Supplementary table 1: Literature search in Pubmed (A) and Web of Science (B)

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| *A: Literature search Pubmed*  |
|  | **MeSH terms and key words in PubMed** | **Hits – December 2016** | **Hits – August 2017** |
| #1 | Parkinson[Title/Abstract] OR Parkinson disease[MeSH] | 62882 | 65259 |
| #2  | Turning[Title/Abstract] OR pivot[Title/Abstract] OR circumduct[Title/Abstract] | 19320 | 20148 |
| #3 | Freezing[Title/Abstract] OR freezing of gait[Title/Abstract] | 29482 | 30512 |
| #4  | #1 AND #2  | 284 | 298 |
| #5 | #1 AND #3 | 756 | 802 |
| #6 | #1 AND #2 AND #3 | 47 | 52 |

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| *B: Literature search Web of Science*  |
|  | **Key words in Web of Science** | **Hits – December 2016** | **Hits – March 2017** |
| #1 | Parkinson[Topic] OR Parkinson disease[Topic] | 93955 | 100159 |
| #2  | Turning[Topic] OR pivot[Topic] OR circumduct[Topic] | 465591 | 488955 |
| #3 | Freezing[Topic] OR freezing of gait[Topic] | 187961 | 196057 |
| #4  | #1 AND #2 | 1376 | 1467 |
| #5 | #1 AND #3 | 1237 | 1360 |
| #6 | #1 AND #2 AND #3 | 93 | 102 |

Supplementary table 2: Data extraction of the included articles. A significant difference between subject characteristics is indicated with \*.

