Supplementary Materials for Beyond Positive Emotion: Deconstructing Happy Moments based on Writing Prompts

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Data exploration

The first round of annotation was conduced in lieu of data exploration. We observed that the happy moments in the CL-Aff HappyDB dataset had recurring themes. For instance, the moments described feeling happy about something that directly involved/implicated the author but they did not bring about (e.g., "My son came and gave me a hug in the morning."), happiness in an everyday experience (e.g., "We enjoyed the lovely sunset from our balcony"), exceeded expectations (e.g., "I got a lot more work done this morning than I expected."), and happiness relating to someone else (e.g., "I loved seeing my daughter's dance ballet."). These themes appear to manifest psychological concepts such as mindfulness (Baer, Lykins, and Peters 2012), selflessness (Dambrun and Ricard 2011) and social interaction (Cohen and Wills 1985), which are known to have a strong relationship with happiness and well-being.

16% of all labels comprised the 'Other' category, and in 1780 cases annotators provided a suggestion of an alternative. We conducted a content analysis of a random sample of these open-ended comments (N=300). Based on an initial reading, we identified the major themes in the comments. We were then able to assign each comment to one of a small set of themes. Table 1 provides the most common suggestions along with their percentage proportion in the labeled sample. The second column specifies the theme to which we assigned the comment. From the many kinds of comments with overlapping themes, we were thus able to crystallize two definitive suggestions. The first was the need to add a distinct label indicating personal agency (taking care of oneself, personal achievements, actively doing something to make a happy moment happen). The second was to indicate social behavior (taking part in a shared experience or spending time with loved ones).

These findings were thus in line with the major psychological theories which encode human behavior along two dimensions:

- **Personal agency:** Describing whether or not the author was directly responsible for the happy moment that occurred. Example: "I made a nice birthday cake today."
- **Sociality:** Indicating whether or not other the happy moment involved other people. Example: "I had a good lunch with my mom."

An example of a moment with both personal agency and sociality: "I made dinner which my family liked it a lot." Figure 1 provides the label inter-correlations obtained after the final annotation task was completed.

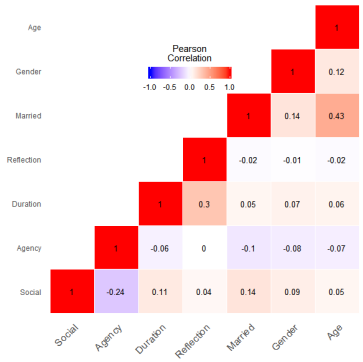

Figure 1: Inter-label correlations of the CL-Aff HappyDB dataset.

Annotation instructions for the CL-Aff HappyDB dataset

Task 1: Data collection

An Amazon Mechanical Turk (AMT) task was launched to collect three happy moments from each participant. Besides the happy moment, participants were also asked about the duration (i.e., the length) of happiness they experienced. After filtering out spam and irrelevant entries, we obtained 17,215 happy moments.

Instructions
What made you happy? Reflect on the past <duration>, and recall three actual events that happened to you that made you happy. Describe your happy moments with a complete sentence. Write three such moments. You will also be asked to note how long each event made you happy. This task also has post-task questions. Please be sure to answer the questions. Examples of happy

Table 1: Content analysis of Option 6: 'Other' category of the coding scheme. Annotators frequently suggested labels which indicated personal agency and social behavior.

Example Comment	Theme	%
The happy moment describes something that you did for yourself.	Self-care	21.6
It describes joy coming out of one's own achievements.	Personal achievement	20.9
Happiness coming from being with valued people.	Social	17.8
Something that the author took some part in creating.	Taking the initiative	8.9
Describes a shared moment with another person.	Shared activity	6.2

