Title: Quantitative methods used to evaluate balance, postural control and the fear of falling in lower limb prosthesis users: A systematic review.

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Abstract

Problems with balance, postural control and fear of falling are highly prevalent in lower limb prosthesis users, with much research conducted to understand these issues. The variety of tools used to assess these concepts presents a challenge when interpreting research outcomes. This systematic review aimed to provide a synthesis of quantifiable methods used in the evaluation of balance, postural control and fear of falling in lower limb prosthesis users with an amputation level at or proximal to the ankle joint. A systematic search was conducted in CINAHL, Medline, AMED, Cochrane, Ageline, Scopus, Web of Science, Proquest, PsychINFO, PsycArticles and PubPsych databases followed by additional manual searching via reference lists in the reviewed articles databases. Included articles utilized quantitative measure of balance or postural control as one of the dependent variables, lower limb prosthesis users as a sample group, were published in a peer-reviewed journal in English. Relevant assessment questions were created by the investigators to rate the assessment methods used in the individual studies. Descriptive and summary statistics are utilized to synthesize the results. The search yielded (n=187) articles assessing balance or postural control (n=5487 persons in total) and (n=66) articles assessing fear of falling or balance confidence (n=7325 persons in total). The most used test to measure balance was the Berg Balance Scale and the most used test to measure fear of falling was the Activities-specific Balance Confidence scale. A large number of studies did not present if the chosen methods were valid and reliable for the lower limb prosthesis users. Among study limitations, small sample size was common.

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Introduction

To be able to maintain static balance, defined as ability to keep the line of gravity within the base of support, and dynamic balance, which is defined as maintained stability during weight shifting, one needs to have postural control (1). Postural control is defined as the act of achieving a state of balance during any posture or activity (2). When this ability is reduced, e.g. due to amputation, fear of falling often is increased. Increased fear of falling has an impact on daily activities and can be liked with decreased balance confidence (3). Balance confidence is defined as the belief to perform a certain action or activity in an individual (4). A recent study has concluded that falls efficacy is a wide concept that involves perceived ability to prevent and manage falls, and that applying measures for the targeted construct is helpful for the perceived capability in preventing and managing falls (5).

Users of lower limb prostheses often experience more falls and have a heightened fear of falling, with most prosthesis users reported having fallen at least once in the past year (6,7). In another study, just over half of the participants reported having fallen in the past year, while just below half reported fear of (8). Falls are multifactorial, with one key determinant of falling being balance ability. Balance ability and postural control in lower limb prosthesis users are worse when compared to similar non-prosthetic using individuals which may explain the increased falls incidence and fear of falling in this clinical population (8). More proximal lower extremity amputations, rather than distal ones, have been linked to reduced balance, with loss of muscle strength and ankle strategy as biomechanical reasons for this reduction (9). Fall-related injuries among prosthesis users are costly as they require medical attention (10). Therefore, methods that assess postural control and balance are crucial when trying to identify potential fallers or those fearful of falling, as a step towards the prevention of the injuries and subsequent negative effects on health.

Various methods have been used to evaluate postural control and balance ability in lower limb prosthesis users. These measures range from quantitative lab-based tests, utilising force platforms and motion capture, sometimes integrating moveable support surfaces (11–13) through to patient-reported outcome measures and questionnaires, such as the Berg Balance Scale (14). Two reviews have attempted to address these issues. Firstly, a review of instrumented methods to assess balance and postural control in lower limb prosthesis users has commented on the heterogeneity of methods used and highlighted the static nature of many assessments (11). However, instrumented methods of balance and postural control may not always accurately reflect an individual's fear of falling or fall

risk. Also, these measures often necessitate equipment not available to a practicing clinician. Additionally, a review evaluating the applicability of common tests used by clinicians to measure gait, balance, and fall risk in lower limb prosthesis users found limited population-specific validation of the tests. Whilst suggesting customisation and validation of new practical tests for lower limb prosthesis users were needed, particularly given the speed of technological development, these activities have not materialised (15).

Since the publication of these two previous reviews, which are around a decade old when the present article was submitted, much development and research into balance, postural control, balance confidence and fear of falling of lower limb prosthesis users has occurred. Despite this development, to our knowledge, there has not been a more recent review of this topic that combines the variety of measures used in both research laboratories and clinical settings. Previous research also did not include investigations of fear of falling or balance confidence. Therefore, a contemporary synthesis of the field including balance, postural control, balance confidence and fear of falling assessment is required to benefit researchers and clinicians working in the field of postural control and balance assessment. This systematic review aimed to provide a synthesis of quantifiable methods used in assessment of balance, postural control, balance confidence and fear of falling in lower limb prosthesis users with an amputation level at or proximal to the ankle joint.

Methods

The method for performing this systematic review was based on the principles of PRISMA (16). The following databases were searched for articles over the period of mid-April to mid-September 2020: CINAHL, Medline, AMED, Cochrane, Ageline, Scopus, Web of Science, Proquest, PsychINFO, PsycArticles and PubPsych followed by additional manual searching via reference lists in the reviewed articles. Each database was selected as it was considered to be a plausible and reliable source of relevant articles and the various backgrounds of each database would provide a broad and extensive search result. The search strings included terms such as balance, posture, prostheses, lower limb amputation, and fear of falling. As differences in terminology and writing style exist between researchers, a list of variations was used for each key term to identify all relevant articles. MeSH Terms, or the equivalent in each database, were used to find variations of words. The results from the different databases were checked for duplicates with the deduplication function in EndNote (Version

X9.3.3). The full list of search strings used in all databases is presented in the Supplementary Material.

Screening of the titles and abstracts was conducted to exclude those not dealing with lower limb prostheses, balance, postural control or a fear of falling. To conduct a blind and independent assessment of the remaining articles by two individuals (XX, XX), Rayyan (17) software was used according to the inclusion criteria below. In the event of disagreement amongst reviewers, discussion was initiated and consensus reached. There were no cases where further arbitration was required. The results of the screening process are included in Figure 1. Where the relevance of a manuscript was unclear at the abstract level, the full version was screened. Inclusion and exclusion criteria were established before the start of the review. The protocol and study were published and registered online at PROSPERO (18).

Inclusion criteria

1. Quantitative (numerical value) measure of balance, postural control, fear of falling or balance confidence as one of the dependent variables.
2. Lower limb prosthesis users, with an amputation at or above the ankle joint, as a sample group.
3. Article published in a peer-reviewed journal.
4. English-language publication

Information such as equipment, test setting, outcome parameters and whether the measures used had been validated and tested for the reliability for use in groups of prosthesis users were extracted. Also, details on the sample groups were retrieved, such as sex and amputation level and whether a control group was included. Exclusion criteria were all except the inclusion criteria.

A double-check of the reference lists of articles included was conducted, that gained additional articles for the summary.

Data Extraction

An extraction framework was constructed to extract information about methods used in individual studies. Extraction was conducted by two investigators (XX, XX) who analysed half of the articles each, followed by a control check of each other's extractions. Any disagreements were discussed to

reach a consensus on the articles concerned with XX and XX. The extraction framework, together with examples of what data could be extracted, was as follows:

What type of assessment is used?

- Type (e.g. force plates for one or two limbs, walking or standing, test protocols, perturbation, level floor, slopes, stairs)
- Instruments:
    - Hardware (e.g. force plates, pressure plates, balance platforms, motion capture)
    - E.g., chairs, cones, stopwatch, protocols.
- Outcomes are presented related to balance or postural control (e.g. CoP, CoM, sway area, sway path, time, distance etc.)

In what setting is the study/assessment conducted?

- Clinic/laboratory/rehabilitation centre.

How many participants are included in the study?

- No. of subjects, level and side of amputation, sex

Are the participants in the study compared to a control group or normative values?

- If yes, state if control group or normative values. No. of participants, gender.

Do the authors of the study report if the assessment method is validated for subjects or not?

- If yes, how valid? Valid for prostheses users or other?

Do the authors report if and how reliable the assessment method is?

- If yes, how reliable? What type of reliability? Reliable for prostheses users or other?

Do the authors report any limitations of the assessment method used?

- State limitations related to the assessment method and/or the instruments.

Results

The initial search yielded (n=3698) articles. After removing duplicates, (n=2233) articles remained. Following title and abstract screening, (n=1885) articles were excluded with (n=348) remaining (Figure 1). During the eligibility stage of screening, articles not fitting the inclusion criteria were removed, leaving n=221 articles for inclusion in the analysis (n=187) articles for the balance assessment, and (n=66) for the balance confidence assessment (Figure 1). The separation of the tables was made to facilitate utility for readers with different interests. The total number of participants in

articles of balance was (n=5487) and the total number of participants on balance confidence articles was (n=7298). Full demographics are presented in Table 1.

***INSERT FIGURE 1 HERE**

INSERT TABLE 1 HERE

Balance studies

Most studies included force plate measurements on dual-limb individually (12,19–70), but also commonly dual-limb combined (Table 3) (13,71–107). Less common were single-limb measurements (79,92,94,108–113). The equipment used across studies varied, but the most common was multiple force plates (Table 3)(12,19–48,51–60,62–70,114–117). Motion capture systems were also common (13,20,21,29,31–36,41,44,45,48,51,54,60,90,91,99,100,102,108,110,112,113,115–138). Single force platforms were also commonly utilized in studies (13,71–108,110). Some few studies used plantar force sensor insoles (50,112–114,139), inertial or accelerometer sensors (95,140–142), instrumented mat or walkway (117,124,143) or a plantar pressure platform (Table 3) (49,61,111,144–146).
Looking at the protocols and tests, the most commonly found was the Berg Balance Scale, or selected items of the Berg Balance Scale (Table 3) (14,31,73,80–82,93,94,103,107,118–120,138,139,139,140,144,147–168). Timed Up and Go (76,107,117,144,145,148,149,151,162,163,165,169–180) and Limits of Stability tests (12,13,20,25,30,37,42,46,47,59,71,72,74,83,84,89) were common (Table 3). One leg stance test appeared with various names in about some studies (109,145,162,174,181–187). The protocol of Sensory Organisation Test was also utilized (12,22,25,26,43,47,52,53,57,58,78,105). Four Square Step Test, or a modified version of it, was less common (74,117,134,148,151,158,169,173,188) and tests involving Narrowing Beam Walking or Narrow Ridge Balance were also utilized (Table 3) (110,136,148,151,169,189–192). Amputee Mobility Predictor (72,167,171,193–195) and Motor Control Test (25,39,46,47,52) were also reported (Table 3).
Studies that explicitly stated limitations or confounders were just over two thirds of the total (Table 2), (13,14,19–22,24,24,28–56,71,71,74,76,77,80–95,108,109,115–132,140–145,147–165,169–180,182–184,188–191,193–198). The most commonly mentioned limitation was small sample size (20,22,24,28,29,32,33,35,37,39,40,42,45,47,52,54–

57,74,80,82,86,87,89,93,95,109,118,119,121,123,126,129,141,143,145,148,149,154–159,161,164,169,172,183,198), followed by generalisability issues (14,19–21,34,38,41,42,44,52–56,80,81,87,89,109,127–130,142,148,151,155,156,162,171,175–177,184,188,189,191,193,196), recall bias (14,148,150,157,171,173,182,184), heterogenous groups (29,42,54,89,142,174,176,177), homogenous groups (21,38,39,44,45,91,164), and convenience samples (14,161,176,177,196).

Balance confidence studies

In a large majority of the balance confidence studies, the ABC, or the modified version ABC-6, was utilized to measure balance confidence or fear of falling (Table 3) (4,6,14,44,46,78,81,83,138,143,145,147,148,150,151,153–157,159,165,172,175–178,183,193,196,199–225). Two other tests were used a handful of times: FES/mFES/FES-I (71,163,206,226,227) and the Houghton scale (Table 3) (155,178,204,228). Some studies posed a simple yes-or-no question to assess fear of falling (8,94,216,224,225), while others utilized a numeric rating scale (Table 3) (154,156,228). One study did not clarify what test was used to assess balance confidence (134).

The large majority of studies of balance confidence explicitly stated limitations or confounders (Table 2) (4,8,14,44,46,71,81,83,94,143,145,147,148,150–157,159,163,165,172,175–177,183,193,196,199–211,213–219,221,222,225–229). Of those reporting limitations or confounders, the most commonly mentioned limitation was generalisability issues (14,44,81,147,148,151,155,156,175–177,193,196,199–201,203–205,209,210,213,214,218,221,225,229), followed by small sample size (143,145,148,154–157,159,172,183,201,203,206,207,211,214,215,226–228), recall bias (4,8,14,148,150,157,201,225), convenience sample (14,175–177,196,200,215), heterogenous groups (176,177,210,214,216,221), and homogenous groups (204,227). Some studies utilized both tests for balance and balance confidence (14,46,71,78,81,83,94,134,138,143,145,147,148,150–157,159,163,165,172,175–178,183,193,196).

Approximately one third of studies reported validation of some sort, related to either test or equipment used for assessing balance (Table 2) (13,14,19–24,71–79,114,118–121,139,140,143,144,147–163,169–178,181,188,189,193–197,230,231). A quarter reported validity directly associated with prosthesis users (13,14,19–24,71,72,74,76,118,119,139,140,144,147–162,169–178,181,189,193–195). Similarly for reporting reliability, where about a third reported any reliability (14,20,22,24–27,71–85,118–120,139,140,143–145,147–163,169,171–178,181,188,193–197,231,232), about a quarter reported reliability directly associated with prosthesis users (6,14,20,22,24–27,71,72,74,76,80,118,119,139,140,144,147–151,153–162,169,171–178,181,193–195).

Just over half of included studies reported their chosen method was valid to assess balance confidence or fear of falling (Table 2) (4,44,71,78,138,145,148,150–153,155,157,159,172,176–178,183,193,200,202–207,209,210,214,215,217–220,223,224,227). Slightly more than half of all balance confidence studies reported validity directly associated with prosthesis users (Table 2) (4,44,138,145,148,150–153,155,157,159,172,176–178,183,193,200,202–207,209,210,214,215,217,218,220,223,224). Reliability was reported in nearly two thirds of all the studies (4,6,14,44,78,83,143,147,148,150,151,153–157,159,165,172,175–178,183,193,200–205,208–211,214,217,218,220,223–225,227) and slightly less reported reliability directly associated with prosthesis users (Table 2) (4,6,14,44,83,143,147,148,150,151,153–157,159,165,172,175–178,183,193,200–205,208–211,214,217,218,220,223,224).

INSERT TABLE 2 HERE

INSERT TABLE 3 HERE

The full table of both balance studies and balance confidence studies can be viewed in Table 4. The table include information of author, assessment type, equipment, outcomes variables, settings, participant demographics, and risks of bias.

INSERT TABLE 4 HERE

Discussion

The aim of this study was to provide a synthesis of quantifiable methods used in the assessment of balance, postural control and fear of falling in lower limb prosthesis users with an amputation level at or proximal to the ankle joint. The results provide both researchers and clinicians with a holistic perspective of the research field of balance assessment, in lower limb prosthesis users, and possibly support them in their choice of method for further research or clinical practice. Approximately one third of articles in this body of literature reported using methods or instruments that are validated or reliable in the target population. Only about a quarter of the articles reported using methods or instruments directly associated with lower limb prosthesis users. However, when looking at the past five years (2015-2020), it seems like the frequency of reporting validation and reliability has increased. This could be an indication that the field is moving towards a more considered approach to

232 the tools used to assess these constructs, which is a positive development. Moreover, there has been
233 an increase in studies using the Berg Balance Scale and studies mentioning that Berg Balance Scale
234 are validated for lower limb prosthesis users since the initial validation for prosthesis users published
235 in 2013 (9). It is therefore easily applicable to this group of patients.
236 Regarding limitations, 33.2% of the studies in balance articles and 12.1% of the studies in balance
237 confidence articles did not mention any study limitations. Stating limitations in a study is important
238 as this provides other researchers with information to avoid pitfalls in their own research and moves
239 the body of literature forward as a whole. It also gives the reader insight into the potential caveats with
240 main takeaway points as well as an insight into authors' critical thinking and view of their own work.
241 In order to improve the general quality of the field, a more frequent appraisal of study limitations
242 should be reported in research in this area. It must be noted that this data is drawn singularly from
243 studies clearly stating something was a limitation or confounder. As the objective was to provide a
244 synthesis of quantifiable methods used in evaluation of balance and balance confidence in studies, the
245 present authors avoided making assumptions and interpretations of individual studies. For example,
246 articles stating that future studies should include a larger sample size, could be considered a form of
247 limitation statement. However, an authors giving directions for future studies is not necessarily
248 always the equivalent to saying it is a limitation in the present study, meaning this is something up for
249 interpretation. In fact, a previous work specific to the P&O field has indicated that sample size may
250 have varying requirements depending on the intention of a study for scientific, economic and ethical
251 reasons (233). Therefore, what appears to be a small sample may or may not be a limitation in the
252 specific context.
253 Among the balance articles reporting limitations, the most common limitation was a small sample
254 size, followed by generalisability issues. For the balance confidence articles, generalisability issues was
255 most common followed by small sample size. A small sample size is a limitation that limits statistical
256 power; therefore, it is possibly a concern that so many studies report it. It may be hard to recruit
257 patients due to medical confidentiality issues and loss of income for the patient as they may have to
258 take time off work. Although this is speculative, it is something that may be interesting for future
259 research to focus on. Generalisability issues could also jeopardise the strength of interpretation of
260 results. Future research should aim to address these issues around sample size and generalisability.
261 However, the reason for generalisability issues could be either that the participants are too
262 homogenous or too heterogenous in various aspects, which is information that was not always

extracted from the articles in this review for the same reason stated earlier, i.e., avoidance of making interpretations. This lack of nuance may be a limitation to this study, but the data in table 4 can be used to further explore articles that report generalisability issues. In exploring the various lower limb prosthesis users and assessment methods, it is reasonable to perform studies recruiting for specific participants, making the group homogenous, as a start. It is likely that an assessment method needs to be validated and reliable for each specific patient group and their conditions, before being applied to a larger, heterogenous mass of participants. The opposite, making a study quite large and heterogenous could possibly lead to subgroups being too small to achieve a desired statistical power. It is possible that the population of lower limb prosthesis users, able to participate in studies, is limited, or hard to reach out to, and efforts should be made to enable researchers and prosthesis users to more easily interact. Sharing data via more widely established and freely available registries would go a long way to addressing this issue. As an example, using a valid and reliable balance or balance confidence test which is easily applicable to both research and clinical settings could be useful in the process of transferring data and knowledge between the researchers, but perhaps also between the researchers and clinical settings. Perhaps could these tests be combined with a software to further facilitate recording, safely storing, and sharing of these data. This is of course speculative and exactly what this and other intiaitves to address this issue should look like is something for all stakeholders i.e. researchers, clinicians and patients, to decide. Recall bias, homogeneity, heterogeneity, and convenience samples, were not as common but were still included in the top reasons for limitations among the balance articles; however, recall bias was often associated with other parts of the studies, e.g. questionnaires about fall history, rather than the actual assessment of balance. Regarding the balance confidence articles, recall bias, convenience sample, homogeneity or heterogeneity in the sample group were present but not as common.

