

Report: the unhappiness of software developers

Daniel Graziotin¹, Fabian Fagerholm², Xiaofeng Wang³ and Pekka Abrahamsson⁴

1 University of Stuttgart, Institute of Software Technology (Stuttgart, (Germany);

2 University of Helsinki, Department of Computer Science (Helsinki, (Finland);

3 Free University of Bozen-Bolzano, Faculty of Computer Science (Bolzano/Bozen, (Italy);

4 NTNU, Department of Computer and Information Science (Trondheim, (Norway)

Abstract

The present document contains an in-progress summary of the data that we obtained while running a large questionnaire in 2014. We conducted the study for (1) estimating how happy software developers are, (2) finding the major causes for unhappiness of software developers, and (3) finding the major consequences of unhappy developers while they develop software. We made this report freely accessible as a way of thanking our participants for their effort as well as to provide all details of the study that cannot be included in publications due to, e.g., page limitations.

Questionnaire items

We made the questionnaire openly available here:

<https://doi.org/10.6084/m9.figshare.3545856.v3>

Data cleaning criteria

Here we list the criteria that we applied when cleaning data.

Not deleted if

- * Inputting joke/bogus value on one field only if it was obviously done for privacy reasons. Example: nationality - "human" or "white" but the rest does not look bad
- * Inputting a single field not in English, e.g., writing the nationality using the local alphabet system, but the rest looks legitimate

- * Inputting N/A or placeholder values for the qualitative data but the rest looks legitimate
- * Small typos, e.g., "Wev developer" and the rest looks legitimate

Deleted if

- * Any happiness dimension is unanswered.
- * Year of birth is not parseable to an unambiguous year.
- * Nationality is not parseable to an unambiguous country
- * How many years have you worked... is an impossible number.
- * Non existing nationality, e.g., Ytalyan, Fingish
- * Bogus salary values, e.g., 123456789
- * Bogus year of birth, e.g., 1900 or 2014
- * Bogus position, e.g., "Legend", "Mad Scientist", "Server bitch" only if the rest does not look legitimate
- * Stating "not your business" in all free-text fields + bogus values
- * Entering empty/whitespace characters instead of answers
- * Not completing the happiness part (even if everything else before was completed)
- * Stating "I don't understand" in most free form text
- * Clearly not understanding English, e.g., answering in foreign language or answering "good" and "bad" to the open questions
- * Insults in the free form text
- * Complaining about the survey in the free-form text or showing impatience, e.g. "never had emotions" or "scrabbli"
- * These factors often appear in some combination

Demographics

Table 1 provides the participation and response rates of the questionnaire. We are grateful to all 2220 participants, regardless of their participation levels. As we could reach a very rich sample, we decided to retain only the 1318 complete responses, as explained in section **"Happiness of software developers."**

The average year of birth was 1984 (standard deviation (sd)=9.33), while the mean was 1986.

Response rate	Count
Participated	2220
Valid data up to happiness measurement	1908
Valid data up to end of questionnaire	1318

Table 1. Participation and response rates

As Table 2 shows, our sample of N=1318 responses resulted in 1236 male participants (94%) and 65 female (5%). The remaining 19 participants declared their gender as other, or preferred not to disclose.

Gender	Count
Male	1236
Female	65
Other/Prefer not to disclose	19

Table 2 Gender count of participants

There was diverseness in terms of nationality, with 88 countries. The most represented nationalities were American (24%), Indian (6%), Brazilian (6%), Russian (5%), and British (4%). Table 3 provides the top entries for the nationality.

Nationality	Count
American	292
Indian	83
Brazilian	71
Russian	68
British	54
French	46
Canadian	43
Chinese	40
Italian	39
German	37
Dutch	29
Spanish	28

Polish	22
Ukrainian	21
Australian	19
Mexican	19
Swedish	19
Colombian	15
Filipino	15
Argentine	14
Japanese	13
Danish	12
Norwegian	12
Swiss	12
South African	11
Turkish	11
Indonesian	10
Bulgarian	9
(Remaining entries)	217
Not provided	37

Table 3 Participant's nationalities

We aggregated the role of the participants. A total of 993 (75%) of the participants were software developers, 15% of the sample were students, and 8% were in other roles (such as manager, CEO, CTO, and academic researcher). The remaining participants were non-employed.

The reported size of the participants' company, organization, or community is available in table 4.

Company size	Count
1	175
2-5	254
6-10	189
11-50	286
51-250	167

250-5000	127
5000	120

Table 4 Reported company/organization/association size in terms of workers

% Working time	Count
0%	68
1-24%	161
25%-49%	249
50%-74%	416
75%-100%	424

Table 5 Percentage of the working time spent developing software

Happiness of software developers

For measuring the happiness of developers we opted for the Scale of Positive And Negative Experience (SPANE)¹. The SPANE is a 12-item questionnaire which includes six items to assess the frequency of positive feelings and six items to assess the frequency of negative feelings in the last four weeks. Each item has a score of 1 (Very Rarely or Never) to 5 (Very often or Always). By subtracting the scores of the six negative feelings to the score of the six positive feelings, we obtain the SPANE-B score, that is a measure of happiness. SPANE-B ranges from -24 (extremely unhappy) to +24 (extremely happy).

