Upper limb absence
Postema, Sietke

IMPORTANT NOTE: You are advised to consult the publisher's version (publisher's PDF) if you wish to cite from it. Please check the document version below.

Document Version
Publisher's PDF, also known as Version of record

Publication date:
2017

Link to publication in University of Groningen/UMCG research database

Citation for published version (APA):

Copyright
Other than for strictly personal use, it is not permitted to download or to forward/distribute the text or part of it without the consent of the author(s) and/or copyright holder(s), unless the work is under an open content license (like Creative Commons).

The publication may also be distributed here under the terms of Article 25fa of the Dutch Copyright Act, indicated by the “Taverne” license. More information can be found on the University of Groningen website: https://www.rug.nl/library/open-access/self-archiving-pure/taverne-amendment.

Take-down policy
If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

Downloaded from the University of Groningen/UMCG research database (Pure): http://www.rug.nl/research/portal. For technical reasons the number of authors shown on this cover page is limited to 10 maximum.
Summary
Upper limb absence (ULA), due to a congenital transversal reduction deficiency (RD) or an acquired amputation (AA), may have an impact on body structures of the trunk and unaffected limb, and may predispose these individuals to specific and non-specific musculoskeletal complaints (MSC) not caused by acute trauma or any systematic disease. The prevalence of MSC among Dutch individuals with ULA is unknown, as well as characteristics of MSC in this population, and effects of presence of MSC on disability, work participation and work productivity. ULA and its consequences on body functions and structures, as well as presence of MSC, may influence activity and capacity. A functional capacity evaluation (FCE) can be used to assess the influence of body functions and structures on activity. An FCE is a set of tests, practices and observations that are combined to determine the ability of the evaluated person to function in a variety of circumstances, most often employment, in an objective manner. FCEs are typically developed for two-handed individuals. In order to assess functional capacity of one-handed individuals, development of an FCE for these individuals is warranted. As awkward posture is a risk factor for MSC, a qualitative scoring system for rating compensatory movements is called for.

The principle aim of this thesis is to explore the effects of ULA, due to RD or AA, on remaining body structures and functions, on development and characteristics of MSC, and on functional capacity.

In chapter 1 the topics assessed in this thesis are introduced. Furthermore, the problem analysis inspiring this thesis, as well as the thesis aims and thesis outline are presented.

The first study performed, is described in chapter 2. This prospective cohort study entailed physical measurements of the upper arms, trunk and spine of children with transversal upper limb RD at the age of eight to 18 years, and 24 years later. During the two measurements the patients were matched on gender and age with able-bodied controls. Both at baseline and at follow-up, within-subject differences in structures of the arm and trunk were found in patients, but not in controls. Spinal deviations were greater in patients compared to controls, but did not develop to clinically relevant scoliosis. Furthermore, patients and controls answered questionnaires regarding presence of back pain (baseline measurement) and presence of chronic pain during the last week and disability (follow-up measurement). Both presence of back pain and presence of chronic pain did not differ between participants and controls.

For the second study a survey was developed, informing after health, presence of MSC, disability, and work participation and productivity. The survey was distributed among individuals with ULA in the Netherlands, and answered by 263 individuals of ≥18 years old. Furthermore, a convenience sample of control subjects with a similar distribution
of age and sex answered the questionnaire. The results of this study are presented in two chapters.

In chapter 3 presence of MSC and disability are assessed. The point and year prevalence of MSC was twice as high in individuals with ULA compared to the controls, and MSC was most often located in the unaffected limb and upper back/neck. Presence of MSC was related to decreased general health perception and mental health. Logistic regression analyses showed the following clinically relevant predictors for presence of MSC: middle age, being divorced/widowed, and lower mental health. When MSC were present, disability was perceived higher in individuals with ULA compared to controls. In individuals with ULA, who experienced MSC, disability was related to higher age, more pain, lower general and mental health, and not using a prosthesis.