From the summarised data, participant sex distribution could be calculated, but to be able to compare to reality, the studies with unspecified sex had to be excluded. In the remaining articles, there were 73,6% males and 26,4% females among lower limb prosthesis user participants, and exactly the same numbers among control participants, in the balance articles. Among the balance confidence articles, the main participating males were 70,5% and females 29,5%, while the control participants were 79,5% male and 20,5% female. Results from the current study showed a large bias towards recruiting males in research in this area. The reported 26,4% of female lower limb prosthesis users participating in studies was lower than what has been reported in a highly regarded national amputation registry

(SwedeAmp), 39% (234), as well as in previous research (34,5-38,4%) such as Claessen et al. (235) and Ziegler-Graham et al. (236). The present authors think it is noteworthy that, out of the (n=161) articles reporting characteristics on sex in the balance articles in Table 4 (12–14,19–23,25,26,28,29,31–42,44,45,47,48,50–56,58,59,62–69,71–75,77–85,88–90,92,94–102,105–120,122–136,138,140–153,155,157–165,167–179,181–184,186–198,230,231) and the (n=62) articles of balance confidence (4,6,8,14,44,71,78,81,83,94,134,138,143,145,147,148,150,151,153,155,157,159,163,165,172,175–178,183,193,196,199–203,205–209,211–229), 29,2% and 19,4% respectively, included male sex exclusively. There were only (n=2) studies with female participants, one balance article (231) and one balance confidence article (220). The reason for this is unknown to us. Potentially, men may volunteer more willingly in research studies, or possibly a selection bias on behalf of the researchers. Data from the previously mentioned national registry indicates that a larger number of males are amputated due to complications from diabetes. It is known that diabetes also affects balance (237), and therefore it is possible to motivate a somewhat larger number of male participants in balance studies in lower-extremity prosthesis users.

Comparing data on amputation levels is more challenging, as registry data may present their statistics differently from the present study. As an example, again comparing to the national registry of Sweden (234), is not done without problems as they only report levels proximal to the ankle. Furthermore, there could be differences in the definitions of the various amputation levels, as demonstrated by Jarl et al. (238). However, in an attempt to compare numbers, a recalculation of the summarised data was made, excluding ankle disarticulation, unspecified transtibial amputations, transfemoral amputations, and knee disarticulation, from the data. With the new numbers compared to those of the registry (234), it is revealed that unilateral transtibial level, in the body of literature, differs only minimally (balance articles 67,4% & balance confidence articles 63% vs 58%). When investigating unilateral transfemoral amputation/knee disarticulation, results differ more (balance articles 28.2% & balance confidence articles 30,3% vs 41%). The level of hip disarticulation is generally low in numbers but also differ (balance articles 0,1% & balance confidence articles 0% vs 1%).

Furthermore, SwedeAmp (234) reports that 11% of register participants are bilateral prosthesis users. In the present article, and with numbers recalculated to match the registry, the known bilateral participants are only 2,3% and 4,4% for balance articles and balance confidence articles, respectively. One should be cautious when interpreting these number, as parts of the body of literature had to be

excluded for the recalculation. Also, the uncertainty of what definitions of amputation levels have been used among the studies could affect this analysis. Further investigation would be needed, together with statistical analysis, in the future to determine if there is a statistically significant difference between the numbers of amputation levels in this review and those of SwedeAmp.

As mentioned, one secondary pattern that formed during extraction was a large number of studies including only male sex. We explored this further looking at amputation levels, limitations, validation and reliability, and the subsequent summarised descriptive statistics. There are possibilities for future investigations within this body of literature, that have not been investigated thoroughly in every possible aspect. E.g. the cause of amputation, age and comorbidity are all variables which could be interesting to compare to real-life statistics. Also, the country of origin for the studies and their participants would be interesting to investigate, as the population of lower limb prosthesis users may differ between different parts of the world. The results of the individual studies could perhaps also be analysed. Also, descriptive statistics investigating if any reason of limitation were more common among any specific study design. Finally, the articles included in this study were of quantitative nature, as were the two previous studies with similar research intention (11,15). It is unknown to us whether the qualitative aspects of balance and balance confidence are overlooked. This is a potential and highly interesting research area outside the scope of this review.

A limitation of this study is the fact that knee disarticulation and transfemoral amputation levels had to be added together to perform calculation of descriptive statistics. The reason is that several studies in the body of literature combined these two user groups when presenting their results, without possibility to distinguish how many of each there actually were. This is problematic as according to the International Classification of Diseases (ICD) (239), transfemoral amputation and knee disarticulation have two different diagnostic codes.

In this study, we have provided a synthesis of quantifiable methods utilized in evaluation of balance for prosthesis users. From the onset, the plan was also to include assessment methods of balance confidence and fear of falling. In the phase of selecting relevant articles from the search results, there was a realisation that both the field of balance assessment and the field of falls efficacy assessment contained sufficient numbers of articles to conduct two individual syntheses. In doing so, we have provided a new synthesis of the state of evidence in the field of balance, posture control and fear of falling that will benefit clinicians, researchers and prosthesis users.

Conclusion

Current research in the area of balance, postural control, balance confidence and fear of falling in individuals who utilize a limb prosthesis often lacks use of validated and reliable methods and instruments. This is problematic given its widespread prevalence in the field, as conclusions derived from this research are generally based on this growing body of literature. This primary issues should be addressed by researchers going forwards. Many studies mentioned small sample size as a limitation; therefore, larger sample sizes are recommended for future research.

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Conflict of interest

The authors report no conflict of interest.

Additional information

The present authors reached out to authors of the articles containing unspecified unilateral or bilateral prosthesis users (22,32,81,106,188), in an attempt to get complete data. However, no contact information was found to the authors of one study (125). Two authors responded with additional information (22,32).

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Figure 1

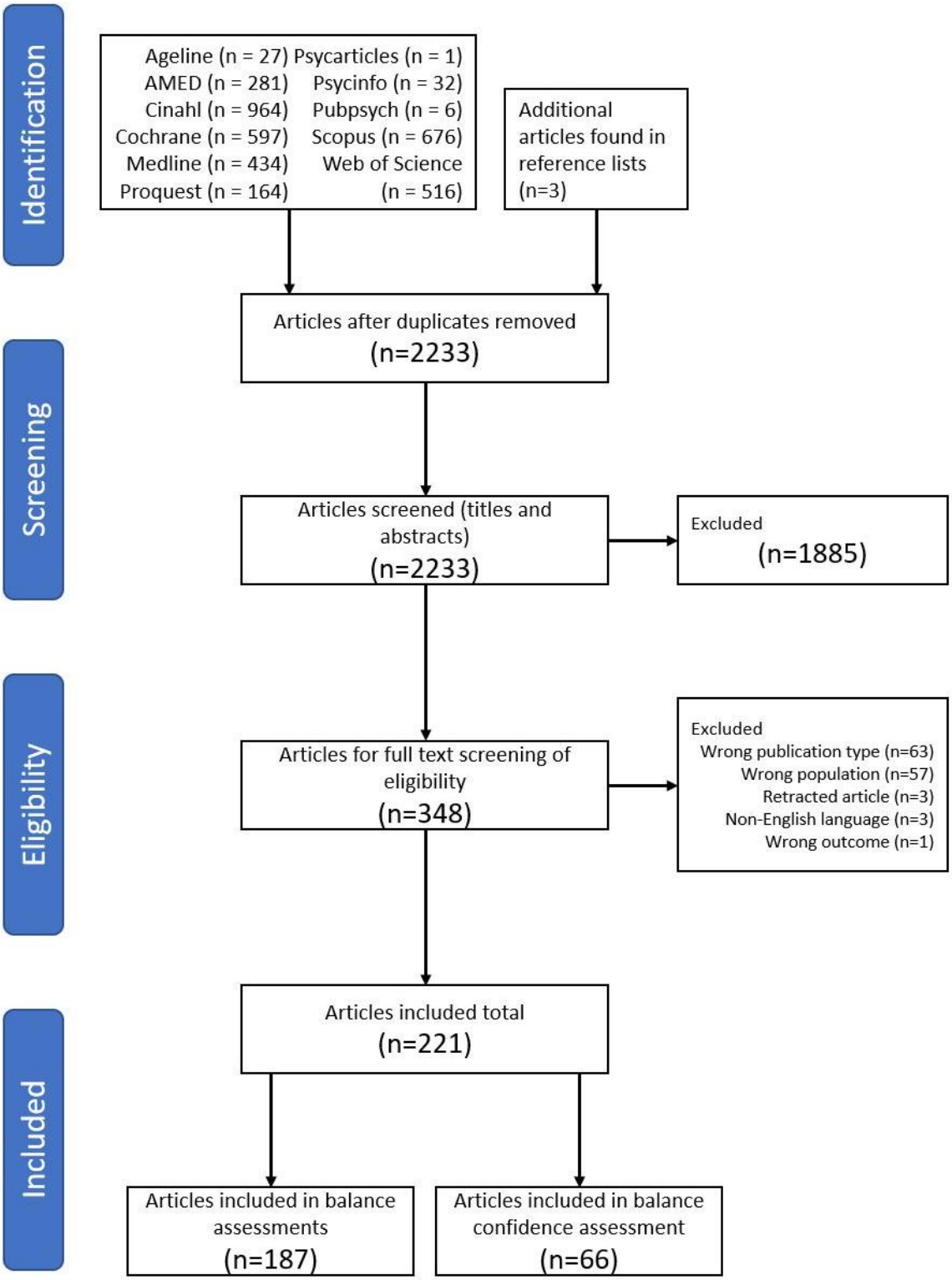

Figure 1 Process from initial database searches for balance, postural control, and balance confidence assessment, to final summary of articles including balance, postural control and balance confidence.

Table 1 Subject characteristics in studies of balance and balance confidence of lower limb prosthesis users.

Subject characteristics

Balance studies	**Participants**	**% total**	**Test group**	**Participants**	**%**
Unilateral TT	3253	59,3%	Male	3728	67,9%
Unilateral TF/KD	1360	24,8%	Female	1339	24,4%
NS TT	364	6,6%	NS sex	420	7,7%
NS TF/KD	284	5,2%	Total	5487	
Other amputation	102	1,9%	**Control group**	**Participants**	**%**
Bilateral	101	1,8%	Male	655	55,3%
Unilateral AD	16	0,3%	Female	235	19,8%
Unilateral HD	7	0,1%	NS sex	294	24,8%
Total	5487		Total	1184	
Balance confidence studies	**Participants**	**% total**	**Test group**	**Participants**	**%**
Unilateral TT	4114	56,4%	Male	5112	70,0%
Unilateral TF/KD	1978	27,1%	Female	2139	29,3%
NS TT	446	6,1%	NS sex	47	0,6%
Bilateral	320	4,4%	Total	7298	
NS TF/KD	310	4,2%	**Control group**	**Participants**	**%**
Other amputation	121	1,7%	Male	35	79,5%
Unilateral AD	8	0,1%	Female	9	20,5%
Unilateral HD	1	0,0%	NS sex	0	0,0%
Total	7298		Total	44	

Table shows participant characteristics, both test groups and control groups, regarding amputation level and sex across 'Balance studies' (n=187) and 'Balance confidence studies' (n=66). HD = hip disarticulation. TF = transfemoral. KD = knee disarticulation. TT = transtibial. AD = ankle disarticulation. NS TT/TF/KD = not specified if

unilateral or bilateral amputation. NS sex = not specified sex.

Table 2

Table 2 Indicators of a risk of bias, including validity, reliability and limitations such as sample size, generalisability issues, heterogeneity and homogeneity in sample, recall bias, and convenience sample, in studies of balance and balance confidence of lower limb prosthesis users.

Risk of bias

Balance studies	**No. of studies**	**%***	**%◇**	**Validity**	Report	LLP	Other
Small sample	51	27,3%	40,8%	No. studies	63	48	18
Generalizability issues	39	20,9%	31,2%	% of total	33,7%	25,7%	9,6%
Heterogeneity in sample	8	4,3%	6,4%	**Reliability**			
Recall bias	8	4,3%	6,4%	No. studies	65	46	23
Homogeneity in sample	7	3,7%	5,6%	% of total	34,8%	24,6%	12,3%
Convenience sample	5	2,7%	4,0%				
No. studies mentioning limitations	125	66,8%					
No. studies not mentioning limitations	62	33,2%					
Balance confidence studies	**No. of studies**	**%***	**%◇**	**Validity**	Report	LLP	Other
Generalizability issues	27	40,9%	46,6%	No. studies	38	34	4
Small sample	20	30,3%	34,5%	% of total	65,5%	58,6%	6,9%
Recall bias	8	12,1%	13,8%	**Reliability**			
Convenience sample	7	10,6%	12,1%	No. studies	43	40	3
Heterogeneity in sample	6	9,1%	10,3%	% of total	74,1%	69,0%	5,2%
No. studies mentioning limitations	58	87,9%					
No. studies not mentioning limitations	8	12,1%					

*Tables show prevalence of statements regarding limitations, validity and reliability in balance studies (n=187) and balance confidence studies (n=66). Only limitations mentioned more than a total of five times across all studies are presented in this table. *%-column shows the percentage of prevalence of each limitation across all studies and ◊%- column shows percentage of prevalence among the no. of studies that reported limitations. Report-column shows no. of studies that presented method or tool as valid or reliable, LLP-column if it was for lower-limb prosthesis users, Other-column if it was for another patient group.*

Table 3

	1978	1981	1986	1988	1991	1992	1994	1997	1998	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	
BALANCE TESTS																															
DUAL OR SINGLE LIMB																															
Dual limb individually				1	1	2	2	1				1			1	1	3		3	2	3	2	2	4	4	3	4	7	3	3	**53**
Dual limb combined		1	2				1	1	1	1		1				1	2	1	2	2	1	5	2	5	3	3		1	1	1	**38**
Single limb measure							1									1	3				1	1				1		1			**9**
EQUIPMENT																															
Multiple forceplates				1	1	2	2	1				1			1	1	3		2	2	2	3	2	5	4	3	5	7	3	3	**54**
Motion capture									1	1						2	2			3	1	3	3	7	4	6	4	7	4	2	**50**
Single force plate		1	2				1	1	1	1		1				1	2	1	2	2	1	5	2	5	3	4		2	1	1	**40**
Plantar pressure platform																	1		1		1		1					2			**6**
Plantar force sensors insoles																1	1			1		1				1					**5**
TESTS AND PROTOCOLS																															
Berg Balance Scale											1						2		2	1		2	2	5	6	5		4	7	3	**40**
Timed-Up-and-Go											2		3		1			1		1		2	1		2			5	3	2	**23**
Limits of Stability																						2	3	2	1	2	2	3	1		**16**
Sensory Organization Test																	1		2	1	1	1	2	1	1			1		1	**12**
One leg balance test											2							1			1	2		2		1		1		1	**11**
Four Square Step Test																				1				2	1	1		1	2	1	**9**
Beam walking/standing							1																		1	1	1	2	2	1	**9**
AMP																				2		1				1	1	1			**6**
MCT/modified MCT																			1				1	1		1		1			**5**
Studies	1	1	2	1	1	2	4	2	1	1	4	2	3	1	2	3	7	2	6	9	6	12	10	20	17	17	9	18	13	10	**187**
BALANCE CONFIDENCE TESTS																															
ABC / ABC-6											2	1	2	1	1		2	1	1	1	3	4	2	6	5	7	2	6	8	3	**58**
FES / FES-I / mFES											1												1					2		1	**5**
Binary question											2			1			1					1										**5**
Houghton Scale											1														1		1	1				**4**
Fear of Falling rating scale																									1	1	1					**3**
Other																										1						**1**
Studies											4	1	2	1	1		3	1	1	1	3	4	3	6	5	8	3	7	8	4	**66**

Table 1 Prevalence of methods, equipment, tests and protocols, in studies assessing balance or balance confidence in lower limb prostheses users, over the years of 1978-2020. Some years are excluded due to absence published studies.

Table 4

Table 4 Results from (n=187) studies that quantifiably assesses balance or postural control followed by (n=67) articles that assess fear of falling or balance confidence. Articles are sorted by year in first hand, and by title in second hand.

