# Supplementary data to:

# Actigraphically measured slowing in depression: Systematic review and meta-analysis

Florian Wüthrich1, Carver B. Nabb2, Vijay A. Mittal2-6, Stewart A. Shankman2, Sebastian Walther1

1Translational Research Center, University Hospital of Psychiatry and Psychotherapy, University of Bern, Switzerland.

2Northwestern University, Department of Psychiatry and Behavioral Sciences, Chicago, IL, USA.

3Northwestern University, Department of Psychology, Evanston, IL, USA

4Northwestern University, Institute for Innovations in Developmental Sciences, Evanston/Chicago, IL, USA

5Northwestern University, Institute for Policy Research, Evanston, IL, USA

6Northwestern University, Medical Social Sciences, Chicago, IL, USA

## Modified Newcastle-Ottawa Scale

Note: Our version of the scale was modified to produce a comprehensive score, ranging from 0 (lowest quality) to 13 (highest quality), to be assigned to each included study.

**Selection of Participants and ascertainment of diagnosis**

1) Representativeness of the depressed or bipolar patients

**2 =** a) representative, drawn from a broader population

**1 =** c) selected group of patients, attribute as important as diagnosis

**0 =** d) no description;

2) Selection of the controls

**2 =** a) drawn from the general community

**1 =** b) drawn from a different specific source, e.g. hospital staff

**0 =** c) no description;

3) Ascertainment of depressed or bipolar disorder

**2 =** a) (semi)structured interview (e.g. MINI, SCID, CIDI)

**1 =** b) records

**1 =** c) self-report

**0 =** d) no description

**Comparability** **of Groups on the Basis of the Design**

4) Groups are similar in age

**1 =** a) less than 20% difference

**0 =** b) more than 20% difference

5) Groups are similar in sex distribution

**1 =** a) less than 20% difference

**0 =** b) more than 20% difference

6) Group sizes are similar

**1** **=** a) less than 20% difference

**0** **=** b) more than 20% difference

**Quality of the Actigraphy Measurement**

7) Ascertainment of outcome, placement of accelerometer

**2 =** a) Accelerometer worn on nondominant wrist or as belt

**1** **=** b) laterality not specified or dominant wrist/arm

**0 =** c) no description;

8) Duration of actigraphy measurement

**2 =** a) longer than 7d

**1** **=** b) 24 hr – 7d

**0 =** c) shorter than 24 hr

Table S1: Detailed rating of risk of bias for each included study

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Study | Selection of patients | Selection of controls | Diagnosis ascertainment | Age comparable | Sex distribution comparable | N of groups similar | Actigraph positioning | Actigraphy duration |
| Akinci 2021 | 1 | 0 | 2 | 1 | 1 | 1 | 2 | 1 |
| Armitage 2004 | 2 | 2 | 2 | 1 | 1 | 0 | 0 | 1 |
| Aronen 2011 | 2 | 2 | 2 | 1 | 1 | 1 | 2 | 1 |
| Avila 2013 | 2 | 0 | 2 | 1 | 1 | 0 | 1 | 1 |
| Benard 2019 | 1 | 1 | 2 | 1 | 1 | 0 | 2 | 2 |
| Bradley 2017 | 2 | 1 | 2 | 1 | 1 | 1 | 2 | 2 |
| Cantisani 2016 | 2 | 2 | 2 | 1 | 1 | 1 | 2 | 1 |
| Difrancesco 2019 | 2 | 2 | 2 | 1 | 1 | 0 | 2 | 2 |
| Esaki 2019 | 2 | 2 | 2 | 1 | 0 | 1 | 2 | 1 |
| Faedda 2016 | 2 | 2 | 2 | 1 | 1 | 0 | 2 | 1 |
| George 2021 | 2 | 2 | 2 | 1 | 1 | 1 | 2 | 2 |
| Glod 1997 | 2 | 2 | 2 | 1 | 0 | 1 | 2 | 1 |
| Harvey 2005 | 2 | 1 | 2 | 1 | 0 | 0 | 2 | 2 |
| Hauge 2011 | 1 | 1 | 2 | 1 | 0 | 0 | 1 | 2 |
| Hori 2016 | 1 | 2 | 2 | 1 | 1 | 1 | 2 | 1 |
| Janney 2014 | 1 | 2 | 2 | 1 | 0 | 1 | 2 | 1 |
| Jones 2005 | 2 | 1 | 2 | 1 | 1 | 1 | 2 | 1 |
| Koo 2019 | 1 | 0 | 2 | 1 | 1 | 1 | 2 | 1 |
| Krane-Gartiser 2014/15 | 2 | 1 | 1 | 1 | 0 | 1 | 1 | 1 |
| Loving 2005 | 1 | 2 | 2 | 1 | 0 | 0 | 1 | 1 |
| McGlashan 2019 | 1 | 1 | 2 | 1 | 1 | 0 | 1 | 2 |
| McGlinchey 2014 | 2 | 2 | 2 | 1 | 1 | 1 | 1 | 2 |
| McNamara 2021 | 1 | 1 | 2 | 1 | 1 | 0 | 2 | 1 |
| O'Brien 2017 | 2 | 2 | 2 | 1 | 1 | 1 | 1 | 1 |
| Pye 2021 | 1 | 1 | 2 | 1 | 0 | 0 | 2 | 2 |
| Reichert 2015 | 2 | 2 | 1 | 1 | 1 | 0 | 2 | 1 |
| Salvatore 2008 | 2 | 1 | 2 | 1 | 1 | 1 | 2 | 1 |
| Sander 2018 | 1 | 1 | 2 | 0 | 1 | 0 | 1 | 1 |
| Schneider 2020 | 2 | 2 | 2 | 1 | 1 | 0 | 1 | 2 |
| Slyepchenko 2019 | 2 | 2 | 2 | 0 | 0 | 0 | 1 | 2 |
| St.Amand 2013 | 2 | 2 | 2 | 1 | 1 | 1 | 2 | 2 |
| Teicher 1997 | 2 | 2 | 2 | 1 | 0 | 0 | 1 | 1 |
| Verkooijen 2017 | 2 | 2 | 2 | 1 | 1 | 1 | 2 | 2 |
| Volkers 2003 | 2 | 0 | 2 | 1 | 0 | 1 | 2 | 1 |