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| --- | --- | --- | --- |
| Article | Participants  | Protocol | Outcome and results  |
| Arias P, et al., 2010 [38] | * 19 PD patients
* FRs n=9
* NFRs: n=10
* Mean values: FRs vs NFRs
* Age: 68.2-64.4 years
* FOG-Q: 16.7-0\*
* UPDRS III: ns
 | * Tests: in OFF-state of medication
* Protocol: Walk down a corridor with a door in the middle 🡪 touch a button on the wall at the end 🡪 turn around 🡪 come back and touch the button on the other wall.
* Equipment: footswitches
 | * *Turn time*: FRs > NFRs
 |
| Bengevoord A., et al., 2016 [31] | * 30 PD patients
* FRs: n=16
* NFRs: n=14
* Mean values: FRs vs NFRs
* Age: 68,8-65,3years
* Gender(%male): 85,7-71,4%
* DD: 9,6-7,8years
* H&Y: 2,5-2,3
* MDS-UPDRS III: 37,9-34,5
* MMSE: 29,1-27,7
* NFOG-Q: 13,5-0\*
* LED (mg/day): 567-472
 | * Tests: in OFF-state of medication
* Protocol: walk 5m and turn 180° 🡪 3 times to the left and 3 times to the right
* The turn was divided in 4 quadrants (between 10°-170°)
* Equipment: “Vicon Motion System with retroreflective markers
 | * *COM behaviour during turning quadrants:*
* *Turn time*: FRs > NFRs
* *COM distance:* no differences between groups
* *COM velocity:* no differences between groups
* *Step width:* FRs < NFRs
* *Medial COM position*: no differences between groups
* *Anterior COM position*: no differences between groups
* *COM behaviour pre-FOG*
* *Turn time*: increased
* *COM distance*: no differences
* *COM velocity*: no differences
* *Step width*: decreased
* *COM position*: more anteriorly, less medially
* *FOG frequency*: 6 FRs had a total of 21 FOG episodes during turning
 |
| Bhatt H, et al., 2013 [35] | * 20 PD patients
* FRs: n=10
* NFRs: n=10
* Mean values: FRs vs NFRs
* Age: 74,4-72,3 years
* UPDRS III: 33,8-33,4
 | * Tests: in ON-state of medication
* Protocol: walk 6m and turn randomly 90°, 120° and 180° to the right. Each 3 trials.
* Equipment: 6 Optotrak Certus Motion Capture cameras; 9 IREDs (foot markers and pelvis markers); Video cameras to identify turn types and FOG episodes
 | * *Step length*: decreased while turning angle increased in both goups
* *Step width*:
* NFRs: increased step width during 180° turns
* FRs: no change at all turning angles
* *Step time variability*: increased while turning angle increased in FRs
* *Turn types*:
* During 90° turn: NFRs showed more crossover turns than FRs
* During 120° turn: FRs and NFRs showed step out strategy
* During 180° turn: FRs used the step out strategy or the mixed strategy (without preference)
* *FOG episode*: 18 episodes in 4FRs 🡪 mainly at 120° and 180°
 |
| De Souza Fortaleza AC, et al. 2017 [41] | * 54 PD patients
* FRs: n=26
* NFRs: n=30
* Mean values: FRs vs NFRs
* Age: 69.2-68.6 years
* Gender(%male): 56.5-70%
* NFOG-Q: 14.3-0\*
* DD: 8.3-6.3 years
* MDS-UPDRS III: 43.1-38.7
* PIGD:6.8-4.5\*
* MoCA: 24.9-25
* Mini-Best: 15.8-19.6\*
* LED (mg/day): 875.5-711.1
 | * Tests: in OFF-state of medication
* Protocol: Walk 7m, turn 180° and walk back with and without a cognitive dual task
* Equipment: 8 Opal inertial sensors (APDM, Inc) on the feet, shanks, wrists, chest and trunk
 | * No Group differences for *dual task costs* during turning
* *Turn peak velocity*: FRs < nFRs
 |
| Fietzek UM, et al., 2017 [37] | * 40 PD patients
* FRs: n=21
* NFRs: n=19
* Mean values: FRs vs NFRs
* Age: 67.0-67.0 years
* DD: 9.1-6.1 years\*
* FOGQ: 13.1-4.0\*
* MDS-UPDRS III: 34.4-25.7\*
* H&Y:2.5-2.0
* LED (mg/day): 1037.5-616.5
* MoCA: 25.5-26.5
 | * Tests: in ON-state of medication
* Protocol: 360° turns in both directions on floor squares of 30x30cm, 40x40cm and 50x50cm. total of 6 trials
* Equipment: two lightweight gyroscopes at the shanks and a 3D-magnetometer on the back
 | * *#steps*: FRs > nFRs in all conditions, differences increases with smaller floor squares
* *Turn duration*: FRs > nFRs in all conditions, differences increases with smaller floor squares
 |
| Lohnes CA, et al., 2011 [40] | * 23 PD patients
* FRs: n=8
* NFRs: n=14
* Mean values: FRs vs NFRs
* DD: 8,6-6,7 years
* MDS-UPDRS III: 40,1-40,1
 | * Tests: in OFF-state of medication
* Protocol: completion of in-place turns (90° and 180°) to the left and to the right (randomly ordered). At least 5 trials to each direction.
* Equipment: Eight camera high-resolution motion capture system and retro-reflective markers. For oculomotor data: Head-mounted infrared binocular eye tracking system and EOG
 | * *Turn duration:* FRs > nFRs
* *# steps:* FRs > nFRs
* *# saccades and amplitude of initial saccade:* no group differences
 |
| Mancini M, et al., 2017 [39] | * 28 PD patients
* FRs: n=16
* NFRs: n=12
* Mean values: FRs vs NFRs
* Age: 67- 65
* UPDRS III: 36,9- 29,2\*
* PIGD: 3,5- 1,8\*
 | * Tests: in OFF-state of medication
* Protocol: 7m iTUG and 360° turn-in-place to the right and left side during for 2 min.
* Equipment: 3 Opal inertial sensors (APDM, Inc) on shanks and trunk
 | * *#turns within 2 min:*

