

WEBINAR

Hybrid Work Arrangements and Ergonomics: Using Mobile Computing Devices at Multiple Locations

Kim Meszaros | January 24, 2023

HYBRID WORK ARRANGEMENTS AND ERGONOMICS: USING MOBILE COMPUTING DEVICES AT MULTIPLE LOCATIONS

Presented by:

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Centre of Research Expertise
for the Prevention of
Musculoskeletal Disorders

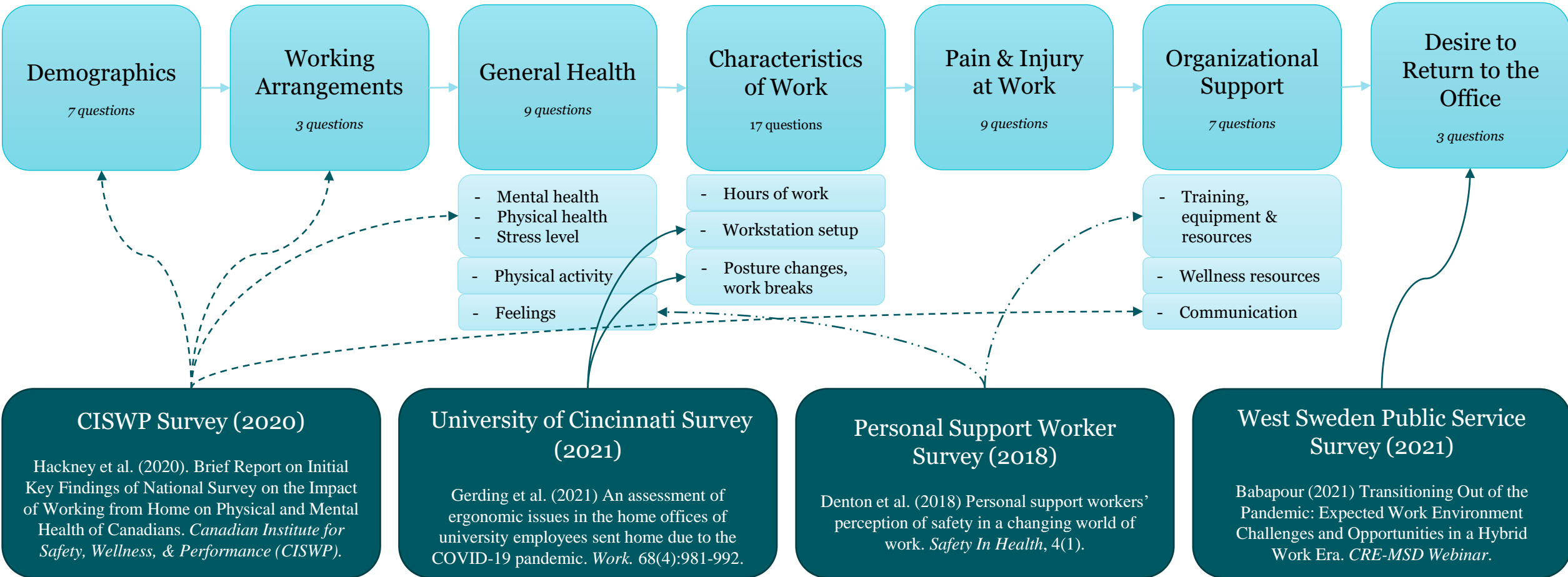
Outline

1. Study background
2. Survey results
 - Work arrangements: actual and preferred
 - Home workstation setup and work organization
3. Analysis: Associations with discomfort and MSD
4. Hybrid work: Workplace responsibilities
5. Recommendations

Study Motivation

- Surveys conducted at the beginning of the pandemic
 - Hackney et al., 2020; Gerding et al., 2021; Babapour, 2021
- Ontario Health & Safety system was interested in understanding current state of teleworkers
- Holistic approach
 - Physical factors associated with workstation setup
 - Psychosocial factors, organizational support
 - Self-reported mental health, stress levels, discomfort and injury
- Identify considerations for post-pandemic, computer-based work

Survey Structure



Demographics Summary

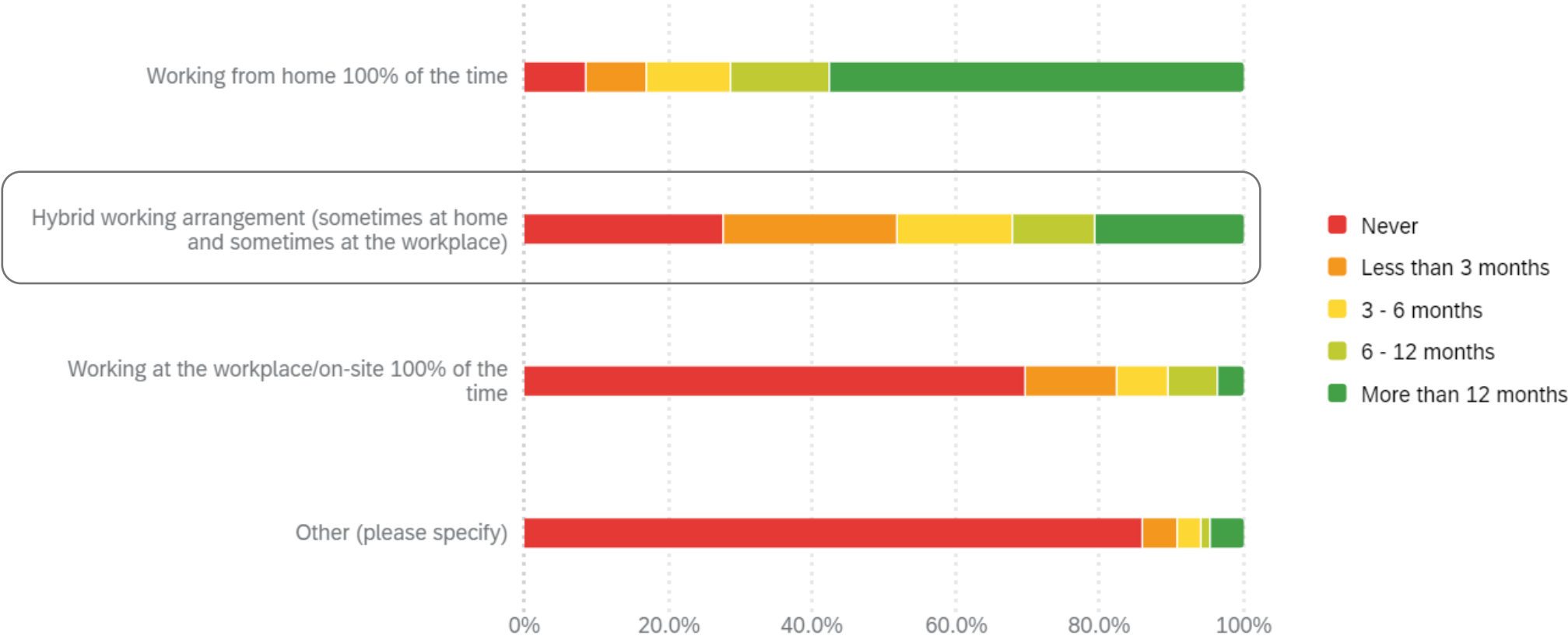
		Count	%
Sex	Male	276	27.6%
	Female	724	72.4%
Age Group	≤ 25 years	29	2.9%
	26 - 35 years	245	24.5%
	36 - 45 years	270	27.0%
	46 - 55 years	272	27.2%
	56 - 65 years	167	16.7%
	≥ 66 years	13	1.3%
	Prefer not to say	5	0.5%
Location	Within Ontario	789	78.7%
	Outside of Ontario, but within Canada	165	16.5%
	Outside of Canada	48	4.8%
Company Size	Micro (5 or less employees)	27	2.7%
	Small (6 - 50 employees)	157	15.7%
	Medium (51-100 employees)	111	11.1%
	Large (more than 100 employees)	706	70.5%
Main Role	Non-managerial employee	521	52.0%
	Supervisor or Team lead	139	13.9%
	Manager/Director	243	24.3%
	Owner of the company	21	2.1%
	Consultant	77	7.7%

Demographics Summary

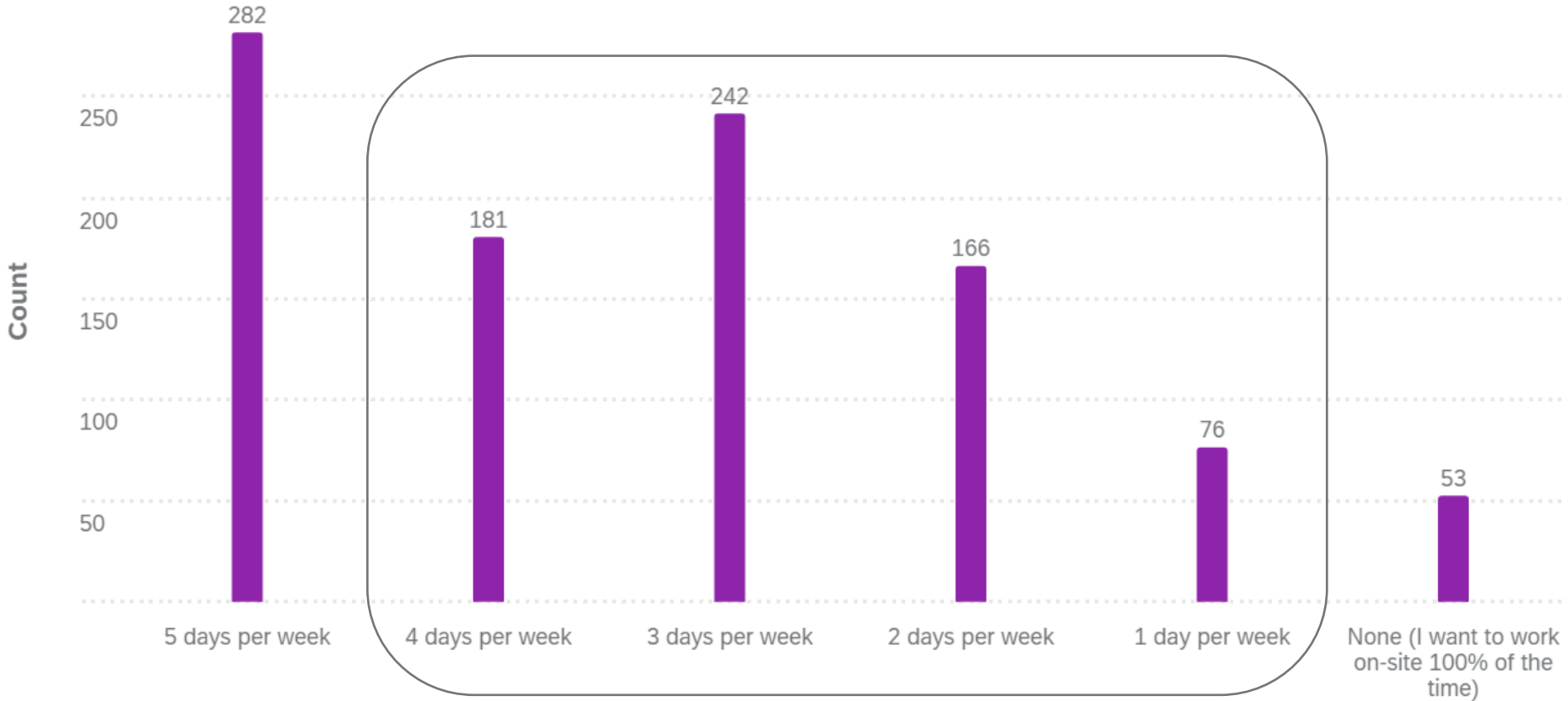
Industry Sector	Count	%
Accommodation and Food Services	7	0.7%
Agriculture, Forestry, Fishing	4	0.4%
Arts, Recreation Services	18	1.8%
Construction	10	1.0%
Education and Training	228	22.8%
Electricity, Gas, Water and Waste Services	39	3.9%
Financial and Insurance Services	47	4.7%
Healthcare & Social Assistance	168	16.8%
Information, Media & Telecommunications	41	4.1%
Manufacturing	23	2.3%
Mining	3	0.3%
Other Services	1	0.1%
Professional, Scientific, and Technical Services	97	9.7%
Public Administration and Safety	150	15.0%
Rental, Hiring & Real Estate Services	4	0.4%
Retail Trade	3	0.3%
Transport, Postal & Warehousing	10	1.0%
Wholesale Trade	3	0.3%
Other (please specify)	139	13.9%
Prefer not to say	7	0.7%

