**Supplementary Material**

**Throughout this Supplementary Material statistical significance (p < 0.05) is indicated by boldface while borderline significance (0.05 < p < 0.1) is indicated by italics.**

**Table S1.** Description of the extended sample [1] (*N* = 747).

| Variable | Statistics | *N* |
|---|---|---|
| Age (years), mean ± SD | 73.4 ± 3.1 | 747 |
| Educational status (%) [2]: | | |
| Low | 16.9% | 126 |
| Middle | 47.9% | 358 |
| High | 35.1% | 262 |
| Missing | 0.1% | 1 |
| Smoking (%) | | |
| Yes | 2.9% | 22 |
| No | 97.1% | 725 |
| Missing | 0% | 0 |
| Passive smoking at home (%) | | |
| Yes | 60.0% | 448 |
| No | 39.4% | 294 |
| Missing | 0.7% | 5 |
| Physician-diagnosed depression (%) | | |
| Yes | 11.0% | 82 |
| No | 88.6% | 662 |
| Missing | 0.4% | 3 |

[1] Study population with non-missing annoyance information and cognitive score (see Figure 1). [2] The highest educational status of the participant or her spouse.

**Table S2.** Adjusted associations of residential noise levels and annoyance with dichotomized cognitive scores [1] ($N$ = 288). Results are presented as odds ratios with 95% confidence intervals.

| Cognitive Score | Model | Residential Noise | | Noise Annoyance | |
|---|---|---|---|---|---|
| | | $L_{DEN}$ | $L_{NIGHT}$ | Day | Night |
| SeFl | Main [2] | 1.28 (0.73, 2.22) | 0.91 (0.55, 1.52) | 0.95 (0.58, 1.54) | 1.04 (0.59, 1.85) |
| | +noise [3] | 1.29 (0.73, 2.26) | 0.91 (0.54, 1.54) | 0.91 (0.56, 1.49) | 1.07 (0.59, 1.93) |
| | +PM$_{10}$, NO$_2$ [4] | 1.49 (0.82, 2.71) | 1.01 (0.59, 1.74) | 1.01 (0.61, 1.67) | 1.13 (0.62, 2.04) |
| | +depression [5] | 1.28 (0.73, 2.22) | 0.91 (0.55, 1.52) | 0.95 (0.58, 1.54) | 1.04 (0.59, 1.86) |
| BNT | Main | 1.45 (0.72, 2.93) | 1.47 (0.82, 2.65) | **0.52 (0.28, 0.95) \*,6** | 0.67 (0.33, 1.38) |
| | +noise | 1.56 (0.77, 3.20) | 1.55 (0.85, 2.84) | **0.48 (0.26, 0.88) \*** | 0.59 (0.28, 1.23) |
| | +PM$_{10}$, NO$_2$ | 1.08 (0.51, 2.29) | 1.16 (0.62, 2.17) | **0.41 (0.21, 0.78) \*\*** | 0.53 (0.25, 1.14) |
| | +depression | 1.45 (0.72, 2.93) | 1.46 (0.81, 2.64) | **0.51 (0.28, 0.94) \*** | 0.66 (0.32, 1.35) |
| PhFl | Main | 1.67 (0.89, 3.14) | 1.26 (0.74, 2.17) | 0.76 (0.45, 1.29) | 0.86 (0.45, 1.61) |
| | +noise | 1.88 (0.99, 3.58) | 1.37 (0.78, 2.39) | 0.70 (0.41, 1.19) | 0.79 (0.41, 1.52) |
| | +PM$_{10}$, NO$_2$ | 1.64 (0.84, 3.20) | 1.19 (0.67, 2.13) | 0.71 (0.41, 1.22) | 0.79 (0.41, 1.53) |
| | +depression | 1.67 (0.89, 3.14) | 1.26 (0.73, 2.17) | 0.75 (0.44, 1.28) | 0.84 (0.45, 1.59) |
| WL-L | Main | 0.76 (0.38, 1.49) | 0.69 (0.38, 1.24) | 0.81 (0.46, 1.43) | 0.79 (0.41, 1.53) |
| | +noise | 0.76 (0.38, 1.52) | 0.72 (0.39, 1.34) | 0.84 (0.47, 1.50) | 0.88 (0.44, 1.75) |
| | +PM$_{10}$, NO$_2$ | 0.81 (0.40, 1.67) | 0.67 (0.36, 1.24) | 0.77 (0.42, 1.38) | 0.73 (0.37, 1.45) |
| | +depression | 0.75 (0.38, 1.49) | 0.68 (0.38, 1.23) | 0.79 (0.45, 1.40) | 0.76 (0.39, 1.48) |
| WL-R | Main | 0.72 (0.39, 1.33) | 0.79 (0.46, 1.35) | 0.73 (0.44, 1.22) | 1.04 (0.56, 1.93) |
| | +noise | 0.76 (0.41, 1.40) | 0.80 (0.46, 1.38) | 0.76 (0.45, 1.28) | 1.12 (0.59, 2.13) |
| | +PM$_{10}$, NO$_2$ | 0.70 (0.36, 1.33) | 0.74 (0.42, 1.31) | 0.67 (0.39, 1.15) | 0.96 (0.51, 1.84) |
| | +depression | 0.72 (0.39, 1.33) | 0.79 (0.46, 1.36) | 0.74 (0.44, 1.23) | 1.05 (0.56, 1.97) |
| Fig-C | Main | **2.72 (1.44, 5.12) \*\*** | 1.05 (0.58, 1.93) | 1.54 (0.85, 2.80) | 1.07 (0.53, 2.13) |
| | +noise | **2.74 (1.43, 5.24) \*** | 1.06 (0.57, 1.97) | 1.32 (0.71, 2.43) | 1.05 (0.52, 2.15) |
| | +PM$_{10}$, NO$_2$ | **2.54 (1.28, 5.03) \*\*** | 0.81 (0.42, 1.55) | 1.31 (0.71, 2.43) | 0.85 (0.41, 1.75) |
| | +depression | **2.72 (1.44, 5.12) \*\*** | 1.05 (0.57, 1.92) | 1.54 (0.85, 2.80) | 1.06 (0.53, 2.12) |
| Fig-R | Main | 1.34 (0.73, 2.45) | 0.94 (0.53, 1.65) | 0.91 (0.53, 1.56) | *0.56 (0.30, 1.03)* (\*) |
| | +noise | 1.41 (0.76, 2.63) | 1.03 (0.57, 1.86) | 0.86 (0.50, 1.49) | *0.54 (0.28, 1.03)* (\*) |