Table S2: Results of (sub)analyses

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Comparison | Number of studies | SMD (95%-CI) | p-value | Q-value | df(Q) | p(Q)-value | I2 | τ2 |
| All patients vs. controls | 33 | -.78 (-.99, -.57) | <.001 | 165 | 32 | <.001 | 84.1 | .30 |
| * Without studies reporting median | 31 | -.78 (-1.0, -.57) | <.001 | 149 | 30 | <.001 | 83.2 | .30 |
| * Studies with recording duration >= 7 days | 20 | -.82 (-1.14, -.50) | <.001 | 117 | 19 | <.001 | 89.6 | .45 |
| Youth patients vs. controls | 4 | -.33 (-.78, .12) | .15 | 8.2 | 3 | .04 | 66.9 | .13 |
| Adult patients vs. controls | 26 | -.88 (-1.13, -.62) | <.001 | 144 | 25 | <.001 | 85.9 | .35 |
| * Without studies reporting median | 24 | -.89 (-1.15, -.62) | <.001 | 126 | 23 | <.001 | 84.9 | .35 |
| * Studies with recording duration >= 7 days | 17 | -.87 (-1.26, -.49) | <.001 | 114 | 16 | <.001 | 91.3 | .57 |
| Elderly patients vs. controls & Duration >= 7 days | 3 | -.57 (-.87, -.27) | <.001 | 3.21 | 2 | .20 | 30.8 | .02 |
|  |  |  |  |  |  |  |  |  |
| MDD patients vs. controls | 23 | -.74 (-.99, -.49) | <.001 | 105 | 22 | <.001 | 83.0 | .30 |
| * Without study reporting median | 21 | -.74 (-1.01, -.47) | <.001 | 89.9 | 20 | <.001 | 81.4 | .30 |
| * Studies with recording duration >= 7 days | 11 | -.74 (-1.23, -.25) | .003 | 60.2 | 10 | <.001 | 91.7 | .60 |
| Depressed MDD patients vs. controls | 21 | -.82 (-1.07, -.56) | <.001 | 83.9 | 20 | <.001 | 80.0 | .27 |
| * Without studies reporting median | 19 | -.81 (-1.09, -.54) | <.001 | 77.5 | 18 | <.001 | 79.9 | .29 |
| * Studies with recording duration >= 7 days | 9 | -.93 (-1.48, -.37) | .001 | 45.9 | 8 | <.001 | 90.7 | .62 |
| * Youth MDD patients vs. controls | 4 | -.38 (-.80, .08) | .08 | 6.29 | 3 | .10 | 54.0 | .10 |
| * Adult MDD patients vs. controls | 14 | -1.0 (-1.35, -.66) | <.001 | 63.9 | 13 | <.001 | 83.6 | .35 |
| * + Without studies reporting median | 12 | -1.03 (-1.43, -.63) | <.001 | 55.8 | 11 | <.001 | 83.9 | .40 |
| * + Duration >= 7 days | 6 | -1.15 (-2.01, -.28) | .009 | 42 | 5 | <.001 | 93.8 | 1.06 |
| * Elderly MDD patients vs. controls & Duration >= 7 days | 3 | -.57 (-.92, -.21) | .002 | 3.42 | 2 | .18 | 40 | .04 |
| Remitted MDD patients vs. controls & Duration >= 7 days | 3 | -.28 (-.56, .00) | .05 | 3.83 | 2 | .15 | 48.4 | .03 |
| * Without study reporting median | 2 | -.45 (-.74, -.16) | .002 | .10 | 1 | .76 | 0.0 | 0.0 |