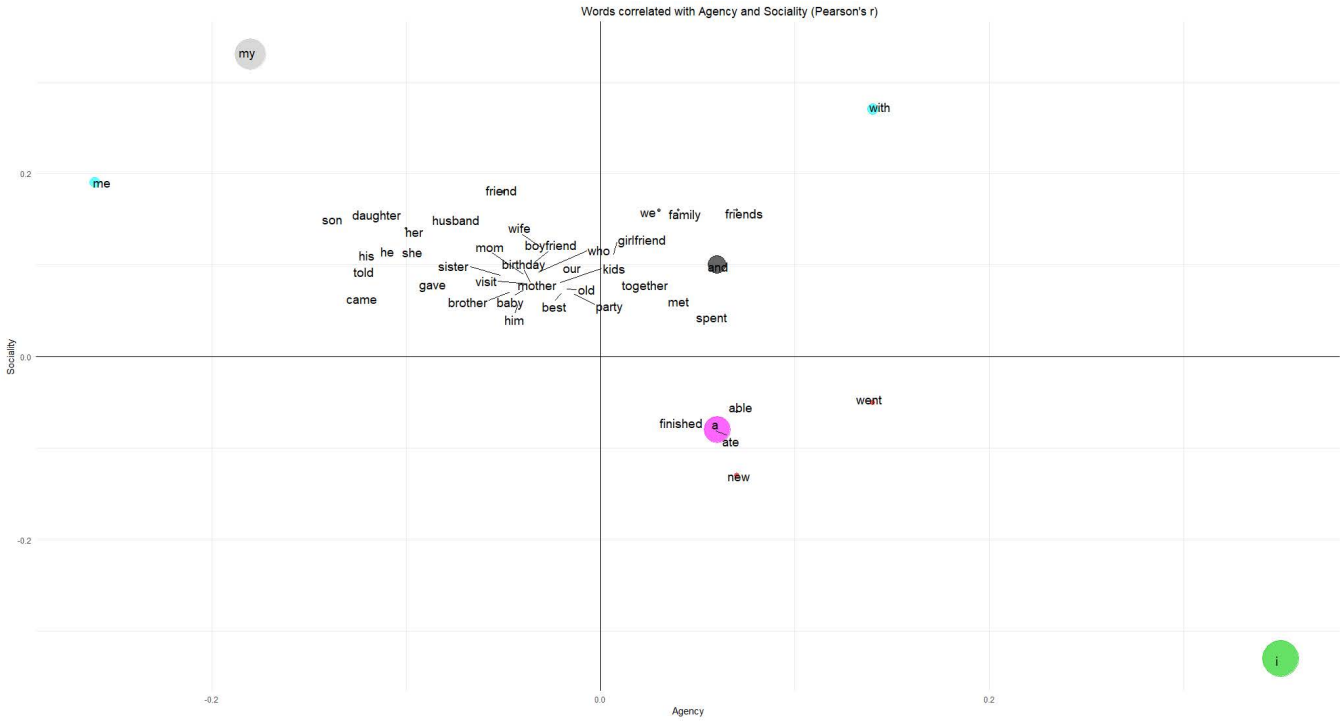

Figure 2: The relationship between agency and sociality in the CL-Aff HappyDB dataset, explored through a two-dimensional language space. The x-coordinate provides the word's correlation with agency and the y-coordinate provides its correlation with sociality.

> moments we are NOT looking for (e.g., events in distant past, incomplete sentence): *The day I married my spouse*; *My dog.*

Each participant was required to enter three happy moments that occurred within a specific time period. Half of the questionnaires specified a time period of 24 hours, while the other half with a <time period> of 3 months. The options provided for the follow-up question about the duration (i.e., the length) of happiness were 'All day, I'm still feeling it,' 'Half a day,' 'At least one hour,' 'A few minutes' or 'Not Applicable.' After the participant answered these questions, demographic information was collected about their country, age, gender ('Male','Female','Other','Not Applicable'), marital status ('single', 'married', 'divorced', 'separated', 'widowed' or 'Not Applicable'), and whether or not they have children ('yes', 'no'). Authors from 105 countries contributed to the dataset. 59% of all countries contributing over ten moments each. USA and India contributed the maximum number of happy moments each, which corresponds to the heavy-tailed distribution in the overall population of Mechanical Turk participants (Difallah, Filatova, and Ipeirotis 2018). The mean age of the authors was 33.3, and 47.8% of them were female.

Task 2a: Annotation

This task was launched on the entire dataset of 17,215 happy moments, with three judgments per moment. Annotators labeled each moment according to their agency and sociality, which can be understood as follows:

- **Personal agency:** Describing whether or not the author was directly responsible for the happy moment that occurred. Example: "I made a nice birthday cake today."
- **Sociality:** Indicating whether or not other the happy moment involved other people. Example: "I had a good lunch with my mom."

An example of an moment with both personal agency and sociality: "I made dinner which my family liked it a lot."