In Figure 0, we plot all 1908 scores from the participants who completed the SPANE part of the questionnaire, while in Figure 1, we plot only those who completed the entire questionnaire (N=1318). The remaining plots are all with N=1318.

¹ <http://internal.psychology.illinois.edu/~ediener/SPANE.html>

Our sample with $N=1908$ had a SPANE-B mean score of 8.64 ($sd=6.78$), a median score of 9, and had a range of $[-16, 24]$. We estimated the population's true mean for SPANE-B via bootstrapping as 8.64 (replications = 2000, 95% CI $[8.34, 8.96]$). We estimated the population's true median for SPANE-B via bootstrapping as 9 (replications = 2000, 95% CI $[7.93, 9.59]$). Therefore, the sample could be considered as slightly happy.

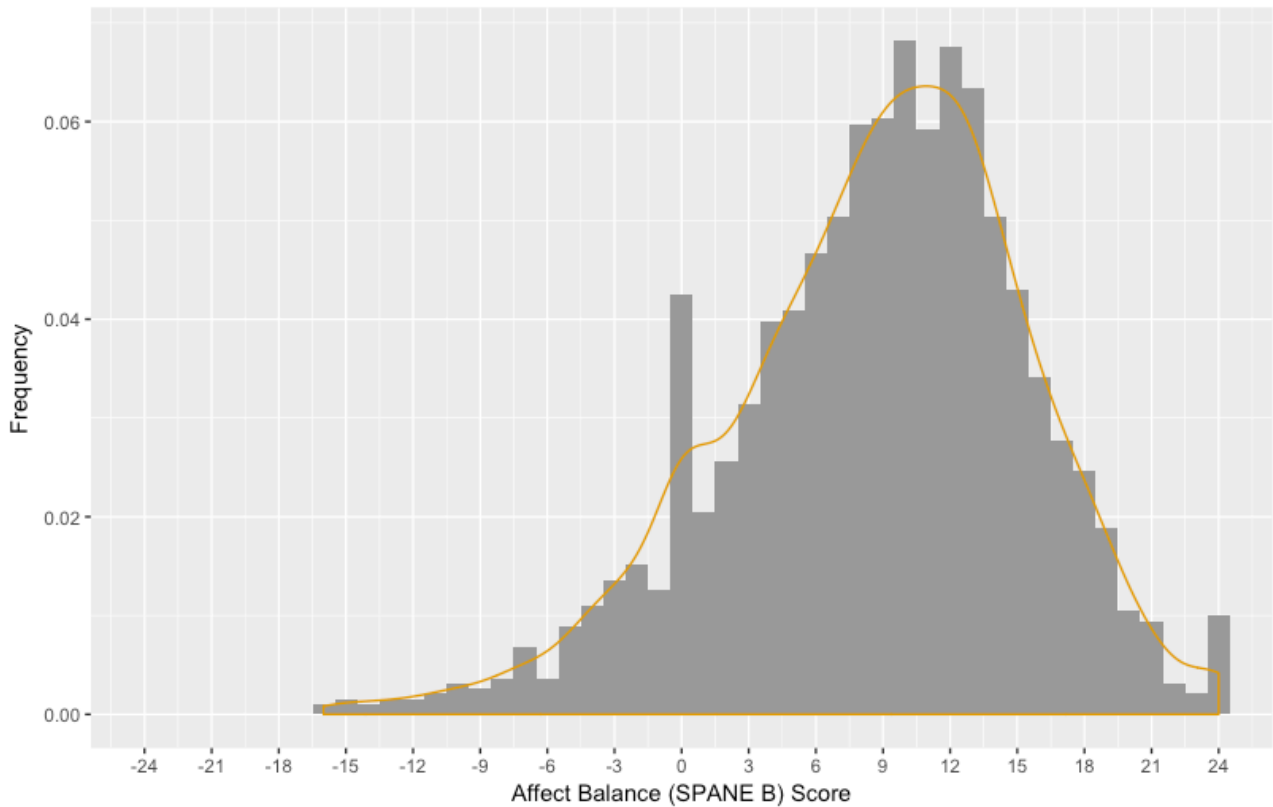


Figure 0 Happiness distribution for all participants who filled the happiness part ($N=1908$)

Our sample with $N=1318$ had a SPANE-B mean score of 9.05 ($sd=6.76$), a median score of 10, and had a range of $[-16, 24]$. We estimated the population's true mean for SPANE-B via bootstrapping as 9.05 (replications = 2000, 95% CI $[8.69, 9.43]$). We estimated the population's true median for SPANE-B via bootstrapping as 10 (replications = 2000, 95% CI $[9.52, 10.67]$). Therefore, the sample could be considered as slightly happy.

