

The Impact of Body Mass on the Ability to Perform Daily Activities – A Modeling Study

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Summary

The aim of the study was to evaluate the effect of body mass changes on muscle activity during daily routines. The analysis was conducted using numerical simulations in the AnyBody Modelling System. Variations in body weight were found to significantly influence muscular function, affecting the ability to perform everyday activities. Abnormal body weight whether underweight, overweight, or obese can lead to challenges in tasks such as lifting, holding a 20 kg object, and walking.

Introduction

Correct body weight is one of the factors that allows you to maintain a properly functioning body. Abnormal body mass can cause muscle tissue remodeling, affecting activity and muscle fatigue, which may result in functional limitations. The aim of the study was to determine the effect of mass change on muscle activity during daily routine.

Methods

Muscle function was assessed by computer simulation using the AnyBody Modelling System. The following activities were analyzed: standing, walking, sitting down and getting up from a chair, holding and lifting object from a table. Simulations were performed using average kinematic data collected from 30 adults. Simulations of the analysed activities were carried out by changing the body mass from 50kg to 100kg with a step by increments of 2kg, which made it possible to determine only the effect of changing mass (from excessive thinness to extreme obesity) on the functioning of the muscular system. The ability of the muscular system to perform activities was analyzed based on muscle activity.

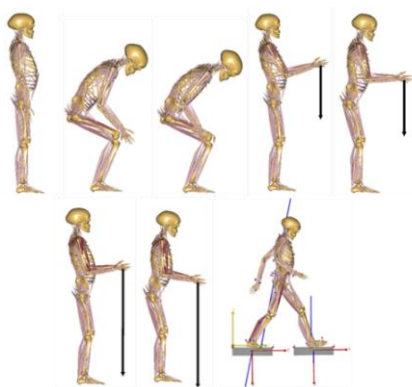


Figure 1: Examples of models analyzing daily activities in the AnyBody Modeling System.

Results and Discussion

Figure 2 summarizes the effect of mass change on the ability to perform basic daily activities. The \checkmark symbol indicates activities where muscle activity ranged from 0 to 1, reflecting normal muscle function. Activities where muscle activity reached 1 are highlighted, showing maximum force generation. The X symbol and color indicate activities where muscle activity exceeded 1, leading to muscular overload.

Body Mass [kg]		Daily activity									
		Under-weight	Normal weight						Overweight	Obesity	
50		✓	✓	✓	✓	✓	✓	✓	✓	✓	
52		✓	✓	✓	✓	✓	✓	✓	✓	✓	
54		✓	✓	✓	✓	✓	✓	✓	✓	✓	
56			✓	✓	✓	✓	✓	✓	✓	✓	
58			✓	✓	✓	✓	✓	✓	✓	✓	
60			✓	✓	✓	✓	✓	✓	✓	✓	
62			✓	✓	✓	✓	✓	✓	✓	✓	
64			✓	✓	✓	✓	✓	✓	✓	✓	
66			✓	✓	✓	✓	✓	✓	✓	✓	
68			✓	✓	✓	✓	✓	✓	✓	✓	
70			✓	✓	✓	✓	✓	✓	✓	✓	
72			✓	✓	✓	✓	✓	✓	✓	✓	
74			✓	✓	✓	✓	✓	✓	✓	✓	
76			✓	✓	✓	✓	✓	✓	✓	✓	
78			✓	✓	✓	✓	✓	✓	✓	✓	
80			✓	✓	✓	✓	✓	✓	✓	✓	
82			✓	✓	✓	✓	✓	✓	✓	✓	
84			✓	✓	✓	✓	✓	✓	✓	✓	
86			✓	✓	✓	✓	✓	✓	✓	✓	
88			✓	✓	✓	✓	✓	✓	✓	✓	
90			✓	✓	✓	✓	✓	✓	✓	✓	X
92			✓	✓	✓	✓	✓	✓	✓	✓	X
94			✓	✓	✓	✓	✓	✓	✓	✓	X
96			✓	✓	✓	✓	✓	✓	✓	✓	X
98			✓	✓	✓	✓	✓	✓	✓	✓	X
100			✓	✓	✓	✓	✓	✓	✓	✓	X

Figure 2: Summary of the ability to perform various daily activities.

Conclusions

Changes in body weight affect muscular function, impacting the ability to perform activities. Abnormal body weight, whether underweight, overweight, or obese, can cause difficulties in tasks such as lifting and holding a 20 kg object and walking.

Acknowledgments

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References

- [1] Zadoń H. et al. (2023), Exploring the impact of body mass change on fatigue and activity of the muscular system during daily routine. *Technol Health Care*, **31**(6):2487-2498.