| Cognitive Score | Model | Residential Noise | | Noise Annoyance | |
| --- | --- | --- | --- | --- | --- |
| | | $L_{DEN}$ | $L_{NIGHT}$ | Day | Night |
| | +PM$_{10}$, NO$_2$ | 1.53 (0.79, 2.94) | 0.97 (0.53, 1.79) | 0.91 (0.52, 1.59) | *0.53 (0.28, 1.01)* [(*)] |
| | +depression | 1.34 (0.73, 2.46) | 0.93 (0.53, 1.64) | 0.89 (0.52, 1.53) | **0.53 (0.28, 1.00) *** |
| TMT-A | Main | 1.14 (0.65, 2.01) | 1.00 (0.60, 1.68) | 0.75 (0.46, 1.23) | 0.86 (0.48, 1.55) |
| | +noise | 1.23 (0.69, 2.20) | 1.06 (0.62, 1.81) | 0.72 (0.44, 1.20) | 0.85 (0.46, 1.56) |
| | +PM$_{10}$, NO$_2$ | 1.17 (0.64, 2.15) | 0.96 (0.55, 1.67) | 0.68 (0.41, 1.14) | 0.79 (0.43, 1.45) |
| | +depression | 1.15 (0.65, 2.03) | 0.98 (0.58, 1.66) | 0.70 (0.43, 1.16) | 0.78 (0.42, 1.42) |
| TMT-B | Main | 1.13 (0.64, 2.01) | 0.85 (0.51, 1.43) | 0.88 (0.54, 1.44) | 0.85 (0.47, 1.54) |
| | +noise | 1.14 (0.64, 2.05) | 0.83 (0.48, 1.41) | 0.86 (0.52, 1.42) | 0.88 (0.47, 1.63) |
| | +PM$_{10}$, NO$_2$ | 1.22 (0.66, 2.25) | 0.86 (0.49, 1.49) | 0.87 (0.52, 1.46) | 0.84 (0.45, 1.56) |
| | +depression | 1.12 (0.63, 1.98) | 0.84 (0.50, 1.41) | 0.84 (0.51, 1.38) | 0.79 (0.43, 1.45) |
| TMT-B/A | Main | 1.05 (0.55, 2.00) | 0.61 (0.34, 1.12) | 1.03 (0.60, 1.79) | 0.91 (0.47, 1.80) |
| | +noise | 1.07 (0.55, 2.07) | *0.59 (0.32, 1.10)* [(*)] | 1.03 (0.59, 1.79) | 1.08 (0.53, 2.18) |
| | +PM$_{10}$, NO$_2$ | 1.00 (0.50, 1.99) | *0.56 (0.29, 1.07)* [(*)] | 1.06 (0.60, 1.87) | 0.93 (0.46, 1.88) |
| | +depression | 1.04 (0.55, 1.99) | 0.61 (0.33, 1.11) | 1.02 (0.59, 1.77) | 0.89 (0.45, 1.76) |
| MMS | Main | 0.97 (0.52, 1.81) | 1.33 (0.75, 2.36) | 0.76 (0.44, 1.29) | 1.10 (0.58, 2.10) |
| | +noise | 0.98 (0.52, 1.85) | 1.38 (0.76, 2.49) | 0.75 (0.44, 1.30) | 1.01 (0.52, 1.98) |
| | +PM$_{10}$, NO$_2$ | 0.85 (0.44, 1.65) | 1.26 (0.68, 2.34) | 0.72 (0.42, 1.26) | 1.08 (0.55, 2.10) |
| | +depression | 0.97 (0.52, 1.81) | 1.33 (0.75, 2.36) | 0.75 (0.44, 1.28) | 1.08 (0.57, 2.07) |
| Total score | Main | *1.69 (0.94, 3.04)* [(*)] | 0.87 (0.51, 1.49) | 0.68 (0.41, 1.14) | 0.64 (0.35, 1.17) |
| | +noise | **1.84 (1.01, 3.38) *** | 0.95 (0.54, 1.65) | *0.62 (0.36, 1.04)* [(*)] | 0.65 (0.35, 1.21) |
| | +PM$_{10}$, NO$_2$ | *1.87 (0.99, 3.52)* [(*)] | 0.83 (0.47, 1.48) | *0.63 (0.37, 1.07)* [(*)] | *0.58 (0.31, 1.09)* [(*)] |
| | +depression | *1.68 (0.93, 3.04)* [(*)] | 0.87 (0.51, 1.49) | 0.67 (0.40, 1.13) | 0.63 (0.34, 1.16) |

