Snoozing: An Examination of A Common Method of Waking

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Supplementary Table and Figure Captions

Appendix A: Mattingly Alarm and Snooze Survey (MASS). A novel survey that asks participants about snoozing. Each question is followed with potential responses.

Appendix B: Snooze Daily Questions. A list questions asked to participants each day. As these were administered via electronic survey, some display logic was used. For instance, if a participant selects ‘no’ to the first question, did you go to bed last night, a followup question asked for intended bedtime in hh:mm, and AM/PM.

Appendix C: Responses to the Mattingly Alarm and Snooze Survey. This table shows the counts of responses to each question by response. Within each cell, there is a count of responses overall, followed by snoozers in parentheses() and non-snoozers within brackets[].question corresponds with an item of the MASS, as indicated by Q. Items have been reorganized from original survey by topic. Snoozers and non-snoozers were defined by response to MASS question 2: do you consider yourself a snoozer. A chi-square test was conducted on each question comparing snoozers to non-snoozers reported in the rightmost column. In this column, parenthesis indicate degrees of freedom, followed by the χ2 value, and its associated Bonferroni corrected p value. \* *p*< .05 \*\* *p*< .01 \*\*\* *p*< .001.

Appendix D: Full Models. Linear mixed effects models are reported for the average HR of the whole night and last hour, as well as each stage of sleep for the whole night and last hour. These models use MASS snoozer status as a predictor and control for sleep duration. \* *p*< .05 \*\* *p*< .01 \*\*\* *p*< .001

**Appendix A: Mattingly Alarm and Snooze Survey (MASS)**

Q1 How often do you nap?

* Never
* Once or more a month
* Once or more a week
* Once or more a day

These survey questions ask about alarm and wake behavior in general; consider your typical work week in answering them. Snoozing can be considered as choosing to go back to sleep after an alarm has awakened you intending to wake up later, setting an alarm earlier than when you intend to wake up, or setting multiple alarms with the intent to not wake up on the first alarm.

Q2 Do you consider yourself a snoozer using this definition?

* Yes
* No

Q3 Where in the room is your alarm placed most often?

* I do not set an alarm
* Within arm's reach of the bed (e.g. night stand, on the bed, etc)
* Further than arm's reach of the bed (you cannot reach the alarm without leaving the bed)

Q4 Which interval best describes time intervals between your snoozing alarms most often?

* I do not set an alarm
* My alarms intervals are evenly spaced (e.g. 5 minutes between each of 3 alarms)
* My alarm intervals are variable, getting shorter (e.g. time between first alarm and second alarm is 10 minutes, and time between second and third alarm is 5 minutes)
* My alarm intervals are variable, getting longer (e.g. time between first alarm and second alarm is 5 minutes, and time between second and third alarm is 10 minutes)
* Other (please describe when prompted)

For the following, please select the best option to fill in the blank

Q5 I feel \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ for work/school most mornings. (note: this assessment does not need to correspond to actual arrival at work. A person who arrives 20 minutes early to work may consider themselves to feel late)

* Very early
* Early
* On time
* Late
* Very Late

Q6 My sleeping environment (bed, room, others) has \_\_\_\_\_\_\_ effect(s) on my snoozing behaviors

* No
* Little
* Some
* Significant

Q7 I consider myself \_\_\_\_\_\_\_\_\_\_\_\_\_ sleep deprived in general.

* Not at all
* Slightly
* Moderately
* Very
* Extremely

Q8 Snoozing is \_\_\_\_\_\_\_\_\_\_\_\_\_ important to me getting out of bed on schedule for a typical work day

o Not at all

o Slightly

o Moderately

o Very

o Extremely

For the next set of statements, you are asked to agree or disagree

Q9 It is easy to fall asleep after waking to an alarm

o Strongly disagree

o Somewhat disagree

o Neither agree nor disagree

o Somewhat agree

o Strongly agree

Q10 I get as much sleep as I want

o Strongly disagree

o Somewhat disagree

o Neither agree nor disagree

o Somewhat agree

o Strongly agree

For each statement, indicate how often you do the noted behavior.