Balance Studies

Author, year	Assessment type	Equipment	Outcomes	Setting	Participants	Control	Validity	Reliability	Limitations
Jennifer Lucarevic et al. (2020)	**mCTSIB**; ABC	mCTSIB: SunMate medium-density foam pad (40.6 × 45.7 × 7.6) with a washable cover was used (Dynamic Systems Inc., Leicester, NC, USA); cTUG protocol; ABC questionnaire	ABC score; mCTSIB classification	NS	67 unil. TT 63 unil. TF (67m, 57f, 6NS)	No control group	mCTSIB**	mCTSIB** test re-test and intra-rater reliability (r=.99, P<.01)	Convenience sample Generalizability Tests does not measure all factors related to balance
Myunghee Kim et al. (2020)	Dual limb individually Quiet standing and walking with various stiffnes settings	Split-belt instrumented treadmill (Bertec); 7-camera motion capture system (Vicon)	MoS; XcoM; step width variability; COP variability	NS	5 unil. TT (5m, 0f)	SATOC	NS	NS	Possibly lacked statistical power

Lonwabo Godlwana et al. (2020)	TUG	TUG protocol	TUG time	NS	60 unil. TT 17 unil. TF (49m, 28f)	44 unil. TT 33 unil. TF (51m, 26f)	NS	NS	Poor return rate of diaries High death rate Challenging follow-up
Hamid Charkhkar et al. (2020)	Dual limb individually SOT	SMART Balance Master (Natus Medical Inc.), safety harness	Equilibrium score; DISTRMS; AreaPE; weight symmetry	NS	2 unil. TT (2m, 0f)	No control group	NS	NS	NS
Christopher K. Wong et al. (2020)	ABC, **BBS**	ABC questionnaire, BBS protocol	ABC score; BBS score	Wellness-walking program	128 TF 177 TT (210m, 95f)	No control group	BBS* has exellent scale validity (person separation index = 2.72, r=0.88; item separation index = 4.70, r=0.96)	ABC* (ICC=0.91 and alpha=0.95) BBS* has excellent scale reliability (person separation index = 2.72, r=0.88; item separation index = 4.70, r=0.96)	No documentaton of volonteers who declined Retrospective design possibly missed data Sample limited to walkers Assessors not individually tested for reliability

Nooranida Arifin et al. (2020)	Dual limb combined Standing on various surfaces.; BBS	Biodex stability system (Biodex Medical System)	MLSI; APSI; OSI; BBS score	NS	10 unil. TT (10m, 0f)	SATOC	NS	BSS*: moderate-to-high intertester and intratester reliability	Small sample size Mixed cause of amputation Less challenging tasks Generalizability issues
Matthew J. Major (2020)	Treadmill walking with perturbation; BBS	Treadmill (Tuff Tread); 10-camera motion capture system (Qualisys)	ΔCoMexposure; ΔCoMpeak; T-reversal; BBS: 0-4 score per task, total 0-56	NS	6 unil. TT (1m, 5f)	13 non-impaired (6m, 7f)	BBS*: valid for LLUP	BBS*: reliable for LLUP	Difficult to isolate the effect of perturbation Disturbance relative to cycle was not controlled Small sample size

Andrew Sawers et al. (2020)	NBWT, FSST, TUG, 10mWT	Narrowing beam, FSST, TUG, 10mWT protocols	NBWT: score, /1.00; TUG: time (s); FSST: time (s); 10mWT: time (s)	NS	45 unil. TT 15 unil. TF (42m, 18f)	RS	NBWT* TUG* FSST* 10mWT*	Interrater ICC (1,1): NBWT*(0.99); TUG*(0.99); FSST*(0.99); 10mWT*(0.99) Test-retest ICC (2,1): NBWT*(0.90); TUG*(0.88); FSST*(0.97); 10mWT*(0.96)	Small sample size
Neža Majdiča, Gaj Vidmar and Helena Burger (2020)	OLSTP	None	Seconds	NS	120 unil. TT (95m, 25f)	No control group	NS	NS	NS
Nahime Al Abiad et al. (2020)	Dual limb individually Walking task	Unspecified forceplatforms ; Vicon motion capture system	CoM; MMA; dCOM-D	Laboratory	5 unil. TF (3m, 2f)	14 healthy controls (NS sex)	NS	NS	Small sample size Heterogenity of amputation levels Control group walked without shoes, prosthetic group with

									shoes Alignment of prosthetic always done with shoes
Andrew Sawers, Brian J. Hafner (2019)	**TUG; FSST; BBS; NBWT**	Narrowing beam; TUG, FSST, BBS protocols	TUG, FSST: time (s) NBWT: distance (m); BBS score	Outpatient clinic and research laboratory	25 unil. TT 15 unil. TF (21m, 19f)	VS	TUG* FSST* BBS* NBWT*	TUG* FSST* BBS* NBWT*	Small sample size Generalizibility issues Recall bias
Pol Monné Cuevas (2019)	BBS	BBS protocol	BBS score	Clinic	1 quadruple amputee (1m, 0f)	SATOC	NS	NS	NS
Amit Kumar Vimal et al. (2019)	Dual limb individually LOS with closed eyes	Forceplate (Zebris Medical GmbH)	COPnet; COPs; COPp	NS	5 unil. TF (NS sex)	5 healthy individuals (NS sex)	NS	NS	Sex distribution Effect of one day training AP-posturographic parameters only

									No intensity control of vibrotactile stimulation
Yuji Azuma et al. (2019)	BBS; TUG; 6MWT	BBS, TUG, 6MWT protocols	BBS score; 6MWT distance (m); TUG time (s)	NS	30 unil. TF (24m, 6f)	Comparing two groups (ambulatory device vs. no ambulatory device)	BBS*	BBS*: Inter- and intrarater is excellent TUG-t*: Inter- and intrarater is excellent	Age distribution Small sample size TFA used to assess validity of BBS Potential series effect, non randomized outcome measures
Nathaniel T. Pickle et al. (2019)	Walking on adjustable ramp	Unspecified amout of cameras for motion capture (Motion Analysis Corp.)	Whole-body angular momentum (H)	NS	10 unil. TT (9m, 1f)	10 able-bodied (8m, 2f)	NS	NS	Assumptions in inertial properties of body segments Sample is not truly random

Noah J. Rosenblatt et al. (2019)	BBS; Gait analysis	BBS protocol; unspecified "standard motion capture methods"	BBS score; Gait parameters	Laboratory	1 unil. TT (1m, 0f)	SATOC	NS	NS	NS
Aaron Fleming et al. (2019)	Balancing a virtual inverted pendulum	EMG-electrodes; Virtual inverted pendulum apparatus	Mean position sway; Sway size; no. of falls	NS	6 TT (5m, 1f)	6 able-bodied (5m, 1f)	NS	NS	Not age matched Small sample size
Claudia Ramos Claret et al. (2019)	Dual limb combined Quiet standing with eyes closed/open; BBS; TUG	FDM-S force platform (Zebris Medical GmbH)	BBS score; TUG time (s); COP; DIST; VEL, AREAce; WBI, EnHL	NS	12 unil. TF (7m, 5f)	12 able-bodied (5m, 7f)	NS	NS	NS
Marie Thomas-Pohl et al. (2019)	Dual limb individually Quiet standing in various slopes; BBS	2 force platforms (AMTI); Unspecified no. of cameras for motion capture (Vicon 8i)	BBS score; COP trajectory	NS	6 unil. TT (5m, 1f)	SATOC	NS	NS	Potential marker replacement errors Often high standard deviations on slope acquisitions.

Christopher Kevin Wong, Stanford T. Chihuri (2019)	BBS: item 10 (looking over both shoulders) and item 11 (turning 360 degrees)	BBS protocol	BBS score	10 outpatient facilities in 6 states	138 TT 105 TF (166m, 77f)	No control group	BBS*	BBS*: ICC>0.90	Selection bias Recall bias Inability to obtain missing information data Tester variability
Andrea Brandt et al. (2019)	Dual limb individually Walking on treadmill.	Dual-belt treadmill (1000Hz, Bertec Corp). 12-camera motion capture system. EMG sensors.	Lateral margin of stability; Stride width; ML COM excursion; Hip abductor activity	Laboratory	5 unil. TF 1 unil. KD (5m, 1f)	SATOC	NS	NS	Small sample size Did not use the same prosthetic ankle components across all subjects
Emma Haldane Beisheim et al. (2019)	F8WT, 360TT, mFSST	F8WT: cones; mFSST: tape	Time (s)	NS	50 unil. TT 17 unil. TF (39m, 28f)	Comparing two groups (K3 vs. K4)	F8WT** 360TT** mFSST**	F8WT**: intraclass correlation coefficient (0.61-0.99)	Generalizability issues Did not control for between group differences

Andrew Sawers, Brian J. Hafner (2019)	NBWT	Four low beams: 2.5 cm height, 1.8 m long, each narrower than the last (20 cm, 10 cm, 4.0 cm, and 2.0 cm)	Distance	NS	25 unil. TT 15 unil. TF (21m, 19f)	No control group	NBWT*	NS	Sample size should be increased in future Generalizability issues Few variables were studied
Andrew Sawers et al. (2018)	**NBWT; BBS; FSST; TUG**	Narrowing beam (6.71m long)	Normalized distance; BBS score; time (s)	Research laboratory and prosthetics clinic	25 unil. TT 15 unil. TF (21m, 19f)	VS	TUG* FSST* BBS* NBWT*	TUG*: excellent inter- and intrarater reliability BBS*: high inter- and intrarater reliabily	Generalizability issues
M. Barbara Silver-Thorn (2018)	Dual limb individually LOS; Weight-bearing Squats; unil. Stance with eyes closed/open	Balance Advantage-Dynamic CDP system (Bertec), safety harness	CoP; CoM; MXE; DC; WBS	NS	3 unil. TT 1 unil. TF 1 bil. TT (4m, 1f)	SATOC	NS	NS	NS
Matthew J. Major et al. (2018)	Treadmill walking with perturbation; BBS	Treadmill (Tuff Tread); 10-camera motion capture system (Qualisys); BBS protocol	MOS; Step length; Step width; Step time; BBS score	NS	6 unil. TT (1m, 5f)	13 non-impaired (6m, 7f)	BBS*	BBS*	Small sample size Did not vary perturbation magnitudes

									Risk of learning effect
Maria Grazia Benedetti at el. (2018)	Single and double quiet stance, with closed/open eyes	Delos Postural Proprioceptive System (DPPS 6.0, Delos)	PI; SI	NS	18 unil. rotationplasty (9m, 9f)	Normative values	NS	NS	Small sample size No data to compare with
Michael Overgaard et al. (2018)	BBS; TUG; Force plate measurements of standing and sitting	Tekscan HR Mat; Tekscan CONFORMat seat sensor	BBS score; TUG time; COP excursions;	"in private"	2 unil. TT 3 unil. TF (2m, 3f)	SATOC	BBS* TUG*	BBS* TUG*	Short duration - may affect reliability No standardized foot-placement
Andrew Sawers (2018)	NBWT	Narrowing beam (7.32m long, 4 segments or different widths)	Normalized distance	NS	25 unil. TT 15 unil. TF (21m, 19f)	No control group	NS	NS	Floor effects may affect the results
Céline Lansade et al. (2018)	TUG	TUG protocol	TUG Time (s)	NS	33 unil. TF 2 unil. KD (27m, 8f)	SATOC	TUG*	NS	Different causes of amputation

Michael McGrath et al. (2018)	Single limb measure Quiet standing, facing down a 5-degree slope	Unspecified no. of cameras, Codamotion system (Charnwood Dynamics); Kistler force plate (Kistler Group)	DOA; GRF; COP RMS	Laboratory	5 unil. TF (4m, 1f)	5 able-bodied (NS sex)	NS	NS	Participants had previous experience
Renée M. Hakim et al. (2018)	AMP PRO, FR, SLS, TUG	Stopwatch, two chairs, ruler, pencil, four inch high obstacle, three-step stairs, gait belt (around waist for safety).	Score 0-47, Time (s), Distance (in)	Prosthetic clinic	34 unil. TT 6 unil. TF (29m, 11f)	Comparing two groups (fallers vs non-fallers)	AMP* SLS* TUG*	AMP*: excellent inter-rater (0.99) and intra-rater (0.97), test-retest (ICC=0.88) SLS*: ICC=0.90-0.99 TUG*: intra- and interrater (r=0.93 and 0.96, respectively)	Generalizability issues Sample bias, all volunteered for the study Recall bias

James A. Sturk et al. (2018)	Dual limb individually Selfpaced walking through simulated environments	CAREN-extended virtual reality system (Motekforce Link), 12-camera motion capture system, 180 degree projection screen, 6-degree-of-freedom motion platform with dual belt instrumented treadmill (Bertec Corp.), safety harness	MOS; Step strategies measures; Variability measures	Laboratory	10 unil. TF (8m, 2f)	10 matched able-bodied (8m, 2f)	NS	NS	Small sample size

Christopher Kevin Wong et al. (2018)	ABC**; BBS (2 items)**	ABC questionnaire	ABC score; **BBS score**	10 outpatient facilities in USA	84 unil. TF 2 unil. KD 4 bil. TF 9 bil. TF/oth 122 unil. TT 10 bil. TT 1 unil. AD 5 bil. other 27 NS level (180m, 83f, 1NS)	SATOC	ABC* BBS*	ABC*	Unknown declined participants, use of prosthesis componentry and medications Dieting measure not validated Varied time between sessions, attendance and different assessors No conclusions can be drawn due to cohort design
Han Houdijk et al. (2018)	Dual limb individually Walking on 10 m walkway	2 force plates (Kistler 0.6x0.4m); 10-camera opto-electronic system (VICON)	SL; COM; Vcom; XcoM; MOSbw; BOS	Prosthetic center	15 unil. TT (15m, 0f)	SATOC	NS	NS	Generalizability issues

Vesna Bokan-Mirković et al. (2018)	**OLST, TUG**	Gaitview AFA-50; stopwatch	P ratio; P ratio p; F/F; F/F ratio p; R/F ratio; R/F ratio p; DP ratio; DP ratio p; Time (s)	NS	17 unil. TT (12m, 5f)	Comparing two groups (Trauma vs. DM)	NS	Gaitview AFA-50**: good to moderate reliability	Small sample size Paedobarography excluded other surfaces
Cleveland T. Barnett et al. (2018)	Dual limb combined **LOS**	Neurocom Pro Balance Master; safety harness	DCL; EPE; MXE; MVL; RT	Laboratory	12 unil. TT (10m, 2f)	12 matched controls (10m, 2f)	LOS*	LOS*	Wide range of ages and level of prosthetic use
Sara R. Koehler-McNicholas et al. (2018)	Dual limb individually SOT, LOS, modified MCT	NeuroCom Clinical Research System. Safety harness.	Mean equilibrium score; Mean COM excursion	NS	18 unil. TT (17m, 1f)	SATOC	NS	Fair-to-good 0.67-0.90 test-retest reliability*	NS
David F. Rusaw (2018)	Dual limb individually Quiet standing	Pro Balance Master (NeuroCom International Inc.); BP400600 AMTI Inc.; safety harness	Mean position COP in AP/ML; Mean magnitude GRF; Integral of AP/ML COP displacement	14 unil. TT (13m, 1f)	14 age-, sex-, height- and weight-matched	Movement of the CoP as a model for movement of centre of mass (CoM) in quiet standing is valid*	NS	Generalizability issues	

Evert S. van Hal et al. (2018)	Dual limb individually Walking with and without ML-pertubation, and stepping on projected light beams	Dual-belt treadmill with 2 forceplates: GRAIL, Motekforce Link. Safety harness. Motion capture: Vicon Bonita 10	GRFh; COP; Mhip; ML-trunk angle.	Center for Rehabilitation of the University Medical Center Groningen, Beatrixoord, Haren, the Netherlands	10 unil. TF (NS sex)	10 able-bodied age- and weight-matched (NS sex)	NS	NS	NS
Kyle H. Yeates et al. (2018)	Dual limb individually Walking with pertubation	4 Rigid force plates: AMTI BP400600. 1 Adjustable force plate: Kistler 9286AA. Motion capture: 12-camera Vicon Motion Systems.	COMx, MLFP; ML impulse; ES foot angle; RCAM	NS	3 unil. TT (3m, 0f)	No control group	NS	NS	Small sample size Terrain disturbance was in all conditions coupled with a step down
Courtney E. Shell et al. (2017)	Walk in 1-m-radius circle; Straight-line walking on 10-m-walkway	6 force plates (AMTI; Kistler); 12-camera motion capture system (Vicon Nexus)	Whole-body angular momentum (*H*); GRF	NS	8 unil. TT (8m, 0f)	SATOC	NS	NS	Only subjects less than 88 kg Prosthesis was modeled as a rigid body with a fixed axis of rotation for inverse dynamics

									calculations
Carol A. Miller et al. (2017)	**F8WT**	F8WT: cones, GAITRite	Time (s), amplitude (no. of steps taken), smoothness	NS	7 unil. TT 6 unil. TF 1 unil. HD 1 bil. TT 1 bil. TT/TF (5m, 11f)	SATOC	F8WT**	GAITRite**: interrater reliability ⩾0.99	Sample size Lack of control group Length of exercise program Residual limb shape and size
James A. Sturk et al. (2017)	Dual limb individually Selfpaced walking through simulated environments	CAREN-Extended virtual reality system (Motek Medical): 12-camera motion capture system (Vicon), 6-degree-of-freedom motion platform with dual-belt instrumented treadmill,	MOS; Step strategies measures; Variability measures	Laboratory	10 unil. TF (8m, 2f)	10 non-amputees (8m, 2f)	NS	NS	Various components could affect walking performance

		safety harness							
Francisco Molina-Rueda et al. (2017)	Dual limb individually LOS	Smart EquiTest System, version 8.0 (NeuroCom International Inc.); safety harness	COG; MXE; EPE; DCL	Motion Analysis, Biomechanics, Ergonomics, and Control Laboratory at Rey Juan Carlos University, Spain	18 unil. TT (15m, 3f)	24 non-amputees (21m, 3f)	NS	NS	Small sample size Instrument assessed low level demanding daily activities No consideration to activity level before amputation Reliability and validity of LOS needs examination

Charla L. Howard et al. (2017)	Dual limb individually Standing (eyes closed/open) on hard or soft surface, single-task and dual-task	2 force plates (Type 4060, Bertec Corp.); 2 soft foam pad (Airex Balance Pad, Sins)	PL; AREA	NS	13 unil. TT (7m, 6f)	15 age- and education-matched non-amputees (8m, 9f)	NS	NS	No homogeneous sample group Generalizability issues Inherent simplicity made it difficult for participants
Jenny A. Kent et al. (2017)	Dynamic balance Walking	12-camera motion capture system (Eagle, Motion Analysis System)	MOSml; AIM; XcoM	Laboratory	21 unil. TT (NS sex)	SATOC	NS	NS	NS
David Rusaw et al. (2017)	Dual limb individually LOS	2 forceplates (BP400600, AMTI, Inc.); 11-camera Oqus motion analysis system (Qualisys AB); Safety harness	COM; COP; DC; EPE; MXE; MV; RT	NS	7 unil. TT (7m, 0f)	7 matched controls (7m, 0f)	LOS*	LOS*: reliability good to excellent except reaction time	Generalizability issues Small sample size