| * Adult patients only | 2 | -.18 (-.48, .12) | .25 | 1.54 | 1 | .22 | 35.1 | .02 |
| Depressed MDD patients vs. remitted & Duration >= 7 days | 3 | -.08 (-.50, .34) | .72 | 8.58 | 2 | .01 | 73.9 | .10 |
| * Without study reporting median | 2 | .15 (-.15, .46) | .33 | .20 | 1 | .65 | 0.0 | 0.0 |
| * Adult patients only | 2 | -.13 (-.77, .51) | .69 | 6.83 | 1 | .01 | 85.4 | .18 |
| Patients with SAD subtype vs. controls | 2 | -.63 (-1.12, -.14) | .01 | .57 | 1 | .45 | 0.0 | 0.0 |
| Mixed (remitted and depressed) vs. controls & Duration >= 7 days | 2 | -.08 (-.46, .30) | .68 | .01 | 1 | .91 | 0.0 | 0.0 |
|  |  |  |  |  |  |  |  |  |
| BD patients vs. controls | 15 | -.72 (-1.03, -.40) | <.001 | 75.1 | 14 | <.001 | 84.8 | .30 |
| * Studies with recording duration >= 7 days | 10 | -.82 (-1.26, -.38) | <.001 | 61.7 | 9 | <.001 | 88.2 | .43 |
| Mixed (euthymic and depressed) vs. controls | 3 | -.20 (-.75, .35) | .47 | 9.13 | 2 | .01 | 77.6 | .18 |
| * Studies with recording duration >= 7 days | 2 | -.34 (-1.16, .47) | .41 | 6.1 | 1 | .01 | 83.6 | .29 |
| Euthymic BD patients vs. controls | 9 | -.92 (-1.36, -.47) | <.001 | 54 | 8 | <.001 | 86.8 | .38 |
| * Studies with recording duration >= 7 days | 8 | -.95 (-1.46, -.44) | <.001 | 54 | 7 | <.001 | 88.5 | .45 |
| Depressed BD patients vs. controls | 2 | -.94 (-1.41, -.46) | <.001 | .09 | 1 | .77 | 0.0 | 0.0 |
|  |  |  |  |  |  |  |  |  |
| BD patients vs. MDD patients | 4 | .15 (-.13, .43) | .29 | .55 | 3 | .91 | 0.0 | 0.0 |
| * Mixed mood | 2 | .17 (-.19, .53) | .37 | .04 | 1 | .85 | 0.0 | 0.0 |
| * Depressed mood | 2 | .13 (-.31, .57) | .57 | .49 | 1 | .48 | 0.0 | 0.0 |

Table S3: Moderators

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| All studies | | | | MDD | | | | BD | | | |
| Moderator | QM | df | p | Moderator | QM | df | p | Moderator | QM | df | p |
| Age group | .46 | 1 | .50 | Age group | .28 | 1 | .60 | Age group | 2.08 | 1 | .15 |
| Sex | .25 | 2 | .88 | Sex | .21 | 2 | .90 | Sex | 5.48 | 2 | .06 |
| Diagnosis | 1.17 | 3 | .76 | Diagnosis | NA | NA | NA | Diagnosis | NA | NA | NA |
| Patient setting | 1.98 | 2 | .37 | Patient setting | 3.60 | 2 | .17 | Patient setting | .25 | 2 | .88 |
| Actigraph placement | .13 | 2 | .94 | Actigraph placement | .51 | 2 | .77 | Actigraph placement | .23 | 2 | .89 |
| Recording duration | .19 | 1 | .67 | Recording duration | 1.70 | 1 | .19 | Recording duration | 1.07 | 1 | .30 |