No group differences when corrected for disease severity (ANCOVA)* *Average peak velocity:*
* *Average jerkiness:*
* *FOG-episode:*
* 13 FRs experienced a FOG episode during 2min-turning
* 2 FRs experienced a FOG episode during the iTUG
 |
| McNeely ME, et al., 2011 [43] | * 20 PD patients
* FRs: n=10
* NFRs: n=10
* Mean values: FRs vs NFRs
* Age: 75,3- 74
* DD: 11,5-9,1
* LED (mg/day): 1490,7-728,9\*
* FOG-Q: 12,6- 4,8\*
* UPDRS III: 28,4-45,0
 | * Tests: in OFF and ON-state of medication
* Protocol: in-place 180° turns, to the left and to the right. 10 times to each direction.
* Equipment: An eight camera 3D motion capturing system
 | * *Turn duration:* FRs > nFRs (larger medication effect in FRs)
* *# steps:* FRs > nFRs (Larger medication effect in FRs)
 |
| Nieuwboer A, et al., 2009 [27] | * 133 PD patients
* 68 FRs
* 65 NFRs
* Mean values: FRs vs NFRs
* Age: 67,3-66
* DD: 8,7-7,8
* FOGQ: 12,5-4,4\*
* UPDRS-III: 35,2-32
* MMSE: 27,9-28,3
* LED: 526,2-405,2
 | * Tests: in ON state of medication
* Protocol: walk to a chair placed 6 m away 🡪 pick up a tray with 2 cups 🡪 turn around 180° 🡪carry the tray back to the start position
* Equipment: The vitaport activity monitor and 5 accelerometers placed on the body.
 | * *FOG episode:* 31 episodes in 8 FRs
* *Turn duration:* FRs > nFRs
 |
| Peterson DS, et al., 2012 [42] | * 31 PD patients
	+ FRs: n=12
	+ NFRs: n=19
* Mean values: FRs vs NFRs
* Age: 72-69 years
* DD: 8,0-6,6 years
* MDS-UPDRS III: 45,5-41,6
* H&Y: 2,63-2,37
* FOG-Q: 12,6-4,2\*
 | * Tests: in OFF state of medication
* Protocol:
* Turning to the left and right in a small radius circle (0,6m)
* Turning to the left and right in a large radius circle (3m)
* Equipment: 6 footswitches on the sole of each shoe (3 near the toes, 3 near the heel) and digital video.
 | * FOG-episodes in 7 FRs: most frequently during small radius circles
* PCI: FRs > nFRs and large radius turn< small radius turn
 |
| Sijobert B, et al., 2016 [36] | * 13 PD patients
* FRs n=9
* NFRs: n=4
* Mean values: FRs vs NFRs
* No information
 | * Medication: No information
* Protocol: Started from standing in the middle of a gait carpet 🡪 walk towards a line 🡪 make U-turn 🡪 walk 5 meters 🡪 walk around a cone and keep walking to the start line
* Equipment:
* An electrical stimulator and a foot mounted inertial measurement unit (as a cueing method)
 | * No statistical comparisons between FR and nFR
 |
| Spildooren J, et al., 2010 [28] | * 28 PD patients
* FRs n=14
* nFRs n=14
* Mean values: FRs vs NFRs
* Age: 68.6-66.7 years
* DD: 9.0-7.8 years
* UPDRS-III: 37.9-34.4
* H&Y: 2.5-2.4
* MMSE: 27.7-28.7\*
 | * Tests: in OFF state of medication
* Protocol: Walk along a walkway of 5m between two retroreflective markers placed 0,5m away from each other 🡪 make a left or right turn of varying angles (180° or 360°) around the marker before walking further
* with and without a verbal cognitive DT
* Equipment: An eight camera VICON data capturing system with retroreflective markers placed on the body
 | * *Turn duration:* FRs > nFRs while turning 360°
* *#steps:* FRs > nFRs while turning 360°
* *Cadence:* increases for FRs during turning (180° and 360°) but decreases in non-freezers during turning
* *Freezing episodes:* in 10 FRs
* During DT: 360° turn> 180° turn
* *Secondary task performance*: decreases in FRs when increasing the turning angle
* Errors on DT: FRs > NFRs
 |
| Spildooren J, et al., 2012 [32] | * 30 PD patients
* FRs: n=16
* NFRs: n=14
* Mean values: FRs vs NFRs
* Age: 67,9- 68,3 years
* DD: 9,3- 8 years
* H&Y: 2- 2,3
* UPDRS-III: 42,4- 37,4
* MMSE: 28 vs 29
 | * Tests: in OFF state of medication
* Protocol: walk 5m 🡪 turn 180° 🡪 walk back to start position