Brian J. Hafner et al. (2017)	**AMP**; ABC	ABC questionnaire; AMP questionnaire	AMP score; ABC score	37 private prosthetic clinic	4 unil. AD 151 unil. TT 7 unil. KD 36 unil. TF 1 other (142m,57f)	NS	ABC*: convergent construct validity, and known-groups construct validity AMP*: has excellent intra- and inter-rater reliability, known-groups construct validity, and convergent construct validity	ABC*: convergent construct validity, and known-groups construct validity AMP*: has excellent intra- and inter-rater reliability, known-groups construct validity, and convergent construct validity	Limited generalizability Variations in clinical settings and/or administration may have been present
Andrew Sawers et al. (2017)	Beam-walking	Three fixed-width beams, 5,5m long	Normalized distance walked	Laboratory	19 unil. TT 11 unil. TF (15m, 15f)	No control group	NS	NS	Generaliziabilit y issues
Nathaniel T. Pickle et al. (2016)	Walking in slope	26-camera motion capture system (Motion Analysis Corp.); 16-ft instrumented walkway	Whole-body angular momentum (*H*); GRF; External Moment Arms	Laboratory	10 unil. TT (9m, 1f)	10 able-bodied (8m, 2f)	NS	NS	Assumptions in inertial properties of residual limb and prostheses

Francisco Molina-Rueda et al. (2016)	Dual limb individually MCT	Smart Equitest System version 8.0 (NeuroCom International Inc.); safety harness	WS; LS	Motion Analysis, Biomechanics, Ergonomics, and Control Laboratory at Rey Juan Carlos University, Spain	16 unil. TT (16m, 0f)	10 non-amputees (10m, 0f)	NS	NS	Small sample size Homogenity in sample group Reliability and validity of MCT outcome measures
David F. Rusaw et al. (2016)	Dual limb individually Quiet standing with eyes closed/open, and with weight-bearing feedback; Inverted Pendulum Model	2 forceplates (BP400600, AMTI); 8-camera Oqus (Qualisys)	iCOP; pCOP; lCOP; rCOP; gCOP; BOS; WBD	NS	6 unil. TT (6m, 0f)	6 able-bodied (6m, 0f)	Inverted Pendulum Model has kinematic and kinetic validity on intact limb and whole-body but not on prosthesis side	NS	Lack of randomization Homogenous sex in sample group, generalizability unknown

Christopher Kevin Wong et al. (2016)	BBS (3 tasks)	BBS protocol	BBS score	Community-based wellness walking programs in 8 U.S. states	1 unil. AD 79 unil. TT 2 unil. KD 63 unil. TF 9 bil. TT 4 bil. TT/TF 6 bil. TF 4 bil. other 12 no level listed (119m, 61f)	Comparison to other studies	BBS*	BBS*	Changes over time not included in study design Usage of walking aids not systematically recorded
Riley C. Sheehan et al. (2016)	**Similar to FSST**	CAREN (Motek Medical); 24-camera Vicon motion capture system	Step width; MOS; XCOM; COMvel; COM; Time	Laboratory	1 unil. TF (1m, 0f)	Normative values	NS	NS	NS
Jennifer Howcroft et al. (2016)	Walking on level ground and soft ground. BBS; CBMS	F-scan pressure-sensor insoles (Tekscan, Inc.); BBS protocol	COP; COP path; COP Path CoV; CBMS score; BBS score	NS	11 unil. TF 20 unil. TT (NS sex)	SATOC	BBS*	BBS*	NS
David F. Rusaw (2016)	Dual limb combined LOS	Pro Balance Master (NeuroCom International Inc); safety harness; 8-camera Oqus motion analysis system	CoP; CoM; RTcop; MVLcop; MXEcop; DCcop; RTcom; MVLcom; MXEcom; DCcom	NS	21 unil. TT (17m, 4f)	21 able-bodied (17m, 4f)	LOS* Forceplate measures of COM*	NS	Caution when applying results to prosthetic limb due to combined limb on forceplate

		(Qualisys)							
Carolin Curtze et al. (2016)	Single leg measure NRBT	Force platform (AMTI); Ridges of various widths; Stopwatch; 8-camera motion analysis system (Vicon Motion System)	NRBT: Score 0-8; COM; COP; RMS	NS	18 unil. TT (18m, 0f)	15 able-bodied (15m, 0f)	NS	NS	NS
Gabriel de Souza Prim et al. (2016)	Adapted Rombergs test; BBS; Tinetti Gait and Balance Test	14-cameras Motion Capture System (Vicon)	MAO; MPO; MOR; MOL; BBS: 0-4 score per task, total 0-56; Tinettis: scoring 0-16; Gait parameters	Laboratory	14 unil. TT (68%m, 32%f)	14 able-bodied (10m, 4f)	BBS**	BBS**: high test-retest objectivity (ICC = 0.98), good reliability (0.96)	Availability of volunteers
Matthijs H Spaan et al. (2016)	Single-limb standing balance test	NS	Score 0-6	Rehabilitation setting	45 unil. TT 37 unil. TF/KD (56m, f26)	No control group	NS	NS	NS

Meissam Sadeghisani et al. (2016)	Dual limb combined Quiet standing with eyes closed/open	Force plate (Kistler 50x60cm)	COP, postural sway in AP and ML	NS	20 TT (NS sex)	20 able-bodied matched (NS sex)	NS	NS	Balance pattern in dynamic tasks not clear Only 2 types of feet was investigated Small sample size
Christopher Kevin Wong et al. (2016)	**BBS**	BBS protocol	BBS score	NS	4 unil. TT 1 unil. TF (NS sex)	SATOC	BBS*	ABC*: excellent test-retest and internal consistency (ICC = 0.99, Chronbach's alpha = 0.95) BBS*: (ICC > 0.94) (person-separation reliability = 0.88, item-separation reliability = 0.96, Cronbach's α = 0.83)	Small sample size No control group
Jason Highsmith et al. (2016)	CS-PFP-10	Stopwatch	Time	Laboratory	20 unil. TF (16m, 4f)	5 non-amputees (3m, 2f)	CS-PFP10**	CS-PFP10**	Not validated for prosthesis users

									No blinding
Zehra Guchan et al. (2016)	BBS	BBS protocol	BBS score	NS	12 unil. TT (12m, 0f)	12 sedentary peer amputees (12m, 0f)	NS	NS	Bias in outcome due to unil. amputation Small sample size Homogenity i sample group
Jason Highsmith et al. (2016)	Dual limb combined CS-PFP-10; AMP; LOS	Stopwatch; Force platform: Biodex Balance SD System	Time; score 0-100	NS	10 unil. TF (8m, 2f)	VS	LOS* AMP* CS-PFP-10*	AMP* CS-PFP-10**	NS
Silvia Porras-Rangel et al. (2016)	Unspecified measure of balance	Training via biofeedback rehabilitation (Biodex)	MxTB; MnTB	Centro de Rehabilitación Integral “Sra. Olivia Miramontes Aguirre” in Guadalajara, Mexico.	20 unil. TF (12m, 8f)	20 unil. TF (16m, 4f)	Biodex biofeedback training system**	NS	NS

Mark D. Geil et al. (2016)	Dual limb individually Quiet standing	2 AMTI force platforms	TOTEX; TOTEXap; TOTEXml; MVELO; MVELOap; MVELOml; AREA-CE; WBC	NS	4 unil. Symes (2m, 2f)	5 age-matched controls (2m, 3f)	NS	NS	Small sample size Few subjects with syme amputation
Jennifer Howcroft et al. (2015)	BBS; CBMS	BBS protocol	BBS score; CBMS score	NS	11 unil. TT (NS sex)	Other studies	NS	NS	NS
Francesco Paradisi et al. (2015)	BBS; UGS	BBS protocol; UGS: Inertial Measurement Unit (FreeSense, Sensorize)	BBS score; RMS in AP/ML	NS	20 unil. TT (17m, 3f)	SATOC	BBS*	BBS*: high reability	No test for uneven terrain
Prasath Jayakaran et al. (2015)	Dual limb individually SOT	SMART EquiTest 2 Force platforms	RMSD; mVel; COP	University balance clinic	18 unil. TT (15m, 3f)	17 able-bodied (12m, 5f)	SOT*	SOT*: acceptable test-retest reliability	Small sample size

Brian J. Hafner et al. (2015)	**TUG**; ABC	ABC questionnaire	ABC score; TUG-Fast (s); TUG-Comf (s)	Laboratory	12 unil. TF (12m, 0f)	NS	TUG*: acceptable validity ABC*: good validity	TUG*: good reliability ABC*: good reliability	Variations in passive knee condition No blinding of investigators to the interventions Small sample size
Ava D. Segal et al. (2015)	Dual limb individually Walking with perturbation	Split-belt instrumented treadmill (Bertec); 12-camera Vicon MX system	COPex; COPmin; moments in ankles and hips	Laboratory	10 unil. TT (9m, 1f)	12 Able-bodied controls (9m, 3f)	NS	NS	Sound from perturbation may have initially startled participants Generalizability issues Uneven amout of trials for amputees and non-amputees

Caroline E. Roffman et al. (2015)	10mWT; TUG; 6MWT; FSST	Standardized equipment	Walking speed, Distance, Time (s)	NS	140 unil. TT 6 unil. KD 41 unil. TF 22 bil. LLA (171m, 38f)	Comparing between two groups	10mWT* 6MWT* TUG*	6MWT* TUG*	Missing retrospective data Recall bias Participants unable to do the tests properly were included in analysis Assessment time varied
Moineau B. et al. (2015)	Dual limb combined Quiet standing with eyes closed; Gait initiation	Force plate (model OR6.5 AMTI)	Mean velocity of COP; Mean amplitude of COP; AP and ML sway	NS	3 unil. HD 8 unil. TF (8m, 3f)	17 healty age-matched (11m, 6f)	NS	NS	NS
Fan Zhang et al. (2015)	Walking on level ground and a ramp	3D motion capture system (Xsens Technologies B.V.)	Full-body angular momentum	Laboratory	2 unil. TF (1m, 1f)	NS	NS	NS	Task transitions not considered between walking on level ground and stairs
Nooranida Arifin et al. (2015)	Dual limb combined Counterbalance test; BBS	Biodex Stability System; BBS protocol	OSI; APSI; MLSI; BBS score	Laboratory	10 unil. TT (10m, 0f)	NS	BSS**	BSS**	NS

Anna Pagel et al. (2015)	Dual limb individually Quiet standing (eyes closed/open) and walking on treadmill	Treadmill: h/p cosmos with 2 force plates.; Unspecified force sensor mounted between prosthetic foot and shank tube.	BWI; RMS; COP; SEn; SDR; SLR	NS	3 unil. TF (3m, 0f)	NS	Collected data valid*	NS	NS
Duo Wai-Chi Wong et al. (2015)	Gait stability test	10-m walkway, three-dimensional motion capture system (MX-40, Vicon)	Lateral sway velocity of COM; Variability index	Laboratory	6 unil. TT (6m, 0f)	NS	NS	NS	Small sample size
Christopher Kevin Wong et al. (2015)	**BBS**	BBS protocol	BBS score	NS	22 unil. TT 13 unil. TF 2 bil. TT 2 bil. TT/TF 1 bil. TF (24m, 16f)	NS	BBS*	BBS*: Excellent inter- and intrarater	Small sample size Generalizability issues

Francisco Molina-Rueda et al. (2015)	Dual limb individually LOS	Smart Equitest System version 8.0 (NeuroCom International Inc.)	MVL; MXE; EPE; DCL; COG	Laboratory (Motion Analysis, Biomechanics, Ergonomics, and Control Laboratory (LAMBECOM) at Rey Juan Carlos University, Spain)	10 unil. TT (10m, 0f)	10 participants (10m, 0f)	NS	NS	Small sample group Heterogenous sex in group Generalizability issues Only statistically measured differences and if not clinically significant Reliability and validity of LOS in LLA needs to be examined

Christopher Kevin Wong et al. (2015)	**BBS**	BBS protocol	BBS score	NS	8 unil. TF 2 bil. TF/TT (NS sex)	SATOC	BBS*	BBS*	Sample size in subgroups Small sample size Inconcistent acclimation period No control of prosthetic fitting and ankle/foot unit Generalizability issues to other MPK designs No control of training or practice outside study
Andrew Sawers et al. (2015)	Beam-walking with motion capture	Three 3,66m long beams of varying width; 8-camera Vicon motion capture system	Normalized distance walked	NS	5 unil. TT (5m, 0f)	NS	NS	NS	NS

Christopher Kevin Wong et al. (2015)	**BBS**	BBS protocol	BBS score	NS	29 unil. TT 18 unil. TF 1 unil. AD 3 bil. TT 1 bil. TF 2 bil. TF/TT (36m, 18f)	NS	BBS*	BBS*: Excellent inter- and intrarater reliability	Recall bias Small sample size
Fatome Khiri et al. (2015)	Dual limb combined Quiet standing and walking on level surface	Force plate: Kistler Motion capture: Qualisys	COPEAP; COP EML; PLAP; PLML; VAP; VML.	NS	5 unil. TF (NS sex)	5 healthy subjects (NS sex)	NS	NS	Small sample size Generalizability issues
Nathaniel T. Pickle et al. (2014)	Walking in stair	26-camera motion capture system (Motion Analysis Corp.); 2 force plates (AMTI)	Whole-body angular momentum (*H*); GRF; External Moment Arms	NS	9 unil. TT (8m, 1f)	9 able-bodied (6m, 3f)	NS	NS	Did not directly evaluate fall risk or ability to recover from perturbation
Jason T. Kahle et al. (2014)	Dual limb combined LOS; FSST	Biodex balance SD system (Biodex Medical Systems); Stopwatch; Canes	LOS: overall score; FSST: time (s)	Laboratory	10 unil. TF (8m, 2f)	NS	FSST* GAITRite**	FSST* GAITRite**	Accommodation time possibly a limitation Sample size small
M. Jason Highsmith et al. (2014)	Dual limb individually SOT	Equitest dynamic posturography balance platform	Sensory preference scores in VIS, VEST and PREF	NS	16 unil. TF (NS sex)	NS	NS	NS	Experimental conditions not randomized

		(NeuroCom)							
Nooranida Arifin et al. (2014)	**Dual limb combined Quiet standing with eyes open/eyes closed; BBS**	BSS (Biodex Medical System)	OSI; APSI; MLSI; BBS score	Laboratory	10 unil. TT (10m, 0f)	SATOC	NS	BSS**	Generalizability issues
C. Beatriz Samitier et al. (2014)	BBS; FSST	BBS and FSST protocol	BBS score; FSST time (s)	NS	16 unil. TT (14m, 2f)	NS	BBS** FSST*	FSST*: excellent inter-observer and test-retest reliabilities	Small sample size Measurements are missing
Kenton R. Kaufman et al. (2014)	Dual limb individually Walking with perturbation	CAREN; instrumented dual-belt treadmill (Forcelink); 12-camera motion capture system (Motion Analysis Corp.); safety harness	Mean trunk flexion angle and velocity	NS	11 unil. TT (11m, 0f)	SATOC	NS	NS	Few biomechanical variables Generalizability issues Homogeneity
Laura Hak et al. (2014)	Walking on treadmill	CAREN (Motek Medical BV); 12-camera motion capture (Vicon); safety	Step length; BW MOS; FFP; TP; vCOM	NS	10 unil. TT (9m, 1f)	NS	NS	NS	Generalizability issues

		harness							
Christopher Kevin Wong et al. (2014)	**BBS**	BBS protocol	BBS score	NS	24 unil. TT 17 unil. TF 1 unil. AD 2 bil. TT 2 bil. TF (32m, 14f)	NS	BBS*	BBS*: excellent intrarater and interrater reliability	Small sample size Self-reported height/weight without adjustment for amputated limb Houghton scale ceiling effect Lack info about prosthetic training Lack clinical measures that contribute to balance ability
Jerrold Scott Petrofsky, Iman Akef Khowailed (2014)	Dual limb combined Standing on various surfaces, performing tasks	Square balance platform with strain gauges in the cornes (TML Strain Gauge FLA-6)	Mean ±SEM of postural sway	NS	10 unil. TT (5m, 5f)	10 able-bodied (5m, 5f)	TML Strain Gauge FLA-6**	TML Strain Gauge FLA-6**	NS

Nooranida Arifin et al. (2014)	Dual limb combined Standing on various surfaces; BBS	Biodex stability system (Biodex Medical System)	MLSI; APSI; OSI; BBS score	Laboratory	10 unil. TT (10m, 0f)	9 able-bodied (9m, 0f)	NS	BSS**	Influence of other accurate sensory systems (visual and vestibular) Experienced and skilled participants Small sample size
Morten Tange Kristensen et al. (2014	OLST	Digital stopwatch	Time (s)	NS	19 unil. TT 17 unil. TF (23m, 13f)	NS	OLST*: valid, but questioned	OLST*: Interrater reliability ICC=0.87	NS
Eduardo J. Beltran et al. (2014)	Walking in virtual enviroment with perturbation	CAREN (Motek); safety harness; 24-camera motion capture system (Oxford Metrics)	Xcom; MOS; BOS	NS	9 unil. TT (9m, 0f)	13 able-bodied (10m, 3f)	NS	NS	Generalizability issues
Christopher K. Wong (2014)	BBS	BBS protocol	BBS score	Acute care hospital; acute rehabilitation; outpatient setting	3 unil. TT 1 unil. AD 1 bil. TF (4m, 1f)	NS	BBS*: internal validity	BBS*: inter- and intrarater is excellent	Limited to people using prostheses Generalizability issues Handheld video recorder

Erik C. Prinsen et al. (2014)	**One leg balance test**	NS	Time (s)	Research department of a rehabilitation centre	10 unil. TF/KD (6m, 4f)	NS	NS	NS	Small sample size Acclimatization time was short Uncertain if mobility test correlate to daily life
Darren Bolger et al. (2014)	Dual limb individually Standing task with perturbation	2 force plates (AMTI); 8-camera motion capture system (Vicon)	COP; COM, Stability margin; net peak COP; peak COM	NS	5 unil. TT (5m, 0f)	5 age- and sex-matched (5m, 0f)	NS	NS	Small sample size Homogenity in sample group
Andrew Hansen et al. (2014)	**Dual limb individually Quiet standing with open/closed eyes; LOS; MCT**	NeuroCom Smart EquiTest Clinical Research System	LOS Maximum Excursion; QS Equilibrium Score;	NS	12 unil. TT (NS sex)	NS	NS	NS	Testing order not randomized Brief accommodation time
Rainer Beurskens et al. (2014)	Walking with and without perturbation	CAREN (Motek); instrumented treadmill embedded in 6-degree-of-freedom motion platform; 24-camera motion capture (Vicon	Step length; Step width; Step lenght variability; Step width variability; MeanSDpos; MeanSDvel; MaxFM; (λ*S)	NS	9 unil. TT (9m, 0f)	13 able-bodied (10m, 3f)	(λ's)**	NS	Small sample size