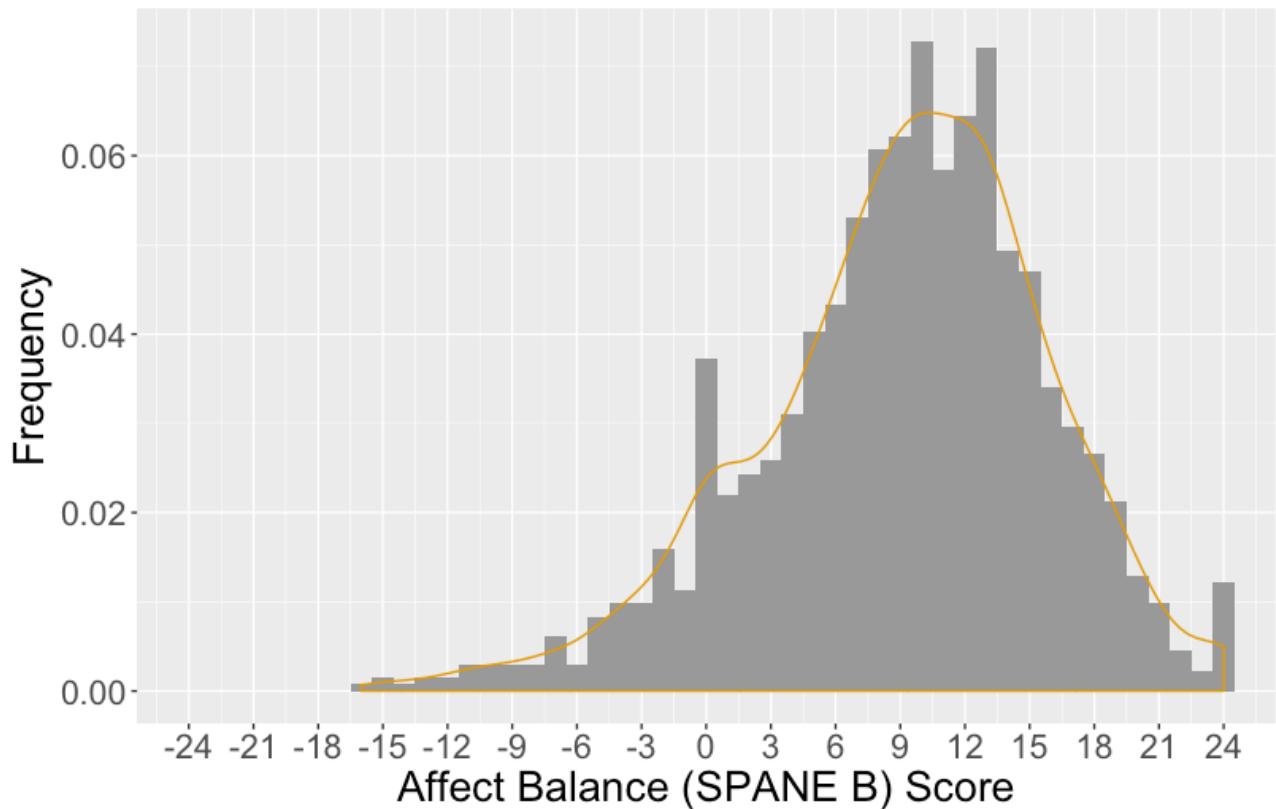


Figure 1 Happiness distribution for all participants who completed the entire questionnaire ($N=1318$)

The two confidence intervals for the mean and median scores for both full and reduced samples are overlapping. We conclude that no evidence exist for a difference between the two SPANE-B scores.