Turning: towards disease dominant and non-dominant side, each condition was executed 3 times. * Equipment: Eight camera VICON data capturing system
 | * *Cadence:* FRs > nFRs,
* Higher when turning toward disease-dominant side in FRs and NFRs
* *#steps:* FRs > nFRs
* more steps needed while turning to disease dominant side
* *Turn duration:*
* Increased when turning towards the disease dominant side
* *#FOG episodes:* 94 were detected in 7 FRs
* No influence of turn direction
* more FOG at the inner side of the turning cycle
* *Effect of cueing the disease dominant or non-dominant side:*
* No interaction effect or main effect
 |
| Spildooren J, et al., 2013 [33] | * 27 PD patients
* FRs: n=13
* NFRs: n=14
* Means FRs vs NFRs:
* Age: 68,1-65,2 years
* DD: 9-7,8 years
* H&Y: 2,5-2,4
* UPDRS-III: 38,7-34,4
* NFOG-Q: 14-0\*
 | * Tests: in OFF-state of medication
* Protocol: 5m walk towards retroreflective makers 🡪 turn 180° around the turning markers (to the left and tot the right). Each condition was executed 3 times
* Equipment: A Vicon data-capturing system and retroreflective markers applied to the body
 | * *Turn depth:* no differences 🡪 good standardization
* No *interaction effect of group-DT* for head, trunk, and pelvis kinematic data 🡪 data pooled
* *FOG episodes:* 29 episodes in 5 FRs 🡪 mainly at the end of a turn
* *Turn preparation:*
* NFRs earlier head rotation compared to FRs
* In FOG-trials: head rotation did not precede thorax and pelvic rotation (lack of axial preparation)
* *Supplementary analysis of footstep pattern pre-FOG*: no differences in cadence, step length, step time, step width between trials with and without FOG
* *Max head*-pelvis separation: No group differences or differences between trials with and without FOG
* *Timing max head-pelvis separation*: nFRs < FRs
* *Neck rigidity*: FRs > nFRS
 |
| Vervoort G, et al., 2016 [34] | * 73 PD patients
* FRs: n=13
* NFRs: n=60
* Means FRs vs NFRs:
* Age: 65,8 -57,7years\*
* DD: 7,9-5,8 years
* H&Y: 2,2-2
* MDS-UPDRS-III: 38.3-25,9\*
* MMSE: 28,5-28
* NFOG-Q: 15,8-0\*
* LED (mg/day): 604,8-409,7
 | * Tests: in OFF state of medication
* Protocol: Turn (360° to the left and to the right) 6 times
* Random application of single task and dual task conditions (auditory Stroop task as dual task)
* Equipment: VICON 3D motion analysis system
 | * *Turn duration:* FRs > nFRs with and without DT
* *#steps:* FRs > nFRs while DT
 |
| Willems AM, et al., 2007 [22] | * 19 PD patients
* 9 freezers
* 10 non-freezers
* Means FRs vs NFRs:
* Age: 68,1-60,6 years\*
* DD: 11,5-6,2 years\*
* UPDRS-III: 27,9-24,7
* H&Y: 2,8-2,6
* FOGQ: 15,6-5,5\*
* MMSE: 26,9-28,5
 | * Tests: in ON state of medication
* Protocol: Walk along a walkway (with obstacle at standard distance of 5m)🡪 make a left turn (180°) around it 🡪 return to starting position
* The condition was repeated 3 times
* Equipment: An eight camera VICON data capturing system
 | * *FOG episodes:* 1 trial in 1 FR
* *#steps and turn duration:* ns
* *Turn height and length:* FRs > nFRS
* *Turn width:* ns
 |

