA). Similar to previous studies (Boden, Thompson, Dizén, Berenbaum, & Baker, 2013; Demiralp et al., 2012; Erbas et al., 2014), a mean NA index was calculated for each participant by averaging all emotion ratings across the different stimuli from the ED task. High scores on this index are an indication that high levels of negative emotions have been reported. Because this measure is derived from the data of the ED task, it could be obtained in all six datasets.

Well-being

Emotional clarity. Clarity of emotions was measured in Datasets 1, 2, and 6 with the Toronto Alexithymia Scale (TAS; Bagby, Parker, & Taylor, 1994a, 1994b). The TAS is a 20-item scale which consists of three subscales: Difficulty Describing Feelings, Difficulty Identifying Feelings, and Externally Oriented Thinking. Of the three subscales, the Difficulty Identifying Feelings (DIF) subscale appears to be the only relevant subscale in relation to ED (Erbas et al., 2014), therefore we only included this subscale in our analyses. The scale consists of items indicating the extent to which individuals have difficulties identifying their own feelings and those of others (e.g. "When I am upset, I don't know if I am sad, frightened, or angry"). Items were rated on five-point Likert scales ranging from 1 (rarely or none of the time) to 4 (most or all of the time). After recoding the contra-indicative items, mean scores were computed for the scales, with higher scores indicating less emotional clarity.

Depression. Depression was measured in Datasets 1, 2, 5, and 6 using the Center for Epidemiologic Studies Depression Scale (CES-D; Radloff, 1977), which is a 20-item scale consisting of 16 indicative (e.g. "my sleep was restless") and 4 contra-indicative (e.g. "I enjoyed life") items. Participants were asked to respond to the items on a four-point Likert scale ranging from 0 (not at all) to 3 (very much). Mean scores were computed, with higher scores reflecting more depressive symptoms after recoding. The depression questionnaire was included in datasets 1, 2, 5, and 6.

Self-esteem. Self-esteem was measured in Datasets 2 and 6 using the Rosenberg (1965) Self-esteem Scale (RSE) which is a widely used scale to measure general self-esteem. The 10-item scale consists of 5 indicative (e.g. "On the whole, I am satisfied with myself") and 5 contra-indicative (e.g. "I feel I do not have much to be proud of") items. Responses were made on a four-point Likert scale, ranging from 1 (strongly agree) to 4 (strongly disagree). Mean scores were computed, with higher scores reflecting higher self-esteem.

Data analytical strategy

To assess which type of ED is most strongly related to well-being, Pearson correlations were computed between the ED indices and the indicators of well-being. Instead of reporting the correlations separately for each dataset, the correlations per variable pair were meta-analyzed across the different datasets, by computing the average effect size (i.e. correlation) and significance by means of Comprehensive Meta-Analysis (Borenstein, Hedges, Higgins, & Rothstein, 2011). This technique is specifically developed to compute mean effect sizes across different samples. Because all the raw data is present, it is not necessary to perform bias or sensitivity tests (which is required when performing a meta-analysis for the purpose of summarising an entire research field, for instance to check for publication biases or an incomplete collection of the included literature).

Results

The means and standard deviations of the ICCs and the well-being variables are reported in Table 2. Although the ICCs were transformed and multiplied by −1 for the analyses, Table 2 includes the raw scores so that the ICCs can be compared to those reported in other studies. Note that higher ICC refers to lower ED for the raw scores, and to higher differentiation in the final transformed scores.

Table 3 reports the meta-analyses of the Pearson correlations between the different (transformed) ICCs across datasets. For completeness, the correlations with the within-category ICCs per emotion category were also included. The findings indicated that all relationships were positive and significant, meaning that all ICCs were positively related to each other. Furthermore, while the integral ICC and the between-category ICC were very strongly related to each other ($r = .89$), their relation to the within-category ICC was less strong ($r = .53$ for integral and $r = .35$ for between-category ED). The within-category ICC in turn related strongly to the separate within-category indices, which is consistent with expectations because the within-category ICC was built up from these separate indices. The separate within-category indices however did not correlate very strongly with the integral and the between-category index, nor with the other separate within-category indices. From these findings we can conclude that although all ED indices are to some extent related to each other, none of them overlap completely. Furthermore, the integral ED index was more strongly associated with the between-category than with the within-category ED index, and the difference between these correlations was significant ($Z = 14.18$, $p < .001$; Lee & Preacher, 2013).

