**A Systematic Review and Meta-analysis of Music Interventions to Improve Sleep in Adults with Mental Health Problems**

**Supplementary material**

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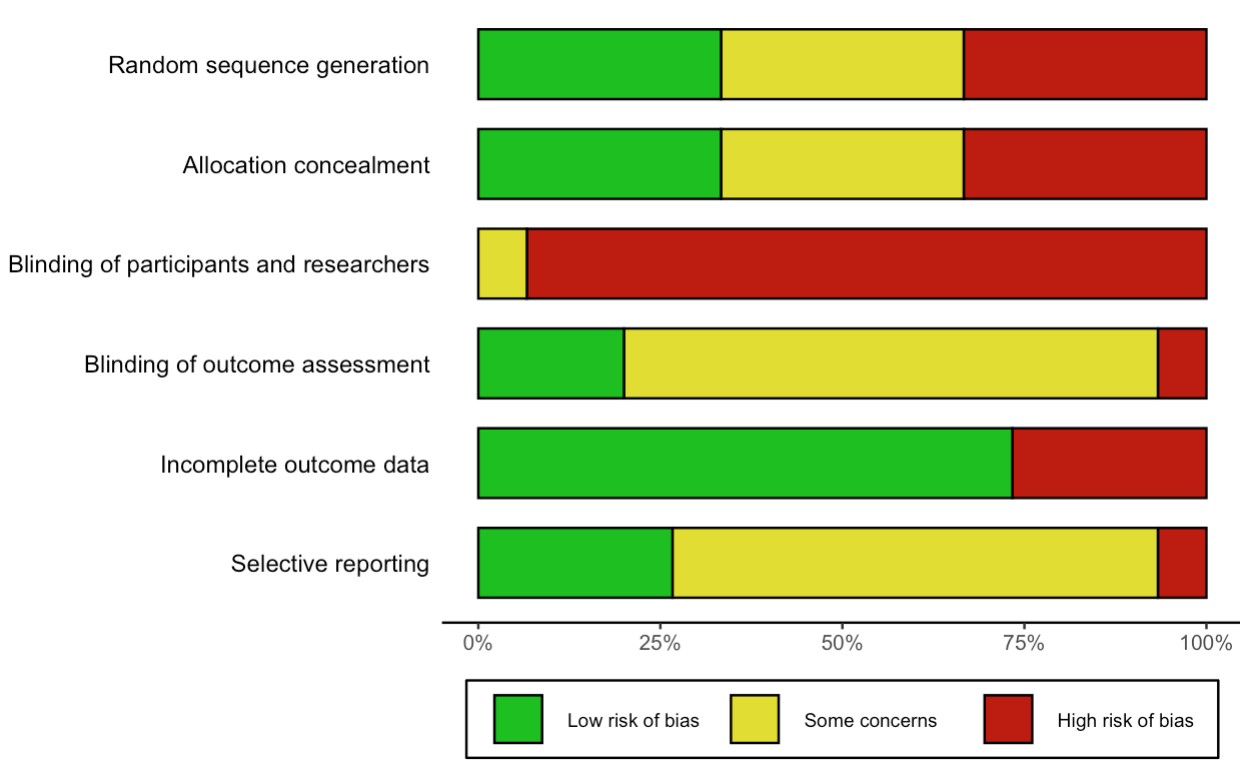
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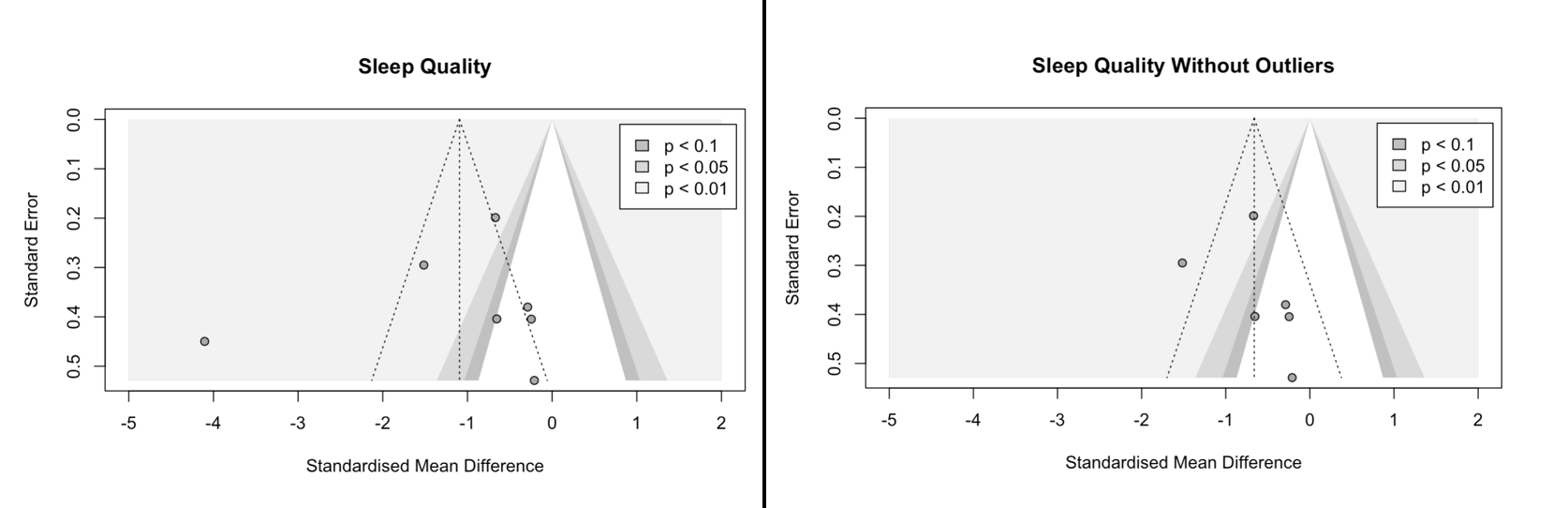
***Table S1 - Overview of database search results***