PD, Parkinson’s Disease; FRs, Freezers; nFRS, non-freezers; FOG, freezing of gait; FOG-Q, Freezing of Gait Questionnaire; NFOG-Q, New Freezing of Gait Questionnaire; UPDRS-III, Unified Parkinson’s Disease Rating Scale part III (motor examination); MDS-UPDRS-III, new modified version of UPDRS; DD, disease duration; H&Y, Hoehn and Yahr stage; LED, levodopa equivalent dose; MMSE, Mini-mental state examination; MoCA, Montreal Cognitive Assessment; PIGD, Postural instability and gait disorders; COM, Center of mass; mini-Best, Mini Balance Evaluation Systems Test; iTUG, instrumented Timed up and go; PCI, Phase coordination index; EOG, electrooculography.

\* p<0.05

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| Supplementary table 3: Strengths and limitation of the included articles  |
| Article | **Strengths**  | **Limitations** |
| Arias P, et al., 2010 [38] | * No differences in demographics and disease development between groups
* Trials were performed at a certain sequence to avoid carryover effect
* Sensitivity analysis
* Mentioning of sources of bias
* Statistical methods were well described
 | * No explanation on how missing data were addressed
* No reporting of numbers of individuals at each stage of the study
* The effect of stimulation was assessed for a limited period of time 🡪 no research of long term effects
* FOG-episodes were included in the analysis of turn parameters
 |
| Bengevoord A., et al., 2016 [31] | * No differences in demographics and disease development between groups
* Sufficiently large power
* Raters for FOG detection were independent and blinded for NFOG-Q scores
* Standardisation of turning arc (retroreflective markers)
* Statistical analyses were well described
* Two separate analysis for trials with and without FOG
 | * Turning in laboratory settings (performance is different from performance at home)
* Low frequency of FOG episodes 🡪 this potentially influences the power of the pre-FOG segments
* No sensitivity analyses
* No explanation on missing data
* No reporting of numbers of individuals at each stage of the study
 |
| Bhatt H, et al., 2013 [35] | * No differences in demographics and disease development between groups
* High inter-rater reliability for FOG-episodes
* Mentioning of sources of bias
 | * The amount of FRs is too small to make a conclusion about turning strategies during a FOG episode
* No explanation on how study size was arrived
* No explanation on missing data
* FOG-episodes were included in the analysis of turn parameters
 |
| De Souza Fortaleza Ac, et al., 2017 [41] | * No differences in demographics and disease development between groups (except for PIGD and mini-best)
* Large sample size
 | * Groups were not matched for postural stability (mini-BEST and PIGD)
* Instructions from examiner can be interpreted as cueing
* Turning period to short for dual task + no instructions on task prioritization
* No information on the frequency of FOG-episodes
* No information on the in- or exclusion of FOG-episodes in the statistical analysis
 |
| Fietzek UM, et al., 2017 [37] | * Safety of patients was ascertained
 | * Groups were not matched for DD, LED and MDS-UPDRS
* No exclusion of freezing trials
* No information on the frequency of FOG-episodes
* No explanation of how study size was arrived
* No reporting of potential sources of bias
* No information on randomisation of the protocol
 |
| Lohnes CA, et al., 2011 [40] | * No differences in demographics and disease development between groups
* Missing data were well documented
* Numbers of individuals at each stage of study was reported
 | * 2 different methods were used to measure saccades
* No mentioning of how study size was arrived
* Participants knew that their execution was being observed and monitored 🡪 influenced their performance
* No information on the frequency of FOG-episodes
* No information on the in- or exclusion of FOG-episodes in the statistical analysis
 |
| Mancini M, et al., 2017 [39] | * ANCOVA was used to correct for disease severity and PIGD
* 2 independent movement disorder specialists blinded for group allocation rated FOG-severity
 | * Groups were not matched for UPDRS and PIGD
* Only a sensor on the lumbar segment was used to characterise turning parameters
* Freezing trials were not analysed separately
 |
| McNeely ME, et al., 2011 [43] | * Explanation on how study size was arrived
* Statistical methods well described
* Characteristics of study participants were well documented
 | * Groups were not matched for LED
* All tests were executed in 1 day in fixed order: OFF state first, ON state second 🡪 fatigue or experience could affect the result