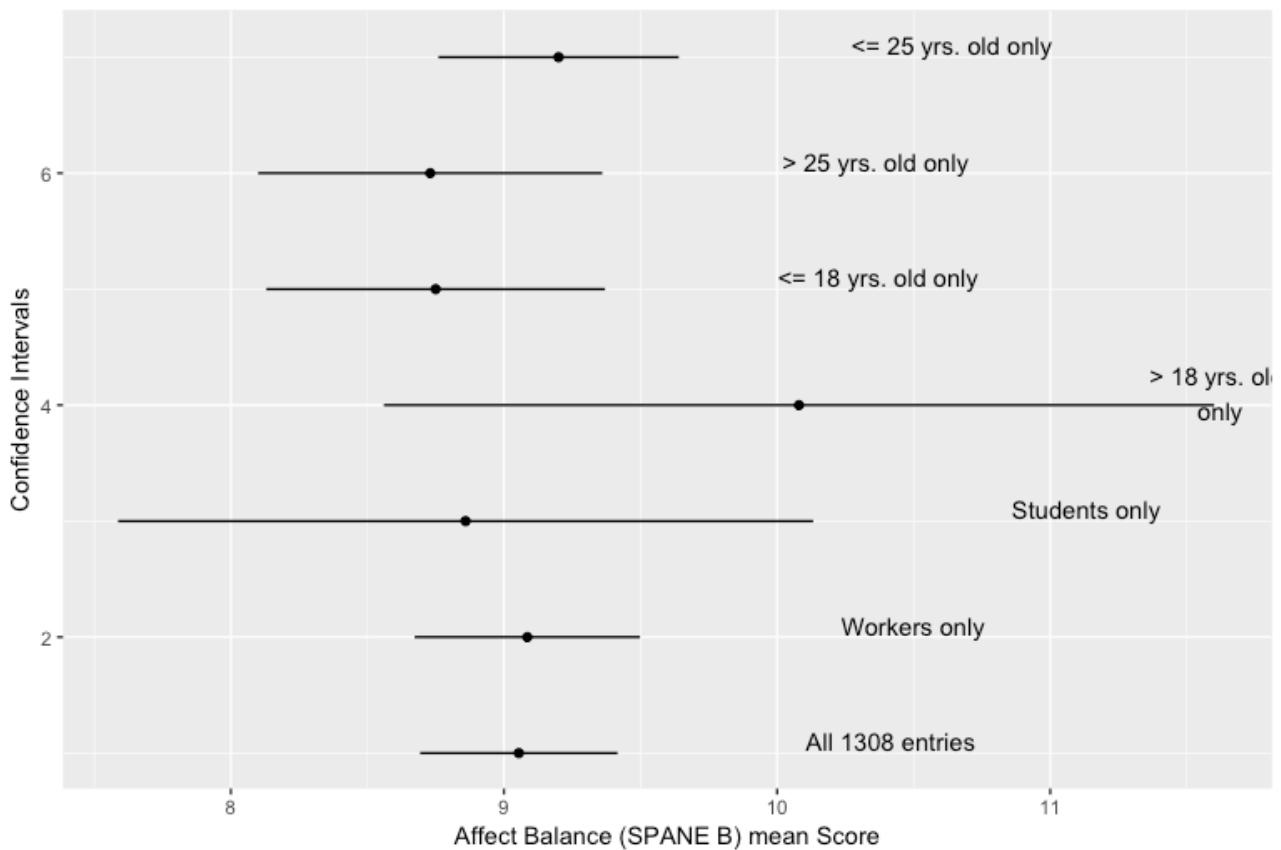


Figure 3 Confidence intervals of happiness distribution for various groups

Furthermore, we bootstrapped and plotted the confidence intervals for mean SPANE-B score of various role and age group. We compare them in Figure 3. First, we plotted the baseline confidence interval of SPANE-B of the entire dataset with cleaned and valid values (N=1381). Then, we added the confidence intervals for software developers as workers and students. There are no noticeable significant differences, although students show a wider confidence interval. Finally, we plotted two “young vs. mature” confidence intervals, using as splitting point either 18 years old or 25 years old. No noticeable differences can be spotted.

The rest of this report will report plots and values with N=1318, as explained in the paper.

The remaining figures shows the plot of the SPANE-B score versus other demographic variables. None of them indicate a relationship with the happiness. That is, year of birth, gender, work status, company size, percentage of working time dedicate to programming, and gross income (US participants only) seem not related to the happiness of developers.