We next examined the relationships between the ED indices and the well-being variables in the different studies. Again, the correlations of the separate studies were meta-analyzed across studies, and the overarching results of the meta-analyses are presented in Table 4. Although there were no specific predictions for the ICCs per emotion category, the meta-analyses of their correlations with the well-being variables were also included in the table.

With regard to mean negative affect (NA), the results showed that all ICCs were significantly related

Table 2. Means and Standard Deviations for the raw integral, between-, and within-category ICCs, the separate within-category ICCs for the anger, fear, shame, and sadness categories, and the well-being variables across studies and separately per study.

	Study					
	Mean (*SD*)					
	1	2	3	4	5	6
Variable						
Integral ED	0.62 (0.19)	0.68 (0.20)	0.64 (0.21)	0.59 (0.22)	0.57 (0.24)	0.55 (0.22)
Between ED	0.42 (0.22)	0.53 (0.17)	0.42 (0.24)	0.39 (0.23)	0.60 (0.22)	0.38 (0.24)
Within ED	0.74 (0.10)	0.68 (0.09)	0.70 (0.11)	0.74 (0.12)	0.45 (0.14)	0.71 (0.10)
Anger ED	0.68 (0.20)	0.69 (0.11)	0.62 (0.21)	0.69 (0.19)	0.41 (0.21)	0.67 (0.17)
Fear ED	0.76 (0.15)	0.69 (0.20)	0.72 (0.17)	0.79 (0.15)	0.41 (0.21)	0.76 (0.12)
Sadness ED	0.84 (0.10)	0.80 (0.14)	0.77 (0.16)	0.78 (0.14)	0.40 (0.21)	0.81 (0.11)
Shame ED	0.65 (0.20)	0.49 (0.22)	0.65 (0.19)	0.66 (0.21)	0.41 (0.22)	0.61 (0.21)
NA	1.53 (0.76)	1.10 (0.58)	1.97 (0.73)	1.26 (0.75)	1.78 (0.61)	2.38 (0.74)
TAS-DIF	1.91 (1.24)	1.87 (1.26)	x	x	x	0.94 (0.66)
CES-D	1.88 (1.17)	1.87 (1.10)	x		1.56 (0.33)	0.49 (0.35)
RSE	x	3.82 (1.19)	x	x	x	3.26 (0.53)

Note: "x" = not included in study. ED = emotion differentiation, NA = mean negative affect, TAS-DIF – Toronto Alexithymia Scale – Difficulty Identifying Feelings, CES-D = Center for Epidemiologic Studies Depression scale, RSE = Rosenberg Self-esteem scale.

Table 3. Meta-analyses of the correlations between the integral, between- and within-category ED indices, as well as the separate within-category ICCs for the anger, fear, shame, and sadness categories.

			95% CI		
	N	*r*	*LL*	*UL*	*Z*
Variable pairs					
Integral ICC					
Between ED	618	.89	.87	.90	34.51
Within ED	853	.53	.48	.58	17.16
Anger ED	940	.29	.23	.35	9.05
Fear ED	961	.33	.27	.39	10.54
Sadness ED	954	.34	.29	.40	10.96
Shame ED	922	.45	.40	.50	14.55
Between ICC					
Within ED	504	.35	.27	.43	8.17
Anger ED	571	.22	.14	.29	5.16
Fear ED	584	.18	.10	.26	4.36
Sadness ED	575	.22	.14	.30	5.37
Shame ED	566	.31	.23	.38	7.47
Within ICC					
Anger ED	900	.69	.65	.72	24.95
Fear ED	900	.62	.58	.66	21.46
Sadness ED	900	.56	.52	.61	18.91
Shame ED	898	.73	.70	.76	27.44
Anger ICC					
Fear ED	973	.28	.22	.34	8.95
Sadness ED	970	.27	.21	.32	8.39
Shame ED	930	.27	.21	.33	8.52
Fear ICC					
Sadness ED	991	.25	.19	.31	8.03
Shame ED	950	.28	.22	.34	8.78
Sadness ICC					
Shame ED	942	.25	.19	.31	7.76