* No reporting of potential sources of bias
 |
| Nieuwboer A, et al., 2009 [27] | * No differences in demographics and disease development between groups
* Home setting
* Data were analysed by a blinded rater who was not involved in data collection for cueing modality
* Potential sources of bias were described
* Explanation of how study size was arrived
 | * No reporting of numbers of individuals at each stage of study
* No sensitivity analyses
* No explanation of how missing data were addressed
 |
| Peterson DS, et al., 2012 [42] | * No differences in demographics and disease development between groups
* The gait tasks were performed at comfortable, preferred pace
* Potential sources of bias were described
 | * Setting, locations, relevant dates are not documented
* No mentioning of how study size was arrived
* No explanation on how missing data were addressed
* No reporting of numbers of individuals at each stage of the study
* No information on how freezing episodes were defined
* No information on the in- or exclusion of FOG-episodes in the statistical analysis
 |
| Sijobert B, et al., 2016 [42] | * external validity
* Eliminated learning bias
 | * No information on subject characteristics
* No information on medication state while testing
* No individual justifications
* Small sample size (13 patients)
* No mentioning of specific objectives and hypotheses
* No explanation of how study size was arrived
* No documentation of statistical analyses
* No reporting of numbers of individuals at each stage of study
* No information on the frequency of FOG-episodes
* No information on the in- or exclusion of FOG-episodes in the statistical analysis
 |
| Spildooren J, et al., 2010 [28] | * No differences in demographics and disease development between groups (except for cognitive outcomes)
* 2 raters were blinded for NFOG-Q score 🡪 they analysed all trials in which FOG occurred (independently)
* Encouragement to standardize turning performance: placement of markers
* Equal walking distance during turning trajectories, for each participant
* Potential sources of bias are described
 | * FRs and NFRs were not matched for MMSE and SCOPA-COG
* No explanation of how study size was arrived
* No explanation of how missing data were addressed
* No sensitivity analyses
 |
| Spildooren J, et al., 2012 [32] | * No differences in demographics and disease development between groups
* Encouragement to standardize turning performance: placement of markers
* Equal walking distance during turning trajectories, for each participant
* Raters who detected the FOG episodes were independent and blinded for NFOG-Q score
* Potential sources of bias were well described
* Numbers of individuals at each stage of study are reported
 | * No explanation of how study size was arrived
* No reporting of reasons for non-participation at each stage
 |
| Spildooren J, et al., 2013 [33] | * No differences in demographics and disease development between groups
* Good standardization of the turning arc
* Statistical analyses were well documented
* Extra analyses were reported
* Numbers of individuals at each stage of study were reported
 | * No reporting of potential sources of bias (methods)
* No explanation on how study size was arrived
 |
| Vervoort G, et al., 2016 [34] | * Potential sources of bias were well described
* Explanation of how quantitative variables were handled in analyses
* Statistical analyses well documented
 | * FRs had higher age and MDS-UPDRS III scores compared to NFRs
* Small number of FRs (n=13, compared to 60 NFRs)
* No explanation on how study size was arrived
* No reporting on how missing data were addressed
 |
| Willems AM, et al., 2007 [22] | * Clear parameters for gait
* Statistical analyses well documented
* Sources and data of methods of assessment for each variable of interest were documented
* External validity was discussed
 | * FRs had higher age and DD compared to NFRs
* The baseline measurements were not the same between the groups
* Small sample size
* Potential sources of bias were not well described
* No explanation of how study size was arrived
* No sensitivity analyses
* No reporting of numbers of individuals at each stage of study
 |

FRs, Freezers; nFRS, non-freezers; FOG, freezing of gait; NFOG-Q, New Freezing of Gait Questionnaire; UPDRS, Unified Parkinson’s Disease Rating Scale; MDS-UPDRS-III, new modified version of UPDRS; DD, disease duration; LED, levodopa equivalent dose; MMSE, Mini-mental state examination; SCOPA-COG, scales for outcomes in Parkinson's Disease-cognition; PIGD, Postural instability and gait disorders; mini-Best, Mini Balance Evaluation Systems Test.