Individuals between the ages of 18 and 65 years (official retirement age in the Netherlands) (n=207) were included in the analyses regarding work participation and productivity, presented in chapter 4. Seventy four percent of the individuals with RD, and 57% of the individuals with AA were employed. Male sex, younger age, a medium or high level of education, prosthesis use, and good general health were predictors of work participation. Presence of MSC did not differ between employed and unemployed individuals. Work productivity did not differ between individuals with RD, AA, and controls, but was negatively influenced by MSC-related pain.

In the following chapters the development, pilot testing and reliability testing of an FCE for individuals with ULA and a qualitative scoring system for rating compensatory movements are described. First, the development and pilot testing of the functional capacity evaluation – one-handed (FCE-OH) is described (chapter 5). The selected tests were derived from an FCE for individuals with work-related upper limb disorders, and were, if necessary, adapted for use by one-handed individuals. Ten individuals with transradial ULA (seven males, three females; all using a prosthesis), and ten individuals with transhumeral ULA (all males; none using a prosthesis during testing) performed these tests. They were matched on age, sex, height and weight with able-bodied control subjects, who also performed these tests. Individuals with transhumeral ULA lifted less weight compared to their matched controls, when the latter were allowed to use both hands. However, lifting capacity was equal when matched controls also used only one hand. There was a strong trend for a lower lifting capacity of individuals with transradial ULA, lifting with their unaffected hand and prosthesis hand, compared to their matched controls, lifting with both hands. The individuals with transhumeral ULA performed worse on the overhead working test compared to their matched controls. Other tests did not show significant differences between individuals with ULA and controls. In this chapter it is concluded that the FCE-OH can be used in one-handed individuals, and that individuals with ULA generally show similar functional capacity as two-handed individuals. It is hypothesized that a higher
physical load on the unaffected limb for individuals with ULA might reflect a relative
deficit of functional capacity.

In chapter 6 assessments of repeatability and safety of the FCE-OH are presented. Twenty three individuals with ULA perform the FCE-OH twice; the majority of these individuals was male (n=20), had transradial ULA or wrist disarticulation (n=20), and their ULA was not congenital (n=22). The median time between sessions was two days. The test-retest reliability of five out of eight items was good or excellent. Agreement of four tests was compared with agreement in able-bodied individuals performing these tests, and three of the four tests showed similar widths of limits of agreement. The FCE-OH was considered safe in use, when the right precautions are taken.

Video recordings of the individuals who pilot tested the FCE-OH (chapter 5) were used to develop a qualitative scoring system for rating compensatory movements of trunk and shoulders of individuals with a transradial ULA using a prosthesis while performing FCE-OH tests (chapter 7). A compensatory movement was defined as a movement different from the control group. In several phases the scoring system was developed, pilot tested and adjusted. For final reliability testing FCE-experts (n=12), and physiotherapists or gait analysists (n=6) scored video recordings of the individuals with ULA twice, two weeks apart. Interrater reliability was satisfactory in most instances, and intrarater reliability was good. Feasibility was established. Raters suggested a short training program, in order to improve feasibility.

Finally, in chapter 8 the main results of the aforementioned studies are discussed. It is concluded that ULA is more than the missing of a limb, as it also affects remaining body functions and structures, such as asymmetry of body halves and decreased range of motion of the shoulder. Presence of MSC is frequently reported by individuals with ULA; it is associated with a higher pain grade compared to controls, complaints on multiple locations, long durations, and increased disability. Both psychosocial and biomechanical factors are likely to play a role in the development of MSC. Presence of MSC was not associated with work participation, but MSC-related pain was the most important predictor for work productivity. Functional capacity of individuals with ULA seems to be equal to two-handed individuals. It is hypothesized that this actually may denote a relative deficit of capacity, as individuals with ULA may have increased physical demands. The FCE-OH and the qualitative scoring system for rating compensatory movements may be a valuable addition to patient assessment.