



University of Groningen

Effects of task difficulty and old age on motor learning and its neural mechanisms

Bootsma, Margot

DOI: 10.33612/diss.179363685

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: 2021

Link to publication in University of Groningen/UMCG research database

Citation for published version (APA): Bootsma, M. (2021). Effects of task difficulty and old age on motor learning and its neural mechanisms. University of Groningen. https://doi.org/10.33612/diss.179363685

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/taverneamendment.

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.

Effects of task difficulty and old age on motor learning and its neural mechanisms

Josje Margriet Bootsma

The experiments described in chapters 2-5 were conducted at the Department of Human Movement Sciences, University Medical Center Groningen, Groningen, the Netherlands.

PhD training was facilitated by the research institute School of Health Research (SHARE), part of the Graduate School of Medical Sciences Groningen.

The printing of this thesis was financially supported by the University of Groningen, University Medical Center Groningen and Research Institute SHARE.

- Paranymphs: Manon Schallig Anièla White
- Layout & design: Studio RATATA | www.ratata.nl
- Printing: Ipskamp Printing | www.ipskampprinting.nl

© Copyright 2021, Josje Margriet Bootsma

All rights reserved. No part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying, recording or any information storage or retrieval system, without written permission of the copyright owner.









Effects of task difficulty and old age on motor learning and its neural mechanisms

Proefschrift

ter verkrijging van de graad van doctor aan de Rijksuniversiteit Groningen op gezag van de rector magnificus prof. dr. C. Wijmenga en volgens besluit van het College voor Promoties.

De openbare verdediging zal plaatsvinden op

maandag 18 oktober 2021 om 11:00 uur

door

Josje Margriet Bootsma

geboren op 1 augustus 1994 te Almere

Promotor Prof. dr. T. Hortobagyi

Copromotor Dr. S.R. Caljouw

Beoordelingscommissie Prof. dr. S. Swinnen Prof. dr. A. Sack Prof. dr. C.K. van der Sluis

Table Of Contents

- 8 Chapter 1: General introduction
- 16 Chapter 2: The role of task difficulty in learning a visuomotor skill
- **32** Chapter 3: The difficulty of a visuomotor skill during practice does not affect its retention when initial skill level is controlled
- 44 Chapter 4: Failure to engage neural plasticity through practice of a high-difficulty task is accompanied by reduced motor skill retention in older adults
- 84 Chapter 5: Neural correlates of motor skill learning are dependent on both age and task difficulty
- 118 Chapter 6: General discussion
- 131 Appendices