WORK ARRANGEMENTS

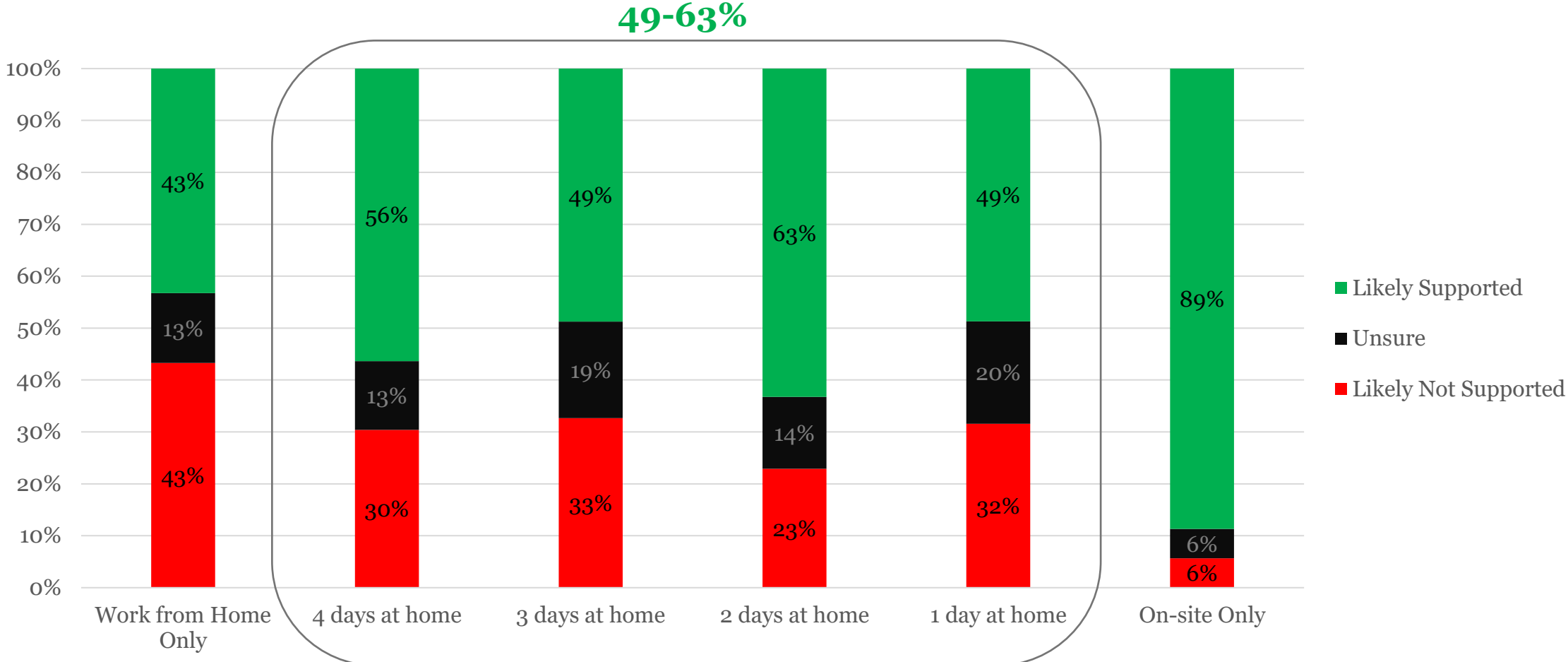
Working Arrangements During the Pandemic



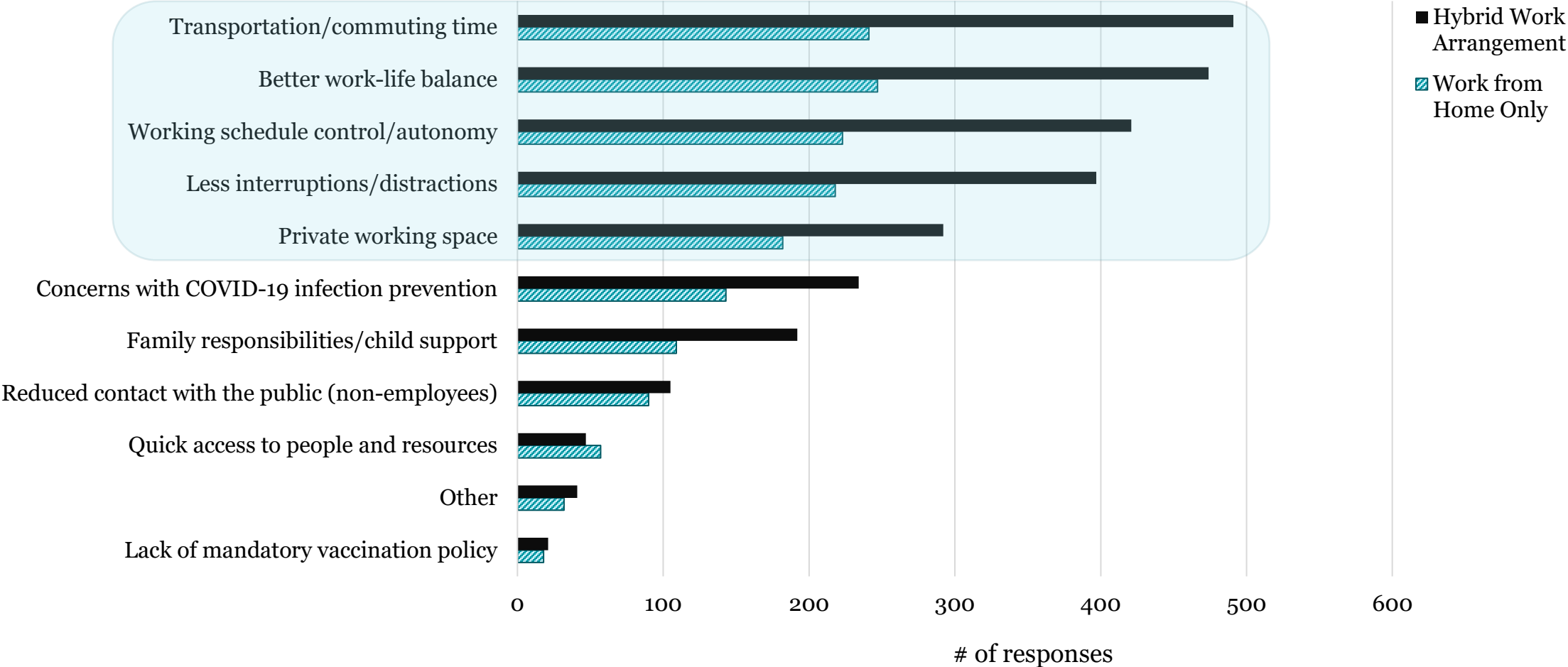
Preferred Work Arrangement Post-Pandemic



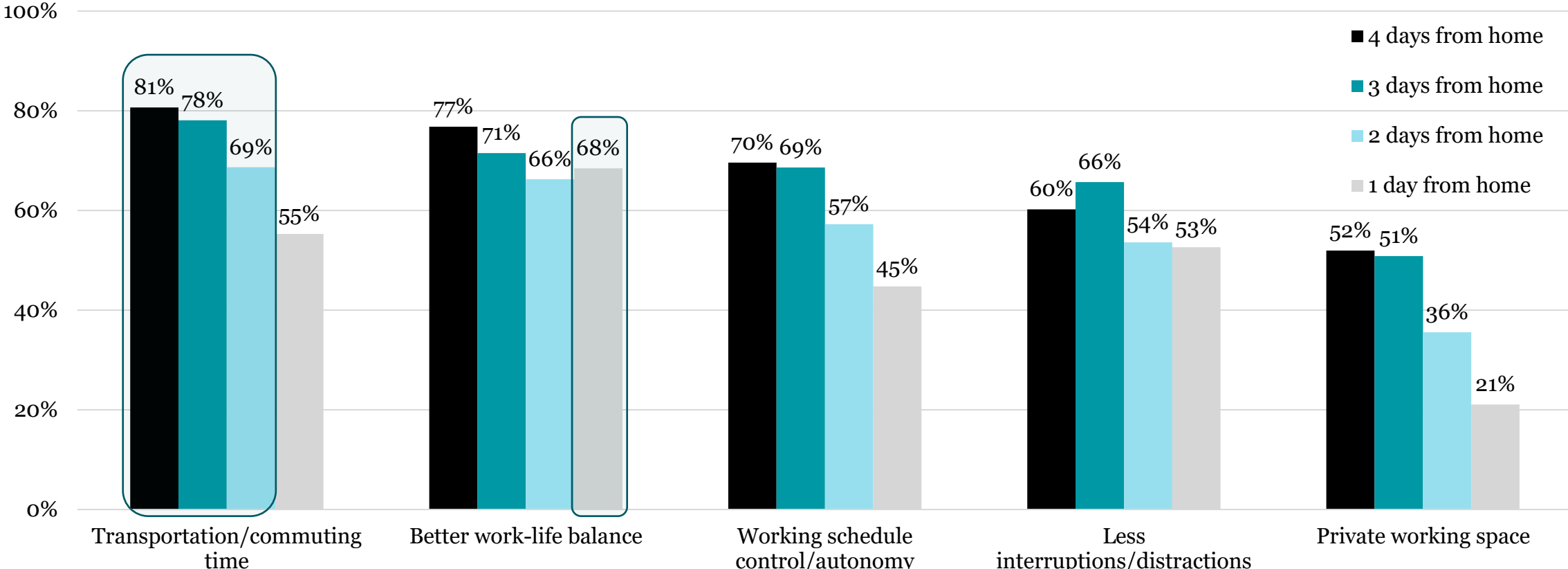
Opinion on Preference Being Supported by Employer



