

Happify Gratitude Analysis

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Data for this study was provided by Happify, a web and mobile phone application that offers users the opportunity to boost happiness and feel better about life through a set of personalized activities based on research from psychologists and neuroscientists.¹

Upon registration, Happify requests that its users submit three “statements of gratitude.” This activity resembles a Seligman, Steen and Peterson (2005) study called “three good things in life,” in which participants were asked to write down three things that went well each day for one week. In addition, they were asked to provide a causal explanation for each good thing.² After one month, participants were found to be happier and less depressed than they had been one month earlier.³

We are unable to draw any similar conclusions from the Happify data because many subjects only performed the exercise once, and those who did perform the exercise more than once did so at non-regular time intervals.

Instead, this investigation focused on the object of our subjects’ gratitude. For what are people grateful? Are people that are grateful for one thing happier than a group that is grateful for something else? For example, is the group of people who express gratitude about their parents happier than the group of people who express gratitude about their kids?

In addition to the subjects’ “statements of gratitude”, Happify included three baseline metrics: a happiness score, a positivity score, and a satisfaction score. Each scored ranged from 0 – 100. These scores are the result of an introductory questionnaire.

Method

Each of the 37,407 participants submitted three “statements of gratitude,” but only the first statement was considered for the sake of this experiment. Many users submitted statements containing multiple sentences. A procedure to identify the sentence most likely to contain the “object of gratitude” was developed.

First, a dictionary of “gratitude words” was compiled by hand. Then, each sentence in a user’s message was scanned. Each word was checked against the dictionary of “gratitude words.” The sentence containing the most “gratitude words” was selected and the others discarded (for code, see file [gratitude.java](#), method “getGratitudeWordCount”).

Next, each subject’s single sentence was tagged using the OpenNLP framework’s parts-of-speech tagger (see file [singleSentTagged.txt](#)). Using the tagged sentence, the “gratitude

clause” of each sentence was removed, e.g. *I am grateful for X*, or *The first thing that makes me grateful is Y*. In the file `gratitude.java`, method “removeGratStatements()” parses each line in `singleSentTagged.txt`. If the first gram in each line is a number, a pronoun or possessive pronoun (indicated by the tags), a word that is contained in the “gratitude word” dictionary, a word contained in the dictionary found or a preposition, then that gram is removed from the sentence. The sentence is then repeatedly subjected to this test until it passes. For example, we will run the method on a sentence from the sample: “1. I’m thankful for our big house.”

On the first iteration, “1.” will be removed. Because the subjects were asked to write three statements of gratitude, many listed them with this format.

On the second iteration, “I’m” will be removed. “I’m” is tagged as “PRP,” or personal pronoun.

On the third iteration, “thankful” will be removed because it is in the dictionary of “gratitude words.”

On the fourth iteration, “for” will be removed because it is a preposition and does not tell us about the object of gratitude.

Last, “our” is removed as it is a possessive pronoun. If grams like *our*, *my*, *her*, etc., are of interest to the reader, this rule can be turned off.

Finally, the object of gratitude has been isolated – the subject’s “big house.”

These rules were developed by hand after similarities were noticed in hundreds of gratitude statements.

N-grams were calculated in a manner that kept track of the subjects who used those particular n-grams. Then, the average happiness, positivity and satisfaction scores were calculated for each particular n-gram used.

The n-grams were sorted manually into hand-made lexica. Each lexicon covers a particular topic: financials, health/activity/exercise, religion/spirituality, art, relationships, alcohol/drugs, work, disease/medicine, and technology/science/engineering. Weighted averages were calculated over the n-grams comprising each lexicon. From this, we gain a better understanding of our subjects’ happiness, positivity and satisfaction and how these scores correlate with particular topics. Results were tested for significance using a t-test; results deemed insignificant have been omitted from discussion.⁴

Results & Discussion

Table 1 shows the mean, mode, standard deviation, variance, maximum, and minimum of the 37,407 participants' happiness, positivity, and satisfaction scores, respectively.

	Happiness	Positivity	Satisfaction
mean	43.59	37.12	49.62
mode	44	38	50
stdev	18.53	18.48	22.42
var	343.19	341.37	502.49
max	100	100	100
min	1	0	0

Table 1 - Sample Statistics

Table 2 shows the mean happiness scores for each topic.⁵ Group **A** describes the set of participants who mentioned a gram contained in that topic's lexicon. Group **B** describes the set of participants who do not mention a gram contained in that topic's lexicon.

Those subjects who mentioned religion or spirituality, using words like *god*, *meditation* and *faith* had the highest mean happiness score, 48.78. This group's happiness score was nearly 3 points happier than those who did not attribute gratitude to their religion or spirituality. Followed closely are those subjects who were grateful for their significant other. This topic had a mean happiness score of 47.22. Least happy were those subjects who mentioned their siblings or parents, with mean happiness scores of 41.59 and 45.89, respectively.