|  |  |  |  |
| --- | --- | --- | --- |
| **Search string for each database (*April, 2023*)** | | | |
| **Database** | **Filter** | **Search string** | **Results** |
| Pubmed | All fields | ("music\*") AND ("sleep\*" OR insomnia\*) AND  (“schizo\*” OR “delusion\*” OR “psychot\*” OR “catatonia” OR “bipolar” OR “cyclothymic” OR “anxiety” OR “anxious\*” OR “depress\*” OR “suici\*” OR “selective mutism” OR “phobia” OR “panic” OR “obsessive” OR “compulsive” OR “OCD” OR “body dysmorphic” OR “reactive attachment” OR “disinhibited social engagement” OR “posttraumatic stress” OR “post-traumatic stress” OR “PTSD” OR “acute stress” OR “adjustment disorder\*” OR “dissociative” OR “depersonalization” OR “derealization” OR “rumination disorder” OR “avoidant food intake disorder” OR “restrictive food intake disorder” OR “anorexia” OR “bulimia” OR “binge-eating” OR “binge eating” OR “oppositional defiant disorder” OR “ODD” OR “intermittent explosive disorder” OR “conduct disorder” OR “antisocial personality” OR “substance-related disorder\*” OR “alcohol-related disorder” OR “alcohol related disorder” OR “caffeine-related disorder” OR “caffeine related disorder” OR “cannabis-related disorder” OR “cannabis related disorder” OR “hallucinogen-related disorder” OR “hallucinogen related disorder” OR “inhalant-related disorder” OR “inhalant related disorder” OR “opioid-related disorder” OR “opioid related disorder” OR “sedative-related disorder” OR “sedative related disorder” OR “hypnotic-related disorder” OR “hypnotic related disorder” OR “anxiolytic-related disorder” OR “anxiolytic related disorder” OR “stimulant-related disorder” OR “stimulant related disorder” OR “tobacco-related disorder” OR “tobacco related disorder” OR “gambling disorder” OR “neurocognitive disorder\*” OR “delirium” OR “personality disorder\*” OR “paranoid personality” OR “schizoid personality” OR “schizotypal personality” OR “borderline personality” OR “histrionic personality” OR “narcissistic personality” OR “avoidant personality” OR “dependent personality” OR “obsessive-compulsive personality” OR “obsessive compulsive personality” OR “mental disorder\*” OR “psychopathol\*” OR “psychiatric disorder\*”) | 302 |
| Scopus | (Titles, Abstracts, Key words) | (TITLE-ABS-KEY("music\*")) AND (TITLE-ABS-KEY ("sleep\*" OR insomnia\*)) AND  (TITLE-ABS-KEY(“schizo\*” OR “delusion\*” OR “psychot\*” OR “catatonia” OR “bipolar” OR “cyclothymic” OR “anxiety” OR “anxious\*” OR “depress\*” OR “suici\*” OR “selective mutism” OR “phobia” OR “panic” OR “obsessive” OR “compulsive” OR “OCD” OR “body dysmorphic” OR “reactive attachment” OR “disinhibited social engagement” OR “posttraumatic stress” OR “post-traumatic stress” OR “PTSD” OR “acute stress” OR “adjustment disorder\*” OR “dissociative” OR “depersonalization” OR “derealization” OR “rumination disorder” OR “avoidant food intake disorder” OR “restrictive food intake disorder” OR “anorexia” OR “bulimia” OR “binge-eating” OR “binge eating” OR “oppositional defiant disorder” OR “ODD” OR “intermittent explosive disorder” OR “conduct disorder” OR “antisocial personality” OR “substance-related disorder\*” OR “alcohol-related disorder” OR “alcohol related disorder” OR “caffeine-related disorder” OR “caffeine related disorder” OR “cannabis-related disorder” OR “cannabis related disorder” OR “hallucinogen-related disorder” OR “hallucinogen related disorder” OR “inhalant-related disorder” OR “inhalant related disorder” OR “opioid-related disorder” OR “opioid related disorder” OR “sedative-related disorder” OR “sedative related disorder” OR “hypnotic-related disorder” OR “hypnotic related disorder” OR “anxiolytic-related disorder” OR “anxiolytic related disorder” OR “stimulant-related disorder” OR “stimulant related disorder” OR “tobacco-related disorder” OR “tobacco related disorder” OR “gambling disorder” OR “neurocognitive disorder\*” OR “delirium” OR “personality disorder\*” OR “paranoid personality” OR “schizoid personality” OR “schizotypal personality” OR “borderline personality” OR “histrionic personality” OR “narcissistic personality” OR “avoidant personality” OR “dependent personality” OR “obsessive-compulsive personality” OR “obsessive compulsive personality” OR “mental disorder\*” OR “psychopathol\*” OR “psychiatric disorder\*”)) | 636 |
| Embase | (Titles, Abstracts, Key words) | 'music\*':ti,ab,kw AND ('sleep\*':ti,ab,kw OR insomnia\*:ti,ab,kw) AND ('schizo\*':ti,ab,kw OR 'delusion\*':ti,ab,kw OR 'psychot\*':ti,ab,kw OR 'catatonia':ti,ab,kw OR 'bipolar':ti,ab,kw OR 'cyclothymic':ti,ab,kw OR 'anxiety':ti,ab,kw OR 'anxious\*':ti,ab,kw OR 'depress\*':ti,ab,kw OR 'suici\*':ti,ab,kw OR 'selective mutism':ti,ab,kw OR 'phobia':ti,ab,kw OR 'panic':ti,ab,kw OR 'obsessive':ti,ab,kw OR 'compulsive':ti,ab,kw OR 'ocd':ti,ab,kw OR 'body dysmorphic':ti,ab,kw OR 'reactive attachment':ti,ab,kw OR 'disinhibited social engagement':ti,ab,kw OR 'posttraumatic stress':ti,ab,kw OR 'post-traumatic stress':ti,ab,kw OR 'ptsd':ti,ab,kw OR 'acute stress':ti,ab,kw OR 'adjustment disorder\*':ti,ab,kw OR 'dissociative':ti,ab,kw OR 'depersonalization':ti,ab,kw OR 'derealization':ti,ab,kw OR 'rumination disorder':ti,ab,kw OR 'avoidant food intake disorder':ti,ab,kw OR 'restrictive food intake disorder':ti,ab,kw OR 'anorexia':ti,ab,kw OR 'bulimia':ti,ab,kw OR 'binge-eating':ti,ab,kw OR 'binge eating':ti,ab,kw OR 'oppositional defiant disorder':ti,ab,kw OR 'odd':ti,ab,kw OR 'intermittent explosive disorder':ti,ab,kw OR 'conduct disorder':ti,ab,kw OR 'antisocial personality':ti,ab,kw OR 'substance-related disorder\*':ti,ab,kw OR 'alcohol-related disorder':ti,ab,kw OR 'alcohol related disorder':ti,ab,kw OR 'caffeine-related disorder':ti,ab,kw OR 'caffeine related disorder':ti,ab,kw OR 'cannabis-related disorder':ti,ab,kw OR 'cannabis related disorder':ti,ab,kw OR 'hallucinogen-related disorder':ti,ab,kw OR 'hallucinogen related disorder':ti,ab,kw OR 'inhalant-related disorder':ti,ab,kw OR 'inhalant related disorder':ti,ab,kw OR 'opioid-related disorder':ti,ab,kw OR 'opioid related disorder':ti,ab,kw OR 'sedative-related disorder':ti,ab,kw OR 'sedative related disorder':ti,ab,kw OR 'hypnotic-related disorder':ti,ab,kw OR 'hypnotic related disorder':ti,ab,kw OR 'anxiolytic-related disorder':ti,ab,kw OR 'anxiolytic related disorder':ti,ab,kw OR 'stimulant-related disorder':ti,ab,kw OR 'stimulant related disorder':ti,ab,kw OR 'tobacco-related disorder':ti,ab,kw OR 'tobacco related disorder':ti,ab,kw OR 'gambling disorder':ti,ab,kw OR 'neurocognitive disorder\*':ti,ab,kw OR 'delirium':ti,ab,kw OR 'personality disorder\*':ti,ab,kw OR 'paranoid personality':ti,ab,kw OR 'schizoid personality':ti,ab,kw OR 'schizotypal personality':ti,ab,kw OR 'borderline personality':ti,ab,kw OR 'histrionic personality':ti,ab,kw OR 'narcissistic personality':ti,ab,kw OR 'avoidant personality':ti,ab,kw OR 'dependent personality':ti,ab,kw OR 'obsessive-compulsive personality':ti,ab,kw OR 'obsessive compulsive personality':ti,ab,kw OR 'mental disorder\*':ti,ab,kw OR 'psychopathol\*':ti,ab,kw OR 'psychiatric disorder\*':ti,ab,kw) | 393 |
| PsycINFO | (Not Full Text)  (Scholarly Journals OR Dissertations & Theses) | noft(("music\*")) AND noft(("sleep\*" OR insomnia\*) ) AND noft((“schizo\*” OR “delusion\*” OR “psychot\*” OR “catatonia” OR “bipolar” OR “cyclothymic” OR “anxiety” OR “anxious\*” OR “depress\*” OR “suici\*” OR “selective mutism” OR “phobia” OR “panic” OR “obsessive” OR “compulsive” OR “OCD” OR “body dysmorphic” OR “reactive attachment” OR “disinhibited social engagement” OR “posttraumatic stress” OR “post-traumatic stress” OR “PTSD” OR “acute stress” OR “adjustment disorder\*” OR “dissociative” OR “depersonalization” OR “derealization” OR “rumination disorder” OR “avoidant food intake disorder” OR “restrictive food intake disorder” OR “anorexia” OR “bulimia” OR “binge-eating” OR “binge eating” OR “oppositional defiant disorder” OR “ODD” OR “intermittent explosive disorder” OR “conduct disorder” OR “antisocial personality” OR “substance-related disorder\*” OR “alcohol-related disorder” OR “alcohol related disorder” OR “caffeine-related disorder” OR “caffeine related disorder” OR “cannabis-related disorder” OR “cannabis related disorder” OR “hallucinogen-related disorder” OR “hallucinogen related disorder” OR “inhalant-related disorder” OR “inhalant related disorder” OR “opioid-related disorder” OR “opioid related disorder” OR “sedative-related disorder” OR “sedative related disorder” OR “hypnotic-related disorder” OR “hypnotic related disorder” OR “anxiolytic-related disorder” OR “anxiolytic related disorder” OR “stimulant-related disorder” OR “stimulant related disorder” OR “tobacco-related disorder” OR “tobacco related disorder” OR “gambling disorder” OR “neurocognitive disorder\*” OR “delirium” OR “personality disorder\*” OR “paranoid personality” OR “schizoid personality” OR “schizotypal personality” OR “borderline personality” OR “histrionic personality” OR “narcissistic personality” OR “avoidant personality” OR “dependent personality” OR “obsessive-compulsive personality” OR “obsessive compulsive personality” OR “mental disorder\*” OR “psychopathol\*” OR “psychiatric disorder\*”)) | 184 |
| Cinahl | (None) | ("music\*") AND ("sleep\*" OR insomnia\*) AND  (“schizo\*” OR “delusion\*” OR “psychot\*” OR “catatonia” OR “bipolar” OR “cyclothymic” OR “anxiety” OR “anxious\*” OR “depress\*” OR “suici\*” OR “selective mutism” OR “phobia” OR “panic” OR “obsessive” OR “compulsive” OR “OCD” OR “body dysmorphic” OR “reactive attachment” OR “disinhibited social engagement” OR “posttraumatic stress” OR “post-traumatic stress” OR “PTSD” OR “acute stress” OR “adjustment disorder\*” OR “dissociative” OR “depersonalization” OR “derealization” OR “rumination disorder” OR “avoidant food intake disorder” OR “restrictive food intake disorder” OR “anorexia” OR “bulimia” OR “binge-eating” OR “binge eating” OR “oppositional defiant disorder” OR “ODD” OR “intermittent explosive disorder” OR “conduct disorder” OR “antisocial personality” OR “substance-related disorder\*” OR “alcohol-related disorder” OR “alcohol related disorder” OR “caffeine-related disorder” OR “caffeine related disorder” OR “cannabis-related disorder” OR “cannabis related disorder” OR “hallucinogen-related disorder” OR “hallucinogen related disorder” OR “inhalant-related disorder” OR “inhalant related disorder” OR “opioid-related disorder” OR “opioid related disorder” OR “sedative-related disorder” OR “sedative related disorder” OR “hypnotic-related disorder” OR “hypnotic related disorder” OR “anxiolytic-related disorder” OR “anxiolytic related disorder” OR “stimulant-related disorder” OR “stimulant related disorder” OR “tobacco-related disorder” OR “tobacco related disorder” OR “gambling disorder” OR “neurocognitive disorder\*” OR “delirium” OR “personality disorder\*” OR “paranoid personality” OR “schizoid personality” OR “schizotypal personality” OR “borderline personality” OR “histrionic personality” OR “narcissistic personality” OR “avoidant personality” OR “dependent personality” OR “obsessive-compulsive personality” OR “obsessive compulsive personality” OR “mental disorder\*” OR “psychopathol\*” OR “psychiatric disorder\*”) | 39 |
| RILM | (None) | ("music\*") AND ("sleep\*" OR insomnia\*) AND  (“schizo\*” OR “delusion\*” OR “psychot\*” OR “catatonia” OR “bipolar” OR “cyclothymic” OR “anxiety” OR “anxious\*” OR “depress\*” OR “suici\*” OR “selective mutism” OR “phobia” OR “panic” OR “obsessive” OR “compulsive” OR “OCD” OR “body dysmorphic” OR “reactive attachment” OR “disinhibited social engagement” OR “posttraumatic stress” OR “post-traumatic stress” OR “PTSD” OR “acute stress” OR “adjustment disorder\*” OR “dissociative” OR “depersonalization” OR “derealization” OR “rumination disorder” OR “avoidant food intake disorder” OR “restrictive food intake disorder” OR “anorexia” OR “bulimia” OR “binge-eating” OR “binge eating” OR “oppositional defiant disorder” OR “ODD” OR “intermittent explosive disorder” OR “conduct disorder” OR “antisocial personality” OR “substance-related disorder\*” OR “alcohol-related disorder” OR “alcohol related disorder” OR “caffeine-related disorder” OR “caffeine related disorder” OR “cannabis-related disorder” OR “cannabis related disorder” OR “hallucinogen-related disorder” OR “hallucinogen related disorder” OR “inhalant-related disorder” OR “inhalant related disorder” OR “opioid-related disorder” OR “opioid related disorder” OR “sedative-related disorder” OR “sedative related disorder” OR “hypnotic-related disorder” OR “hypnotic related disorder” OR “anxiolytic-related disorder” OR “anxiolytic related disorder” OR “stimulant-related disorder” OR “stimulant related disorder” OR “tobacco-related disorder” OR “tobacco related disorder” OR “gambling disorder” OR “neurocognitive disorder\*” OR “delirium” OR “personality disorder\*” OR “paranoid personality” OR “schizoid personality” OR “schizotypal personality” OR “borderline personality” OR “histrionic personality” OR “narcissistic personality” OR “avoidant personality” OR “dependent personality” OR “obsessive-compulsive personality” OR “obsessive compulsive personality” OR “mental disorder\*” OR “psychopathol\*” OR “psychiatric disorder\*”) | 74 |
| OSF | (Registrations) | ("music\*") AND ("sleep\*" OR insomnia\*) AND  (“schizo\*” OR “delusion\*” OR “psychot\*” OR “catatonia” OR “bipolar” OR “cyclothymic” OR “anxiety” OR “anxious\*” OR “depress\*” OR “suici\*” OR “selective mutism” OR “phobia” OR “panic” OR “obsessive” OR “compulsive” OR “OCD” OR “body dysmorphic” OR “reactive attachment” OR “disinhibited social engagement” OR “posttraumatic stress” OR “post-traumatic stress” OR “PTSD” OR “acute stress” OR “adjustment disorder\*” OR “dissociative” OR “depersonalization” OR “derealization” OR “rumination disorder” OR “avoidant food intake disorder” OR “restrictive food intake disorder” OR “anorexia” OR “bulimia” OR “binge-eating” OR “binge eating” OR “oppositional defiant disorder” OR “ODD” OR “intermittent explosive disorder” OR “conduct disorder” OR “antisocial personality” OR “substance-related disorder\*” OR “alcohol-related disorder” OR “alcohol related disorder” OR “caffeine-related disorder” OR “caffeine related disorder” OR “cannabis-related disorder” OR “cannabis related disorder” OR “hallucinogen-related disorder” OR “hallucinogen related disorder” OR “inhalant-related disorder” OR “inhalant related disorder” OR “opioid-related disorder” OR “opioid related disorder” OR “sedative-related disorder” OR “sedative related disorder” OR “hypnotic-related disorder” OR “hypnotic related disorder” OR “anxiolytic-related disorder” OR “anxiolytic related disorder” OR “stimulant-related disorder” OR “stimulant related disorder” OR “tobacco-related disorder” OR “tobacco related disorder” OR “gambling disorder” OR “neurocognitive disorder\*” OR “delirium” OR “personality disorder\*” OR “paranoid personality” OR “schizoid personality” OR “schizotypal personality” OR “borderline personality” OR “histrionic personality” OR “narcissistic personality” OR “avoidant personality” OR “dependent personality” OR “obsessive-compulsive personality” OR “obsessive compulsive personality” OR “mental disorder\*” OR “psychopathol\*” OR “psychiatric disorder\*”) | 14 |
| WHO Clinical Trails Database | (None) | ("music\*") AND ("sleep\*" OR insomnia\*) AND  (“schizo\*” OR “delusion\*” OR “psychot\*” OR “catatonia” OR “bipolar” OR “cyclothymic” OR “anxiety” OR “anxious\*” OR “depress\*” OR “suici\*” OR “selective mutism” OR “phobia” OR “panic” OR “obsessive” OR “compulsive” OR “OCD” OR “body dysmorphic” OR “reactive attachment” OR “disinhibited social engagement” OR “posttraumatic stress” OR “post-traumatic stress” OR “PTSD” OR “acute stress” OR “adjustment disorder\*” OR “dissociative” OR “depersonalization” OR “derealization” OR “rumination disorder” OR “avoidant food intake disorder” OR “restrictive food intake disorder” OR “anorexia” OR “bulimia” OR “binge-eating” OR “binge eating” OR “oppositional defiant disorder” OR “ODD” OR “intermittent explosive disorder” OR “conduct disorder” OR “antisocial personality” OR “substance-related disorder\*” OR “alcohol-related disorder” OR “alcohol related disorder” OR “caffeine-related disorder” OR “caffeine related disorder” OR “cannabis-related disorder” OR “cannabis related disorder” OR “hallucinogen-related disorder” OR “hallucinogen related disorder” OR “inhalant-related disorder” OR “inhalant related disorder” OR “opioid-related disorder” OR “opioid related disorder” OR “sedative-related disorder” OR “sedative related disorder” OR “hypnotic-related disorder” OR “hypnotic related disorder” OR “anxiolytic-related disorder” OR “anxiolytic related disorder” OR “stimulant-related disorder” OR “stimulant related disorder” OR “tobacco-related disorder” OR “tobacco related disorder” OR “gambling disorder” OR “neurocognitive disorder\*” OR “delirium” OR “personality disorder\*” OR “paranoid personality” OR “schizoid personality” OR “schizotypal personality” OR “borderline personality” OR “histrionic personality” OR “narcissistic personality” OR “avoidant personality” OR “dependent personality” OR “obsessive-compulsive personality” OR “obsessive compulsive personality” OR “mental disorder\*” OR “psychopathol\*” OR “psychiatric disorder\*”) | 44 |
| Cochrane Library | (Trails) | ("music\*") in Title Abstract Keyword AND ("sleep\*" OR insomnia\*) in Title Abstract Keyword AND (“schizo\*” OR “delusion\*” OR “psychot\*” OR “catatonia” OR “bipolar” OR “cyclothymic” OR “anxiety” OR “anxious\*” OR “depress\*” OR “suici\*” OR “selective mutism” OR “phobia” OR “panic” OR “obsessive” OR “compulsive” OR “OCD” OR “body dysmorphic” OR “reactive attachment” OR “disinhibited social engagement” OR “posttraumatic stress” OR “post-traumatic stress” OR “PTSD” OR “acute stress” OR “adjustment disorder\*” OR “dissociative” OR “depersonalization” OR “derealization” OR “rumination disorder” OR “avoidant food intake disorder” OR “restrictive food intake disorder” OR “anorexia” OR “bulimia” OR “binge-eating” OR “binge eating” OR “oppositional defiant disorder” OR “ODD” OR “intermittent explosive disorder” OR “conduct disorder” OR “antisocial personality” OR “substance-related disorder\*” OR “alcohol-related disorder” OR “alcohol related disorder” OR “caffeine-related disorder” OR “caffeine related disorder” OR “cannabis-related disorder” OR “cannabis related disorder” OR “hallucinogen-related disorder” OR “hallucinogen related disorder” OR “inhalant-related disorder” OR “inhalant related disorder” OR “opioid-related disorder” OR “opioid related disorder” OR “sedative-related disorder” OR “sedative related disorder” OR “hypnotic-related disorder” OR “hypnotic related disorder” OR “anxiolytic-related disorder” OR “anxiolytic related disorder” OR “stimulant-related disorder” OR “stimulant related disorder” OR “tobacco-related disorder” OR “tobacco related disorder” OR “gambling disorder” OR “neurocognitive disorder\*” OR “delirium” OR “personality disorder\*” OR “paranoid personality” OR “schizoid personality” OR “schizotypal personality” OR “borderline personality” OR “histrionic personality” OR “narcissistic personality” OR “avoidant personality” OR “dependent personality” OR “obsessive-compulsive personality” OR “obsessive compulsive personality” OR “mental disorder\*” OR “psychopathol\*”) in Title Abstract Keyword - (Word variations have been searched) | 271 |
| ClincalTrials.gov | (Adults, older adults) | CONDITION OR DISEASE: sleep;  OTHER TERMS: music | 65 |
| CNKI | (Research paper) | 音乐 AND (睡眠+失眠) AND (心理+抑郁+焦虑)  *English translation:*  *Music AND (sleep + insomnia) AND (mental + depression + anxious)* | 316 |

