School Furniture as a Risk Factor for Musculoskeletal Pain among

Slovenian Students

N. Podrekar1,2\*, M. Burnard1,3 N. Šarabon2

1 InnoRenew CoE, Livade 6 6310 Izola, nastja.podrekar@innorenew.eu

2 Faculty of Health Sciences, Universtiy of Primorska, Polje 42, 6310 Izola, nejc.sarabon@fvz.ups.si

3Andrej Marusic Institure, University of Primorska, Muzejski trg 2, 6000 Koper, mike.burnard@innorenew.eu

The very first environment where a human is exposed to long term sitting is school environment. School furniture could be one of the external risk factors for musculoskeletal pain among students. The aim of this study was to evaluate school furniture as a risk factor for musculoskeletal pain among Slovenian students. The study was divided into two parts. Firstly, a review regarding the student-furniture mismatch was conducted. Secondly, student-furniture mismatch in Slovenian schools was calculated and correlation between the mismatch and musculoskeletal pain was evaluated. Students from primary and secondary school, and from higher educational programs were included in the study. To calculate the mismatch, eight anthropometric measures (popliteal height, knee height, thigh thickness, elbow height sitting, shoulder height sitting, subscapular height, hip width, buttock-popliteal length) and six furniture dimensions (seat height, seat depth, seat width, seat inclination, upper edge of backrest, sitting desk clearance) were measured. Additionally, students completed the Nordic Musculoskeletal Questionnaire. The results of the literature review indicate a high student-furniture mismatch among the existing studies, ranging from 30% to 90 % (Batistão et al., 2012; van Niekerk et al., 2013). Similarly, the high mismatch was found among Slovenian students at all educational levels. Further on, ergonomically designed school furniture was proposed based on the anthropometric data of the students. The high mismatch between the furniture and students’ anthropometry indicates that there is a need to ergonomically redesign school furniture in Slovenian schools at all levels. Furthermore, the data obtained could be considered when designing new school furniture in Slovenia. Studies with larger sample sizes assessing multiple age groups are desired to better understand the student-furniture mismatch.

**Keywords:** ergonomics, design, school-furniture mismatch

**Acknowledgements:** The authors gratefully acknowledge the European Commission for funding the InnoRenew CoE project (Grant Agreement #739574) under the Horizon2020 Widespread-Teaming program and the Republic of Slovenia (Investment funding of the Republic of Slovenia and the European Union of the European regional Development Fund).

REFERENCES

Batistão, M.V., Sentanin, A.C., Moriguchi, C.S., Hansson, G.-Å., Coury, H.J.C.G., de Oliveira Sato, T., 2012. Furniture dimensions and postural overload for schoolchildren’s head, upper back and upper limbs. Work 41 Suppl 1, 4817–24. https://doi.org/10.3233/WOR-2012-0770-4817

van Niekerk, S.-M., Louw, Q.A., Grimmer-Somers, K., Harvey, J., Hendry, K.J., 2013. The anthropometric match between high school learners of the Cape Metropole area, Western Cape, South Africa and their computer workstation at school. Appl. Ergon. 44, 366–371. https://doi.org/10.1016/j.apergo.2012.09.008