Never is approximately 0% of the time.

Sometimes is less than 50% of the time.

Often is less than 75% of the time.

Regularly is greater than 75% of the time.

Q11 How often do you set alarms(s) based on a regular schedule? (e.g. 7am on work days)

o Never

o Sometimes

o Often

o Regularly

Q12 How often do you set alarm(s) based on the next day's schedule? (e.g. alarm at 7am Monday for an important meeting, but 11am for Tuesday without an important meeting)

o Never

o Sometimes

o Often

o Regularly

Q13 On a work day, how often do you snooze (hit a button marked snooze or use an auto-snooze effect?)

o Never

o Sometimes

o Often

o Regularly

Q14 How often do you wake up to an initial alarm and set another alarm to wake up later?

o Never

o Sometimes

o Often

o Regularly

Q15 How often do you sleep through the alarm you intend to wake up to?

o Never

o Sometimes

o Often

o Regularly

**Split Instructions:**

If Do you consider yourself a snoozer using this definition? = Yes,

“For the next questions, indicate your agreement with how snoozing makes you feel.”

If Do you consider yourself a snoozer using this definition? = No,

“For the next questions, indicate your agreement with how you think snoozing would make you feel. “

Snoozing....

Q16 Improves my mood

Strongly agree, Agree, Somewhat agree, Neither agree nor disagree, Somewhat disagree, Disagree, Strongly disagree

Q17 Makes you feel guilty

Strongly agree, Agree, Somewhat agree, Neither agree nor disagree, Somewhat disagree, Disagree, Strongly disagree

Q18 Makes you feel happy

Strongly agree, Agree, Somewhat agree, Neither agree nor disagree, Somewhat disagree, Disagree, Strongly disagree

Q19 Makes you feel alert

Strongly agree, Agree, Somewhat agree, Neither agree nor disagree, Somewhat disagree, Disagree, Strongly disagree

Q20 Worsens your mood

Strongly agree, Agree, Somewhat agree, Neither agree nor disagree, Somewhat disagree, Disagree, Strongly disagree

Q21 Snoozing makes you feel nervous

Strongly agree, Agree, Somewhat agree, Neither agree nor disagree, Somewhat disagree, Disagree, Strongly disagree

If Do you consider yourself a snoozer using this definition? = Yes,

Why do you snooze? Check all that apply

▢ I do not snooze

▢ I snooze because it makes me feel more pleasant in the moment

▢ I snooze because it will make me feel more pleasant later

▢ I snooze because I cannot get out of bed on my first alarm

▢ I snooze because it allows me to feel less tired when I do get out of bed

▢ I snooze because it is part of my structured routine

▢ I snooze because it allows me to feel more in control

▢ I snooze because I feel comfortable in bed

▢ I snooze because I think it will improve my work performance

▢ I snooze for another reason (please specify)