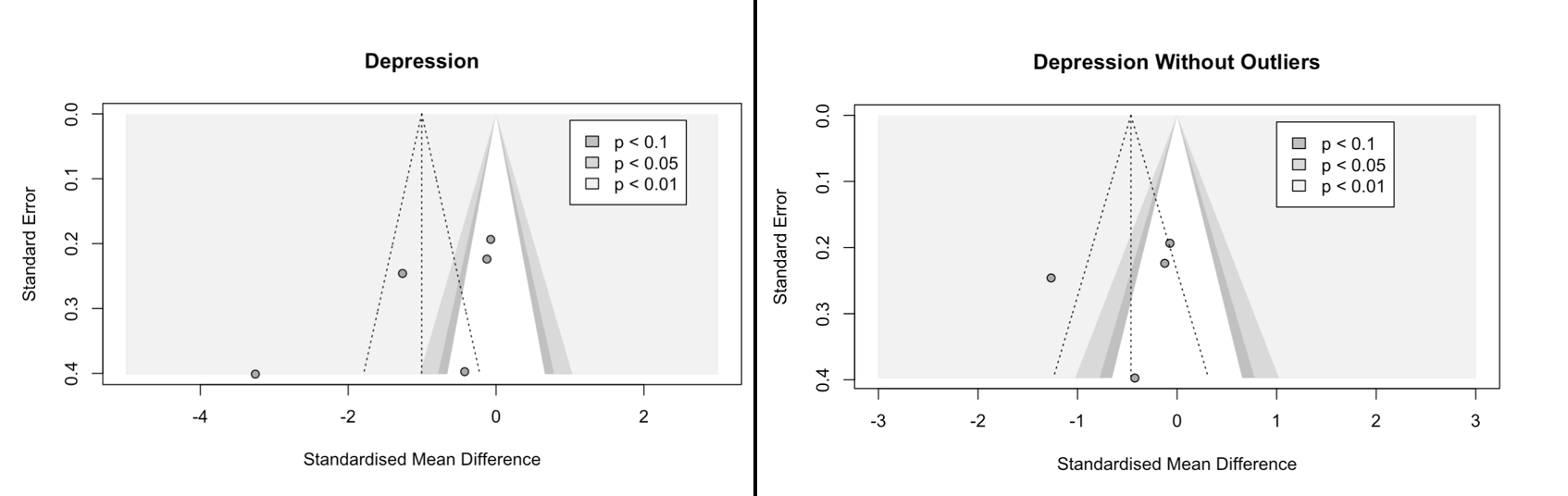
***Figure S1 - Risk of bias overview plot***