Interestingly, those subjects who mention their offspring scored more than 1.5 points higher, on average, than those who mention their parents.

Topic	t-score	p	Size, A	Mean happiness, A	Standard Deviation of happiness, A	Size, B	Mean happiness, B	Standard Deviation of happiness, B
financial	2.145	0.032	3726	46.57	18.57	34570	45.88	19.57
offspring	-3.085	0.00209	980	44.08	18.28	36412	45.91	19.54
parental	-9.167	9.52E-20	2374	42.46	18.65	35131	46.09	19.54
religion/spirituality	2.222	0.0271	249	48.78	20.81	37090	45.84	19.50
siblings	-3.852	1.46E-04	279	41.59	18.54	37047	45.89	19.52
significant other	4.813	1.53E-06	4433	47.22	18.34	33836	45.80	19.61
relationships ⁶	-3.611	3.05E-04	10951	45.46	18.64	29270	46.23	19.70

Table 2 – Topic Averages

Table 3 displays the top 20 happiness scoring objects of gratitude (where $p < 0.10$).

Object of Gratitude	t-score	p	Size, A	Mean happiness, A	Standard Deviation of happiness, A	Size, B	Mean happiness, B	Standard Deviation of happiness, B
companionship	6.174	8.26E-04	7	72.857	11.568	37304	45.855	19.510
sport	2.943	3.21E-02	6	65.167	16.068	37305	45.857	19.511
adventure	2.220	0.068	7	63.143	20.603	37304	45.857	19.511
Christ	3.478	3.69E-03	15	62.600	18.643	37296	45.853	19.510
wellness	2.432	0.051	7	62.000	17.559	37304	45.857	19.511
comfort	3.640	0.008	8	61.125	11.862	37303	45.856	19.512
meetings	2.657	0.045	6	60.833	13.805	37305	45.857	19.512
sex	2.183	0.052	12	60.333	22.968	37300	45.856	19.510
pancakes	3.016	0.015	10	58.500	13.252	37301	45.856	19.512
system	2.995	0.010	15	58.467	16.305	37296	45.855	19.512
result	2.031	0.082	8	57.750	16.559	37303	45.857	19.512
relative	2.046	0.080	8	57.625	16.265	37303	45.857	19.512
plants	1.855	0.091	12	57.500	21.744	37299	45.856	19.510
marriage	4.531	4.01E-05	48	56.813	16.756	37263	45.846	19.512
cards	2.227	0.056	9	56.556	14.406	37302	45.857	19.513
sobriety	2.342	0.047	9	55.778	12.706	37302	45.857	19.513
business	4.536	4.35E-05	45	55.711	14.569	37267	45.848	19.514
circle	2.360	0.033	15	55.533	15.878	37296	45.856	19.513
credit	2.720	1.40E-02	19	55.474	15.411	37292	45.855	19.513
fiancee	2.336	0.080	5	54.800	8.556	37306	45.859	19.513

Table 3 – 20 Highest Scoring Nouns

Possible Sources of Error

The data is skewed; stay-at-home moms (women ages 25-44) are largely over represented – they comprise more than 75% of the sample. In an article with the New Yorker, Happify creator Ofer Leidner names this particular demographic “the most unhappy group in America.”⁷ If this is true, the happiness scores are likely lower than we would find in a random sample.

Further Investigation

- Correlate word sentiment with the happiness, positivity and sentiment scores, using the Stanford CoreNLP framework. Does positivity (or negativity) in the gratitude statement correlate with Happify’s positivity score?
- Are people who use names (in their gratitude statement) happier than those who do not use names?
- Do happier people use a particular tense more than unhappier people?
- Run the same analysis using improved lexica. Lexica might be developed automatically through machine learning. Additionally, a wider range of topics could be explored.

¹ "Happify." *App Store*. N.p., n.d. Web. 19 Aug. 2014.

² Seligman, M. E. P., Steen, T. T., Park, N., & Peterson, C. (2005). Positive psychology progress: Empirical validation of interventions. *American Psychologist*, 60(5), 410-421.

³ Doverspike, William, Ph. D. *Gratitude: A Key to Happiness*. Georgia Psychological Association, n.d. Web. 19 Aug. 2014.

⁴ Topics “health/activity/exercise,” “art,” “disease/medicine,” “alcohol/drugs,” and “work” did not have significant results.

⁵ The individual lexica for each topic can be found in folder “Lexicon.” For example, the lexica used for the “financial” topic can be found in “Lexicon/financial.txt”

⁶ The “relationships” lexicon consists of several of the other lexica and cannot be compared statistically.

⁷ Morais, Betsy. "The Happiness App." *New Yorker* 14 Apr. 2014: *The New Yorker*. Web. 19 Aug. 2014.