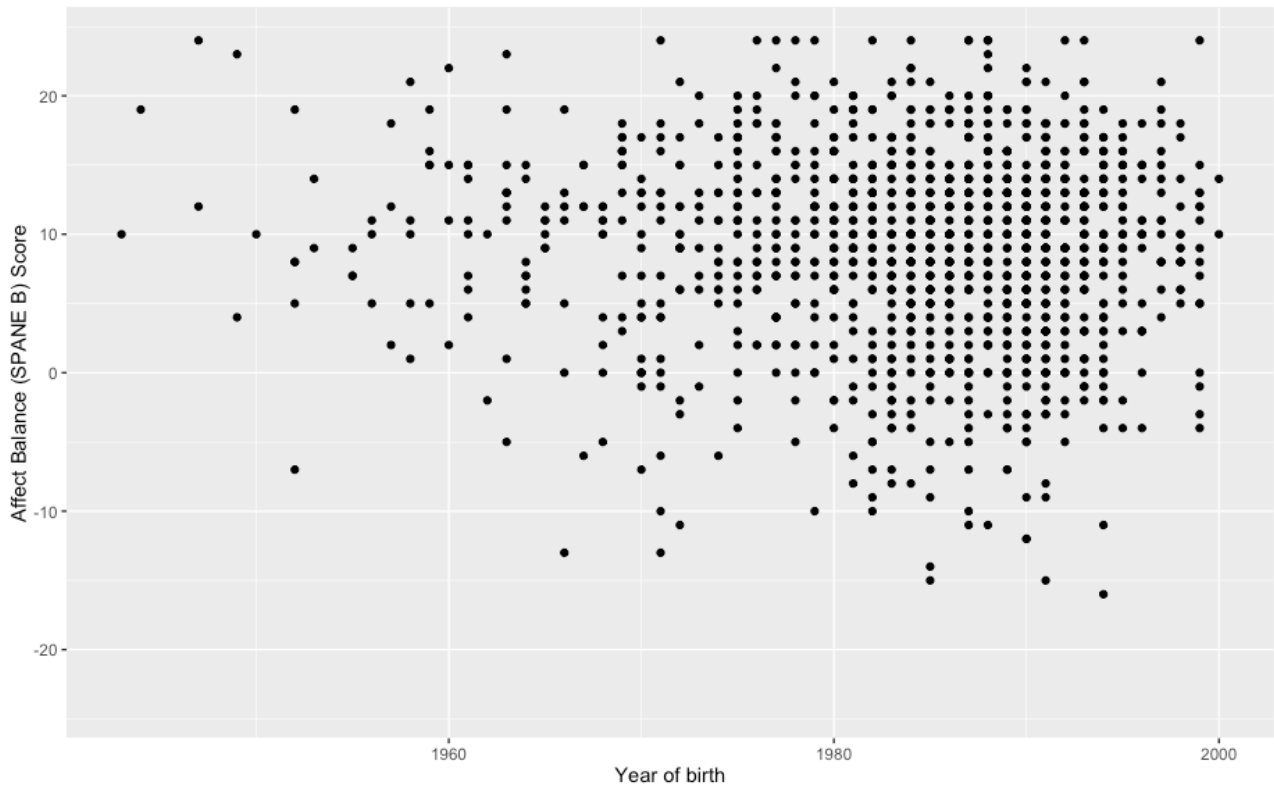


Figure 3 Happiness of developers versus their year of birth

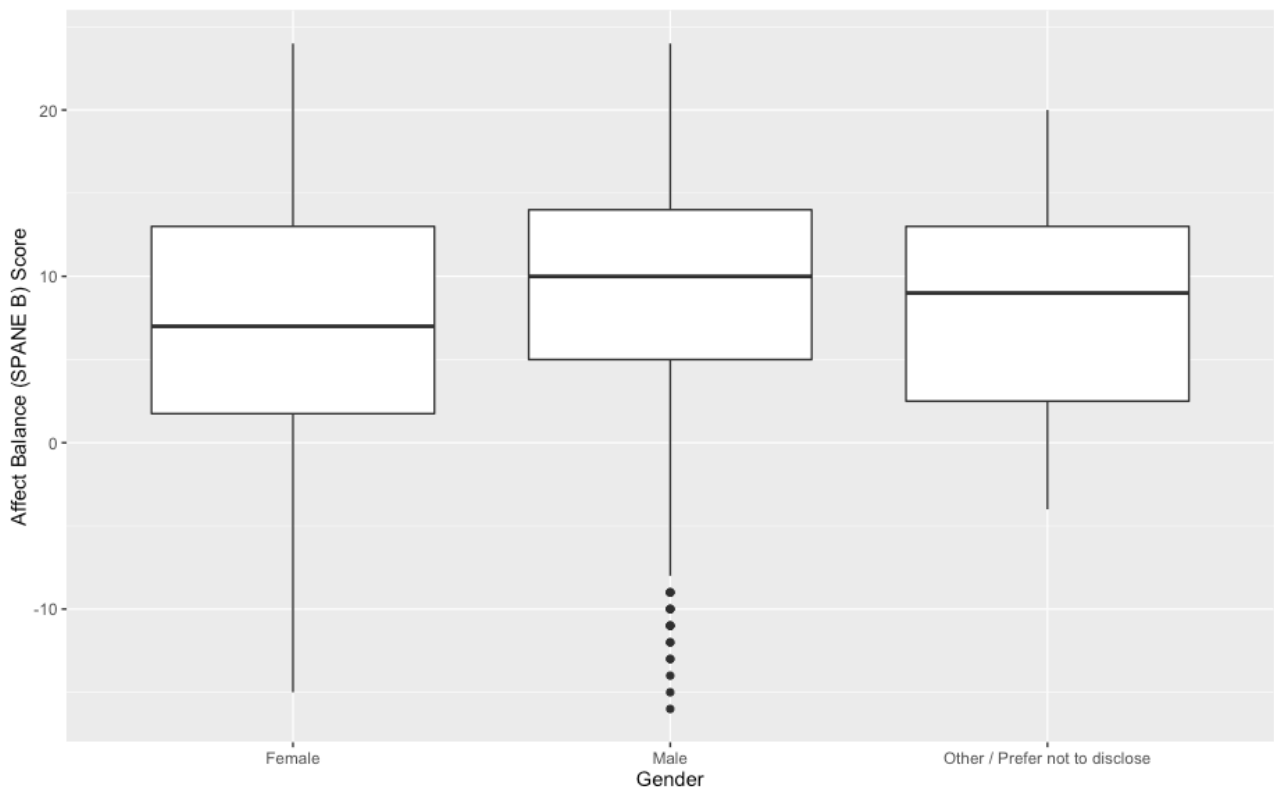


Figure 4 Happiness of developers grouped by gender

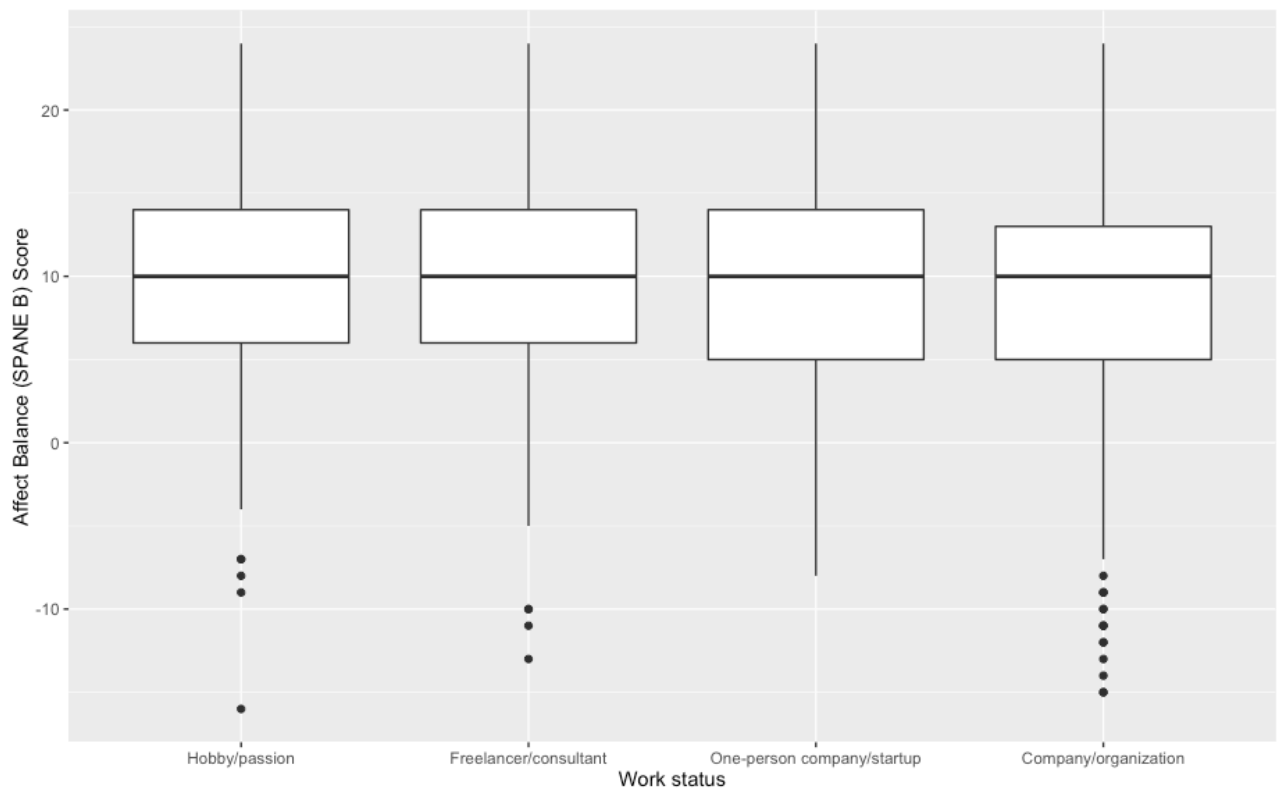