Motivations for Working from Home

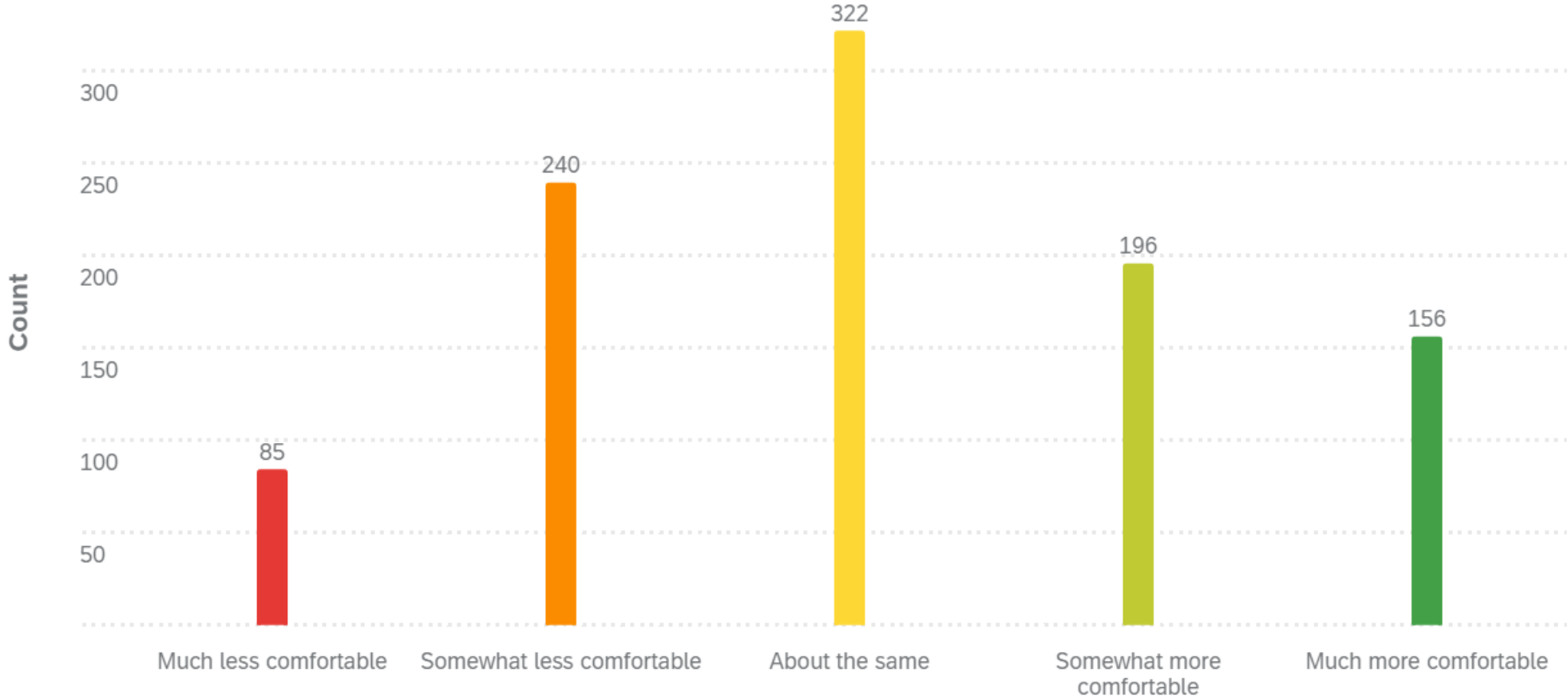


Motivations for Hybrid Work Arrangement



HOME WORKSTATION

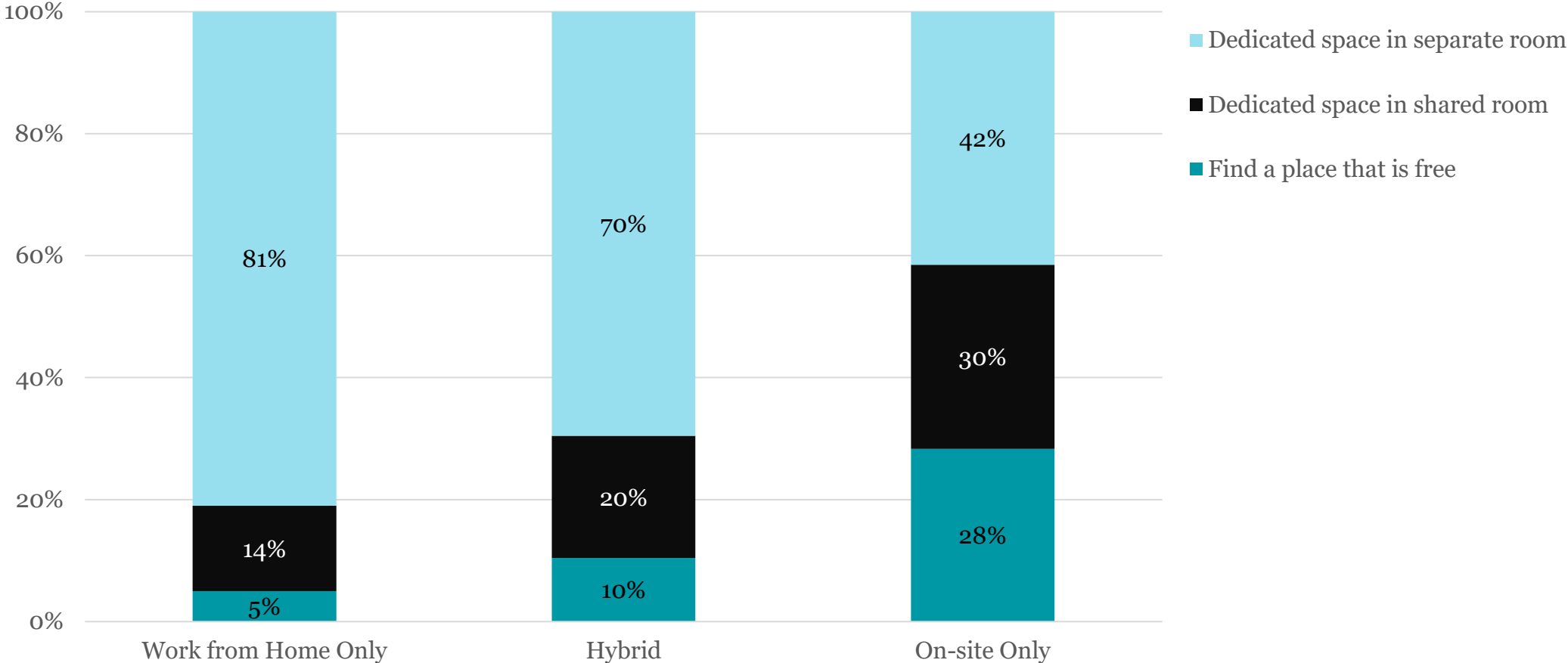
Home Office Environment



(Pearson Correlation = 0.384, p<0.001, n=999)