[1] We modeled the probability that score < 0 (cognitive performance lower than expected for the participant's age and educational level).

[2] Adjusted for age (linear, squared, and cubic terms), smoking, passive smoking, and educational level.

[3] The models with $L_{DEN}$ and $L_{NIGHT}$ as main exposure were adjusted for annoyance (day or night, respectively). The models with annoyance as main exposure were adjusted for $L_{DEN}$ or $L_{NIGHT}$, correspondingly.

[4] Main model additionally adjusted for PM$_{10}$ and NO$_2$.

[5] Main model additionally adjusted for physician-diagnosed depression.

[6] Statistical significance: (*) $p < 0.1$, * $p < 0.05$, ** $p < 0.01$.

Statistical significance ($p < 0.05$) is indicated by boldface while borderline significance ($0.05 < p < 0.1$) is indicated by italics.

**Table S3.** Adjusted [1] association of L$_{NIGHT}$ ≥ 40 dB(A) with dichotomized cognitive scores [2].

| Cognitive Score | Odds Ratio (95% CI) | *p*-Value |
|---|---|---|
| SeFl | 1.04 (0.54, 2.03) | 0.8971 |
| BNT | 1.51 (0.64, 3.54) | 0.3453 |
| PhFl | 1.38 (0.66, 2.89) | 0.3890 |
| WL-L | 0.89 (0.39, 2.05) | 0.7895 |
| WL-R | 1.05 (0.51, 2.18) | 0.8966 |
| Fig-C | **2.27 (1.09, 4.72)** | **0.0285** |
| Fig-R | 0.98 (0.46, 2.09) | 0.9630 |
| TMT-A | 1.10 (0.55, 2.20) | 0.7824 |
| TMT-B | 0.64 (0.32, 1.26) | 0.1937 |
| TMT-B/A | 0.98 (0.44, 2.16) | 0.9555 |
| MMS | 0.91 (0.42, 1.95) | 0.8021 |
| Total score | 1.74 (0.85, 3.55) | 0.1289 |