Figure 5 Happiness of developers grouped by work status

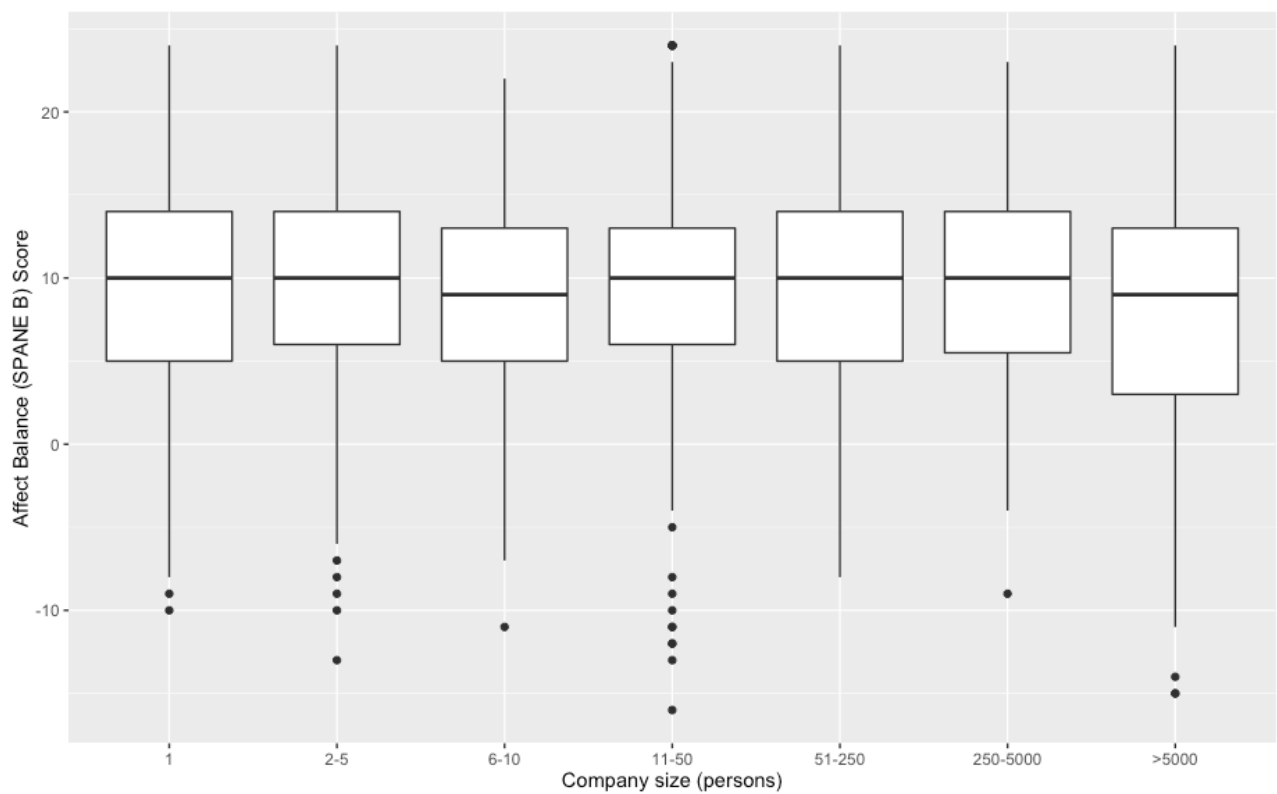


Figure 6 Happiness of developers grouped by company size

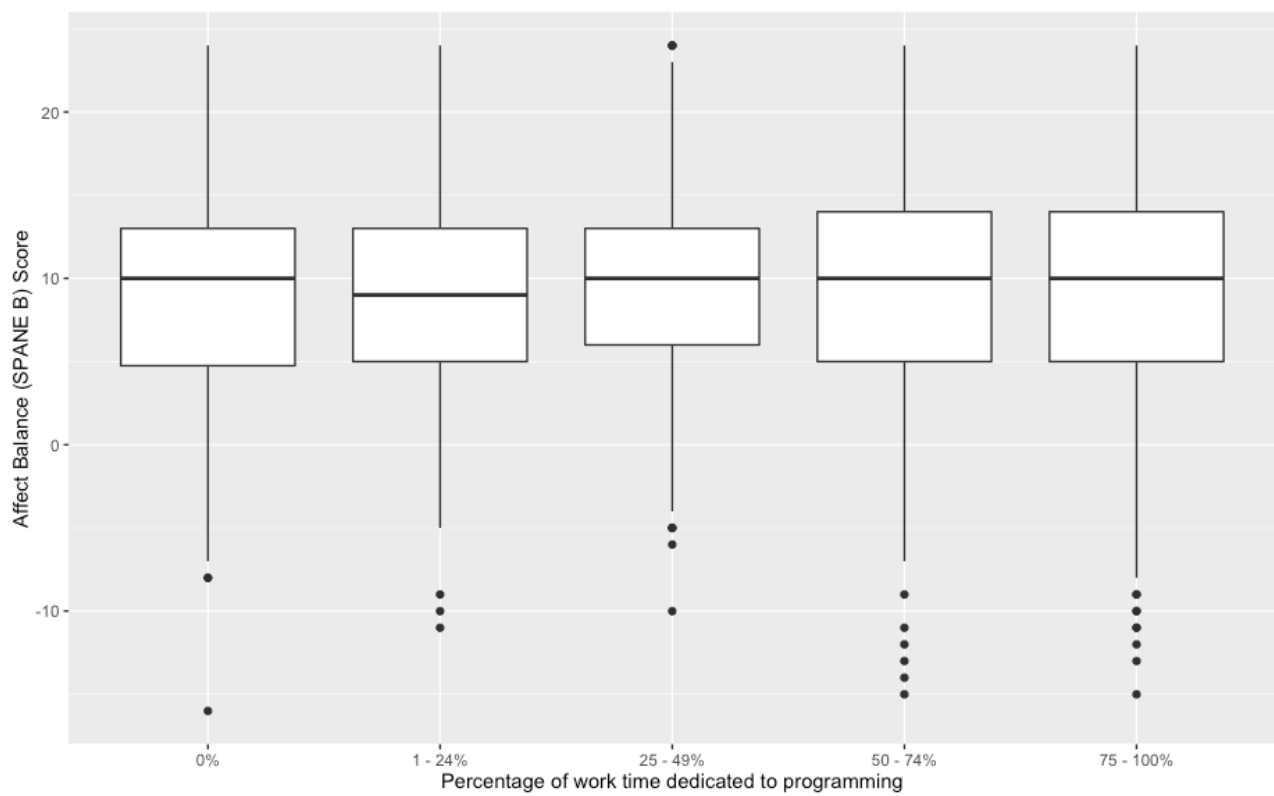


Figure 7 Happiness of developers grouped by percentage of working time dedicated to programming