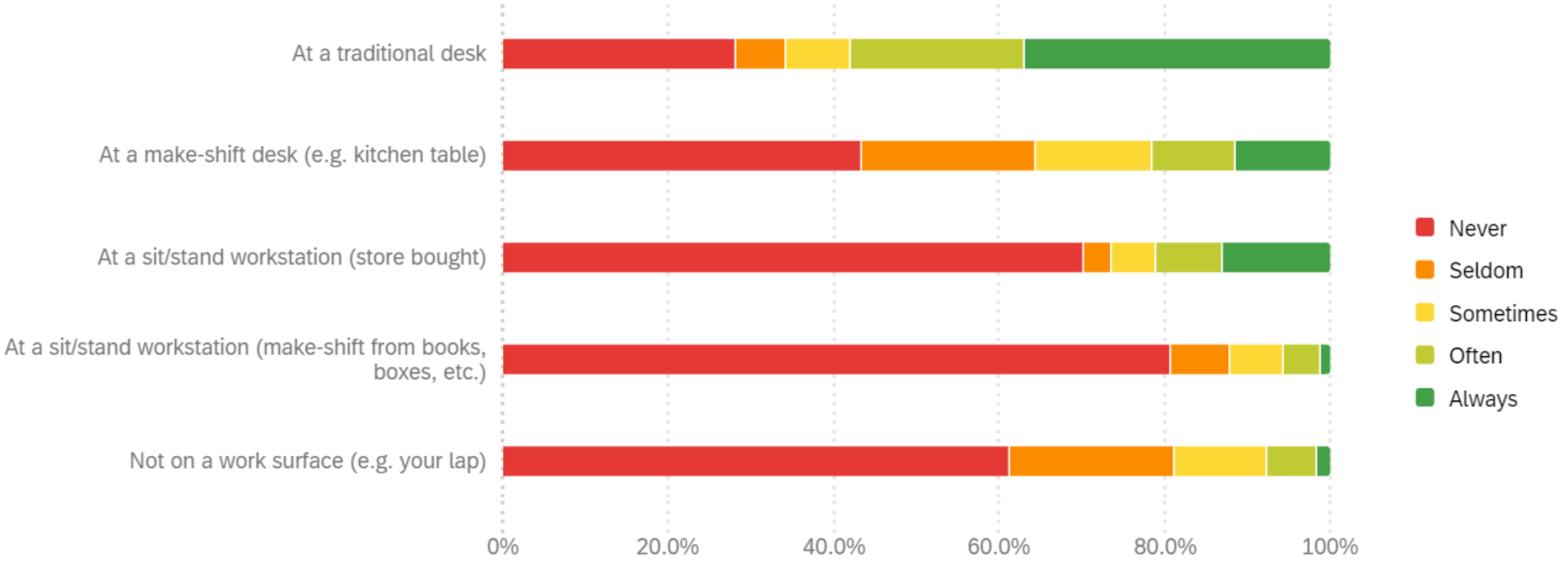


Home Office Environment

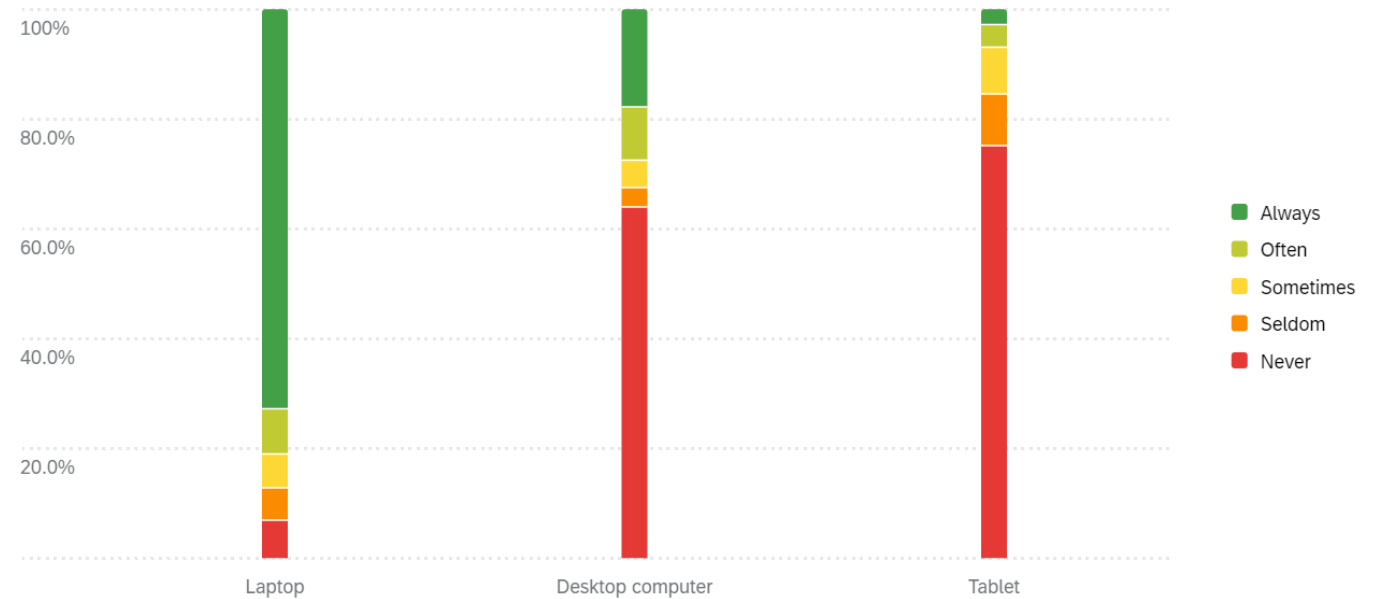


(Kruskal-Wallis H=34.939, df=2, p<0.001, n=1000)

Types of Home Work Surfaces



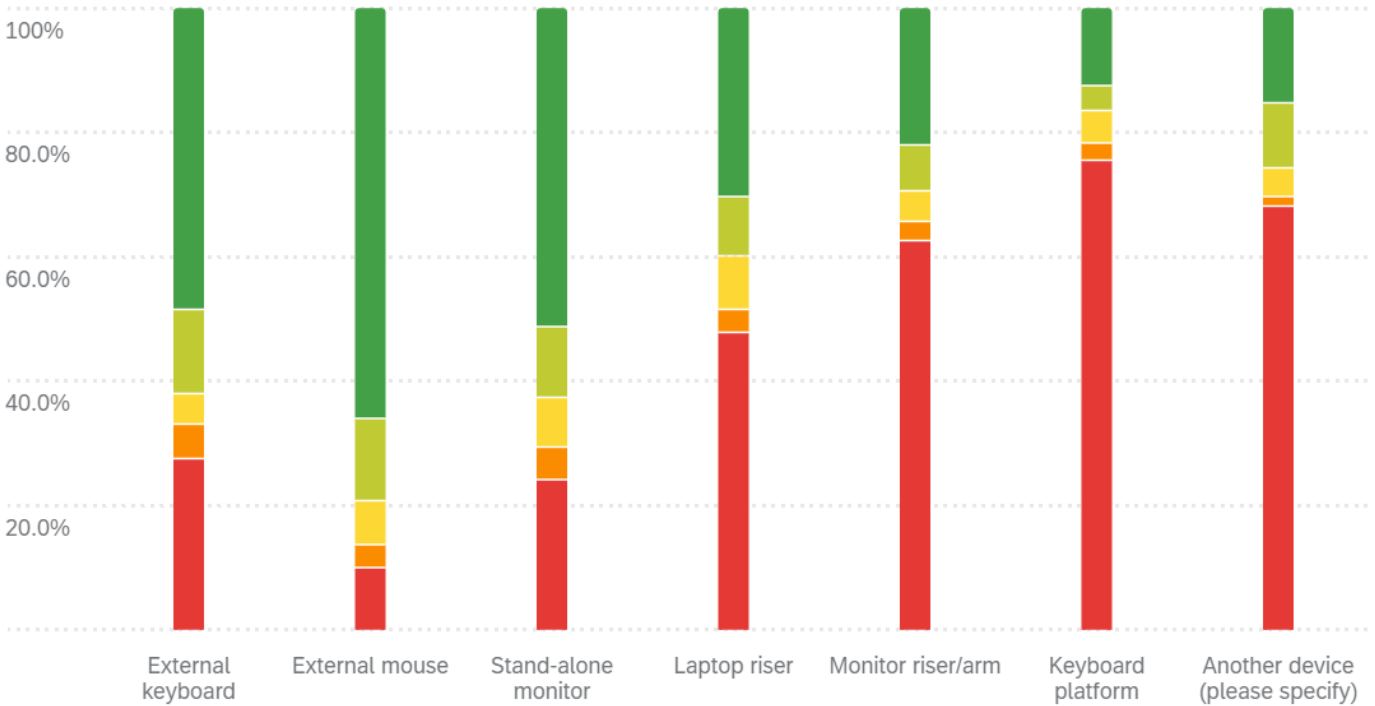
Teleworking Devices Used



Frequent laptop users (often-always): n=814

Infrequent laptop users (seldom-sometimes): n=119

External Devices Used with Laptop



- Always
- Often
- Sometimes
- Seldom
- Never

External Devices – Frequent Laptop Users

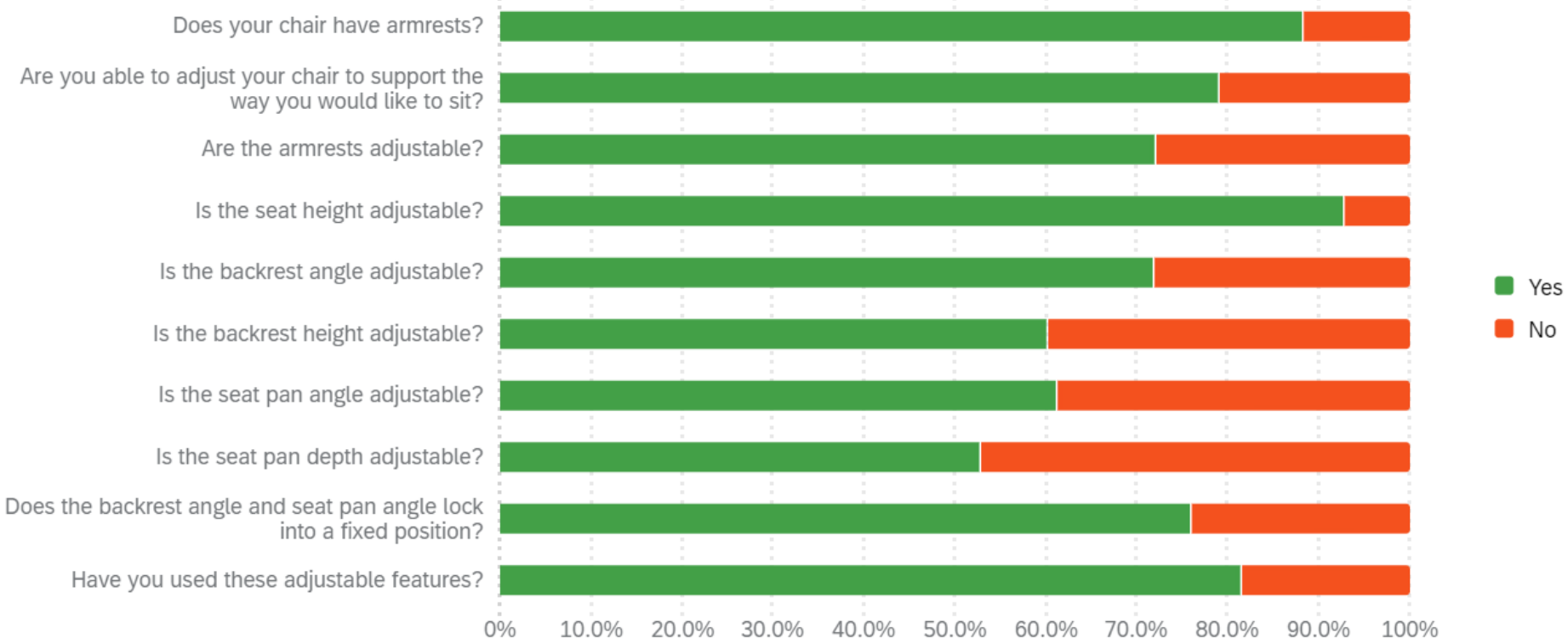
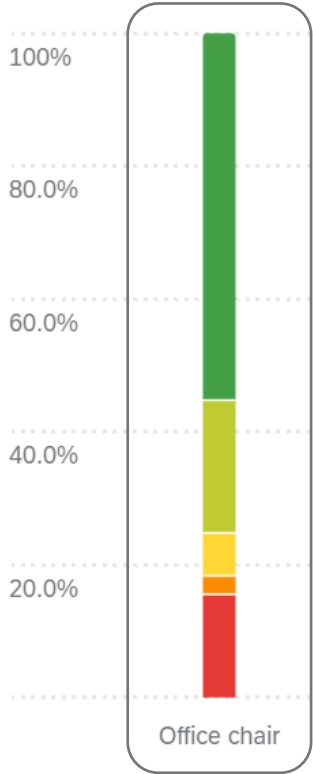