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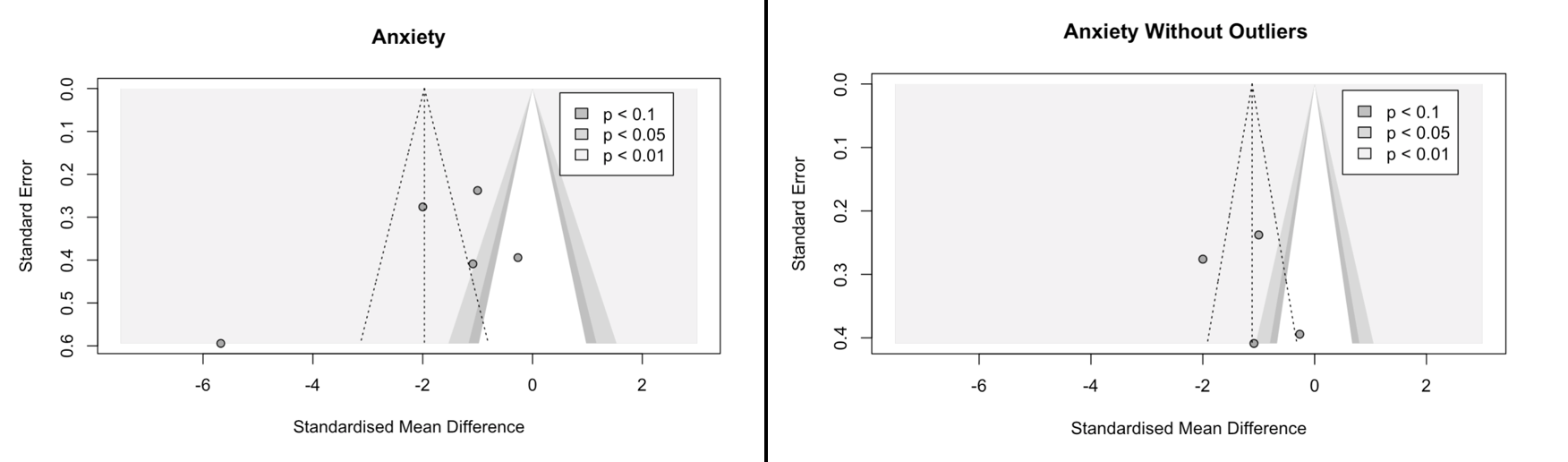
***Figure S2.1- Sleep quality funnel plots***