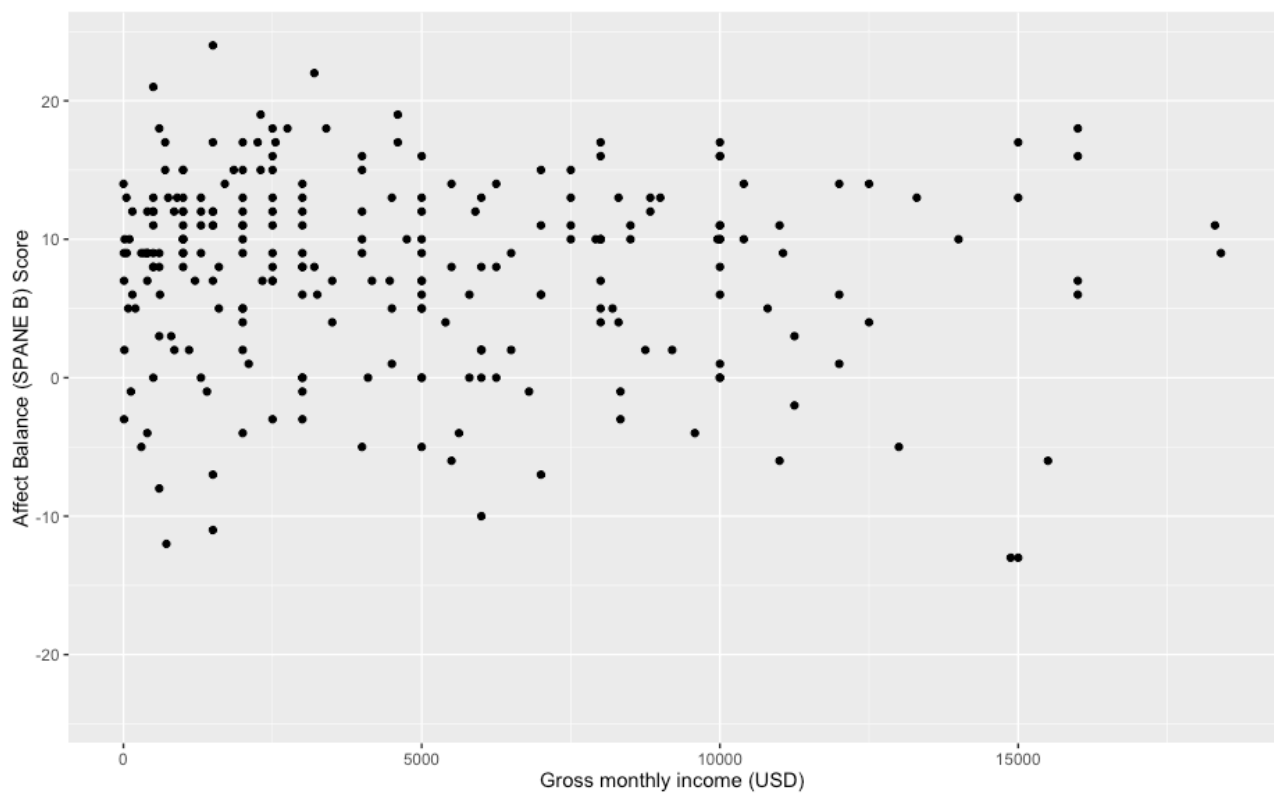


Figure 8 Happiness of developers versus the gross monthly income (only USA, N=247)

Causes of unhappiness among developers

We exported the entire coding structure and made it available as open data here:

<https://doi.org/10.6084/m9.figshare.4596337>

Consequences of unhappiness among developers

We exported the entire coding structure and made it available as open data here:

<https://doi.org/10.6084/m9.figshare.4497218>