External Devices Used with Tablet

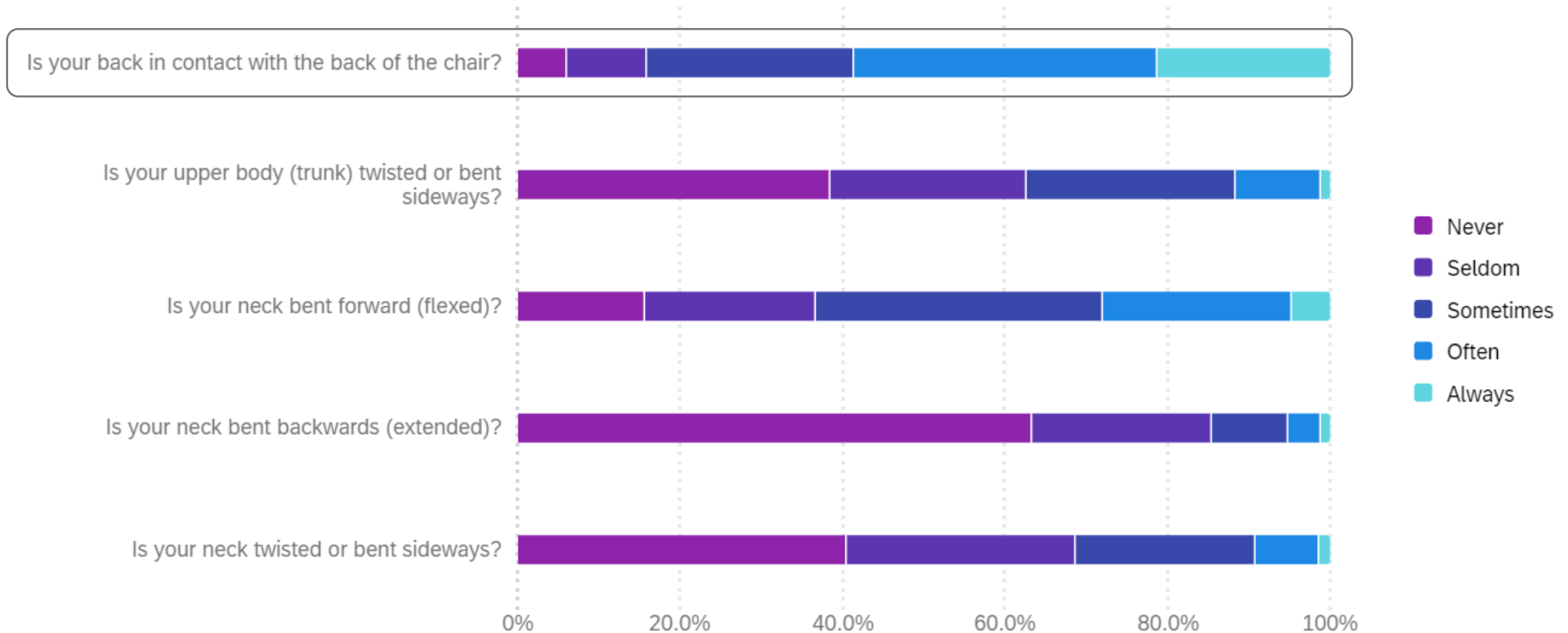


External Devices Used Regularly (Often – Always)	Frequent Users (Often – Always) n=70	Infrequent Users (Seldom – Sometimes) n=180
External Keyboard	61%	26%
External Mouse	49%	19%
Stand-alone Monitor	41%	19%
Tablet riser	29%	17%