**Appendix B: Snooze daily questions.**

|  |
| --- |
| Did you go to bed last night when you intended to? (y/n)  If No: |
| When do you intend to go to bed last night? Note: 12:00 AM = Midnight, 12:00 PM = Noon (Hour, Minute, AM/PM) |
| How many minutes did you use your phone in bed before falling asleep? if you did not use your phone after going to bed, please enter 0. ( Minutes) |
| Did you get out of bed this morning when you intended to? (y/n)  If No: |
| When did you intend to get out of bed this morning? Note 12:00 AM = Midnight, 12:00 PM = Noon (Hour, Minute, AM/PM) |
| How many minutes did you use your phone before getting out of bed? if you did not use your phone before getting out of bed, please enter 0. (Minutes) |
| How many servings of caffeine did you have today? ( 1 serving - 8 oz of coffee, or 100 mgs. A person who as a 'venti' coffee from starbucks has 2.5 servings) |
| Did an alarm wake you up this morning? (y/n)  If No: |
| How did you wake up this morning?  (Naturally, without any other factors, External factors such as a pet, children, construction noise, light, etc., Personal factors such as injury, medical condition, stress, anxiety, excitement, etc.)  If Yes: |
| Check all that apply: What device(s) had the alarm that woke you up?  Garmin Vivosmart 3  Wearable, other  Cell phone alarm  Alarm app or sleep app on phone  Bedside clock with alarm function  vibration alarm  specialized wake device  other alarms or methods of waking not including naturally waking up |
| Did you hit the snooze button (or wake up to an alarm earlier than the one you use to get out of bed)? |
| How many minutes between first alarm and getting out of bed? |
| How long was your morning routine (e.g. waking up to leaving the house for work, or beginning work at home, or otherwise going about your day?) (Hours, Minutes, AM/PM) |