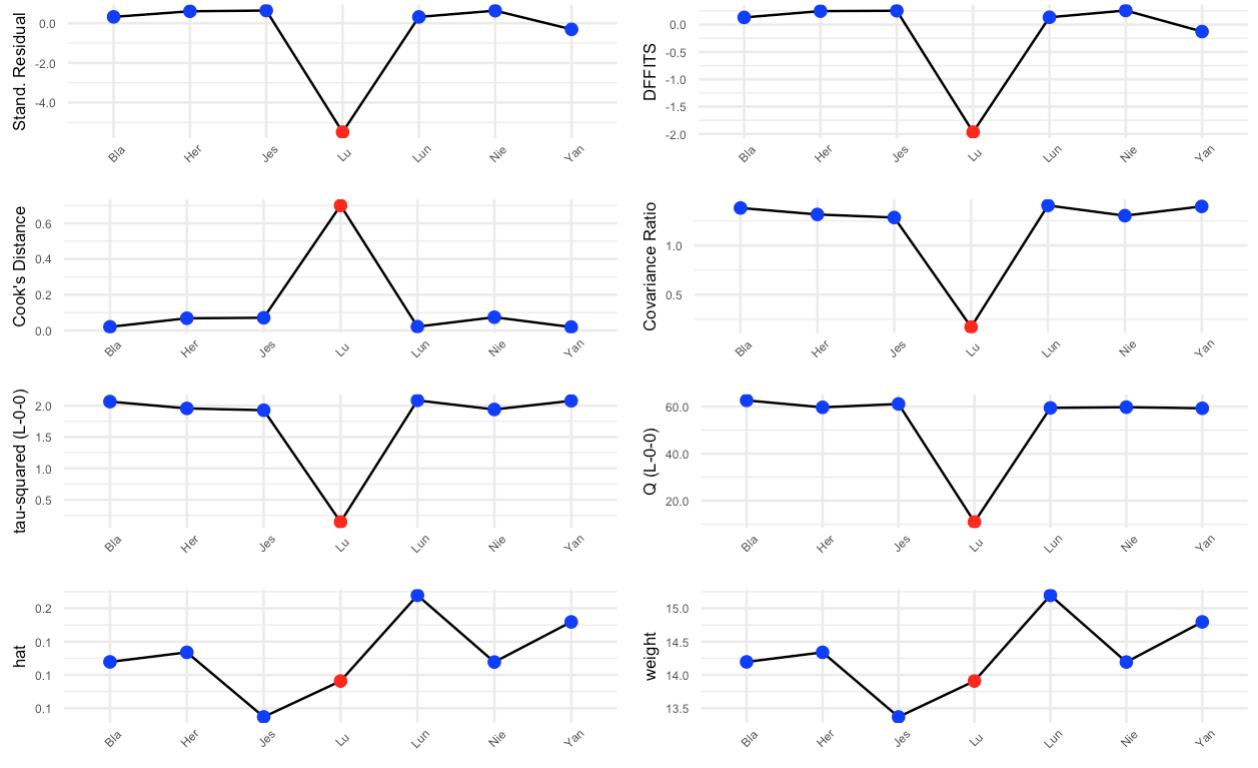
***Figure S2.2- Depression funnel plots***