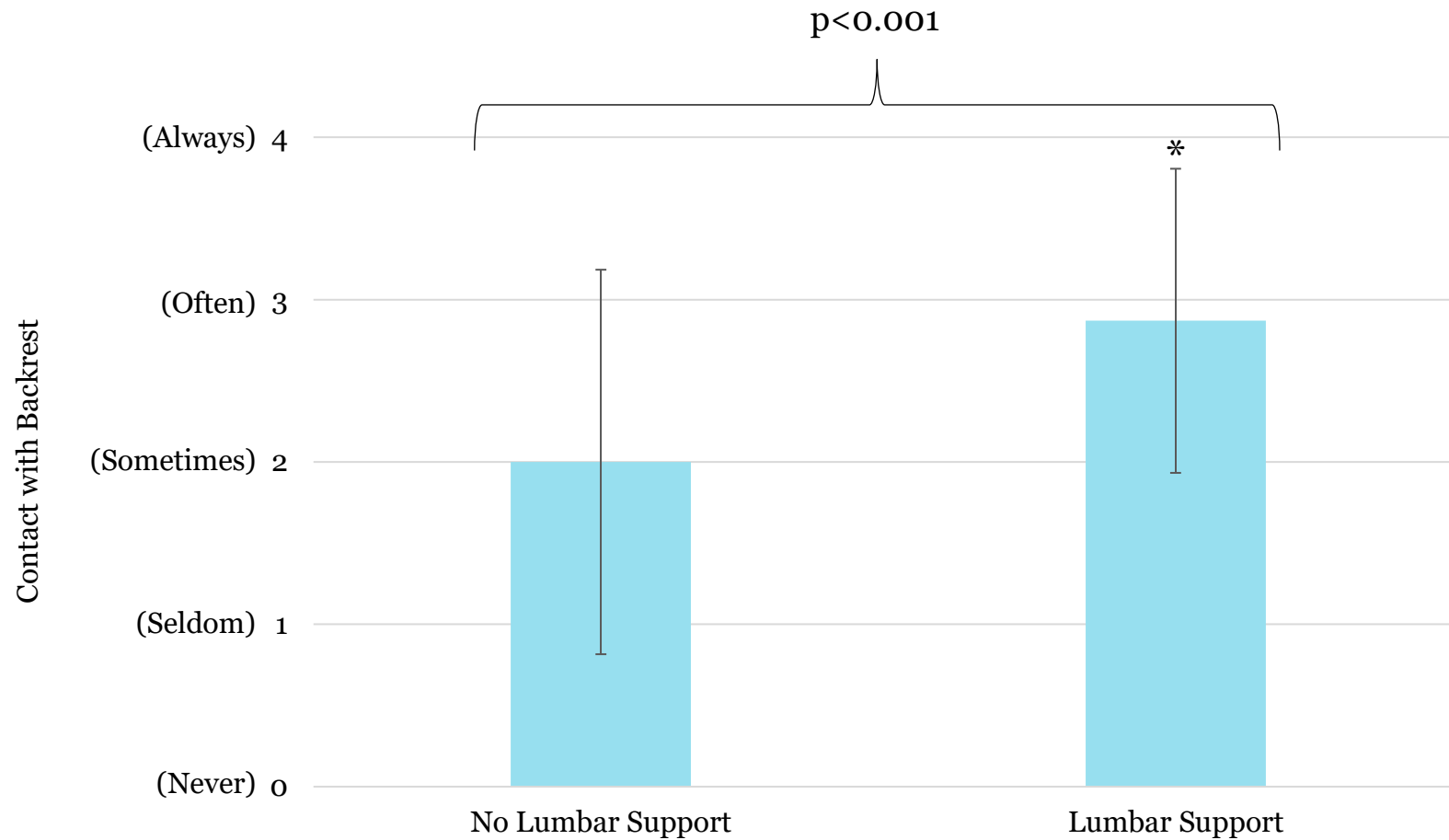
Types of Seating at Home



Seated Posture & Lumbar Support

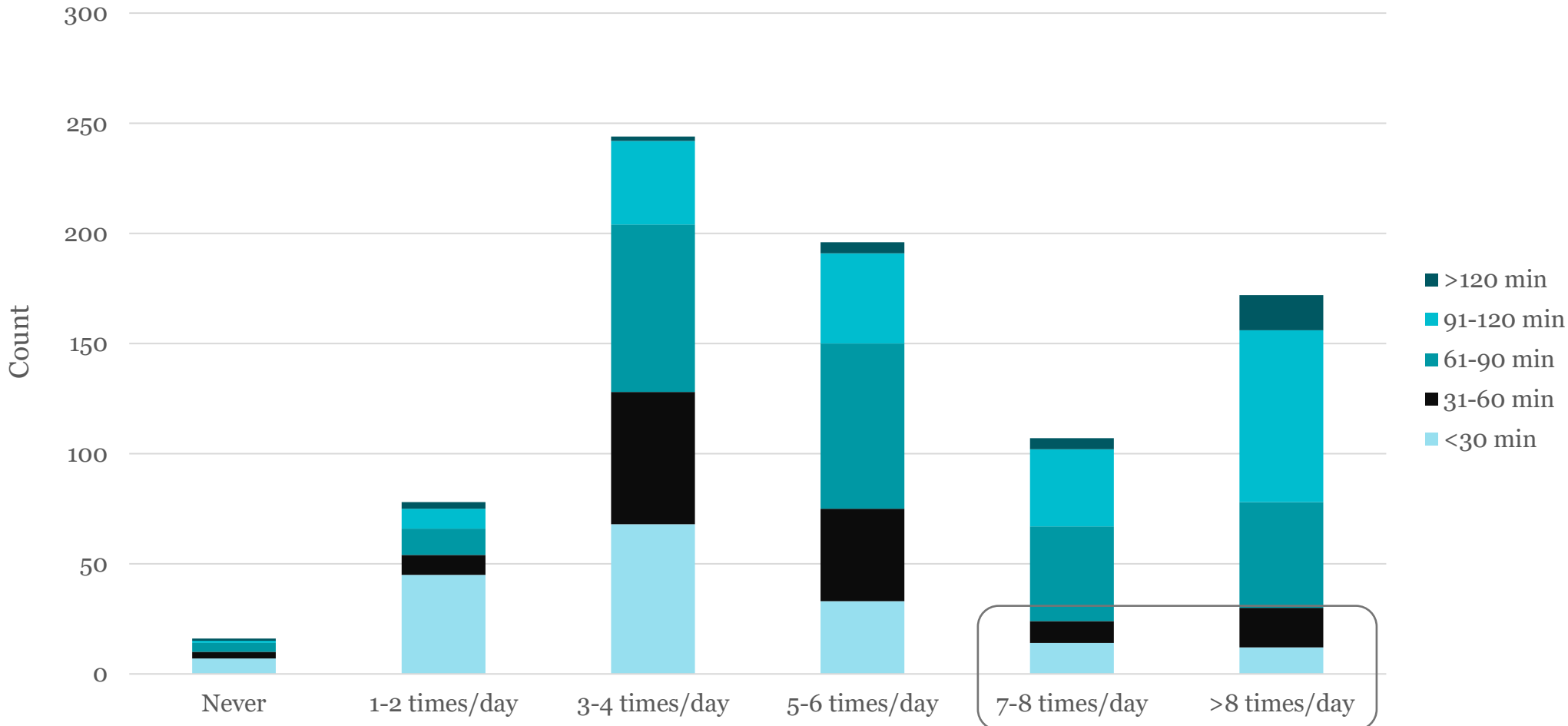


Seated Posture & Lumbar Support



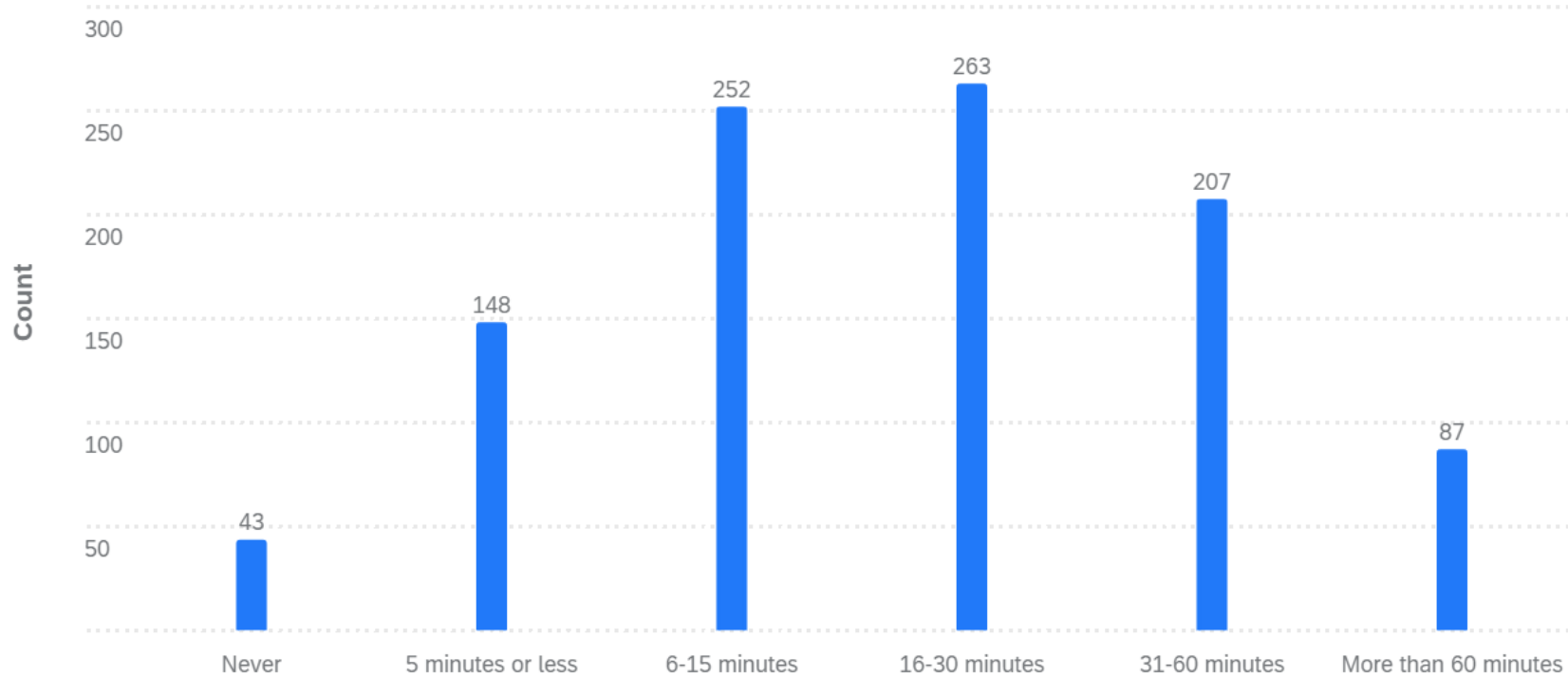
(Mann-Whitney $U=154699.0$, $n_1=322$, $n_2=677$, $p < 0.001$ two-sided test)

Work Pacing & Posture Changes During Workday

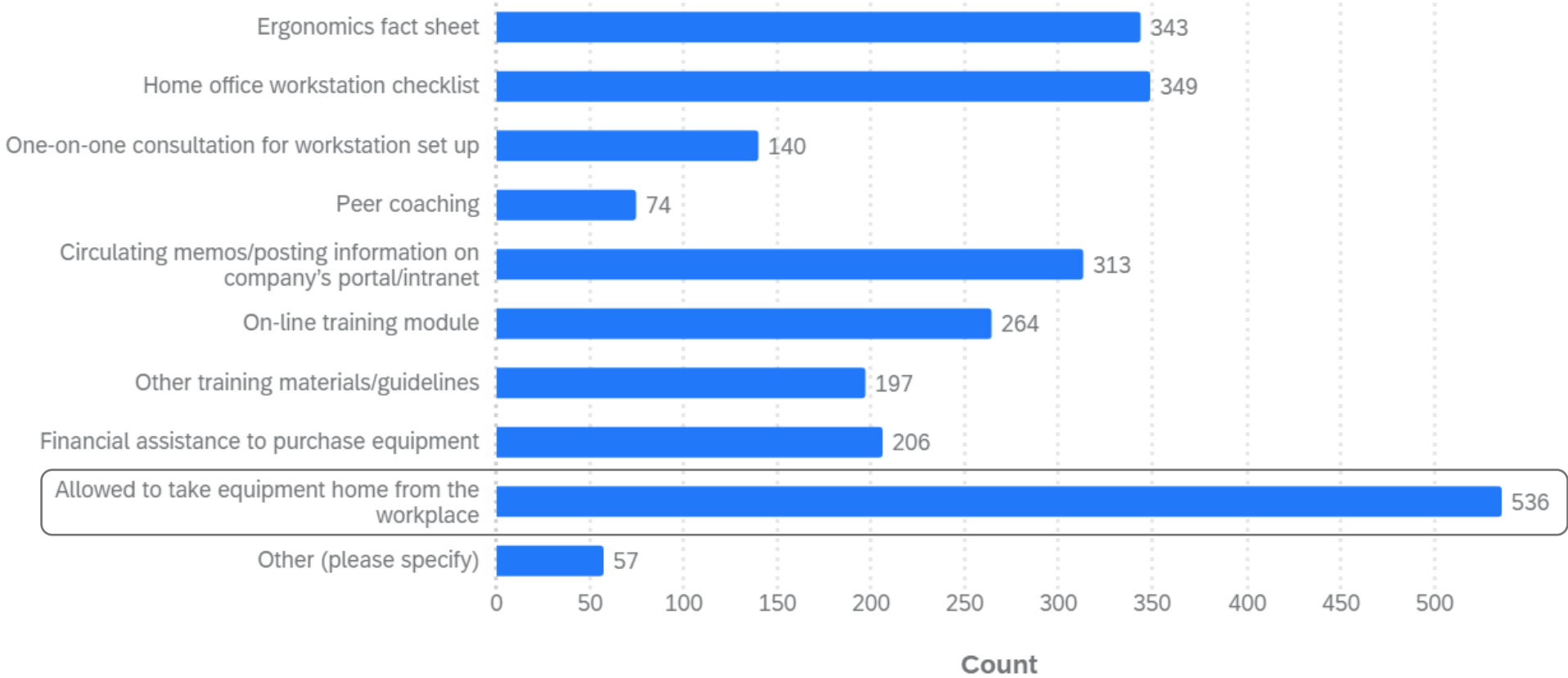


7%

Active Movement During Workday

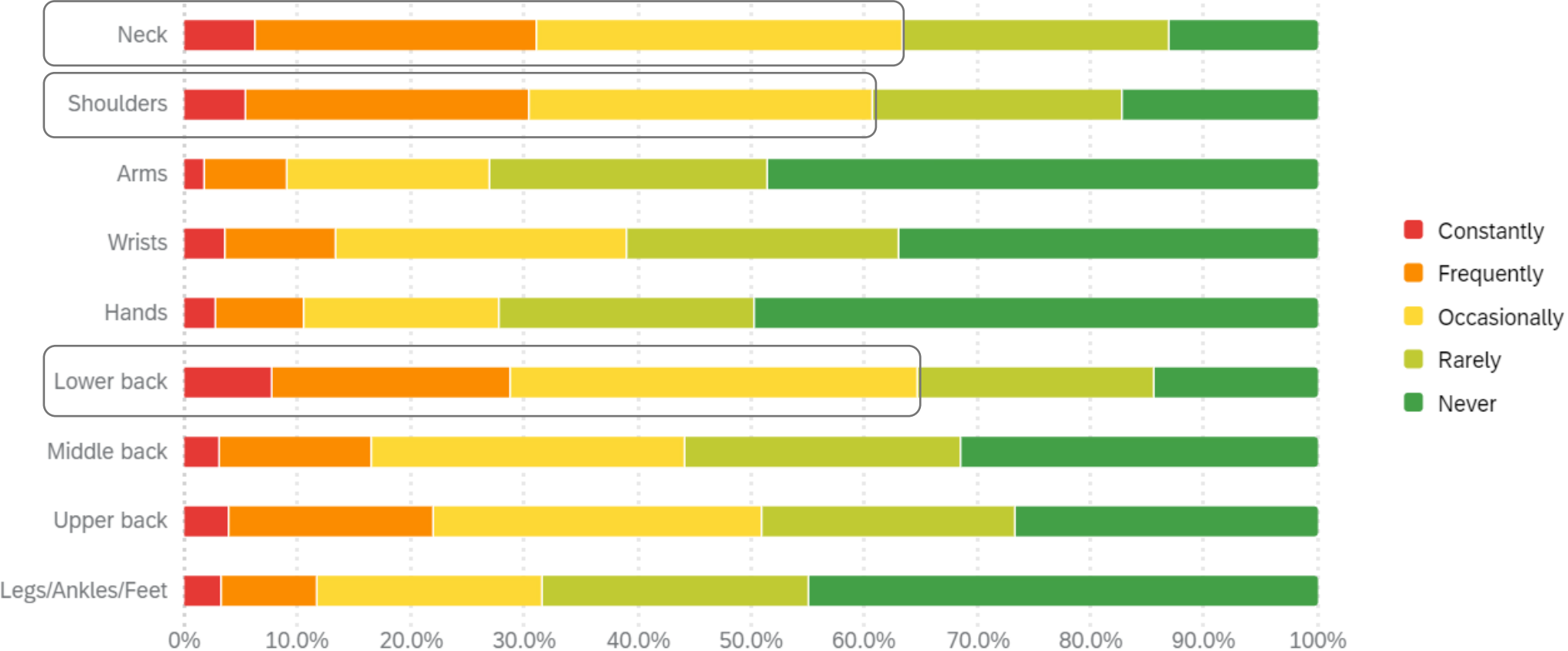


What type of support was provided by the Employer?