**Appendix C: Responses to the Mattingly Alarm and Snooze Survey.**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | | | | | | (degrees of freedom),χ2, Bonferroni corrected *p* value | |
| **Snoozing Identification** | | | | | | | | |
| **Q2 Snoozer** | Yes | No |  |  |  |  |  |  |
|  | (257) | [193] |  |  |  |  |  |  |
| **alarms and snoozing behaviors** | | | | | | | | |
| **Q3 Alarm placement\*** | No alarm Set | Arms reach | Outside arm's reach |  |  |  |  | (2)15.5977, |
|  | 28(6)[22] | 370(221)[149] | 53(30)[22] |  |  |  |  | .008\*\* |
| **Q4 Snooze interval\*** | No alarm Set | Evenly spaced | Variable shorter | Variable longer | Other (reported in text) |  |  | (4)77.3575, |
|  | 50(7)[43] | 266(183)[83] | 67(46)[21] | 19(9)[10] | 48(12)[36] |  |  | <.001\*\*\* |
| **Q11 How often do you set alarm(s) based on a regular schedule?** | Never (~0%) | Sometimes (~ 0 - 50%) | Often (~50-75% ) | Regularly (>75%) |  |  |  | (3)12.8942, |
|  | 35(13)[22] | 36(15)[21] | 63(33)[30] | 316(196)[120] |  |  |  | 0.1 |
| **Q12 How often do you set alarm(s) based on the next day's schedule?** | Never (~0%) | Sometimes (~ 0 - 50%) | Often (~50-75% ) | Regularly (>75%) |  |  |  | (3)4.0869, |
|  | 112(57)[55] | 136(80)[56] | 61(32)[29] | 141(88)[53] |  |  |  | 1 |
| **Q13 On a work day, how often do you snooze (hit a button marked snooze or use an auto-snooze effect?)** | Never (~0%) | Sometimes (~ 0 - 50%) | Often (~50-75% ) | Regularly (>75%) |  |  |  | (3)188.9997, |
|  | 134(17)[117] | 122(68)[54] | 80(66)[14] | 114(106)[8] |  |  |  | <.001\*\*\* |
| **Q14 How often do you wake up to an initial alarm and set another alarm to wake up later?** | Never (~0%) | Sometimes (~ 0 - 50%) | Often (~50-75% ) | Regularly (>75%) |  |  |  | (3)34.353, |
|  | 195(81)[114] | 140(96)[44] | 57(41)[16] | 58(39)[19] |  |  |  | <.001\*\*\* |
| **Q15 How often do you sleep through the alarm you intend to wake up to?** | Never (~0%) | Sometimes (~ 0 - 50%) | Often (~50-75% ) | Regularly (>75%) |  |  |  | (3) 23.7846, |
|  | 285(139)[146] | 126(93)[33] | 28(19)[9] | 11(6)[5] |  |  |  | <.001\*\*\* |
| **contributing factors** | | | | | | | | |
| **Q1 Nap frequency** | Never | Once or more a Month | Once or more a week | Once or more a Day |  |  |  | (3)5.0779, |
|  | 161(83)[78] | 186(107)[79] | 99(65)[34] | 4(2)[2] |  |  |  | 1 |
| **Q5 Feelings about being on time to work/school** | Very early | Early | On time | Late | Very late |  |  | (4) 25.6291, |
|  | 14(4)[10] | 95(39)[56] | 243(142)[101] | 93(68)[25] | 5(4)[1] |  |  | <.001\*\*\* |
| **Q6 Environmental effect on snoozing** | No | Little | Some | Significant |  |  |  | (3)17.4588, |
|  | 136(58)[78] | 145(89)[56] | 118(75)[43] | 51(35)[16] |  |  |  | 0.01\* |
| **Q7 Feelings about being sleep deprived?** | Not at all | slightly | moderately | very | extremely |  |  | (4)9.5541, |