[1] Adjusted for age (linear, squared, and cubic terms), smoking, passive smoking, and educational level. [2] We modeled the probability that score < 0 (cognitive performance lower than expected for the participant's age and educational level). Statistical significance (p < 0.05) is indicated by boldface while borderline significance (0.05 < p < 0.1) is indicated by italics.

**Table S4.** Adjusted [1] association of noise annoyance with dichotomized cognitive scores [2] in the extended dataset (*N* = 747).

| Cognitive Score | Annoyance at Day | | Annoyance at Night | |
|---|---|---|---|---|
| | Odds Ratio (95% CI) | *p*-Value | Odds Ratio (95% CI) | *p*-Value |
| SeFl | 1.18 (0.87, 1.6) | 0.2833 | *1.42 (0.96, 2.1)* | *0.0772* |
| BNT | **0.67 (0.48, 0.95)** | **0.0247** | 0.69 (0.44, 1.08) | 0.1046 |
| PhFl | 0.86 (0.62, 1.19) | 0.3641 | 0.86 (0.57, 1.32) | 0.5003 |
| WL-L | 0.79 (0.55, 1.12) | 0.1853 | 0.84 (0.54, 1.3) | 0.4266 |
| WL-R | **0.69 (0.5, 0.95)** | **0.0238** | 0.91 (0.6, 1.36) | 0.6304 |
| Fig-C | 1.16 (0.78, 1.72) | 0.4608 | 0.99 (0.6, 1.64) | 0.9838 |
| Fig-R | 0.84 (0.59, 1.21) | 0.3478 | 0.70 (0.45, 1.08) | 0.1071 |
| TMT-A | 0.91 (0.66, 1.24) | 0.5490 | 0.84 (0.56, 1.24) | 0.3744 |
| TMT-B | 0.83 (0.61, 1.14) | 0.2465 | 0.82 (0.55, 1.23) | 0.3417 |
| TMT-B/A | 0.93 (0.66, 1.3) | 0.6597 | 0.77 (0.49, 1.2) | 0.2488 |
| MMS | 1.09 (0.77, 1.54) | 0.6379 | 1.13 (0.72, 1.76) | 0.5974 |
| Total score | *0.75 (0.54, 1.04)* | *0.0817* | 0.79 (0.53, 1.18) | 0.2490 |

[1] Adjusted for age (linear, squared, and cubic terms), smoking, passive smoking, and educational level. [2] We modeled the probability that score < 0 (cognitive performance lower than expected for the participant's age and educational level). Statistical significance (p < 0.05) is indicated by boldface while borderline significance (0.05 < p < 0.1) is indicated by italics.

**Table S5.** Adjusted [1] association of annoyance (cutpoint "moderately") with dichotomized cognitive scores [2].

| Cognitive Score | Annoyance at Day | | Annoyance at Night | |
|---|---|---|---|---|
| | Odds Ratio (95% CI) | *p*-Value | Odds Ratio (95% CI) | *p*-Value |

| | | | | |
|---|---|---|---|---|
| SeFl | 0.93 (0.53, 1.61) | 0.7915 | 1.09 (0.52, 2.29) | 0.8151 |
| BNT | 0.96 (0.50, 1.83) | 0.8935 | 0.97 (0.40, 2.33) | 0.9445 |
| PhFl | 0.67 (0.36, 1.24) | 0.2003 | 0.81 (0.35, 1.84) | 0.6119 |
| WL-L | 1.23 (0.63, 2.41) | 0.5390 | 0.68 (0.29, 1.55) | 0.3557 |
| WL-R | 0.79 (0.44, 1.42) | 0.4347 | 0.98 (0.44, 2.18) | 0.9648 |
| Fig-C | 1.21 (0.61, 2.38) | 0.5861 | 1.45 (0.56, 3.72) | 0.4451 |
| Fig-R | 1.02 (0.54, 1.90) | 0.9547 | 1.07 (0.46, 2.46) | 0.8818 |
| TMT-A | 0.79 (0.45, 1.39) | 0.4178 | 0.77 (0.36, 1.63) | 0.4963 |
| TMT-B | 0.92 (0.52, 1.62) | 0.7765 | 1.52 (0.72, 3.21) | 0.2736 |
| TMT-B/A | 0.93 (0.49, 1.76) | 0.8154 | 1.17 (0.50, 2.70) | 0.7186 |
| MMS | 0.75 (0.41, 1.37) | 0.3457 | 1.28 (0.55, 2.99) | 0.5708 |
| Total score | 0.95 (0.53, 1.69) | 0.8487 | 0.94 (0.43, 2.05) | 0.8813 |

