

Ergonomic Evaluation of Home Workspaces during the Coronavirus Pandemic

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Background

The coronavirus pandemic (COVID-19) has caused many to work from home, particularly those working principally with computers.

- New lifestyle = finding ways to create an ergonomic workspace at home to limit risk of injury and musculoskeletal disorders particularly associated with **poor posture at work** [1].
- Assessing physical workspaces and postures during work from home = understand home-based working conditions → adapted interventions
- Office ergonomics' risks specific to Rapid Office Strain Assessment (ROSA) [2]
- Occupational Health Clinics for Ontario Workers' June webinar included other variables [3]
- Davis et al. [4] evaluated the home workspaces of faculty and staff members of the University of Cincinnati.

The present study considers a more diverse population.

Aims

Design methodology to measure actual working conditions experienced by people who normally work in an office, but work from home because of the Covid-19 pandemic.

- Build on ROSA [2] using questionnaire and photographs.
- Current work-from-home vs. in-office pre-pandemic.

Share success & challenges associated with first participants

Method

Data collection =

- Online survey (Table 1)
- 2-photo analysis.

Apply ROSA [2] to evaluate participants' home workspaces.

Table 1 Variables measured by survey. *= ROSA [2]; !=OHCOW [3]

Question	Responses possible
How long working from home?!	# months {<1, 1, 2, 3, ≥4}
How different is home office from work office?!	1 (no different), 2, ..., 10 (completely different)}
Location of home workspace!	{Bedroom, Kitchen, Living room, Spare room, Other}
Daily hours computer work*	1: < 0.5 consecutive h OR < 1 h total
Daily hours seated *	2: < 1 consecutive h OR 1 - 4 h total
Daily hours phone calls *	3: > 1 consecutive hr OR > 4 h total
Impact of working from home on perceived productivity!	If 'Yes' Select specific elements 'more' / 'less productive'
Type of chair used!	{Adjustable, Non-adjustable, Kitchen chair / stool, Foldable, Bed, Couch, Other}
Adjustable chair components*	{height, depth, armrests, lumbar support, back tilt, seat tilt}
Phone within arm's reach? *	Yes/No
Device used most often for phone calls*	{Headset, Held in hand, Held - neck & shoulder, Phone on speaker, Other}
Intensity of typical pain / fatigue by body region after day working at home!	{1 (none), 2, 3, ..., 9, 10 (maximum)} for each of overall, neck, upper back, lower back, shoulders, hands, eyes

Photo analysis two photos / participant, capturing their posture and most commonly-used home workstation.

Photo 1 – viewing sagittal plane,

- angles of knees, hips, ankles, trunk, elbow, neck and one arm
- visual angle between the eyes and the computer.

Photo 2 - perpendicular (overhead / behind / in front & above computer screen)

- Elements not visible in photo 1
- additional information for qualitative assessment.

Results

a. Sagittal deviation



b. Frontal deviation



c. Legs' position



d. Global posture



Fig. 1 Survey illustrations % duration by plane (a,b), body region (c,d) inspired by CCOHS [5]

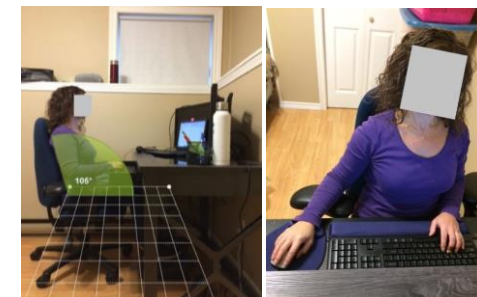


Fig. 2 Photo analysis: Sagittal view, hip angle illustrated using Kinovea software + Overhead view

- 15 completed the survey ; 12 provided photos
- Aged between 30 and 59 years, half female
- All working from home for ≥ 3 months and ≥ 1 consecutive hour or more than 4 hours in total on the computer per workday
- 93.33% used an adjustable office chair
- 60% noted an impact on their productivity (22.22% both + and – impacts)
- 66.67% = hips flexed over 90° (knees too high)
- 50% = seat too long (<7.5 cm free behind knee)
- 66.67% adequate lumbar support; 16.67% angled too far back

Discussion / Conclusion

- Proved methodology operational; 15 participants from various employers
- Drop out between questionnaire and photos
- Estimate require 40 participants for detailed statistical analysis
- Greater participation = link between discomfort and measured conditions

References

- [1] Marcus M, Gerr F, Monteilh C, Ortiz DJ, Gentry E, Cohen S, et al. A prospective study of computer users: II. Postural risk factors for musculoskeletal symptoms and disorders. *Am J Ind Med.* 2002;41:236–49.
- [2] Sonne M, Villalta DL, Andrews DM. Development and evaluation of an office ergonomic risk checklist: ROSA – Rapid office strain assessment. *Appl Ergon.* 2012;43:98–108.
- [3] OHCOW. Ergonomic Tips for Temporary Home Workstations...3 Months Later [Internet]. [cited 2021 Feb 8]. Available from: <https://www.ohcow.on.ca/news/ergonomic-tips-for-temporary-home-workstations3-months-later.html>
- [4] Davis KG, Kotowski SE, Daniel D, Gerding T, Naylor J, Syck M. The Home Office: Ergonomic Lessons From the "New Normal." *Ergon Des.* SAGE Publications Inc; 2020;1064804620937907.
- [5] Government of Canada CC for OH and S. Work-related Musculoskeletal Disorders (WMSDs) - Risk Factors : OSH Answers [Internet]. 2021 [cited 2021 Feb 10]. Available from: <https://www.ccohs.ca/>