|  | 86(39)[47] | 229(130)[99] | 108(68)[40] | 19(14)[5] | 8(6)[2] |  |  | 0.97 |
| **Q10 I get as much sleep as I want** | Strongly disagree | Somewhat disagree | Neither agree nor disagree | Somewhat agree | Strongly agree |  |  | (4)8.3488, |
|  | 91(54)[37] | 181(115)[66] | 61(33)[28] | 92(43)[49] | 25(12)[13] |  |  | 1 |
| **Q9 Easy to fall asleep after waking to an alarm** | Strongly disagree | Somewhat disagree | Neither agree nor disagree | Somewhat agree | Strongly agree |  |  | 86.2538, |
|  | 40(4)[36] | 99(40)[59] | 63(28)[35] | 161(113)[48] | 87(72)[15] |  |  | <.001\*\*\* |
| **Attitudes toward snoozing** | | | | | | | | |
| **Q8 Snoozing importance for workday schedule** | Not at all | slightly | moderately | very | extremely |  |  | (4) 169.9712 |
|  | 172(33)[139] | 137(100)[37] | 82(72)[10] | 47(42)[5] | 12(10)[2] |  |  | <.001\*\*\* |
| For the next questions; snoozers were asked how they feel. For non-snoozers, they were asked to imagine how they feel. | | | | | | | | |
| **Positive Snooze Attitudes** | | | | | | | | |
| **Q16 Snoozing improves your mood** | Strongly Agree | Agree | Somewhat Agree | Neither Agree nor Disagree | Somewhat disagree | Disagree | Strongly disagree | (6) 56.9285, |
|  | (24)[4] | (36)[11] | (49)[19] | (79)[59] | (26)[12] | (28)[51] | (15)[37] | <.001\*\*\* |
| **Q18 Snoozing makes you feel happy** | Strongly Agree | Agree | Somewhat Agree | Neither Agree nor Disagree | Somewhat disagree | Disagree | Strongly disagree | (6) 37.0823, |
|  | (16)[3] | (30)[9] | (55)[25] | (93)[70] | (24)[16] | (24)[39] | (15)[31] | <.001\*\*\* |
| **Q19 Snoozing makes you feel alert** | Strongly Agree | Agree | Somewhat Agree | Neither Agree nor Disagree | Somewhat disagree | Disagree | Strongly disagree | (6) 23.9041, |
|  | (5)[5] | (29)[11] | (50)[19] | (76)[64] | (36)[21] | (45)[41] | (16)[32] | .01\* |
| **Negative Snooze Attitudes** | | | | | | | | |
| **Q17 Snoozing makes you feel guilty** | Strongly Agree | Agree | Somewhat Agree | Neither Agree nor Disagree | Somewhat disagree | Disagree | Strongly disagree | (6) 18.1088, |
|  | (17)[13] | (33)[28] | (70)[30] | (45)[52] | (25)[15] | (28)[35] | (39)[20] | 0.12 |
| **Q20 Snoozing worsens your mood** | Strongly Agree | Agree | Somewhat Agree | Neither Agree nor Disagree | Somewhat disagree | Disagree | Strongly disagree | (6) 20.51, |
|  | (2)[13] | (14)[12] | (26)[24] | (81)[74] | (35)[19] | (64)[36] | (35)[15] | 0.04\* |
| **Q21 Snoozing makes you feel nervous** | Strongly Agree | Agree | Somewhat Agree | Neither Agree nor Disagree | Somewhat disagree | Disagree | Strongly disagree | (6) 21.0187, |
|  | (6)[14] | (24)[17] | (43)[24] | (58)[71] | (23)[15] | (58)[31] | (45)[21] | .04\* |
| \* *p<* .05, \*\* *p<* .01, \*\*\* *p<* .001 | | | | | | | | |