		Motion Systems)							
Rainer Beurskens et al. (2014)	Walking with and without perturbation	2m x 3m treadmill in CAREN (Motek); 24-camera motion capture (Vicon Motion Systems)	COM; ML and AP trajectories of segmental COM movements; (λ*s); MaxFM;	NS	9 unil. TT (9m, 0f)	13 able-bodied (10m, 3f)	NS	NS	NS
Marco Iosa et al. (2014)	Walking on level surface	Inertial sensor (3-axis accelerometer. Freesense, Sensorize)	RMS; Harmonic ratio; SRI	Clinical setting	14 unil. TF 8 unil. TT (15m, 7f)	22 age-matched (12m, 10f)	NS	NS	Small subgroup size Possible influenced results from walking aids (crutches) Different prosthetic components

Emma Feick et al. (2014)	Dual limb combined Quiet standing CB&M	Force plate: Bertec; Nexus software Inc.	Force plate: COP RMS in the combined AP/ML direction CBMS: Score 0-96	Laboratory	3 unil. Symes 3 unil. TT 4 unil. TF/KD (3m, 7f)	10 healthy age-matched controls (7m, 3f)	NS	NS	Not all selected measures investigated for pediatric LLA population
Laura Hak et al. (2013)	Walking with and without perturbation	CAREN (Motek Medical BV), 6-degree-of-freedom motion platform in combination with a virtual enviroment; 12-camera motion capture system (Vicon)	Lyapunov exponent (λs-step); BW and ML MOS;	NS	10 unil. TT (9m, 1f)	9 able-bodied (4m, 5f)	NS	NS	Small sample size Generalizability issues Possible COM was not accurate
Matthew J. Major et al. (2013)	**BBS; L-test**	BBS and L-test protocol	BBS score; L-test time (s)	Research laboratory	13 unil. TT 14 unil. TF 3 bil. LLA (20m, 10f)	TT vs. TF	BBS*: high validity	BBS*: high reliability L-test*: Intrarater reliability (ICC=.97); interrater reliability (ICC=.96)	Convenience sample Generalizability issues Recall bias Unknown if BBS can identify changes from therapeutic

									interventions
Prasath Jayakaran (2013)	Dual limb combined SQT; TUG	NeuroCom BM force platform	TT*; TS; time (s)	NS	12 unil. TT (NS sex)	NS	SQTT*	SQTT*	Unclear precision of variables in test (SQT)
Christopher Kevin Wong et al. (2013)	BBS	BBS protocol	BBS score	NS	24 unil. TT 13 unil. TF 2 bil. TT 1 bil. TF/TT (26m, 14f)	NS	BBS*: scale validity excellent	BBS*: PSI of 2.72, with a reliability of .88; ISI of 4.70, with a reliability of .96	Convenience sample Small sample size Clinical info that may have influenced balance wasn't recorded Limited info about participants prosthesis, not recorded
C.T. Barnett et al. (2013)	Dual limb individually LOS; SOT	2 Force plates in NeuroCom Equitest	COG; MXE; EPE; DCL; MVL; RT	NS	7 unil. TT (7m, 0f)	NS	NS	NS	NS

Gigi Adrian Aiordachioae et al. (2013)	Walking on level surface	Capacitive platform (Zebris)	COP trajectory	NS	8 unil. TT (7m, 1f)	NS	NS	NS	NS
J. Ackman et al. (2013)	Dual limb individually SOT; MCT; LOS	2 AMTI Force plates; NeuroCom SMART EquiTest	GRF; Postural sway; Dynamic posturography; Weight bearing symmetry; Mean maximum excursion	NS	12 unil. rotationplasty (8m, 4f)	12 age and sex matched controls (NS sex)	NS	NS	Small sample size
Barbora Kolarova et al. (2013)	Dual limb combined LOS	Force platform in a Smart EquiTest System (NeuroCom)	COG; MXE; EPE; DCL; MVL; RT	Laboratory	10 unil. TT (10m, 0f)	17 healthy (17m, 0f)	NS	NS	Small sample size Heterogenous and non-randomized group Use of only one prosthetic foot Generalizability issues
Deanna H. Gates et al. (2013)	Walking over loosed rock surface	26-camera motion capture system (Motion Analysis, Santa	COM; COM velocity; MOS; Step width; Step length	Laboratory	11 unil. TT (10m, 1f)	Compared to another study	NS	NS	NS

		Rosa)							
Deanna H. Gates et al. (2013)	Walking on level ground and loose rock surface	Unspecified camera amount for motion capture (Motion Analysis, Santa Rosa, CA)	MOSmin; COM; step width variability	Laboratory	13 unil. TT (12m, 1f)	15 healthy young adults (12m, 3f)	NS	NS	Generalizability issues Impossible to measure COP on rock surface
L. Yang et al. (2012)	Dynamic walking	LEAFS; 8-camera Vicon motion analysis system; 2 force platforms (AMTI OR-6)	GRF; Trunk sway; Symmetry ratio	Clinical motion analysis laboratory	3 unil. TT (1m, 2f)	NS	LEAFS**	NS	NS
Carol A. Miller et al. (2012)	**Dual limb combined LOS**	Biodex Balance System	OSI; API; MLI	NS	2 unil. TF (2m, 0f)	Normative values	NS	BSS** GAITRite**	Can not conclude if balance indeed had improved
Carolin Curtze et al. (2012)	Dual limb individually Standing with perturbation	2 unspecified force plates; 8-camera Vicon motion capture system.	Joint moments; GRF	NS	15 unil. TT (15m, 0f)	13 able-bodied (NS sex)	NS	NS	Predictable method for participants Different from real-life

Vincent Gremeaux et al. (2012)	TUG; BBS; FRT; 2MWT; One-leg balance test	TUG, BBS, FRT protocols	TUG time; BBS score; FRT distance; 2MWT distance; One-leg balance time	NS	47 unil. TT 17 unil. TF (54m, 10f)	VS	TUG*	TUG* BBS**: good intra- and interexaminer reproducibility FRT**: reasonable reproducibility 2MWT*	No validation at initial phase Selection bias Generalizability issues Selection of tests could be criticized
Jan Andrysek et al. (2012)	Dual limb combined Quiet standing on forceplate; CB&M	Forceplate (Bertec Corp., Model 4060)	COP Area; Max COP excursion; RMS; Score 0-96	University hospital outpatient clinic and participants' places of residence	3 unil. TF 3 unil. Van Ness (2m, 4f)	10 typically developing children (5m, 5f)	CB&M**	CB&M**	Data problem No control group not recieving Wii fit therapy CB&M needs formally examination 4 of 6 participants past 12mo postsurgery

Aydan Aytar et al. (2012)	Single limb measure Static balance	Kinesthetic Ability Trainer (SportKAT 3000)	BI, static balance score	NS	6 unil. TT 3 unil. TF 1 unil. HD (10m, 0f)	No control group	NS	NS	Small sample size No control group Other statistical analysis was impossible due to sample size Generalizability issues
Marc J. Nederhand et al. (2012)	Dual limb combined Quiet standing with and without perturbation	1 forceplatform (AMT-Mini 45SI-580-20) embedded in 6-degree-of-freedom dynamic motion platform. 6-camera motion analysis (VICON)	SW; DW; DBC	NS	8 unil. TT 6 unil. TF (12m, 2f)	Reference values	NS	NS	Only focuses on ankle Unclear relation between functional level and balance strategy
Robert S. Gailey (2012)	AMP; CHAMP	AMP protocol; CHAMP protocol	AMP score; CHAMP score	NS	60 unil. TT 32 unil. TF 12 bil. TT 7 bil. TF 7 bil. TT/TF (118m, 0f)	VS	AMP*	AMP*: excellent reliability	NS

Prasath Jayakaran et al. (2012)	Dual limb individually SOT	NeuroCom SMART Equitest® version 8.4.0	ES; SS; COP excursion in AP; COP velocity in AP	NS	15 unil. TT (NS sex)	VS	NS	NS	Small sample size
David Rusaw et al. (2012)	Dual limb combined LOS; RWS; SB	Pro Balance Master (NeuroCom International Inc.)	AVml; AVap; DCml; DCap; RT; ME; DC; RMSap; RMSml; MVap; MVml; PPS; Pml; Pap; AMPml; AMPap	NS	24 unil. TT (19m, 5f)	SATOC	NS	SB**: moderate to excellent LOS**: moderate to excellent (ICC 0.78-0.93) RWS**: moderate (ICC 0.6-0.7)	Use of single force platform instead of two Settings in feedback system
Christopher Kevin Wong et al. (2012)	**BBS; TUG**	BBS protocol; TUG protocol	BBS score TUG time	NS	1 TF (1m, 0f)	SATOC	NS	NS	Single-case study No recording of prosthetic adjustment or parameter setting Not standardized physical therapy

Jason T. Panzenbeck, Glenn K. Klute. (2012	Dual limb combined Standing balance, eyes open/closed; Gait on treadmill with disturbance	Force plate: Kistler Unspecified treadmill and force plate; Safety harness Motion capture: 12-camera Vicon system	Standing: COP deviation. Gait: step width in millimeters.	NS	1 unil. TF (NS sex)	SATOC	NS	NS	Heavy weight of prosthetic foot Only short stump TT could be fitted
Prasath Jayakaran et al. (2011)	Dual limb individually SOT	NeuroCom SMART Equitest system, version 8.4.0	ES; SS; CS	University balance laboratory	15 unil. TT (12m, 3f)	RS	NS	SOT*	NS
Prasath Jayakaran et al. (2011	SQT	NeuroCom Static BM system - dual force platforms	Turn time; Turn sway	NS	15 unil. TT (NS sex)	SATOC	SQT*	SQT*	Turning side in TUG not specified Preferred turning side not recorded Small sample size
Carolin Curtze et al. (2011)	Walking on irregular surface	8-camera Vicon motion capture system	COM; XcoM; Gait parameters	Laboratory	18 unil. TT (18m, 0f)	17 healthy subjects (17m, 0f)	NS	NS	Problem measuring exact COP position

Monica spruit-van eijk (2011)	One-leg-standing balance test	NS	unspecified	Nursing facilities	1 unil. HD 17 unil. TF 5 unil. KD 23 unil. TT 2 unil. minor amp. (18m, 30f)	Compared to other studies	NS	NS	Possible recall bias Generalizability issues
Petra Hlavackova et al. (2011)	Dual limb individually Quiet standing with eyes closed	Plantar pressure (Zebris FDM-S Multifunction Force Measuring Plate)	ACoP, VCoP; BW distribution; SEnCoP	NS	8 unil. TF (NS sex)	NS	NS	NS	Standardized foot position possibly contributing to postural behaviour
Ágnes Mayer et al. (2011)	Dual limb combined and Single limb measurement	Force platform: ZWE-PII, Budapest	COP trajectories; Td; Rd	NS	10 unil. TT (8m, 2f)	Comparing between two groups (SPU vs. FFA)	NS	NS	One and not two independent force platforms
Claudine J.C. Lamoth et al. (2010)	Walking with self-selected speed in four different terrains	A tri-axial accelerometer (Dynaport MiniMod, McRoberts BV)	RMS of AP/ML trunk accelerations; Sample entropy; Local stability exponent	NS	8 unil. TF (5m, 3f)	8 controls (5m, 3f)	NS	NS	Heterogenous group Subjects were experienced walkers
Claude Vincent et al. (2010)	BBS; AMP	BBS and AMP protocol	BBS score, AMP score	Participants homes	2 unil. TT 8 unil. TF (8m, 2f)	No control group	NS	NS	NS

Ahmed HA Mohieldin et al. (2010)	Dual limb combined SOT	SMART Balance Master (NeuroCom International, Inc.)	Composite Equilibrium Score	NS	14 unil. TT 7 unil. TF (20m, 1f)	20 healthy individuals (18m, 2f)	NS	NS	NS
Noel Lythgo et al. (2010)	TUG; 6MWT; FSST	Peak Motus Motion Measurement System; GAITRite; Digital video camera (Sony); 2 Force plates (AMTI)	Gait parameters; Time (s); Distance (m)	University research center	5 unil. TF (5m, 0f)	SATOC	NS	NS	Possible that test was not sensitive enough and "ceiling effect" was present
Ava D. Segal et al. (2010)	Walking in a circle(1m radius) and on a treadmill	12-camera Vicon 612 motion capture system	Lyapunov Exponent (λ)	NS	10 unil. TT (9m, 1f)	Compared with other mobility-impaired populations	NS	NS	Limited by safety issues in creating a more challenging task
C. Kendell et al. (2010)	Dual limb individually Walking in various environments	F-Scan pressure-sensor insoles	A/P COP; M/L COP; CellTrig; MaxLat; ST; DST	NS	20 unil. TT (15m, 5f)	15 able-bodied (NS sex)	NS	NS	Not age matched controls Modification of instruments
Michele A. Raya et al. (2010)	AMP with prosthesis	AMP protocol	AMP score	NS	44 unil. TT 28 unil. TF (47m, 25f)	NS (No control)	AMP*	AMP*: Good interrater and intrarater reliability	Large number of predictor variables could limit reproducibility

Lenka PK et al. (2010)	Dual limb combined Quiet standing with eyes closed/open	Forceplate with two load cells (strain gauges, Gauge factor-2)	AP range; ML range; RMS distance; mean distance; sway velocity; sway area and mean power frequency	NS	20 unil. TT (NS sex)	NS	NS	NS	NS
Carolin Curtze et al. (2010)	Dual limb individually Balance recovery from an evoked fall in 10% forward-inclined position	2 AMTI force plate, 8-camera Vicon motion capture system. Safety harness.	XcoM; COM; COP	NS	17 unil. TT (17m, 0f)	17 healthy age-, sex-, height- and weight-matched (17m, 0f)	NS	NS	Too simplified dynamics in stumbling Test method different from daily life
Barbara Susan Robinson et al. (2009)	Dual limb combined SOT; ABC	NeuroCom SMART Balance Master (NeuroCom Interna-tional, Inc.)	Equilibrium score; ABC score 0-100%	NS	1 bil. TT (1m, 0f)	SATOC	SOT**	SOT**	NS
Natalie Vanicek et al. (2009)	Dual limb individually SOT; MCT	2 force plates NeuroCom Smart Equitest system	Equilibrium score; Strategy score; COG; response latency (ms); Weight symmetry	Laboratory	9 unil. TT (7m, 2f)	9 able-bodied (5m, 4f)	NS	NS	Small sample size Generalizibility issues

Cyril Duclos et al. (2009)	Dual limb combined Quiet standing; BBS	Balance Master (NeuroCom International), safety harness; BBS protocol	BBS score; CP position; RMS	NS	10 unil. TT 4 unil. TF 1 unil. KD (NS sex)	17 non-amputated age-matched healthy controls (NS sex)	NS	NS	Small sample size, limited statistical test
Petra Hlavackova et al. (2009)	Dual limb individually Quiet standing	Zebris FDM-S Multifunction Force Measuring Plate system	WBI; COP displacements	Unversity medical bioengineering laboratory	12 unil. TF (NS sex)	SATOC	NS	NS	NS
Özlem Ülger et al. (2009)	BBS	BBS protocol	BBS score	NS	10 unil. TF (NS sex)	SATOC	NS	NS	NS
Rougier P.R. et al. (2009)	Dual limb individually Quiet stance	Force platforms: PF02, Equi+	Body weight distribution; CPres; CPa; CPs	NS	15 unil. TT 11 unil. TF (22m, 4f)	Comparison between two groups (TF vs. TT)	NS	NS	NS
Suh-Jen Lin et al. (2008)	6MWT; TUG; One-leg balance	6MWT, TUG, one-leg balance protocols	6MWT: Distance (m); TUG: time (s); One-leg balance: time (s)	University research laboratory	13 unil. TT (9m, 4f)	NS (no control)	TUG*	TUG*: high intrarater and interrater reliability One-leg balance** 6MWT*	Heterogenous group Cause of comorbidity uncertain

Kanade RV et al. (2008)	Dual limb combined Quiet standing	Kistler force platform (Kistler 925 3A12 Multicomponent force plate)	CoP 2D; CoP M-L; CoP A-P	NS	22 unil. TT (20m, 2f)	23 controls with diabetic neuropathy (19m, 4f)	NS	CoP-sway**	Uncertain cause of balance deficit Only side-by-side stance
Duclos C. et al. (2007)	Dual limb combined BBS	Equitest (Neurocom); BBS protocol	CoP; BBS Score	NS	4 unil. TF 1 unil. KD 9 unil. TT (NS sex)	18 healthy subjects age matched (NS sex)	NS	NS	NS
L. Ming-Yih et al. (2007)	Single leg quiet standing	Force measurement system (Model CMS-HS, Zebris Medizintechnik)	COM; HTI; CTSLI; MSDI; ASDI	NS	4 unil. TT (3m, 1f)	SATOC	NS	NS	NS
K.R. Kaufman et al. (2007)	Dual limb individually; SOT	Computerized dynamic posturography platform (Equitest, NeuroCom international Inc.); safety harness	Equilibrum score	NS	15 unil. TF (12m, 3f)	SATOC	NS	NS	Short time accommodating Generalizability issues
Kamil Yazicioglu et al. (2007)	Dual limb combined One-leg static balance measure; BBS; Binary question of fear of falling	KAT balance system (Kinesthetic Ability Trainer); BBS protocol;	BBS score; BI; Fear of falling Yes/No	NS	9 unil. TT (9m, 0f)	10 unil. TT (10m, 0f)	NS	NS	Uncertain if balance made football better or vice versa Distribution of dominant-side

									amputation between groups
At L. Hof et al. (2007)	Dual limb individually Walking on treadmill; Stroop-test	Treadmill which walking surface was divided into a left and a right half, each provided with four transducers for measuring the vertical ground reaction force	COM; COP; XcoM; Step width	NS	6 unil. TF (4m, 2f)	6 healthy controls (NS sex)	NS	NS	NS
A.H. Vrieling et al. (2007)	Dual limb individually Standing on moving platform in AP-direction; Open eyes, blindfolded and while performing a dual task	CAREN system, 2 force plates	WBI; GRFz; GRFy; dCOPy	NS	5 unil. TT 3 unil. TF (6m, 2f)	9 able-bodied (8m, 1f)	NS	NS	Small sample size and heterogenous groups Generalizability issues Different foot positions among subjects Technical limitations