[1] Adjusted for age (linear, squared, and cubic terms), smoking, passive smoking, and educational level. [2] We modeled the probability that score < 0 (cognitive performance lower than expected for the participant's age and educational level).

**Table S6.** Effect modification analysis, using combined residential noise exposure and annoyance at night in the main adjusted model [1]. Odds ratios and 95% confidence intervals are presented.

| Cognitive Score [2] | $L_{NIGHT}$ < 50 dB(A), No Annoyance at Night | $L_{NIGHT}$ ≥ 50 dB(A), No Annoyance at Night | $L_{NIGHT}$ < 50 dB(A), Annoyance at Night | $L_{NIGHT}$ ≥ 50 dB(A), Annoyance at Night |
|---|---|---|---|---|
| SeFl | 1.00 (reference) | 0.94 (0.51, 1.73) | 1.16 (0.50, 2.70) | 0.93 (0.44, 1.94) |
| BNT | 1.00 (reference) | 1.65 (0.84, 3.25) | 0.59 (0.19, 1.89) | 0.96 (0.39, 2.35) |
| PhFl | 1.00 (reference) | 1.64 (0.87, 3.09) | 1.23 (0.50, 3.03) | 0.85 (0.36, 1.98) |
| WL-L | 1.00 (reference) | 0.69 (0.34, 1.41) | 0.84 (0.31, 2.31) | 0.63 (0.27, 1.46) |
| WL-R | 1.00 (reference) | 0.68 (0.36, 1.29) | 0.87 (0.35, 2.16) | 0.97 (0.43, 2.16) |
| Fig-C | 1.00 (reference) | 1.16 (0.56, 2.41) | 1.32 (0.45, 3.87) | 1.00 (0.42, 2.37) |
| Fig-R | 1.00 (reference) | 1.33 (0.63, 2.78) | 0.73 (0.29, 1.84) | 0.52 (0.24, 1.14) |
| TMT-A | 1.00 (reference) | 1.29 (0.69, 2.43) | 1.30 (0.53, 3.18) | 0.74 (0.35, 1.57) |
| TMT-B | 1.00 (reference) | 1.11 (0.60, 2.04) | 1.40 (0.59, 3.3) | 0.60 (0.27, 1.36) |
| TMT-B/A | 1.00 (reference) | 0.61 (0.30, 1.26) | 1.12 (0.42, 2.94) | 0.63 (0.26, 1.53) |
| MMS | 1.00 (reference) | 1.00 (0.51, 1.98) | 0.62 (0.26, 1.51) | 1.80 (0.72, 4.47) |
| Total score | 1.00 (reference) | 0.70 (0.36, 1.35) | **0.37 (0.15, 0.89) \*,[3]** | 0.81 (0.37, 1.77) |

[1] Adjusted for age (linear, squared, and cubic terms), smoking, passive smoking, and educational level. [2] We modeled the probability that score < 0 (cognitive performance lower than expected for the participant's age and educational level). [3] Statistical significance: (*) $p < 0.1$, * $p < 0.05$, ** $p < 0.01$. Statistical significance ($p < 0.05$) is indicated by boldface while borderline significance ($0.05 < p < 0.1$) is indicated by italics.