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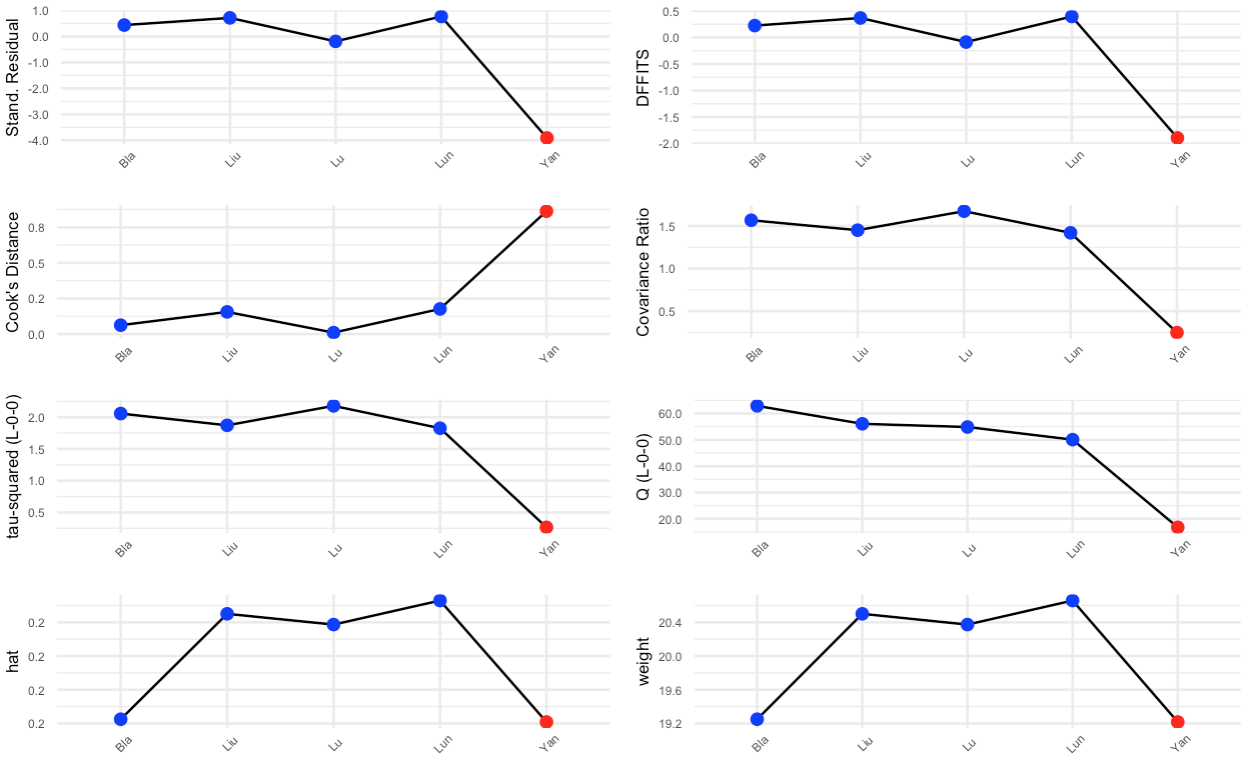
***Figure S2.3- Anxiety funnel plots***