Ming-Yih Lee et al. (2007)	Single leg standing Treadmill gait	Motion analysis system: Zebris CMS-HS Plantar Force sensors: FSR Treadmill: AG-7600 Aerogym trading company	HTI; SLI; MSDI; ASDI; DSTI; CTCI; SSTI; SSPI	NS	5 unil. TT (3m, 2f)	SATOC	NS	NS	NS
Ming-Yih Lee et al. (2006)	Single leg standing Treadmill gait	Motion analysis system: Zebris CMS-HS Plantar Force sensors: FSR	HTI; SLI; MSDI; ASDI; DSTI; CTCI; SSTI; SSPI	NS	2 unil. TT (2m, 0f)	SATOC	NS	NS	NS
Ajay Gupta et al. (2006)	Dual limb individually Static standing, eyes closed	2 unspecified force plates; dynamic posturography unit	Sway in % LOS	NS	15 unil. TT (11m, 4f)	15 unil. TT (12m, 3f)	NS	NS	NS
Mouchnino L. et al. (2006)	Dual limb combined Quiet standing and lateral leg raise	Kistler force platform Motion capture (E.L.I.T.E. system)	CM displacement; joint angles	NS	5 unil. TT (5m, 0f)	5 unimpaired (5m, 0f)	NS	NS	NS

A. Barry Deathe et al. (2005)	ABC scale; **TUG**	ABC questionnaire; TUG protocol	ABC score; TUG time	NS	69 unil. TT 24 unil. TF (73m, 20f)	RS/VS	TUG*	TUG*: excellent intrarater (r=.93), interrater (r=.96). ABC*: Internal consistency (cronbach alpha=.93), 4-week retest reliability (ICC=.91)	Walk test not random order Randomly selected sample would have led to more confidence in findings Generalizability is limited
Tammie M. Quai et al. (2005)	Dual limb individually Quiet stance with eyes close/open; FLRT	2 forceplates (Kistler Instrumente)	COP; COPE; WB	Laboratory	22 unil. TT (16m, 6f)	Compariso n between two groups	NS	NS	Relatively small sample size Generalizability issues Use of "classification and regression trees" uncommon in rehabilitation
Trad L. McGuire (2004)	FRT; Tinetti Gait and Balance assessment	Yardstick	Distance; Tinetti: points	Nursing facility	1 unil. TT (0m, 1f)	SATOC	Tinetti** 6MWT** TUG** FRT**	Tinetti** 6MWT** TUG** FRT**	NS

William C. Miller et al. (2003)	ABC; **TUG**	ABC questionnaire	ABC score; TUG time	Outpatient amputee clinic in Ontario	281 unil. TT 98 unil. TF (278m, 101f)	RS/VS	ABC*: Good support for construct validity TUG*: convergent and divergent validity	ABC* internal consistency: Cronbach alpha=.93; 4-week test retest reliability was ICC=0.91. TUG*: excellent test-retest (ICC=.93), interrater (ICC=.96)	Convenience sample Estimate of scale's reliability may be biased due to drop-outs Generalizability issues Heterogeneity in sample
William C. Miller et al. (2003)	ABC; **TUG**	ABC questionnaire	ABC score, TUG Time (s)	60 unil. TT 24 unil. TF (66m, 18f)	SATOC	ABC* TUG*	ABC*: strong internal consistency and four-week test - retest reliability TUG* has exellent intra- and inter-rater reliability		Convenience sample Heterogeneity in sample Generalizability issues
Z. Matjacic et al. (2003)	Standing on prosthetic leg only during stance; TUG; 10mWT	NS	Time (s)	Clinical setting	14 unil. TT (NS sex)	SATOC	NS	NS	Methodological difficulties e.g. changing prosthesis due to modfification of the new one

									Subjects were "old" accustomed users
Buckley J.G. et al. (2002)	Dual limb combined Quiet standing (static balance) and dynamic balance.	Force platform (Kistler); Modified dynamic stabilimeter.	RsqCP; CPrange; ES; CP	Department of Sport and Exercise Science at the Manchester Metropolitan University	3 unil. TT 3 unil. TF (6m, 0f)	6 able-bodied (6m, 0f)	NS	NS	NS
Heidi Nadollek et al. (2002)	Dual limb individually 'Quiet stance' and 'even stance' with eyes closed/open	2 forceplates (Kistler Instrument Corp.)	Weight-bearing in percentage; ML SD COPE; AP SD COPE	NS	22 unil. TT (NS sex)	NS (no control)	NS	Gait measures*	NS

William C. Miller et al. (2001)	**TUG**	ABC questionnare; Houghton questionnare	ABC score; Houghton score	University-affiliated outpatient amputee clinic, in Ontario, Canada	286 unil. TT 103 unil. TF (287m, 102f)	SATOC	TUG*: convergent or divergent validity ABC**: Convergent and discriminant validity Houghton*: Convergent validity to 2MWT, TUG, ABC	TUG*: Test-retest (r=.93), interrater (r=.96) ABC*: internal consistency (alpha=.96), 2-week test-retest reliability (r=.92) Houghton*: internal consistency (alpha=.68), test-retest (r=.85)	NS
H. Burger et al. (2001)	One leg balance test	NS	Time (s)	Participants homes	17 unil. TT 11 unil. TF (28m, 0f)	55 healthy sedentary (20m, 35f)	NS	NS	NS
Faith Erbahceci et al. (2001)	Flamingo Balance Test (Standing on one leg)	Stopwatch	Amount of time required for balanced stance on one leg in seconds	NS	20 unil. TT (NS sex)	20 unil. TT (NS sex)	NS	NS	NS

Anne Cowley et al. (2001)	**BBS, TUG**, FES	BBS, TUG, FES: protocols	BBS score; TUG time; FES score	Clinical setting	7 unil. TT (6m, 1f)	SATOC	BBS** TUG**	BBS**: ICC>0.95 both inter- and intra-rater TUG**: ICC>0.99 both inter- and intra-rater	Limited amount of data Longer follow-up desirable
J-M. Viton et al. (2000)	Dual limb combined Standing lateral leg raise	Kistler force plate; optoelectic system(ELITE) for motion capture; unspecified EMG-electrodes	RMS; CP; Lateral shift of CP; EMG-recordings of various muscles	NS	5 unil. TT (5m, 0f)	5 age-matched controls (5m, 0f)	NS	NS	NS
L. Mouchnino et al. (1998)	Dual limb combined Standing with lateral leg raise	1 Kistler force platform; TV-image processor (EL.I.TE. System); EGM-electrode	COP; RMS; CG	NS	5 unil. TT (5m, 0f)	5 unimpaired age- and sex-matched controls (5m, 0f)	NS	NS	NS
Eli Isakov et al. (1997)	Dual limb individually Standing with eyes opened/closed	2 force plates (Kistler Z-4305)	AP and ML forces	NS	19 unil. TT (19m, 0f)	9 healthy (9m, 0f)	NS	NS	NS

Aruin AS et al. (1997)	Dual limb combined Quiet standing, load manipulations, catching falling objects	Force platform (AMTI OR-6); three 2-axis gonimeters; accelerometer (Sensotec)	EMG; degrees; dCP; time (s)	NS	6 unil. TT (5m, 1f)	6 healthy subject (5m, 1f)	NS	NS	Small sample size
Y. Hermodsson et al. (1994)	Dual limb combined Standing balance: one and two legs	Force platform (Kistler)	Standing time; S(x); S(y)	NS	36 unil. TT (27m, 9f)	27 healthy persons (19m, 8f)	Standing balance test**	Standing balance test**	NS
E. Isakov et al. (1994)	Dual limb individually Standing with eyes closed	2 Kistler Z-4305 platforms	TSA; ASYM; WBI; AP and ML forces	NS	3 unil. TT (2m, 1f)	SATOC	NS	NS	NS
Alexander C. H. Geurts et al. (1994)	Dual limb individually Quiet standing and active weight shifting, while performing arithmetic tast	Unspecified force platform with 2 aluminium plates.	RMS; Vcp; Acp	NS	4 unil. TT 5 unil. KD 3 unil. TF (9m, 3f)	12 healthy age- and sex-matched (9m, 3f)	NS	NS	NS
Kathi G. Tedford et al. (1994)	B.O.G.M.T.	Beam	B.O.G.M.T.-score	NS	21 unil. TT (16m, 5f)	21 able-bodied (16m, 5f)	NS	NS	NS
Eli Isakov et al. (1992)	Dual limb individually Quiet standing with eyes closed/open.	2 force plates (Kistler Z-4305)	SA; ASYM; WBI	NS	11 unil. TT (11m, 0f)	9 able bodied (9m, 0f)	NS	NS	NS

Geurts AC et al. (1992)	Dual limb individually Quiet standing with eyes closed/open/blurred	2 unspecified force platforms	CP; RMS; CP velocity; Weight distribution	NS	3 unil. TF 3 unil. KD 4 unil. TT (7m, 3f)	10 healthy (7m, 3f)	NS	NS	NS
Alexander C.H. Geurts et al. (1991)	Dual limb individually Quiet standing with dual-task assignment (Stroop-test)	2 forceplates (Load cells, type LM-IOOKA, Kyowa Electronic Instruments CO.)	RMS CP velocity in AP and ML;	NS	2 unil. TF 2 unil. KD 4 unil. TT (5m, 3f)	Group of healthy, age- and sex-matched subjects (5m, 3f)	NS	NS	Sample size small Generalizability issues
G.D. Summer et al. (1988)	Dual limb individually Unsupported standing	DVF (double video forceplate)	WD; Maximum weight-bearing under each foot; Area of stability; AP stability; Lateral stability	NS	4 unil. TT 2 unil. Gritti-stokes (TF) 3 unil. TF 1 unil. HD (NS sex)	SATOC	NS	NS	NS
Vittas D et al. (1986)	Dual limb combined Quiet standing	Unspecified force plate with strain-gauges	COP movement	NS	20 unil. TT (18m, 2f)	Comparing two groups (age >59 vs age <59)	NS	NS	NS

Christiane Gauthier-Gagnon et al. (1986)	Dual limb combined Quiet standing with eyes closed/open	Unspecified force plate with strain-gauges	Mean COP position; Mean surface of sway	NS	11 unil. TT (10m, 1f)	30 non-amputees (15m, 15f)	NS	NS	NS
L.A. Clark et al. (1981)	Dual limb combined	1 force platform (Kistler 9261A)	COP; COP deviations;	NS	5 unil. TF (1m, 4f)	SATOC	NS	NS	NS
Geoffrey R. Fernie et al. (1978)	Quiet standing with eyes closed/open, with pull cables attached to body and transducers	Transducers (R.I. Controls, model 4046)	Mean sway speed	NS	50 TF 29 TT (NS sex)	134 controls (NS sex)	NS	Methodology**	NS

Balance confidence studies

Author, year	Assessment type	Equipment	Outcomes	Setting	Participants	Control	Validity	Reliability	Limitations
Robert Gailey et al. (2020)	ABC	ABC questionnaire	ABC score 0-100%	National conference for people with limb loss	36 unil. TT 32 unil. TF (27m, 41f)	No control	NS	NS	Generalizability issues Functional muscle test is a gross measurement Reported statistical significance may be overly liberal

Jennifer Lucarevic et al. (2020)	mCTSIB; **ABC**	mCTSIB: SunMate medium-density foam pad (40.6 × 45.7 × 7.6) with a washable cover was used (Dynamic Systems Inc., Leicester, NC, USA); ABC questionnaire	ABC score 0-100%; mCTSIB classification	NS	67 unil. TT 63 unil. TF (67m, 57f, 6NS)	No control group	mCTSIB**	mCTSIB**: (test re-test and intra-rater reliability (r=.99, P<.01)	Convenience sample Genelizability issues Tests does not measure all factors related to balance
Christopher K. Wong et al. (2020)	**ABC**, BBS	ABC questionnaire, BBS protocol	ABC score; BBS score 0-100%	Wellness-walking program	128 TF 177 TT (210m, 95f)	No control group	BBS* has exellent scale validity (person separation index = 2.72, r=0.88; item separation index = 4.70, r=0.96)	ABC* (ICC=0.91 and alpha=0.95) BBS* has excellent scale reliability (person separation index = 2.72, r=0.88; item separation index = 4.70, r=0.96)	No documentaton of volonteers who declined Retrospective design possibly missed data Sample limited to walkers Assessors not individually tested for reliability

Cory L. Christiansen et al. (2020)	FES-I	FES-I questionnaire	FES-I score (of 64)	Veterans Administrations Medical Center	26 unil. TT 5 unil. TF (31m, 0f)	SATOC	FES-I**	FES-I** Cronbach alpha=0.96 and ICC=0.92-0.96	Small sample size Male participants only
Andrew Sawers et al. (2019)	TUG; FSST; BBS; NBWT; **ABC**	Narrowing beam; TUG, FSST, BBS, NBWT protocols; ABC questionnaire	TUG, FSST: time (s) NBWT: distance (m); BBS score; ABC score 0-100%	Outpatient clinic and research laboratory	25 unil. TT 15 unil. TF (21m, 19f)	VS	All balance instruments *	All balance instruments*: (intraclass correlation coefficient range .70-.99)	Small sample size Generalization of study result Recall bias
Christos Karatzios et al. (2019)	ABC	Self-administered questionnaire	ABC score 0-100%	Three tertiary care centres of physical and rehabilitation medicine	28 unil. TT 12 unil. TF 12 Gritti-Stokes (40m, 12f)	RS	NS	NS	Generalizability issues No cognitive screening

Katherine Fuller et al. (2019)	ABC, ABC-6	ABC questionnaire; ABC-6 short questionnaire	ABC score 0-100%; ABC-6 score 0-100%	Parkwood Institute in London, Ontario, Canada.	40 unil. TT 15 unil. TF 5 bil. TT (48m, 12f)	RS	ABC* ABC-6*	ABC-6*: Total study population (ICC = 0.92, 95% CI: 0.87–0.95), TTA-nonvas group (ICC = 0.95, 95% CI: 0.87–0.98), TFA/bil. group (ICC = 0.90, 95% CI: 0.76–0.96), TTA-vas group (ICC = 0.88, 95% CI: 0.72–0.95). Good internal consistency (Cronbach's α = 0.88). ABC*: Total study population (ICC = 0.90, (95% CI: 0.85–0.95), TTA-nonvas (ICC = 0.94, 95% CI: 0.85–0.98), TFA/bil. (ICC = 0.95, 95% CI:	Convenience sample Generalizability issues

						0.86–0.98), TTA-vas (ICC = 0.80, 95% CI: 0.55–0.92). Internal consistency (Cronbach's α = 0.92).

Noah J. Rosenblatt et al. (2019)	**ABC**; BBS; Gait analysis	BBS protocol; unspecified "standard motion capture methods"; ABC questionnare	ABC score 0-100%; BBS score; Gait parameters	Laboratory	1 unil. TT (1m, 0f)	SATOC	ABC*	NS	NS
Christopher Kevin Wong et al. (2019)	**ABC**; BBS: item 10 (looking over both shoulders) and item 11 (turning 360 degrees)	ABC questionnaire; BBS protocol	ABC score 0-4; BBS score	10 outpatient facilities in 6 states	138 TT 105 TF (166m, 77f)	No control group	ABC* BBS*	ABC* BBS*: ICC>0.90	Selection bias Recall bias Inability to obtain missing information data Tester variability
Susan W. Hunter (2019)	ABC	ABC questionnaire	ABC score 0-100%	NS	21 unil. TT 6 unil. TF (15m, 12f)	SATOC	NS	ABC*: good internal consistency and test-retest reliability	Small sample size Generalizability issues Follow-up time possibly too short Possibly recall bias in self-report

Valerie E. Kelly et. al. (2019)	ABC	ABC questionnaire	ABC score 0-4	Survey via computer or paper	703 unil. TT 383 unil. TF 205 bil. (904m, 384f, 3NS)	NS	ABC*: good convergent construct validity relative to performanc e-based instruments (r=0.72 with the 2-Minute Walk Test and r=−0.70 with the Timed Up and Go)	ABC*: shows excellent internal consistency (Chronbach α=0.95) [29], excellent test-retest reliability (ICC(1,1)=0.91 -ICC(3,1)=0.94 over repeated administration s)	Cross-sectional method cannot confirm a causal relationship between cognition and mobility Self-report ability and actual performance often differ Other variables may impact the relationship between cognition and mobility
Jette Schack et al. (2019)	ABC	ABC questionnaire	ABC score 0-4	Motion analysis laboratory Oslo Metropolitan University	22 unil. TF 28 unil. TT (30m, 20f)	VS	ABC* with simplified 5-option format	ABC* with simplified 5-option format has high internal consistency reliability	Small sample size Generalizability issues Laboratory setting may not reflext mobility in daily life

Andrew Sawers et al. (2018)	NBWT; BBS; FSST; TUG; **ABC**	Narrowing beam (6.71m long); NBWT, BBS, FSST, TUG protocols; ABC questionnaire	Normalized distance; BBS score; time (s); ABC score 0-100%	Research laboratory and prosthetics clinic	25 unil. TT 15 unil. TF (21m, 19f)	VS	NBWT* ABC* TUG* BBS* FSST*	ABC* TUG* BBS*	Limited generalizability
Jaclyn M. Sions et al. (2018)	ABC; Houghton scale	ABC questionnarie; Houghton questionnaire	ABC score 0-100%; Houghton score 0-12	NS	47 unil. TT (31m, 16f)	NS	ABC* Houghton*	ABC* Houghton*	Homogenous sample Generalizability issues Study design cannot determine long-term predicitve ability
Sara J. Morgan et al. (2018)	ABC	ABC questionnare	ABC score 0-4	NS	27 unil. TT (22m, 5f)	ABC* good construct validity	ABC* good test-retest reliability		Generalizability issues Potential bias in participant report Not blinded interventions

Christopher Kevin Wong and William Brooks Gibbs (2018)	**ABC**; BBS (2 items)	ABC questionnaire	ABC score 0-4	10 outpatient facilities in USA	84 unil. TF 2 unil. KD 4 bil. TF 9 bil. TF/oth 122 unil. TT 10 bil. TT 1 unil. AD 5 bil. other 27 NS level (180m, 83f, 1NS)	SATOC	ABC* BBS*	ABC*	Unknown declined participants, use of prosthesis componentry and medications Dieting measure not validated Varied time between sessions, attendance and different assessors No conclusions can be drawn due to cohort design