**Table S7.** Associations of residential noise with annoyance [1].

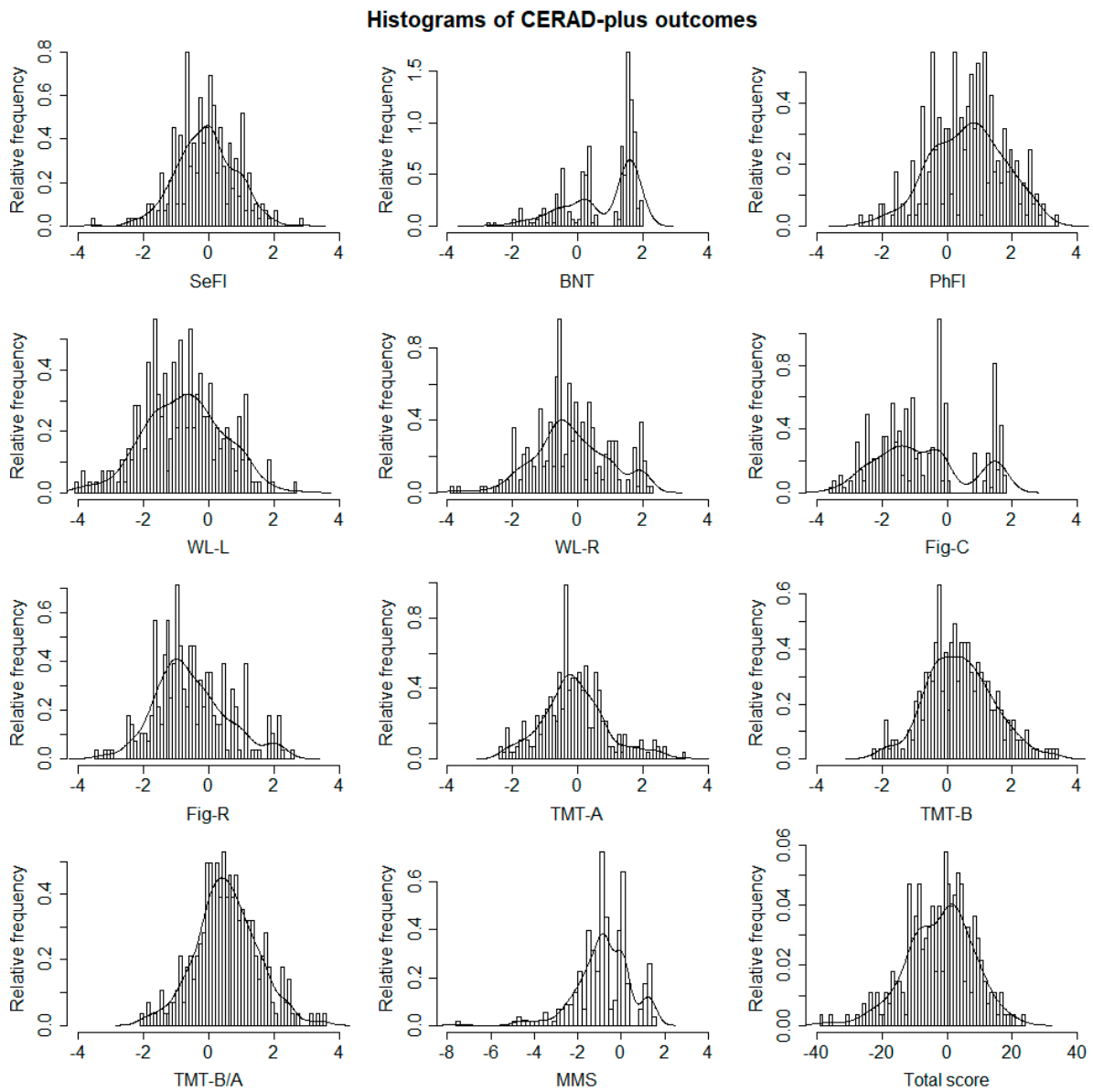| Outcome | Crude Model | | Main Model [2] | |
|---|---|---|---|---|
| | OR (95% CI) | *p*-Value | OR (95% CI) | *p*-Value |
| Annoyance at day [3] | **2.21 (1.26, 3.9)** | **0.006** | **2.38 (1.33, 4.26)** | **0.0033** |
| Annoyance at night [4] | **3.29 (1.87, 5.78)** | **<0.0001** | **3.21 (1.79, 5.76)** | **0.0001** |

**Histograms of CERAD-plus outcomes**



**Figure S1.** Distributions of CERAD-Plus z-scores in main sample ($N = 288$).