

LOWER LIMB AMPUTEES HAVE SIMILAR UPPER LIMB FUNCTION 8Y POST INJURY AS UNINJURED GROUP: THE ADVANCE COHORT STUDY

Fraje Watson (1), Angela E Kedgley (1), Alex Bennett (2), Anthony Bull (1)

1. Imperial College London, UK; 2. The Defence Medical Rehabilitation Centre, UK

Introduction

Increased biomechanical load on the upper limb (UL), and subsequent injury has been identified in wheelchair users [1]. We hypothesised that lower limb (LL) amputees make similar biomechanical compensations with their ULs through crutch use, balance and coordination needs, transfer activities and UL bodyweight loading.

ADVANCE is a 20yr prospective cohort study collecting medical and psychosocial data from 1145 military servicemen, half of whom sustain combat injury [2]. The aims of this study are to compare UL disability, at the initial assessment (a mean of 8yrs post-injury), in (1) LL amputees with the uninjured comparison group, and (2) the full cohort.

Methods

Disability of the Arm, Shoulder, and Hand (DASH) questionnaire data was collected from ADVANCE participants frequency matched for deployment, age, and rank. DASH scores range from 0-100, with a higher score denoting more UL disability.

DASH data was non-parametric, and appropriate statistical tests were used with an alpha level of 0.05.

Results

DASH data was available and valid for 1092 participants (mean age: 34yrs). DASH was higher for injured compared to uninjured participants ($p < 0.001$). UL amputees, triple amputees and LL amputees with partial UL amputation had higher DASH scores than uninjured controls ($p < 0.002$) (Table 1, Figure 1).

DASH was not significantly different between unilateral or bilateral LL amputees and uninjured controls. Similarly, DASH was not significantly different for triple amputees compared to unilateral major and partial UL amputees in isolation (Table 1, Figure 1).

Injury type	n	DASH (SD)
Uninjured ^{abcd}	562	3.6 (8.3)
Injured	530	9.7 (14.2)
Non-amputee ^{ae}	363	9.8 (14.1)
Unilat LL amp ^{fgh}	70	4.4 (7.0)
Bilat LL amp ⁱ	38	5.9 (11.0)
UL amp (major + partial) ^{befi}	14	21.7 (19.5)
Triple amp (unilat major UL) ^{cg}	12	13.5 (13.7)
LL amp + partial UL amp ^{dh}	32	17.6 (20.3)

Table 1: DASH scores for ADVANCE participants

^{a-i} $p < 0.002$ per Bonferroni correction.

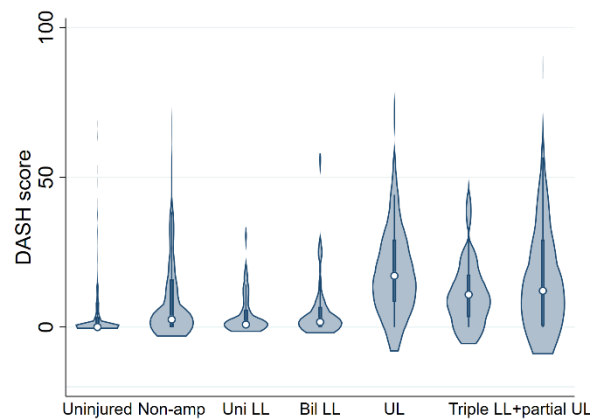


Figure 1: Violin plots for DASH scores of ADVANCE participants (LL=lower limb, UL=upper limb, uni=unilateral, bil=bilateral).

Discussion

Contrary to our hypothesis, unilateral and bilateral LL amputees had low DASH scores, similar to the uninjured population. This finding suggests minimal UL disability 8yrs post-injury that we hypothesised might result from high reliance on the ULs. Also, triple amputees and LL amputees with partial UL amputation were no more disabled than unilateral major UL amputees in isolation, further supporting the finding that LL amputation did not increase UL disability.

As expected, injured participants had more UL disability than uninjured participants. Equally, participants with major or partial UL amputations (in isolation or in combination with a LL amputation) had higher DASH scores than those that did not.

Overall, the ADVANCE cohort have lower DASH scores than equivalent military and civilian populations [3,4]. The ADVANCE cohort is currently young, so longitudinal study of their UL disability will be of great interest, particularly for the LL amputees.

References

1. Tsai et al, Clin Biomech, 55: 79-85, 2018
2. Bennett et al, BMJ Open, 10:e037850, 2020
3. Pfister et al, BMJ Mil Health, 6:393-397, 2021
4. Pet et al, Injury, 47:2783-2788, 2016

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