Fuenzalida Squella et al. (2018)	ABC; FES-I	ABC questionnaire; FES-I questionnaire	ABC score 0-100%, FES-I score	Study center	13 unil. TF (11m, 2f)	SATOC	ABC* FES-I*	NS	Selection bias Average age much younger compared to North American or European studies Small sample size Not standardized NMPK condition or prosthetic feet Not randomized
Vesna Bokan-Mirković et al. (2018)	**ABC**; TUG; OLST	ABC questionnare; Gaitview AFA-50; stopwatch	P ratio; P ratio p; F/F; F/F ratio p; R/F ratio; R/F ratio p; DP ratio; DP ratio p; Time (s); ABC score	Clinical centre of Montenegro	17 unil. TT (12m, 5f)	ABC*	Gaitview AFA-50**: good to moderate reliability		Small sample size Paedobarography excluded other surfaces
Cleveland T. Barnett et al. (2018)	Dual limb indivually. LOS **FES-I**	Neurocom Pro Balance Master; safety harness	DCL; EPE; MXE; MVL; RT; FES-I score 0-4	University biomechanics laboratory	12 unil. TT (10m, 2f)	12 matched controls (10m, 2f)	LOS* FES-I**	NS	Wide range of ages and level of prosthetic use

Carol A. Miller et al. (2017)	F8WT, **ABC**	F8WT protocol; GAITRite (GAITRite® Gold; CIR Systems, Havertown, PA, USA)	**ABC score 0-100%**; gait velocity at CWS (comfortable walking speed); time to complete, no. of steps taken.	ProCare Prosthetics & Orthotics, Inc. in Buford, GA, USA	7 unil. TT 6 unil. TF 1 unil. HD 1 bil. TT 1 bil. TF/TT (5m, 11f)	SATOC	F8WT**	ABC*: test-retest (r = .91) GAITrite**: (ICC = .80-.92 at preferred walking speed and ICC = .79-.89 at fast walking speed)	Small sample size No control group Length of exercise program No monitoring of stump shape and size
Milana P. Mileusnic et al. (2017)	Houghton scale; Fear of falling 10-point scale	Houghton questionnaire	Houghton Yes/no; Fear of falling score	NS	22 unil. TF 1 bil. 6 NS amputation (18m, 11f)	SATOC	NS	NS	Collected data not complete Small sample size
Brian J. Hafner et al. (2017)	AMP; **ABC**	ABC questionnaire; AMP questionnaire	AMP score; **ABC score 0-4**	37 private prosthetic clinic	4 unil. AD 151 unil. TT 7 unil. KD 36 unil. TF 1 other (142m,57f)	NS	ABC*: convergent construct validity, and known-groups construct validity AMP*: has excellent intra- and inter-rater reliability, known-	ABC*: convergent construct validity, and known-groups construct validity AMP*: has excellent intra- and inter-rater reliability, known-groups construct	Limited generalizability Variations in clinical settings or administration may have been present

							groups construct validity, and convergent construct validity	validity, and convergent construct validity	
Christopher Kevin Wong et al. (2016)	**ABC**; BBS (3 tasks)	ABC questionnaire; BBS protocol	ABC score 0-4; BBS score	Community-based wellness walking programs in 8 U.S. states	1 unil. AD 79 unil. TT 2 unil. KD 63 unil. TF 9 bil. TT 4 bil. TT/TF 6 bil. TF 4 bil. other 12 no level listed (119m, 61f)	Comparison to other studies	ABC* BBS*	ABC* BBS*	Changes over time not included in study design Usage of walking aids not systematically recorded

Riley C. Sheehan et al. (2016)	Similar to FSST; **Unknown survey regarding perceived stability and balance confidence.**	CAREN (Motek Medical); 24-camera Vicon motion capture system	Step width; MOS; XCOM; COMvel; COM; Time	Laboratory	1 unil. TF (1m, 0f)	Normative values	NS	NS	NS
Jason T. Kahle et al. (2016)	ABC	ABC questionnaire	ABC score 0-100%	NS	13 unil. TF (11m, 2f)	Comparison between two socket types	ABC*: "recognized as being valid and widely used"	NS	Small sample size
Brian J. Hafner et al (2016)	ABC	ABC questionnaire	ABC 0-4 scale	Letter/mail to participants	131 TT 70 TF (135m, 66f)	RS	NS	ABC* (ICC=0.95)	Time between test/re-test was relatively short Only paper and electronic methods of administration were included in this study
Laura Desveaux et al. (2016)	ABC	ABC questionnaire	ABC score 0-100%	NS	15 unil. TT (10m, 5f)	SATOC	ABC*	ABC*	Generalizability issues

Christopher K. Wong (2016)	ABC; fear of falling single numering rating scale	ABC questionnaire	ABC score 0-100%; Fear of falling numeric rating 0-10	NS	4 unil. TT 1 unil. TF (NS sex)	SATOC	BBS*	ABC*: excellent test-retest and internal consistency (ICC = 0.99, Chronbach's alpha = 0.95) BBS*: (ICC > 0.94) (person-separation reliability = 0.88, item-separation reliability = 0.96, Cronbach's α = 0.83)	Small sample size No control group
Barri L. Schnall et al. (2016)	ABC	ABC questionnaire	ABC score 0-100% of question regarding stair ascent	NS	10 bil. TF/KD	SATOC	ABC*	ABC*	Difference between study population and general population More heterogenous and complex injuries in study population than general population

Alena Mandel et al. (2016)	ABC	ABC questionnaire	ABC score 0-100%	NS	22 unil. TT (14m, 8f)	NS	NS	ABC*	Small sample size Can not say that low balance confidence causes physical activity avoidance Limited period of measuring activity
Brian J. Hafner and Robert L. Askew (2015	**ABC**	ABC questionnaire	ABC score 0-100%	Laboratory	12 unil. TF (12m, 0f)	SATOC	TUG*: acceptable validity ABC*: good validity	TUG*: good reliability ABC*: good reliability	Variations in passive knee condition No blinding of investigators to the interventions Small sample size
Lauren Reid (2015)	ABC	ABC questionnaire	ABC score	Ottawa Hospital Rehabilitation Centre	4 unil. Syme 63 unil. TT 3 unil. KD 13 unil. TF 3 bil. (66m, 20f)	NS	NS	NS	NS

Christopher Kevin Wong et al. (2015)	**ABC, Houghton scale,** BBS	BBS protocol ABC questionnaire Houghton questionnaire	BBS score ABC score 0-100% Houghton score	NS	22 unil. TT 13 unil. TF 2 bil. TT 2 bil. TT/TF 1 bil. TF (24m, 16f)	NS	BBS* ABC* Houghton* moderately correlate with TUG and 2MWT	BBS*: Excellent inter- and intrarater ABC* Houghton*: moderate internal consistency, excellent test-retest reliability	Small sample size Generalizability issues
Christopher Kevin Wong et al. (2015)	BBS; **Fear of falling rating scale, ABC**	BBS protocol; ABC questionnaire; Fear of falling scale,	BBS: 0-4 score per task, total 0-56; ABC score 0-100%; Fear of falling 0-10 numeric scale	NS	8 unil. TF 2 bil. TF/TT (NS sex)	SATOC	BBS*	BBS* ABC*: good test-retest reliability and internal consistency	Small sample size in subgroups Inconcistent acclimation period No control of prosthetic fitting and ankle/foot unit Generalizbility to other MPK designs limited No control of training or

									practice outside study
Christopher Kevin Wong et al. (2015)	**ABC**, BBS	ABC questionnaire BBS protocol	ABC score 0-100% BBS score	NS	29 unil. TT 18 unil. TF 1 unil. AD 3 bil. TT 1 bil. TF 2 bil. TF/TT (36m, 18f)	NS	ABC* BBS*	ABC* BBS*: Excellent inter- and intrarater reliability	Recall bias Small sample size No screening for medication
Nooranida Arifin et al. (2014)	Dual limb combined Quiet standing with eyes open/eyes closed; BBS; **ABC**	BSS (Biodex Medical System)	OSI; APSI; MLSI; BBS score; **ABC score 0-100%**	Laboratory	10 unil. TT (10m, 0f)	SATOC	NS	BSS**	Generalizability issues
Kenton R. Kaufman et al. (2014)	ABC	ABC questionnaire	ABC score 0-100%	NS	14 unil. TT (14m, 0f)	SATOC	ABC*	ABC*	Limited no. of biomechanical variables Generalizability issues

Christopher Kevin Wong et al. (2014)	BBS; **ABC**	BBS protocol; ABC questionnaire	BBS: 0-4 score per task, total 0-56; ABC score 0-100%	NS	24 unil. TT 17 unil. TF 1 unil. AD 2 bil. TT 2 bil. TF (32m, 14f)	NS	BBS* ABC*	BBS* ABC*	Small sample size Self-reported height/weight without adjustment for amputated limb Lack info about prosthetic training Lack clinical measures that contribute to balance ability
Erik C. Prinsen et al. (2014)	One leg balance test; **ABC**	ABC questionnaire	Time (s); ABC score 0-100%	Research department of a rehabilitation centre	10 unil. TF/KD (6m, 4f)	NS	ABC*	ABC*: Strong internal consistency and reliability	Small sample size Acclimatization time short Uncertain if mobility test correlate to daily life

Andrew Hansen et al. (2014)	Dual limb individually. Quiet standing with open/closed eyes; LOS; MCT; **ABC**	NeuroCom Smart EquiTest Clinical Research System ABC questionnaire	LOS Maximum Excursion; QS Equilibrium Score; ABC score	NS	12 unil. TT (NS gender)	NS	NS	NS	Testing order not randomized Brief accommodation time
Tim Pauley (2014)	ABC	ABC questionnaire	ABC score 0-100%	NS	17 unil. TF (13m, 4f)	SATOC	NS	NS	Generalizability issues
Matthew J. Major et al. (2013)	BBS; L-test; **ABC**	BBS and L-test protocol; ABC questionnaire	BBS score; time (s); ABC score 0-100%	Research laboratory	13 unil. TT 14 unil. TF 3 bil. LLA (20m, 10f)	TT vs. TF	BBS*	BBS*: high reliability L-test*: Intrarater reliability (ICC=.97); interrater reliability (ICC=.96)	Convenience sample Generalizability limited Recall bias Unknown if BBS can identify changes from therapeutic interventions
Cleveland T. Barnett et al. (2013)	mFES	mFES questionnaire	mFES overall score; mFES Factor One; mFES Factor Two	Human Performance Laboratory	7 unil. TT (7m, 0f)	SATOC	NS	NS	Small sample size Recruitment issues

Bita Imam et al. (2013)	ABC	ABC questionnaire	ABC score 0-100%	GF Strong Rehabilitation Centre, Vancouver, British Columbia	4 unil. TT 2 unil. TF (5m, 1f)	SATOC	ABC*	ABC*: Test-retest reliability (ICC = 0.96)	Cannot confirm results was from the intervention Small heterogenous sample and generalizability issues Possibly learning bias
Carol A. Miller et al. (2012)	Dual limb combined. LOS; **ABC**	Biodex Balance System; **ABC questionnaire**	OSI; API; MLI; **ABC score** 0-100%	NS	2 unil. TF (2m, 0f)	Normative values	NS	ABC*: test-retest reliability within a 4-week period (r = .91)	Can not conclude if balance indeed had improved
Kim Parker et al. (2012)	ABC	ABC questionnaire	ABC score 0-100%	NS	34 unil. TT (22m, 12f)	Comparison between two groups	ABC*	NS	Small sample size Convenience sample
Christopher Kevin Wong et al. (2012)	BBS; TUG; **ABC**	BBS protocol; TUG protocol; ABC questionnaire	BBS score; TUG time; ABC score 0-100%	NS	1 unil. TF (1m, 0f)	SATOC	NS	ABC*	Single-case study No recording of prosthetic adjustment or parameter setting

									Not standardized physical therap.
Han Houdijk et al. (2012)	ABC, Binary question of fear of falling.	ABC questionnaire	ABC score 0-100%; Fear of falling (yes/no)	NS	12 unil. TF 12 unil. TT (17m, 7f)	12 able-bodied (6m, 6f)	NS	NS	Walking speed potential confounding factor for gait adaptability performance Use of handrails for participants Heterogenous sample
William C. Miller et al. (2011)	ABC	ABC questionnaire	ABC score 0-100%	Tertiary rehabilitation hospital in the province of Ontario, Canada	55 unil. TT 10 unil. TF (52m, 13f)	SATOC	ABC*	ABC*	Other covariates could influence result Participants was in a programme specific target for obtaining prosthesis and maximizing

									walk ability Longer follow-up period would have been ideal
Brodie Sakakibara (2011)	ABC	ABC questionnaire	ABC score 0-4	NS	299 unil. TT 112 unil. TF 21 bil. 16 other (325m, 123f)	NS	ABC*	ABC*	Generalizability issues Cognitive function was not assessed
Christie Ferraro (2011)	ABC	ABC questionnaire	ABC score 0-100%	Four different physiotherapy offices	12 unil. TT 1 unil. TF (8m, 5f)	NS	ABC**	NS	Stude should be repeated with a larger population more representative of the actual population
Randy Carson et al. (2010)	ABC	ABC questionnaire	ABC score 0-100%	NS	1 unil. TF (0m, 1f)	NS	ABC*	ABC*	NS

Barbara Susan Robinson et al. (2009)	Dual limb combined SOT **ABC**	NeuroCom SMART Balance Master (NeuroCom Interna-tional, Inc.); ABC questionnaire	Equilibrium score; ABC score 0-100%	NS	1 bil. TT (1m, 0f)	SATOC	SOT** ABC**	SOT** ABC**	NS
Miho Asano et al. (2008)	ABC	ABC questionnaire	ABC score 0-100%	NS	303 unil. TT 112 unil. TF (295m, 120f)	NS	NS	NS	Young and heterogeneous sample Generalizability issues
Aline H. Vrieling et al. (2007)	ABC	ABC questionnaire	ABC-score 0-100%	University Medical Centre	12 unil. TT 7 unil. TF (16m, 3f)	10 able-bodied (9m, 1f)	NS	NS	No information of leg dominance
Kamil Yazicioglu et al. (2007)	Dual limb combined One-leg static balance; BBS; Binary question of fear of falling	KAT balance system (Kinesthetic Ability Trainer); BBS protocol	BBS score; BI; Fear of falling Yes/No	NS	9 unil. TT (9m, 0f)	10 unil. TT (10m, 0f)	NS	NS	Uncertain if balance made football better or vice versa Distribution of dominant-side amputation between groups
Philip M. Stevens et al. (2007)	ABC	ABC questionnaire	ABC score 0-100%	NS	1 unil. TF (1m, 0f)	SATOC	ABC*	ABC*	NS

A. Barry Deathe et al. (2005)	**ABC**; TUG	ABC questionnaire; TUG protocol	ABC score 0-100%; TUG time	NS	69 unil. TT 24 unil. TF (73m, 20f)	RS/VS	ABC* TUG*	ABC*: internal consistency: Cronbach alpha=.93; 4-week test retest reliability was ICC=0.91. TUG*: excellent test-retest (ICC=.93), interrater (ICC=.96)	Walk test not random order Randomly selected sample would have led to more confidence in findings Generalizability is limited
William C. Miller et al. (2004)	ABC; Binary question of fear of falling	ABC questionnaire	ABC score 0-100%; Binary answer (YES/NO)	Mailed surveys	156 unil. TF 63 unil. TT 15 unil. Symes 11 unil. KD (181m, 64f)	SATOC	ABC*	ABC*	NS

William C. Miller et al. (2003)	**ABC**; TUG	ABC questionnaire	ABC score 0-100%; TUG time	Outpatient amputee clinic in Ontario	281 unil. TT 98 unil. TF (278m, 101f)	NS	ABC* TUG*	ABC*: internal consistency: Cronbach alpha=.93; 4-week test retest reliability was ICC=0.91. TUG*: excellent test-retest (ICC=.93), interrater (ICC=.96)	Convenience sample Estimate of scale's reliability may be biased due to drop-outs Generalizability issues Heterogeneity in sample
William C. Miller et al. (2003)	**ABC;** TUG	ABC questionnaire	ABC score, TUG Time (s)	60 unil. TT 24 unil. TF (66m, 18f)	SATOC	ABC* TUG*	ABC*: strong internal consistency and four-week test - retest reliability. TUG* has exellent intra- and inter-rater reliability	Convenience sample Heterogeneity in sample Generalizability issues	

W.C Miller et al. (2002)	ABC	ABC questionnaire	ABC score 0-100%	NS	111 unil. TF 5 unil. KD 296 unil. TT 23 unil. Symes (309m,126f)	No control	ABC*: Further strong correlations with walk tests (r=.7) and self-report measures of prosthetic function (r=.67-.82)	ABC*: ICC=.91; inter-item ICC=.53-.87	Recall bias No temporal or causal relationship can be made due to cross-sectional method Validity and reliability undetermined for other test than ABC
William C. Miller et al. (2001)	Binary question of fear of falling	Questionnaire	Yes/no to binary question	Two Canadian, regional, university-affiliated outpatient amputee clinics.	23 unil. Symes 5 unil. KD 296 unil. TT 111 unil. TF (307m, 128f)	No control	NS	NS	Recall bias
William C. Miller et al. (2001)	Binary question of fear of falling; ABC scale	Questionnaire	Binary question of fear of falling: yes or no; ABC score 0-100%	Two university-affiliated outpatient amputee programs in southwestern Ontario.	319 unil. BK 116 unil. AK (309m, 126f)	SATOC	ABC: Evidence of convergent and discriminant validity is accumulating	ABC Scale**: 2-week test-retest reliability of r=.92 and Cronbach's alpha of .96	Recall bias Generalizability issues Cross-sectional data problematic

William C. Miller et al. (2001)	**Houghton scale**; TUG; **ABC**	ABC questionnare; Houghton questionnare	ABC score; Houghton score	University-affiliated outpatient amputee clinic, in Ontario, Canada	286 unil. TT 103 unil. TF (287m, 102f)	SATOC	TUG* ABC** Houghton*	TUG*: Test-retest (r=.93), interrater (r=.96) ABC**: internal consistency (alpha=.96), 2-week test-retest reliability (r=.92) Houghton*: internal consistency (alpha=.68), test-retest (r=.85)	NS
Anne Cowley and Kate Kerr (2001)	BBS, TUG, **FES**	BBS, TUG, FES: protocols	BBS score; TUG time; FES score	Clinical setting	7 unil. TT (6m, 1f)	SATOC	TUG**	BBS**: ICC>0,95 both inter- and intra-rater TUG**: ICC>0,99 both inter- and intra-rater	Limited data