Supplementary table 4: The results on the STROBE checklist for case-control studies.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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|  |  **Arias P, et al., 2010 [38]** |  **Bengevoord A., et al., 2016 [31]** |  **Bhatt H, et al., 2013 [35]** | **de Souza Fortaleza AC, et al., 2017 [41]** | **Fietzek UM, et al., 2017 [37]** | **Lohnes CA, et al., 2011 [40]** | **Mancini M, et al., 2017 [39]** | **McNeely ME, et al., 2011 [43]** |  **Nieuwboer A, et al., 2009 [27]** |  **Peterson DS, et al., 2012 [42]** |  **Sijobert B, et al., 2016 [36]** |  **Spildooren J, et al., 2010 [28]** |  **Spildooren J, et al., 2012 [32]** |  **Spildooren J, et al., 2013 [33]** |  **Vervoort G, et al., 2016 [34]** |  **Willems AM, et al., 2007 [22]** |
| Title and abstract |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Study design |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Abstract |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Introduction |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Background |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Objectives |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Methods |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Study design |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Setting |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Selection participants |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Matching criteria | na | na |  | na | na | na | na | na | na |  | na |  |  |  | na | na |
| Variables |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Measurement |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Bias |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Study size |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Quantitative variables |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Statistical methods |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Subgroups |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Missing data |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Matching group |  | na |  | na | na | na | na | na | na |  | na |  |  |  | na | na |
| Sensitivity analysis |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Results |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Number of participants |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Non-participation |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Flow-diagram |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Subject characteristics |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Missing data |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Outcome data | na | na | na | na | na | na | na | na | na | na | na | na | na | na | na | na |
| Unadjusted estimates |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Category boundaries | na |  | na | na | na | na | na | na | na | na | na | na | na | na | na | na |
| Riskanalysis | na | na  | na | na | na | na | na | na | na | na | na | na | na | na | na | na |
| Other |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Discussion |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Key results |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Limitations |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Interpretation |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Generalisability |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Other information |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Funding |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

= yes, = no, na= not applicableSupplementary table 5: Quality assessment (presented in %) of the included articles.

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| --- | --- | --- |
| **Author(s)** | **%** | **Quality** |
| Arias P, et al., 2010 [38] | 75,9% | High |
| Bengevoord A., et al., 2016 [31] | 75,9% | High |
| Bhatt H, et al., 2013 [35] | 66,7% | High |
| De Souza Fortaleza AC, et al., 2017 [41] | 64.3% | High |
| Fietzek UM, et al. 2017 [37] | 67,9% | High |
| Lohnes CA, et al., 2011 [40] | 75% | High |
| Mancini M, et al., 2017 [39] | 75% | High |
| McNeely ME, et al., 2011 [43] | 67,9% | High |
| Nieuwboer A, et al., 2009 [27] | 75% | High |
| Peterson DS, et al., 2012 [42] | 73,3% | High |
| Sijobert B, et al., 2016 [36] | 46,4% | Moderate |
| Spildooren J, et al., 2010 [28] | 73,3% | High |
| Spildooren J, et al., 2012 [32] | 80% | High |
| Spildooren J, et al., 2013 [33] | 76,7% | High |
| Vervoort G, et al., 2016 [34] | 75% | High |
| Willems AM, et al., 2007 [22] | 64,3% | High |

\*0-40% low, 41-60% moderate, 61-80% high and 81-100% very high |