Note: Each line represents the results of the meta-analysis of the correlations across datasets between the listed variable and the bold variable in the corresponding block. All analyses were significant at the $p < .001$ level. ED = emotion differentiation, NA = mean negative affect, TAS-DIF – Toronto Alexithymia Scale – Difficulty Identifying Feelings, CES-D = Center for Epidemiologic Studies Depression scale, RSE = Rosenberg Self-esteem scale.

to it, but the correlation with the integral index was the strongest. In line with expectations, all correlations were negative, meaning that high ICCs (and thus higher levels of ED) were related to lower NA. Alexithymia – DIF was significantly related to the integral and the between-differentiation index, and again the correlation with the integral index was the strongest. The direction of the correlations was negative, meaning that high levels of Alexithymia-DIF were associated with low ICCs (and therefore lower ED). Finally, the CES-D and RSE were only significantly correlated with the integral differentiation index. The correlation was negative for the integral index and the CES-D, and positive for the integral index and the RSE, which means that higher levels of ED were associated with lower depressive feelings and higher self-esteem.

Table 4. Meta-analyses of the correlations between the well-being variables and the integral, between- and within-category ED indices, as well as the within-category ED indices for the separate categories.

			95% CI			
	N	*r*	*LL*	*UL*	*Z*	*p*
Variable pairs						
Mean NA						
Integral ED	993	$-.34_a$	.29	.40	−11.12	<.001
Between ED	617	$-.26_b$	.18	.33	−6.48	<.001
Within ED	897	$-.32_{ab}$	.26	.38	−9.81	<.001
Anger ED	993	−.27	.21	.33	−8.73	<.001
Fear ED	1019	−.13	.07	.19	−4.29	<.001
Sadness ED	1013	−.27	.21	.32	−8.60	<.001
Shame ED	970	−.21	.15	.27	−6.50	<.001
TAS – DIF						
Integral ED	343	$-.20_a$	.09	.30	−3.69	<.001
Between ED	195	$-.17_a$	.03	.31	−2.41	.02
Within ED	338	$.02_b$	−.18	.04	1.29	.20
Anger ED	350	.03	−.14	.07	0.59	.56
Fear ED	359	.10	−.20	.01	1.79	.07
Sadness ED	359	−.06	−.05	.16	−1.12	.26
Shame ED	348	.03	−.14	.07	0.66	.51
CES-D						
Integral ED	473	$-.11_a$	.02	.20	−2.34	.02
Between ED	321	$-.04_b$	−.07	.15	−0.70	.48
Within ED	390	$.03_b$	−.13	.07	0.54	.59
Anger ED	444	−.01	−.08	.11	−0.29	.77
Fear ED	463	.03	−.12	.06	0.70	.48
Sadness ED	455	−.09	−.01	.18	−1.82	.07
Shame ED	448	.01	−.10	.09	0.13	.90
RSE						
Integral ED	183	$.18_a$	−.32	−.04	2.45	.01
Between ED	85	$.12_a$	−.33	.10	1.09	.27
Within ED	187	$-.00_b$	−.14	.15	−0.03	.97
Anger ED	190	.06	−.20	.09	0.75	.46
Fear ED	191	.02	−.16	.12	0.25	.80
Sadness ED	191	−.00	−.14	.14	0.02	.98
Shame ED	188	−.02	−.12	.16	−0.27	.79

Note: Each line represents the results of the meta-analysis of the correlations across datasets between the listed variable and the bold variable in the corresponding block. Significant differences in the strength of the relationship between the integral, between-, and within-category indices and the well-being variables are indicated with subscripts (a or b) next to the correlation coefficient. Different subscripts point to a significant difference at $p < .05$. ED = emotion differentiation, NA = mean negative affect, TAS-DIF – Toronto Alexithymia Scale – Difficulty Identifying Feelings, CES-D = Center for Epidemiologic Studies Depression scale, RSE = Rosenberg Self-esteem scale.

We then tested whether the correlations between the integral, the between- and the within-category ICCs with the four well-being indicators significantly differed from each other, by using software by Lee and Preacher (2013) that implements Steiger's (1980) method to test the equality of two correlation coefficients obtained from the same sample, with the two correlations sharing one variable in common. The subscripts next to the correlation coefficients in Table 4 show which of the correlations significantly differed from each other. The results from these analyses

indicated that for mean NA, the correlation with the integral index differed only significantly from the correlation with the between-category index. For Alexithymia-DIF and the RSE, the integral index significantly differed from the within-category index. Finally, for the CES-D, the correlation with the integral index was significantly different from both the between- and the within-category indices.