*Explanations of the headings: Under the heading "Author (year)", the authors and year published are found. If there were three or more authors, only the first author is named and followed by "et al.". Under "Assessment", the type of assessment is presented. E.g., dual-limb combined mean that two limbs were placed at a single platform, while dual-limb individually means two limbs were placed on separate platforms in standing position or walking over multiple platforms with each limb hitting separate platforms, and single-limb measure mean one limb was placed in a force platform at a time. Also, if a specific task was performed, e.g., a named protocol or test, walking or standing, or a specific questionnaire, e.g., ABC, it can be found under this heading. Under the heading "Equipment", the equipment or protocols used for assessing balance, postural control or balance confidence, e.g., motion capture system, force plates, protocols or other specific items, can be found. Under the "Outcome"-heading, all the outcome measures relevant to balance assessment are found. Note that no specific outcome data are presented. The heading "Setting" present in what setting the study was conducted. If no setting was reported, it was marked with not specified (NS). Under "Participants"-heading, the number of participants, together with the amputation level, is presented. Also, the number of male or female participants in the parenthesis, where "(42m, 18f)" mean 42 males and 18 females. Under the heading "Control", it is presented the number of participants in the control group, if applicable. The sex is presented in the parenthesis. However, in some studies, the regular participants served as their own control group (SATOC), or there were comparisons made between participant sub-groups. Furthermore, some other studies were reliability or validation studies (RS and VS), where a control group was not applicable, and some studies compared their results to other studies or normative values. Under the "Validation" and "Reliability" headings, it is presented if the studies reported validity or reliability related to the assessment method. If a test, protocol, method or equipment was valid or reliable for lower limb prostheses users, this was marked with one *, e.g., "BBS*". If it was valid or reliable for other diagnoses or disabilities, this was marked with two **, e.g., "BSS**". If the study also reported what type of validity and reliability, and also any values, this was presented in the present summary as well. Lastly, the heading "Limitations" presents the mentioned limitations in the studies. Full abbreviation list can be found at the bottom of this table. In studies where variables were extracted but not utilized for both "Balance Studies" and "Balance Confidence Studies", bold text indicates the relevant variable.* ***(λ*S)*** *= local divergence exponents,* ***10mWT*** *= 10 meter walk test,* ***360TT*** *= 360-degree turn test,* ***6MWT*** *= 6 minute walk test,* ***A/P COP*** *= anteroposterior centre of pressure,* ***ABC*** *= activities-specific balance confidence,* ***ABC-6*** *= activities-specific balance confidence short-form,* ***ACoP*** *= centre of pressure amplitude,* ***Acp*** *= root mean square centre of pressure amplitude,* ***AIM*** *= anterior instability margin,* ***AMP PRO*** *= amputee mobility predictor with prosthesis,* ***AMP*** *= amputee mobility predictor,* ***AMPap*** *= AP sway amplitude,* ***AMPml*** *= ML sway amplitude,* ***AP SD COPE*** *= anteroposterior standard deviation excursion,* ***AP*** *= anteroposterior,* ***API*** *= anteroposterior index,* ***APSI*** *= anterior/posterior stability index,* ***AREA*** *= sway area,* ***AREAce*** *= 95% confidence ellipse area,* ***AREA-CE*** *= 95% confidence ellipse of COP excursion,* ***ASDI*** *= average sway distance index,* ***ASYM*** *= asymmetry,* ***AVap*** *= AP on-axis velocity,* ***AVml*** *= ML on-axis velocity,* ***B.O.G.M.T.*** *= Bruininsk-Oseretsky gross motor test,* ***BBS*** *= berg balance scale,* ***BI*** *= balance index,* ***BOS*** *= base of support,* ***BSS*** *= Biodex stability system,* ***CB&M*** *= community based mobility scale,* ***CBMS*** *= community based mobility scale,* ***CDP*** *= computerized dynamic posturography,* ***CellTrig*** *= no. of times a sensor is activated during a stride,* ***CHAMP*** *= comprehensive high-level activity mobility predictor,* ***COG*** *= centre of gravity,* ***COM/CM*** *= centre of mass,* ***COMvel*** *= centre of mass velocity,* ***COMx*** *= centre of mass mediolateral position,* ***COP EML*** *= excursion of COP in ML-direction,* ***COP/CP*** *= centre of pressure,* ***COPE*** *= COP excursion,* ***COPEAP*** *= excursion of the COP,* ***COPex*** *= centre of pressure excursion,* ***COPmin*** *= minimum centre of pressure distance,* ***COPnet*** *= centre of pressure net,* ***COPp*** *= centre of pressure prosthetic limb,* ***COPs*** *= centre of pressure sound limb,* ***CoV*** *= coefficient of variation,* ***CPa*** *= CP amputated leg,* ***CPres*** *= CP resultant,* ***CPs*** *= CP sound leg,* ***CS*** *= composite score,* ***CS-PFP-10*** *= continuous-scale physical functional performance-10,* ***CTCI*** *= constant time cadence index,* ***CTSLI*** *= constant time sway length index,* ***CTSNI*** *= constant time step number index,* ***DBC*** *= dynamic balance contribution,* ***DC*** *= directional control,* ***DCap*** *= AP directional control,* ***DCcom*** *= directional control centre of mass,* ***DCcop*** *= directional*

control centre of pressure, ***DCL*** *= directional control,* ***DCml*** *= ML directional control,* ***dCOM-D*** *= minimal moment axis,* ***dCOPy*** *= displacement of COP in AP-direction,* ***dCP*** *= distance centre of pressure,* ***DIST*** *= mean distance from COP mean,* ***DISTRMS*** *= root mean square distance,* ***DOA*** *= degree-of-asymmetry,* ***DP ratio p*** *= dynamic pressure ratio prosthetic foot,* ***DP ratio*** *= dynamic pressure ratio,* ***DPPS*** *= the Delos postural proprioceptive system,* ***DST*** *= double support time,* ***DSTI*** *= double support time index,* ***DSTSI*** *= double support time symmetry index,* ***DW*** *= dynamic weight distribution,* ***EMG*** *= electromyography,* ***EnHL*** *= entropic half-life,* ***EPE*** *= endpoint excursion,* ***ES foot angle*** *= early stance foot angle,* ***ES*** *= effect size,* ***ES*** *= equilibrium score,* ***F/F ratio p*** *= forefoot ratio load percentage prosthetic foot,* ***F/F*** *= forefoot ratio load percentage,* ***F8WT*** *= figure-of-8 walk test,* ***FES*** *= falls efficacy scale,* ***FES-I*** *= falls efficacy scale international,* ***FFP*** *= foot forward placement,* ***FLRT*** *= functional and lateral reach test,* ***FR*** *= functional reach,* ***FSST*** *= four square step test,* ***gCOP*** *= global COP,* ***GPTRI*** *= gait phase time ratio index,* ***GRF*** *= ground reaction force,* ***GRFh*** *= horizontal GRF,* ***GRFy*** *= AP GRF,* ***GRFz*** *= vertical GRF,* ***HTI*** *= holding time index,* ***ICC*** *= intra class coefficient,* ***iCOP*** *= intact side COP,* ***lCOP*** *= left side COP (control group),* ***LOS*** *= limits of stability,* ***LS*** *= latency score,* ***M/L COP*** *= mediolateral centre of pressure,* ***MAO*** *= angle at the moment of major anterior oscillation,* ***MaxFM*** *= mean orbital stability/maximum floquet multipliers,* ***MaxLat*** *= maximum lateral force placement,* ***MCT*** *= motor control test,* ***mCTSIB*** *= modified clinical test of sensory interaction and balance,* ***ME*** *= max excursion,* ***MeanSDpos*** *= mean standard deviation of C7 vertebra marker displacements,* ***MeanSDvel =*** *mean standard deviation of C7 vertebra marker velocity,* ***mFES*** *= modified falls efficacy scale,* ***mFSST*** *= modified four-square step test,* ***Mhip*** *= moment at hip,* ***ML SD COPE*** *= mediolateral standard deviation excursion,* ***ML*** *= mediolateral,* ***MLFP*** *= mediolateral foot position,* ***MLI*** *= mediolateral index,* ***MLSI*** *= medial/lateral stability index,* ***MMA*** *= minimum moment axis,* ***MnTB*** *= minimum time for balance,* ***MOL*** *= angle at the moment of major lateral oscillation to the left,* ***MOR*** *= angle at the moment of major lateral oscillation to the right,* ***MOSbw*** *= margin of stability backwards,* ***MOSmin*** *= minimum margin of stability,* ***MOSml*** *= margin of stability in ML-direction,* ***MPO*** *= angle at the moment of major posterior oscillation,* ***MSDI*** *= max sway distance index,* ***MV*** *= mean velocity,* ***MVap*** *= mean AP velocity,* ***Mvel*** *= mean velocity,* ***MVELO*** *= mean velocity of COP displacement from mean COP,* ***MVELOap*** *= mean velocity of COP displacement from mean COP in AP direction,* ***MVELOml*** *= mean velocity of COP displacement from mean COP in ML direction,* ***MVL*** *= movement angular velocity,* ***MVLcom*** *= mean velocity centre of mass,* ***MVLcop*** *= mean velocity centre of pressure,* ***MVml*** *= mean ML velocity,* ***MXE*** *= maximum excursion,* ***MXEcop*** *= maximum excursion centre of pressure,* ***MxTB*** *= maximum time for balance,* ***NBWT*** *= narrowing beam walking test,* ***NRBT*** *= narrow ridge balance test,* ***NS*** *= not specified,* ***OLST*** *= one leg stand test,* ***OLSTP*** *= one-leg standing test prosthesis side,* ***OSI*** *= overall stability index,* ***P ratio p*** *= pressure ratio prosthetic foot,* ***P ratio*** *= pressure ratio,* ***Pap*** *= mean AP path length,* ***PBT*** *= postural balance test,* ***pCOP*** *= prosthetic side COP,* ***PI*** *= postural instability,* ***PL*** *= path length,* ***PLAP*** *= path length in AP-direction,* ***PLML*** *= path length in ML-direction,* ***Pml*** *= mean ML path length,* ***PPS*** *= path length per second,* ***PREF*** *= preference system,* ***QS*** *= quiet stance,* ***QSA*** *= quiet stance ability,* ***R/F ratio p*** *= rearfoot ratio load percentage prosthetic foot,* ***R/F ratio*** *= rearfoot ratio load percentage,* ***RCAM*** *= range of coronal angular momentum,* ***rCOP*** *= right side COP (control group),* ***Rd*** *= radius of circle containing 95% of sampled points,* ***RMS*** *= root mean square,* ***RMSap*** *= root mean square AP,* ***RMSD*** *= root mean square distance,* ***RMSml*** *= root mean square ML,* ***RsqCP*** *= mean centre of pressure location,* ***RT*** *= reaction time,* ***RTcom*** *= reaction time centre of mass,* ***RTcop*** *= reaction time centre of pressure,* ***RWS*** *= rhythmic weight shift,* ***S(x)*** *= standard deviations of the sway amplitude in ML,* ***S(y)*** *= standard deviations of the sway amplitude in AP,* ***SB*** *= standing balance,* ***SDR*** *= stance duration ratio,* ***SEn*** *= reflects the amount of attentive and automated balance control,* ***SEnCoP*** *= centre of pressure regularity,* ***SI*** *= stability index,* ***SL*** *= step length,* ***SLI*** *= constant time sway length index,* ***SLR*** *= step length ratio,* ***SLS*** *= single limb stance,* ***SOT*** *= sensory organisation test,* ***SQT*** *= step quick turn test,* ***SS*** *= strategy score,* ***SSPI*** *= stance/swing phase index,* ***SSTI*** *= single support time index,* ***SSTSI*** *= single support time symmetry index,* ***ST*** *= stride time,* ***SW*** *= static weight distribution,* ***Td*** *= total length of COP excursions,* ***TF*** *= transfemoral,* ***TOTEX*** *= total excursion of COP,* ***TOTEXap*** *= total excursion of COP in ML,* ***TP*** *= trunk progression,* ***TS*** *= turn speed,* ***TSA*** *= total sway activity,* ***TT**** *= turn time,* ***TT*** *= transtibial,*

TUG *= timed-up-and-go,* ***UGS*** *= upright gait stability,* ***VAP*** *= velocity of COP in AP-direction,* ***WBC*** *= weight-bearing contribution,* ***WBD*** *= weight-bearing distribution,* ***WBI*** *= weight-bearing index,* ***WBS*** *= weight body symmetry,* ***vCOM*** *= centre of mass velocity,* ***VCoP*** *= centre of pressure velocity,* ***Vcp*** *= root mean square centre of pressure velocity,* ***VEL*** *= mean velocity,* ***VEST*** *= vestibular system,* ***VIS*** *= visual system,* ***VML*** *= velocity of COP in ML-direction,* ***WS*** *= weight symmetry,* ***XcoM*** *= extrapolated centre of mass.*

Database	Search tag	Limit (to)	No. of articles (2020-09-17)
Ageline	((prosthetics or artificial limbs or prosthesis or prosthetic OR amputee OR amputation) AND (balance or postural control or posturography)) OR ((prosthetics or artificial limbs or prosthesis or prosthetic or amputee or amputation) AND (fall* OR fear of fall* OR risk of fall* OR falls efficacy OR balance confidence OR accidental falls))	None	27
AMED	((prosthetics or artificial limbs or prosthesis or prosthetic OR amputee OR amputation) AND (balance or postural control or posturography)) OR ((prosthetics or artificial limbs or prosthesis or prosthetic or amputee or amputation) AND (fall* OR fear of fall* OR risk of fall* OR falls efficacy OR balance confidence OR accidental falls))	None	281
Cinahl	(MH ("Posturography") OR "posturography" OR (MH "Tilt-Table Test") OR MH ("Balance, Postural") OR "balance" OR ”postural balance" OR (MH "Balance, Postural") OR ”postural control” OR ”static balance” OR ”dynamic balance”) AND ((MH ”amputees”) OR ”amput*” OR ”prosthesis” OR ”prosthetic” OR ”prostheses”) OR ((MH "Accidental Falls") OR (MH "Fall Risk Assessment Tool") OR (MH "Fall Risk (Saba CCC)") OR (MH "Fall Prevention (Iowa NIC)") OR (MH "Hendrich Fall Risk Model") OR (MH "Safety Behavior: Fall Prevention (Iowa NOC)") OR ”fear of fall” OR ”fear of falling” OR ”fall* effic*” OR "balance confidence" OR "fall*" OR "accidental falls") AND ((MH "Limb Prosthesis") OR (MH "Myoelectric Prosthesis") OR (MH "Below-Knee Amputation") OR (MH "Above-Knee Amputation") OR (MH "Amputation") OR (MH "Amputation Stumps") OR (MH "Disarticulation") OR (MH "Hemicorporectomy") OR (MH "Hemipelvectomy") OR (MH "Prosthesis Design") OR (MH "Prosthetic Fitting") OR (MH "amputees") OR ”amput*”)	Peer reviewed and English language	964
Cochrane	((prosthetics or artificial limbs or prosthesis or prosthetic OR amputee OR amputation) AND (balance or postural control or posturography)) OR ((prosthetics or artificial limbs or prosthesis or prosthetic or amputee or amputation) AND (fall* OR fear of fall* OR risk of fall* OR falls efficacy OR balance confidence OR accidental falls))	Title, abstract, keyword	597

Medline	(((Prosth* OR (MH "Bone-Anchored Prosthesis")) AND ((MH "Amputees") OR (MH "Amputation") OR (MH "Amputation, Traumatic") OR (MH "Amputation Stumps") OR "Amput*" OR (MH "Disarticulation") OR (MH "Hemipelvectomy"))) AND ((MH "Postural Balance") OR "balance" OR ”postural control"))) OR (((MH "Accidental Falls") OR "fall*" OR ”fear of fall*” OR ”fall* efficacy*” OR "balance confidence" OR "accidental falls") AND (((Prosth* OR (MH "Bone-Anchored Prosthesis")) AND ((MH "Amputees") OR (MH "Amputation") OR (MH "Amputation, Traumatic") OR (MH "Amputation Stumps") OR "Amput*" OR (MH "Disarticulation") OR (MH "Hemipelvectomy"))))	English language	434
Proquest	(noft(Prosth* OR artificial limbs) AND noft(amput*) AND noft(postural control OR balance OR posturography)) OR (noft(Prosth* OR artificial limbs) AND noft(amput*) AND noft(fall* OR fear of fall* OR risk of fall* OR fall* efficacy OR accidental falls OR balance confidence))	Peer reviewed and English language	164
PsycArticles	(noft(Prosth* OR artificial limbs) AND noft(amput*) AND noft(postural control OR balance OR posturography)) OR (noft(Prosth* OR artificial limbs) AND noft(amput*) AND noft(fall* OR fear of fall* OR risk of fall* OR fall* efficacy OR accidental falls OR balance confidence))	None	1
PsycInfo	(noft(Prosth* OR artificial limbs) AND noft(amput*) AND noft(postural control OR balance OR posturography)) OR (noft(Prosth* OR artificial limbs) AND noft(amput*) AND noft(fall* OR fear of fall* OR risk of fall* OR fall* efficacy OR accidental falls OR balance confidence))	Peer reviewed	32
PubPsych	(((prosth* or "artificial limbs") AND (amput*) AND (balance OR "postural control" OR posturography)) OR ((prosth* or "artificial limbs") AND (amput*) AND (fall* OR "fear of fall*" OR "risk of fall*" OR "fall* efficacy" OR "balance confidence" OR "accidental falls")))	None	6
Scopus	TITLE-ABS-KEY(((prosth* or "artificial limbs") AND (amput*) AND (balance OR "postural control" OR posturography)) OR ((prosth* or "artificial limbs") AND (amput*) AND (fall* OR "fear of fall*" OR "risk of fall*" OR "fall* efficacy" OR "balance confidence" OR "accidental falls")))	None	676
Web of Science	(TS=(Prosth* OR artificial limb) AND TS=(amput*) AND (TS=(balance OR postural balance OR posturography OR tilt table test)) OR (TS=(Prosth* OR artificial limb OR limb prosth* OR "myoelectric prosth*") AND TS=(amput*) AND TS=(Accidental fall OR fall risk OR fall* OR fall prevention OR fall risk assessment tool OR hendrich fall risk model OR safety behavior OR falls efficacy OR balance confidence))	English language	516