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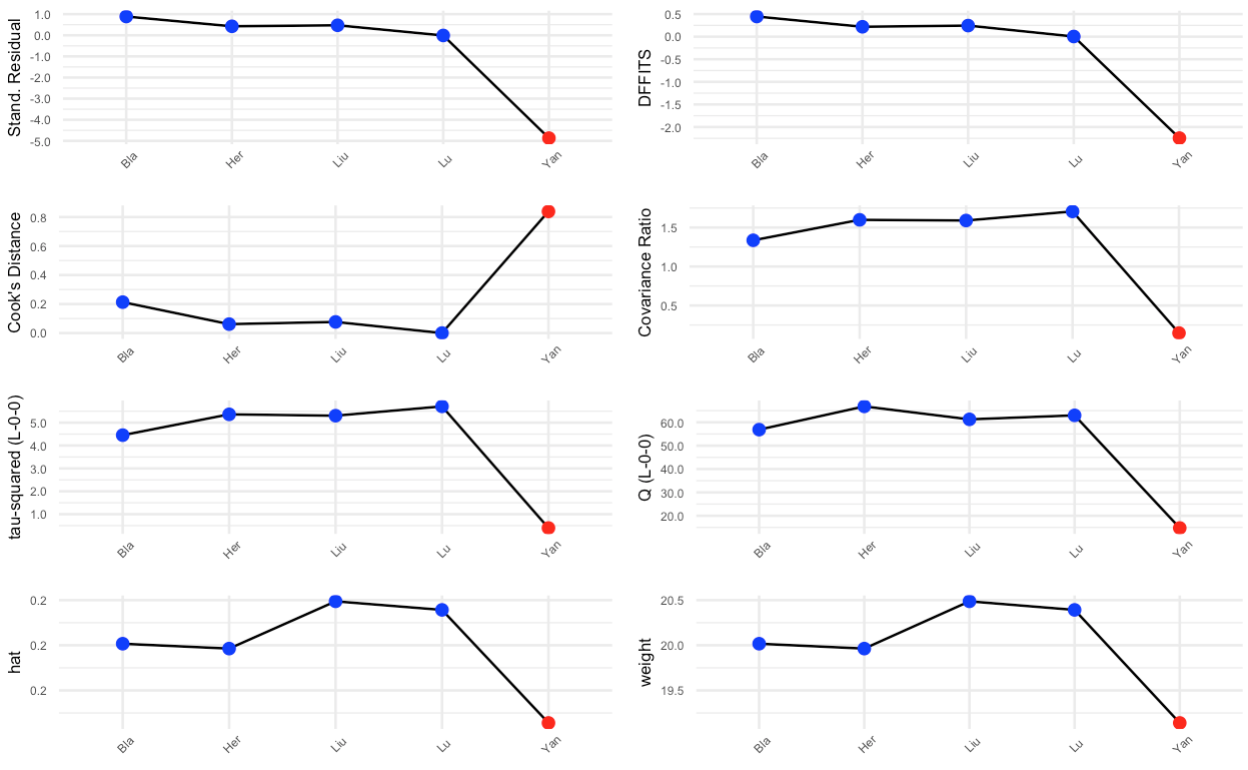
***Figure S3.1 - Sleep quality meta-analysis outlier analyses***



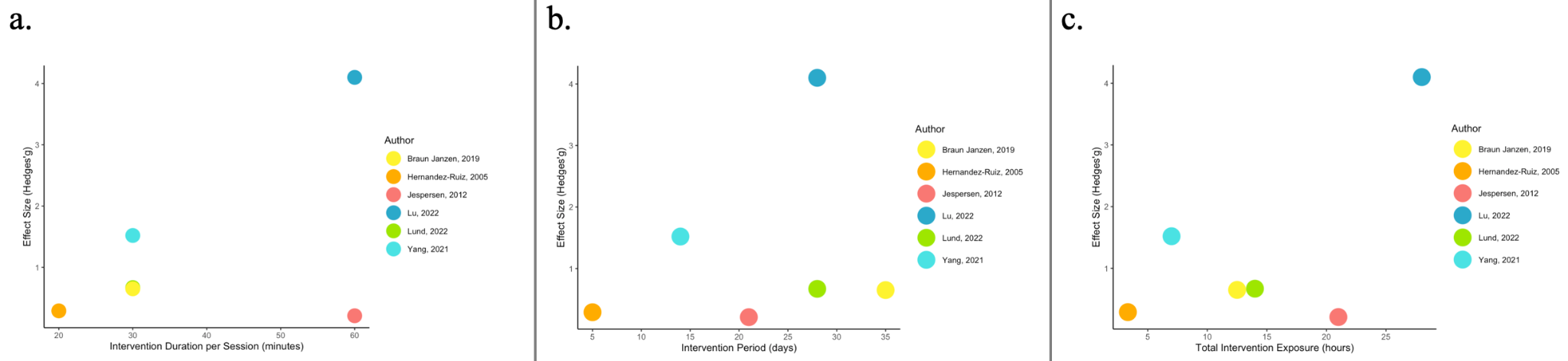
***Figure S3.2 - Depression meta-analysis outlier analyses***