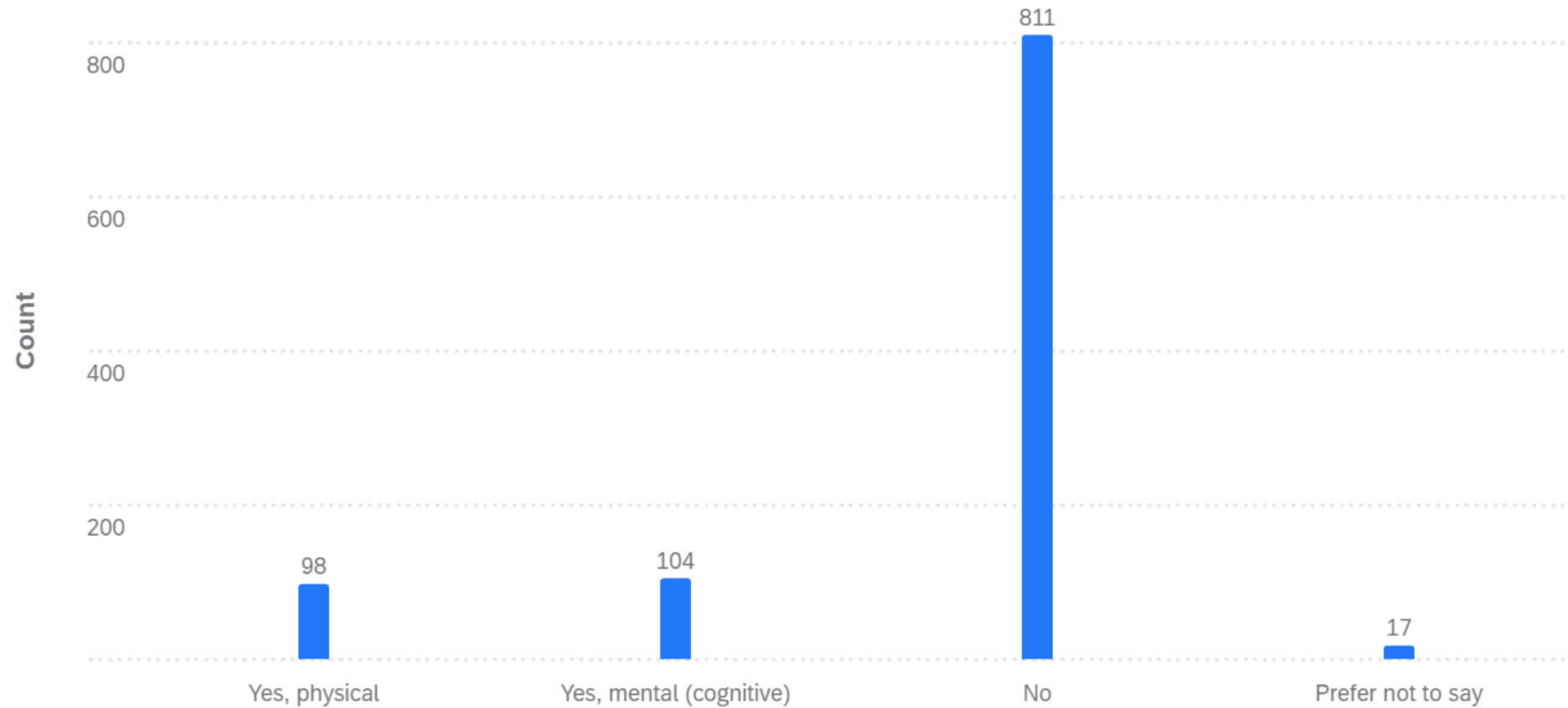


PAIN & INJURY

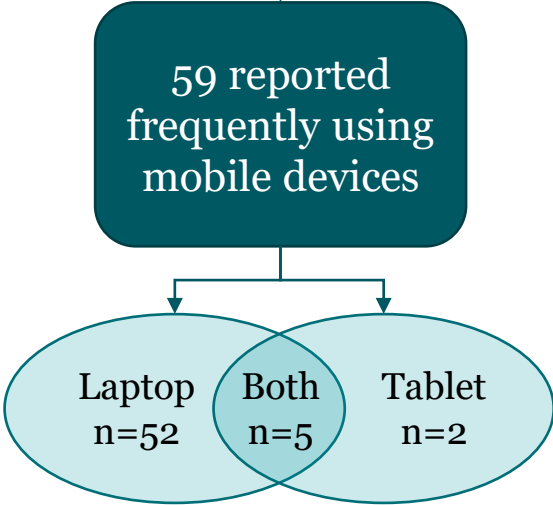
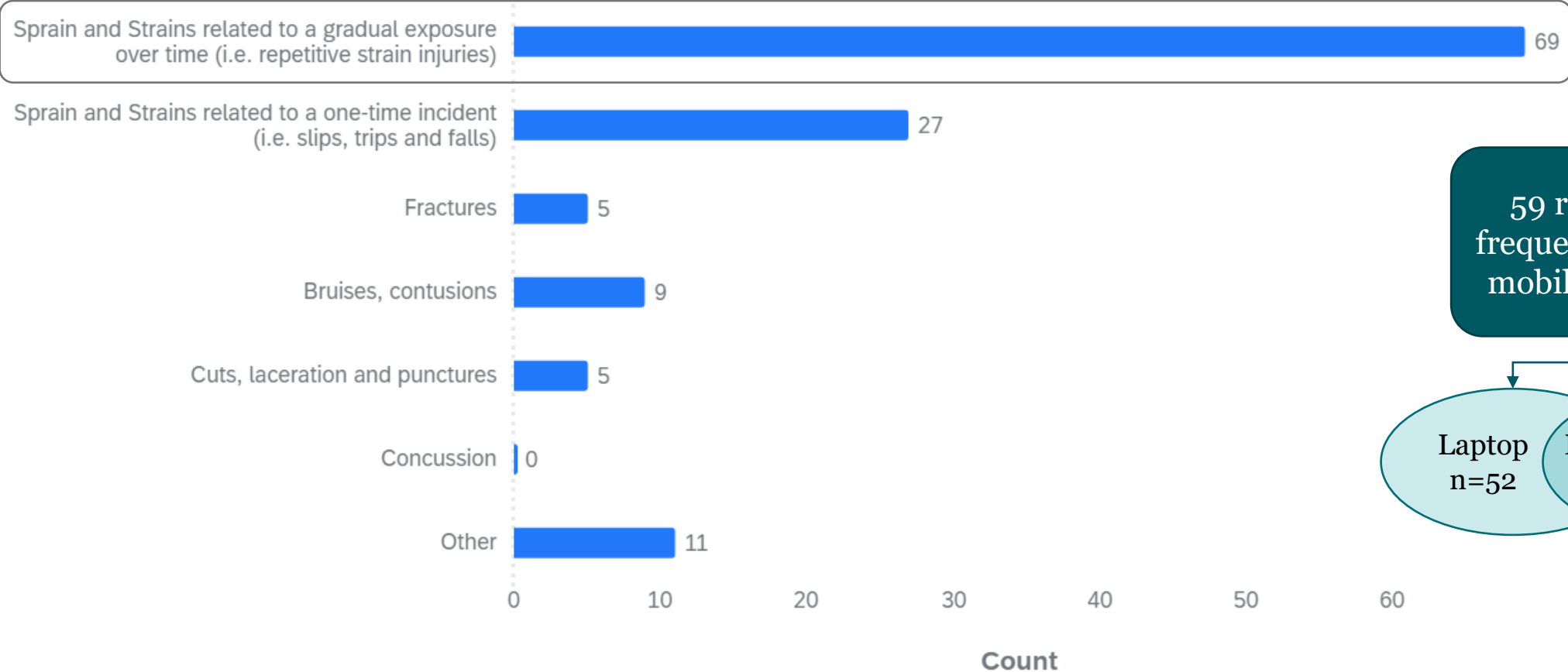
Reported Pain when Teleworking during the Pandemic