Next, we examined whether there were differences in measurement error between the integral, the between- and the within-category index, by calculating the difference score between the upper and lower limit of the confidence intervals for the three indices, and comparing them with each other. Across the six datasets, we saw that the between-category index had the most measurement error (M = 1.67, SD = 1.35), followed by the integral index (M = .61, SD = .44). The within-category index had the smallest measurement error (M = .55, SD = .35). Paired samples t-tests showed that for all pairs, the difference between the means was significant (integral-between: $t(1064) = 35.35$, $p < .001$; integral-within: $t(1064) = 3.76$, $p < .001$; between-within: $t(1064) = 25.75$, $p < .001$). These results indicate that the between-category index is particularly hard to estimate, which means that it is relatively less reliable compared to the other indices.

Finally, we repeated the meta-analyses of the relation between the emotion differentiation indices and the indicators of well-being, while controlling for mean NA. While the correlations between the ED indices and mean NA were not extremely high, it has been suggested that the level of ED can be confounded with mean NA levels. Therefore, examining how ED relates to well-being above and beyond levels of mean NA, can be informative. Table 5 shows the results of the meta-analyses of the correlations between the integral-, between-, and within-category ED indices and the indicators of well-being, after controlling for mean NA. While the relation between emotion differentiation and the CES-D did not remain statistically significant, the integral index still predicted alexithymia and self-esteem, while the between index marginally predicted alexithymia (p = .06). Interestingly, the within index was now significantly negatively related to the CES-D and to alexithymia, meaning that more within-category differentiation relates to higher levels of CES-D and alexithymia-DIF.

In sum, the results show that only the integral differentiation index consistently correlates with all well-being variables. While mean NA was also correlated to the other ED indices, and alexithymia-DIF also to the between-category index, the integral ICC consistently had the strongest relationship to all the well-being variables, although the difference with the other indices was not always significant.

Table 5. Meta-analyses of the correlations between the well-being variables and the integral, between- and within-category ED indices, controlling for mean negative affect.

			95% CI			
	N	*r*	*LL*	*UL*	*Z*	*p*
Variable pairs						
CES-D						
Integral ED	473	−.03	−0.06	0.12	0.67	.50
Between ED	321	.03	−0.14	0.08	−0.5	.62
Within ED	390	.12	−0.22	−0.02	−2.36	.02
Alexithymia – DIF						
Integral ED	343	−.14	0.04	0.25	2.65	.01
Between ED	195	−.14	−0.01	0.27	1.87	.06
Within ED	338	.18	−0.29	−0.08	−3.36	<.001
RSE						
Integral ED	183	.20	−0.34	−0.05	−2.68	.01
Between ED	85	.13	−0.34	0.09	−1.19	.23
Within ED	187	−.00	−0.15	0.14	−0.05	.96

Note: Each line represents the results of the meta-analysis of the correlations across datasets between the listed variable and the bold variable in the corresponding block. ED = emotion differentiation, NA = mean negative affect, TAS-DIF – Toronto Alexithymia Scale – Difficulty Identifying Feelings, CES-D = Center for Epidemiologic Studies Depression scale, RSE = Rosenberg Self-esteem scale.

Discussion

In the current study, we investigated what level of specificity in the categorising and labelling of emotions is most strongly associated with well-being. More specifically, by meta-analyzing data from six different studies, we examined how differentiation between negative emotion categories, differentiation within negative emotion categories, and an integration of the two, referred to as integral differentiation, were related to indicators of well-being.

The findings showed that the integral ED index, computed across emotions from both the same and from different emotion categories, is consistently the most strongly related to well-being (but the difference with the between- and within-category indices was not always significant). The separate within-category ED indices, the overall within-category index and the between-category index did not relate strongly to the well-being indicators (with some exceptions).