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***Figure S3.3 - Anxiety meta-analysis outlier analyses***

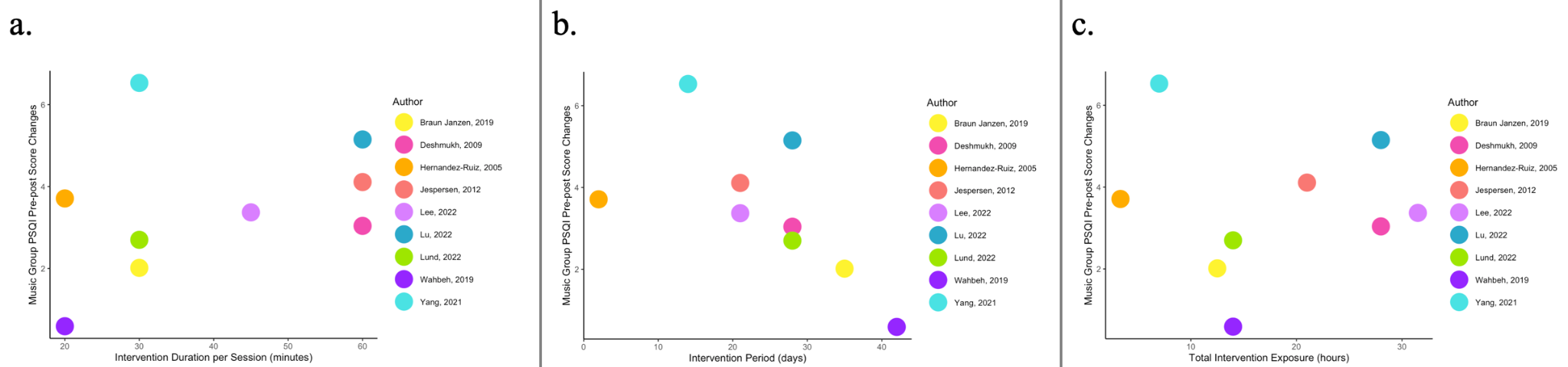
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***Figure S4.1 - Intervention duration and meta-analyses effect size comparison plot***

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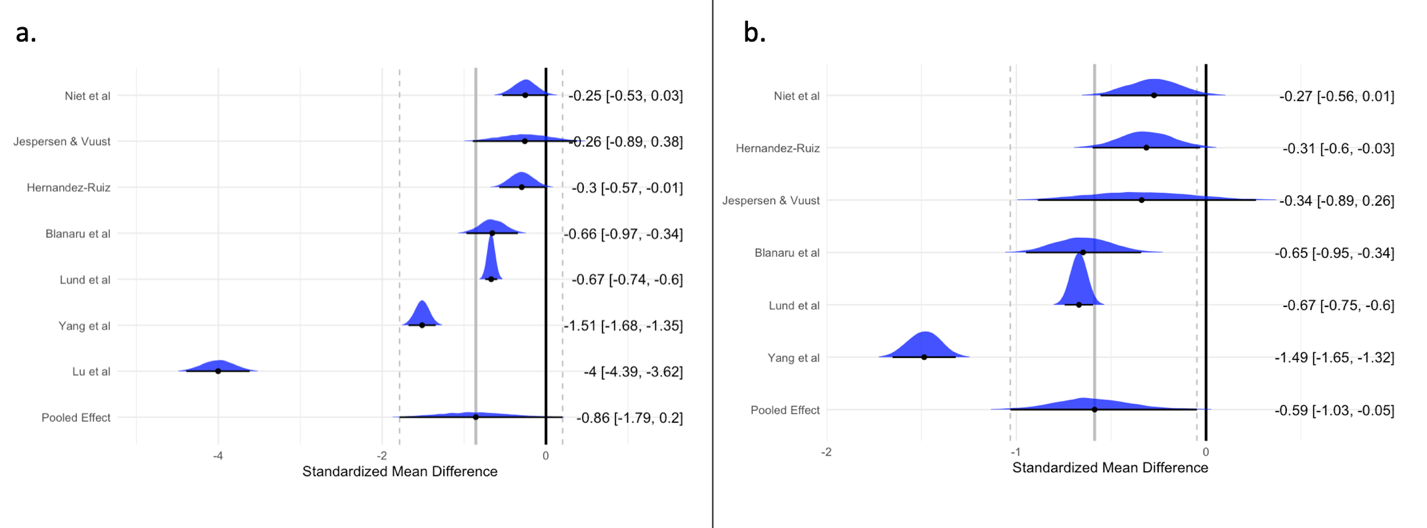
*Note. a.= music intervention duration per session (mins) vs. single study effect size; b.= intervention period vs. single effect size; c.= total intervention exposure (hours) (time per session x days) vs. single effect size. This graph only included studies that were in the sleep outcome meta-analysis*

***Figure S4.2 - Intervention duration and music group PSQI pre-post score change plot***

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*Note. a.= music intervention duration per session (mins) vs. music group PSQI pre–post score changes; b.= intervention period vs. music group PSQI pre–post score changes; c.= total intervention exposure (hours) (time per session x days) vs. music group PSQI pre–post score changes. This graph included all studies that were in the systematic review using PSQI for sleep outcomes.*

***Figure S5 – Bayesian meta-analysis forest plot for sleep quality outcome (sensitivity analysis)***

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*Note. a. = results with the outlier (Lu), b. = results without the outlier; Weakly informative priors were used in this sensitivity analysis: with a normal distribution with a mean of 0 and a standard deviation of 1 for the overall effect size; with a Half- Cauchy distribution with a location parameter of 0 and a scale parameter of 0.5.*