Instructions Read the following happy moment. Choose any of the following that applies:

Agency: Is the author in control? YES/NO
Examples of sentences where the author is in control (Answer is YES):

- *"I ran on the treadmill for 20 minutes straight when I could barely do 5 minutes 3 months ago."*
- *"Going out to a special birthday lunch for my great-grandmother in law's birthday."*

Examples of sentences where the author is not in control (Answer is NO):

- *"My youngest daughter got accepted to many prestigious universities and accepted an offer to attend college in San Diego."*
- *"A small business deal change over for small profit."*

Social: Does this moment involve other people other than the author? YES/NO
Please note that objects (e.g., bus, work) should not be counted as social. Examples of sentences which involve other people (Answer is YES):

- "Going out to a special birthday lunch for my great-grandmother in law's birthday."
- "My youngest daughter got accepted to many prestigious universities and accepted an offer to attend college in San Diego."

Topical annotations

In the topic annotation task, annotators could label each happy moment with up to four topic labels. We finally assigned a topic label to a happy moment if and only if at least two out of the three annotators selected that topic.

The four options provided to the annotators for topic labeling comprised the fifteen topic labels which were inductively derived by the authors of the original HappyDB dataset (Asai et al. 2018) based on unsupervised clustering methods applied to the dataset of over 80,000 happy moments which they originally collected. We simply use those broad themes as options provided to the annotators, selecting the four that have the highest likelihood of being associated with the moment based on their classifier.

To have a comparable labeling of the #Joy and the random Twitter dataset, we used the fifteen topic classifiers built for this purpose by the original authors on the basis of the topical clusters in the HappyDB dataset. We then labeled each post for the presence or absence of each of the 15 topics.

Linguistic insights

Figure 2 offers a lens to visualize how the language of agency and sociality interact in the expressions of happy moments. It plots the words in happy moments which are significantly correlated with both, agency and sociality, after Benjamini Hochberg p-correction. Each point represents a word in a happy moment, and its x-coordinate reflects its Pearson correlation with agency while the y-coordinate is its correlation with sociality. The size reflects its relative frequency. Words plotted with similar colors had the same frequency of occurrence. In the first quadrant are the words that are negatively correlated with agency and positively correlated with sociality. At the top left, the word 'me' has the lowest agency (r_{agency}=-.26). 'Me' is typically used in happy moments that indicate something that was done to the author (*surprised me*) by someone else, 'My' also has low agency ($r_{agencyl}$= -.18) and is used to identify the actor of the happy moment (*my girlfriend*). In the bottom right, the word 'i' has the highest agency (r_{agency}= .35) and is typically used in moments where the author describes something that they did for themselves (*i completed*). The spectrum of words between them shows words which have a weak negative correlation with agency and mainly describe people in close relationships, moving on words with a weak positive correlation with agency that comprise verbs ('ate', 'finished', 'went') (r_{agency}= .05) and finally leading up to 'i' (r_{agency}=.35).

Similarly, we can use the words along the off-diagonal to understand how words reflect social behavior in happy moments; however, there are no words in the fourth quadrant which are low on both agency and sociality. In the second and the top right quadrant, the word 'with' has the highest positive correlation with sociality ($r_{sociality}$=) while 'i' has the highest negative correlation with sociality ($r_{sociality}$=-.33). Interestingly, according to this plot, verbs such as 'met', 'spent', and 'together' (0.05<$r_{sociality}$<0.08) are much lower on the sociality spectrum than the preposition 'with' ($r_{sociality}$= .27). Adding to the surprising inverse relationship between agency and sociality, the linguistic insights provided here hint at the nuanced role of the self in social situations, which merits further investigation.

Table 2: Predictive performance on self-reported life satisfaction based on social media posts reported as a Pearson's r (N = 258) with emotion/happiness detection approaches.

Life Satisfaction	
CL-Aff HappyDB (Agency)	.08
CL-Aff HappyDB (Sociality)	0
WWBP Affect	.10
LabMT	-.07
Extended ANEW Valence	-.08
NRC Hashtag Emotion (Joy)	-.01
Senticnet Joy	-.06
LIWC 2015 emotions	-.07

Predictions on the MyPersonality dataset

Table 2 summarizes the results of well-being prediction at the individual level. None of the results have statistical power at N=258. We see that our happiness model has

a weak association with self-reported life satisfaction. As was mentioned in the overall findings, agency is predictive of life satisfaction while sociality is not. The WWBP Affect model reports a weak association in the correct direction, and might be slightly better than other language-based approaches; however Overall, the findings are somewhat inconclusive. The finding that positive emotion is not predictive of life satisfaction in most cases corroborates other recent findings.

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