From these findings, we can conclude that with regard to between-category differentiation, i.e. the more broader type of differentiation, the findings are

not conclusive. While the relationships with the well-being indicators were not significant, this could also have been caused by the large amount of missing values (due to negative ICCs which, as discussed above, are uninterpretable), as well as the large measurement errors, implying that this index was especially hard to estimate. With regard to differentiating between emotions from the same category, the original results clearly showed that it is not related to well-being. However, after controlling for mean levels of negative affect, more differentiation between emotions from the same category was related to higher levels of depression and alexithymia. This finding is in line with our alternative hypothesis, which states that too specific categorisation of emotions is detrimental for well-being. This finding is interesting, because it implies that more differentiation between emotions is not always good. However, these findings were not observed in the original analyses, and only appeared after controlling for mean levels of negative affect. Therefore, it is unclear whether the findings are meaningful, or whether they result from a statistical artefact. For instance, one possibility is that it is caused by a suppressor effect. And while suppressor effects should be interpreted with caution, some such effects have been replicated in the past and appear to be meaningful (Paulhus, Robins, Trzesniewski, & Tracy, 2004). As such, future research should investigate whether this finding is consistent across samples, and whether it is theoretically meaningful or a statistical artefact.

If the between- and within-category indices are not consistently related to well-being, then why is that the case for the integral index? The integral index is based on ratings of emotions that belong to both the same and different emotion categories. A possible explanation for the finding that the combination of both appeared important, while the separate indices were not, is that an index computed across 16 emotions contains much more information than the sum of the between- and within-category indices, which were both computed across four emotions. As such, the integral index may simply be a more reliable measure than the other two.

While the findings are not very conclusive with regard to which type of differentiation is most important for well-being, they are very informative about the nature of ED. Firstly, the fact that the between- and within-category indices were not strongly correlated, suggests that these measures are separate constructs, and thus tap onto different skills or abilities that people possess. Furthermore, the within-category indices for the separate emotion categories were also included in the analyses, but appeared to relate only to the overall within-category index, and less to the other ED indices or the well-being indicators. Interestingly, they also did not relate very strongly to each other. This suggests that the ability to differentiate between more closely related emotions is perhaps not a general skill, but instead depends on the type of emotions. In other words, a high level of differentiation between emotions from one category does not necessarily mean that the same individual also differentiates highly between emotions from another category.

Secondly, the results showed that the between-category index had the lowest mean ICC (and thus the highest differentiation on average), meaning that individuals differentiate most between emotions that are more different from each other. The overall within-category index on the other hand, had the highest mean ICC, which means that individuals differentiate less between more related emotions. While this is not surprising, it is interesting to note that, even though the within-category ICC across participants was high, so was the standard deviation. This means that there are considerable differences between individuals in the extent to which they differentiate between more similar emotions.

Moreover, if individuals have different levels of ED for different groups of emotions, it is possible that differentiation between emotions from one category could be related to one indicator of well-being, whereas differentiation between emotions from a different category could relate to another indicator. However, it is also simply possible that differentiating is important for some emotions but not for others, irrespective of whether the emotions are from the same or from a different emotion category. An even more extensive dissection of different types of ED in relation to more indicators of well-being would be an interesting avenue for future research, with findings that could potentially be advantageous in clinical settings.

While the current project resulted in contributions on both the theoretical and the practical level, it also pointed out a methodological limitation in ED research. Although ICCs are the most common measure of ED, based on the current study it can be questioned whether it is in fact an optimally accurate and valid measure in all circumstances or all types or distributions of data. In the datasets used here, computing ICCs between different emotion categories

appeared to be especially problematic. Although in most cases an ICC is probably a good reflection of an individual's level of differentiation, there are thus instances where using the ICC as a measure of differentiation is not a very successful practice. Using the ICC gives ED researchers the clear benefit of enabling them to compare their research to previous research on ED. But when participants have to be excluded from analyses because a reliable ED index cannot be derived, this can lead to unreliable findings. For instance, our data showed that when comparing the group for which we could not compute a reliable ICC (because the value was negative) to the group with a reliable ICC, the no-ICC group appeared to have better values on the well-being variables. It also appears that negative correlations between emotions result in negative ICCs. These two observations combined raise the question how high differentiators exactly experience and label their emotions, and how their level of ED can best be captured. One potential way of conquering the issues related to using the ICC as an index for ED, is by applying clustering techniques to the data, which could help to identify individuals with a very dense emotion structure (the low differentiators) versus individuals with a more compartmentalised emotional structure (De Roover, Ceulemans, & Timmerman, 2012).