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**Appendix D: Models**

|  |  |  |  |
| --- | --- | --- | --- |
| Heart Rate, Whole Night | | | |
| Predictors | Parameter Estimate | Confidence Interval | *p* |
| (Intercept) | 65.01 | 63.80 – 66.13 | **<.001\*\*\*** |
| Snooze2 [Yes] | 1.87 | 0.35 – 3.39 | **.02\*** |
| sleep\_duration\_hours | 0.13 | 00.06– 0.19 | **<.001\*\*\*** |
| **Random Effects** |  |  |  |
| σ2 | 30.24 | ICC | 0.69 |
| τ00 snapshot\_id | 66.91 | N snapshot\_id | 450 |
| Observations | 103,169 |  |  |
| Heart Rate, Last Hour | | | |
| Predictors | Parameter Estimate | Confidence Interval | *p* |
| (Intercept) | 65.33 | 64.27 – 66.39 | **<0.001\*\*\*** |
| Snooze2 [Yes] | 1.62 | 0.19 – 3.06 | **0.03\*** |
| sleep\_duration\_hours | 0.19 | 0.11 – 0.26 | **<0.001\*\*\*** |
| **Random Effects** |  |  |  |
| σ2 | 41.50 | ICC | 0.59 |
| τ00 snapshot\_id | 59.32 | N snapshot\_id | 450 |
| Observations | 103,169 |  |  |
| Wake, Whole Night | | | |
| Predictors | Parameter Estimate | Confidence Interval | *p* |
| (Intercept) | 2.63 | 2.46 – 2.80 | **<0.001\*\*\*** |
| Snooze2 [Yes] | 0.23 | -0.04 – 0.50 | 0.098 |
| sleep\_duration\_hours | 0.64 | 0.46 – 0.71 | **<0.001\*\*\*** |
| **Random Effects** |  |  |  |
| σ2 | 14.46 | ICC | .13 |
|  |  | N snapshot\_id | 450 |
| Observations | 103,169 |  |  |
| Wake, Last Hour | | | |
| Predictors | Parameter Estimate | Confidence Interval | *p* |
| (Intercept) | 5.32 | 5.12 – 5.52 | **<0.001\*\*\*** |
| Snooze2 [Yes] | 0.02 | -0.24 – 0.28 | 0.87 |
| sleep\_duration\_hours | 0.41 | 0.35 – 0.48 | **<0.001\*\*\*** |
| **Random Effects** |  |  |  |
| σ2 | 67.84 | ICC | 0.02 |
|  |  | N snapshot\_id | 450 |
| Observations | 103,169 |  |  |
| Stage R Sleep, Whole Night | | | |
| Predictors | Parameter Estimate | Confidence Interval | *p* |
| (Intercept) | 6.78 | 6.32 – 7.24 | **<0.001\*\*\*** |
| Snooze2 [Yes] | -0.47 | -1.07 – 0.13 | 0.13 |
| sleep\_duration | 0.67 | -0.59 – 0.74 | **<0.001\*\*\*** |
| **Usnapshot\_id** | -0.08 | -0.12 – -0.04 |  |
| **Random Effects** |  |  |  |
| σ2 | 46.05 | ICC | 0.20 |
| τ00 snapshot\_id | 117.26 | N snapshot\_id | 450 |
| Observations | 103,169 |  |  |
| Stage R Sleep, Last Hour | | | |
| Predictors | Parameter Estimate | Confidence Interval | *p* |
| (Intercept) | 13.96 | 13.11 – 14.81 | **<0.001\*\*\*** |
| Snooze2 [Yes] | -0.35 | 1-1.48 – 0.78 | .48 |
| sleep\_duration\_hours | 1.75 | 1.48 – 1.92 | **<0.001\*\*\*** |
| **Usnapshot\_id** | -0.27 | -0.38 – -0.16 |  |
| **Random Effects** |  |  |  |
| σ2 | 400.64 | ICC | 0.08 |
| τ00 snapshot\_id | 73.32 | N snapshot\_id | 450 |
| Observations | 103,169 |  |  |
| Light Sleep, Whole Night | | | |
| Predictors | Parameter Estimate | Confidence Interval | *p* |
| (Intercept) | 59.39 | 58.20 – 60.58 | **<0.001\*\*\*** |
| Snooze2 [Yes] | 1.31 | -0.35 – 2.97 | 0.123 |
| sleep\_duration\_hours | -0.19 | -0.39 – 0.02 | <0.08 |
| **Usnapshot\_id** | -0.90 | -0.95 – -0.86 |  |
| **Random Effects** |  |  |  |
| σ2 | 207.38 | ICC | 0.33 |
| τ00 snapshot\_id | 117.26 | N snapshot\_id | 450 |
| Observations | 103,169 |  |  |
| Light Sleep, Last Hour | | | |
| Predictors | Parameter Estimate | Confidence Interval | *p* |
| (Intercept) | 66.62 | 65.5 – 67.74 | **<0.001\*\*\*** |
| Snooze2 [Yes] | 2.19 | 0.68 – 3.69 | **0.004\*\*** |
| sleep\_duration\_hours | -1.81 | -2.05 – -1.58 | **<0.001\*\*\*** |
| **Usnapshot\_id** | -0.76 | -0.87 – -0.64 |  |
| **Random Effects** |  |  |  |
| σ2 | 660.14 | ICC | 0.10 |
| τ00 snapshot\_id | 73.32 | N snapshot\_id | 450 |
| Observations | 103,169 |  |  |
| Deep Sleep, Whole Night | | | |
| Predictors | Parameter Estimate | Confidence Interval | *p* |
| (Intercept) | 31.19 | 29.91 – 32.48 | **<0.001\*\*\*** |
| Snooze2 [Yes] | -1.07 | -2.87 – 0.74 | .25 |
| sleep\_duration\_hours | -1.12 | -1.37 – -0.87 | **<0.001\*\*\*** |
| **Usnapshot\_id** | 1 |  |  |
| **Random Effects** |  |  |  |
| σ2 | 235.66 | ICC | 0.33 |
| τ00 snapshot\_id | 117.26 | N snapshot\_id | 450 |
| Observations | 103,169 |  |  |
| Deep Sleep, Last Hour | | | |
| Predictors | Parameter Estimate | Confidence Interval | *p* |
| (Intercept) | 14.1 | 12.99 – 15.21 | **<0.001\*\*\*** |
| Snooze2 [Yes] | -1.86 | -3.45 – -0.26 | **0.02\*** |
| sleep\_duration\_hours | -0.35 | -0.60 – -0.10 | **0.007\*\*** |
| **Usnapshot\_id** | 1 |  |  |
| **Random Effects** |  |  |  |
| σ2 | 404.45 | ICC | 0.16 |
| τ00 snapshot\_id | 73.32 | N snapshot\_id | 450 |
| Observations | 103,169 |  |  |
|  |  |  |  |
|  | \* *p<* .05 | \*\* *p<* .01 | \*\*\* *p<* .001 |