Apart from the inability to derive reliable ICCs for all participants, the current research had two more potential shortcomings. Firstly, four of the six samples included in the meta-analysis consisted of students. So far, it is known that clinical populations differ in their level of differentiation from non-clinical populations (Kashdan et al., 2015), but it is not clear whether various populations differ in how their ED skills relate to well-being. However, it is possible that in certain clinical populations, there is a difference in which type of differentiation is important to different facets of well-being, something which should be explored further in future research. Secondly, while most research on ED used experience sampling methods (ESM), the current studies used lab tasks. While lab tasks have the clear benefit of being more time- and cost-effective, and of enabling researchers to study phenomena in a more controlled environment, it is not clear whether they also have such a high ecological validity as daily life measures. However, previously we have demonstrated that an ED index derived from a lab task relates to well-being variables similarly as an ESM ED index (Erbas et al., 2014). Moreover, we show that indices derived from the two methods correlate with each other (see note 1: $r = .22$, $p = .006$). When interpreting this correlation, it must be taken into account that both methods use different stimuli (IAPS pictures in lab task vs. daily life events in ESM), that the index from the lab task is based on the assessment of 16 emotion labels that are measured 20 times, whereas the experience sampling index is based on 5 emotions labels measured (maximum) 70 times, and that the experience sampling index is based on data from 7 days, and the lab index is based on data sampled in approximately 20 min. As such, we can conclude from this correlation that the two sampling methods do assess overlapping constructs.

In sum, the present study shows that the ability to differentiate between more related and more distinct emotions may tap onto different processes that can, when combined in a larger index, be of relevance for well-being. While differentiating between emotion categories and within emotion categories was not related to indicators of well-being, the combination of the two was. It is therefore possible that the integral index captures something conceptually different than the sum of its parts, or that it is a more reliable measure because it contains more information. However, it is also possible that between-category ED was not captured well in the current data, or that within-category ED was simply not relevant for the current well-being variables, or the current population. In conclusion, this project is the first to examine such qualitative differences in ED, but further research is needed to pinpoint exactly which types of ED are important in which contexts.

Notes

1. ED measures derived from this task have also been shown to correlate with ED measures derived from experience sampling methods. Specifically, dataset 6 (see below) included both the ED lab task and a week of experience sampling. Overall ICCs were computed for both the lab task data and the ESM data. Pearson's correlation between the two indices was .22 ($p < .01$), meaning that both methods capture at least partially the same phenomenon.
2. To check whether the person or the couple should be the unit of analysis, we assessed the degree of nonindependence, i.e., the degree of similarity between the two members of the dyad on the variables of interest. In line with Kenny, Kashy, and Cook (2006), we assessed how strongly males and females correlated on the ED indices, on mean NA, and on the CES-D. Pearson correlations showed that there was a high level of independence within couples with regard to the ED indices and

the CES-D (all p-values > .46) and a negative correlation for mean NA ($r = -.27$, $p = .03$). As such, in this dataset, the person will be treated as the unit of analysis.

3. Negative ICCs can be the result of negative correlations between the items (which is probably what happens with very high differentiators), but also of random error, and it is not possible to distinguish between the two. Moreover, a negative ICC is theoretically impossible to interpret (Giraudeau, 1996). Therefore, all negative ICCs were excluded from further analyses. This resulted in a large number of missing cases in some datasets. We examined whether the individuals with a missing ED index differed from individuals with ICC in terms of the well-being indicators. Independent t-tests showed that for between- and within-category differentiation, the no-ICC group had a significantly higher mean for most of the well-being indicators than the ICC group. For instance, for the between-category index which had the highest number of missings (as can be inferred from the lowest N in Table 3), across the whole sample, the no-ICC individuals rated significantly higher on the CES-D ($t(496) = 5.37$, $p < .001$), on mean negative affect ($t(895) = 6.61$, $p < .001$), and on the alexithymia-DIF scale ($t(359 = 5.43$, $p < .001$) than the group of individuals for which a reliable ICC could be derived. While it may seem problematic that the no-ICC group seems to have significantly better values on the well-being variables, this can in fact be expected. As discussed above, the negative values are likely a sign of higher levels of differentiation, which is in turn related to better well-being. Therefore, these findings are in line with our hypotheses.

Disclosure statement

No potential conflict of interest was reported by the authors.

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ORCID

Peter Kuppens http://orcid.org/0000-0002-2363-2356

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