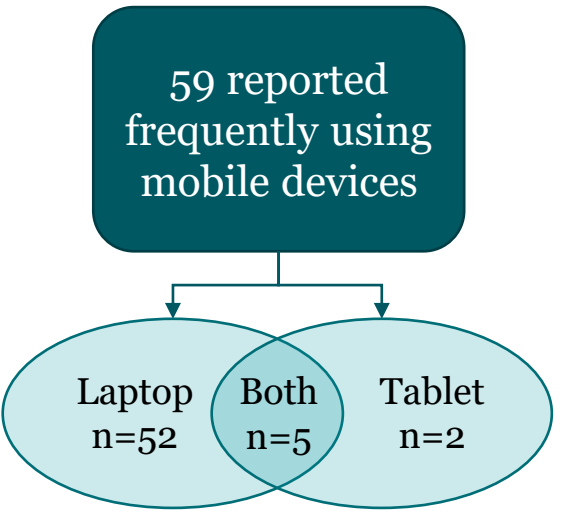
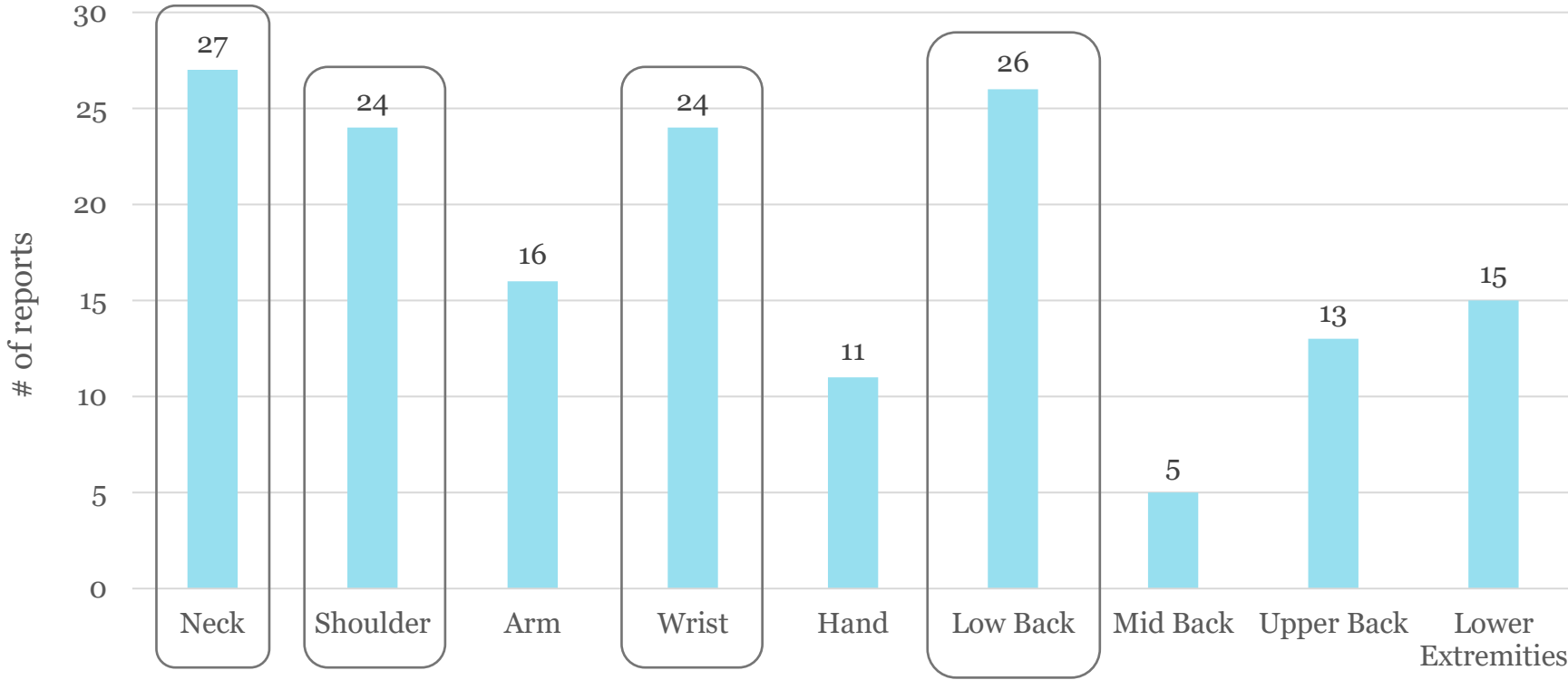
Self-Reported Injuries/Disorders During the Pandemic



Types of Physical Injuries



Types of MSD Reported



RESEARCH QUESTION #1

For those frequently using laptops at home, what workstation factors were associated with pain?

1. Lower Back
2. Neck
3. Shoulders

Frequent Laptop Use: Factors Associated with REDUCED Pain Score

Question Theme	Work Factor	Lower Back	Neck	Shoulders
Laptop Use	External keyboard	-0.100** (n=803)	-	-
	External mouse	-0.085* (n=804)	-	-
	Stand-alone monitor	-0.079* (n=803)	-	-
	Laptop riser	-0.087* (n=804)	-	-
Type of Chair	Office chair	-0.143** (n=801)	-0.094** (n=803)	-0.111** (n=805)
Chair Adjustability	Ability to adjust chair to support the way you would like to sit	-0.167** (n=667)	-0.129** (n=669)	-0.148** (n=670)
Lumbar support	Presence of lumbar support in chair	-0.121** (n=804)	-0.069* (n=806)	-
Seated Posture	Back in contact with the back of the chair	-0.128** (n=804)	-0.101** (n=806)	-0.115** (n=808)
Type of Workstation	Traditional desk	-0.091* (n=802)	-	-
Work Pacing & Breaks	↓ duration of work prior to taking a break	-0.103** (n=803)	-0.169** (n=806)	-0.165** (n=808)
	↑ frequency of movement (posture change) during the workday	-0.133** (n=804)	-0.199** (n=806)	-0.229** (n=808)
	↑ duration of active breaks to move during the workday	-0.145** (n=804)	-0.110** (n=806)	-0.117** (n=808)

**correlation is significant at the 0.01 level (2-tailed)

*correlation is significant at the 0.05 level (2-tailed)

Frequent Laptop Use: Factors Associated with INCREASED Pain Score

Question Theme	Work Factor	Lower Back	Neck	Shoulders
Type of Chair	Kitchen/dining chair	0.149** (n=802)	0.118** (n=804)	0.115** (n=806)
	Couch, sofa or recliner	0.174** (n=801)	0.114** (n=803)	-
	Bed arm/body cushion support	0.115** (n=801)	0.103** (n=803)	0.079* (n=805)
Posture	Upper body (trunk) twisted or bent sideways	0.205** (n=804)	0.159** (n=806)	0.143** (n=808)
	Neck bent forward (flexed)	0.282** (n=804)	0.286** (n=806)	0.260** (n=808)
	Neck bent backwards (extended)	0.087* (n=804)	0.098** (n=806)	0.098** (n=808)
	Neck twisted or bent sideways	0.180** (n=804)	0.193** (n=806)	0.149** (n=808)
Type of Workstation	Make-shift desk (e.g. kitchen table)	0.156** (n=798)	0.104** (n=800)	0.113** (n=802)
	Not on a work surface (e.g. your lap)	0.149** (n=799)	-	0.075* (n=803)

**correlation is significant at the 0.01 level (2-tailed)

*correlation is significant at the 0.05 level (2-tailed)

Laptop Use at Home: Common Factors Associated with Pain in Top 3 Body Areas (Lower Back, Neck and Shoulders)

↓ PAIN

Sitting in an office chair:

- Able to adjust your chair to support the way you would like to sit
- ↑ back contact with the back of the chair

Work pacing & breaks:

- ↑ frequency of posture changes
- ↓ duration of work before taking a break
- ↑ duration of active breaks to move during the workday

Physical Setup & Work Organization factors

↑ PAIN

Sitting in household furniture:

- Kitchen/dining chair
- Couch/bed arm/body cushion support

Temporary work surfaces:

- At a make-shift desk (e.g., kitchen table)
- Not on a work surface (e.g., your lap)

Working in non-optimal postures:

- Upper body twisted or bent sideways
- Neck flexed, extended, twisted or bent sideways

RESEARCH QUESTION #2

What characteristics of work were different between laptop users reporting MSD versus no reports of MSD?

Laptop Use: Differences between reported MSD & no MSD groups

	Factor Description	Chi-Square	Cramer's V	P-value
External Devices	External keyboard (n=813)	20.799	0.160	<0.001
	External mouse (n=814)	9.660	0.109	0.047
	Stand-alone monitor (n=813)	11.652	0.120	0.020
	Laptop riser (n=814)	11.089	0.117	0.026
	Monitor riser/arm (n=810)	11.486	0.119	0.022
	Keyboard tray (n=812)	13.961	0.131	0.007
Chair	Folding chair (n=808)	37.211	0.215	<0.001
	Bed arm/body cushion support (n=810)	11.484	0.119	0.022
Posture	Upper body (trunk) twisted or bent sideways (n=814)	12.598	0.124	0.013
	Neck bent forward (flexed) (n=814)	16.324	0.142	0.003
	Neck bent backwards (extended) (n=814)	9.776	0.110	0.044
	Neck twisted or bent sideways (n=814)	18.973	0.153	<0.001
Other	Make-shift sit/stand workstation (n=808)	9.849	0.110	0.043
	Wear glasses while working on the computer (n=814)	12.207	0.122	0.007

Conclusion

- 67% of respondents would prefer a hybrid working arrangement post-pandemic
 - 49-63% felt that this preference would be supported by their employer
 - Transportation/commuting time & work-life balance were top reasons
 - Home work environment influenced preferences for amount of time working from home
- Work factors associated with discomfort and/or MSD when working on mobile computing devices:
 - Support the body in optimal working postures
 - Consider external devices and appropriate supports
 - Incorporate regular movement and activity throughout the workday

WHO IS RESPONSIBLE FOR MSD PREVENTION IN HYBRID WORK ARRANGEMENTS?

Employers have the Greatest Responsibility

MSD hazards in the workplace are covered by the ***General Duty Clause***, of the **Occupational Health and Safety Act (OHSA)** [Part III, 25 (2)(h)]

- Although the OHSA does not apply to a worker's private residence [Part I, 3 (1)], **Workplace Safety and Insurance Act (WSIA)** applies to workers who sustain a personal injury in the course of his or her employment [c. 16, Sched. A, 13 (1)]
 - If a worker is injured at home during the course of employment, a valid claim would be accepted for employers covered under WSIB
 - Reinforces importance of MSD prevention in all work locations

Employers have the Greatest Responsibility

Hybrid work arrangements include the office and as per the OHSA,

Employers are responsible for:

1. Taking every precaution reasonable in the circumstances for the protection of a worker
2. Ensuring that the **Internal Responsibility System (IRS)** is established, promoted, and that it functions successfully
 - Employers, Supervisors and Workers; everyone in the workplace has a role to play in keeping workplaces safe and healthy
 - Establish MSD Prevention Roles

All Workplace Parties have Responsibilities

Employers:

- Incorporating MSD prevention into health and safety policy and program
- Instruct, inform and supervise workers to protect their health and safety [Part III, 25(2)(a)]
 - Provide training/resources on computer workstation setup, work methods and MSD
- Inform a worker, or a person in authority over a worker, about any hazards in the work and train that worker in the handling, storage, use, disposal and transport of any equipment, substances, tools, material, etc. [Part III, 25 (2)(d)]
 - Implementing controls for known MSD hazards in the office and providing training on use of controls

All Workplace Parties have Responsibilities

Supervisors:

- making workers fully aware of MSD hazards that may be encountered on the job or in the workplace;
- ensuring that they work safely,
- responding to any of the MSD hazards brought to their attention, including taking every precaution reasonable in the circumstances for the protection of a worker.

All Workplace Parties have Responsibilities

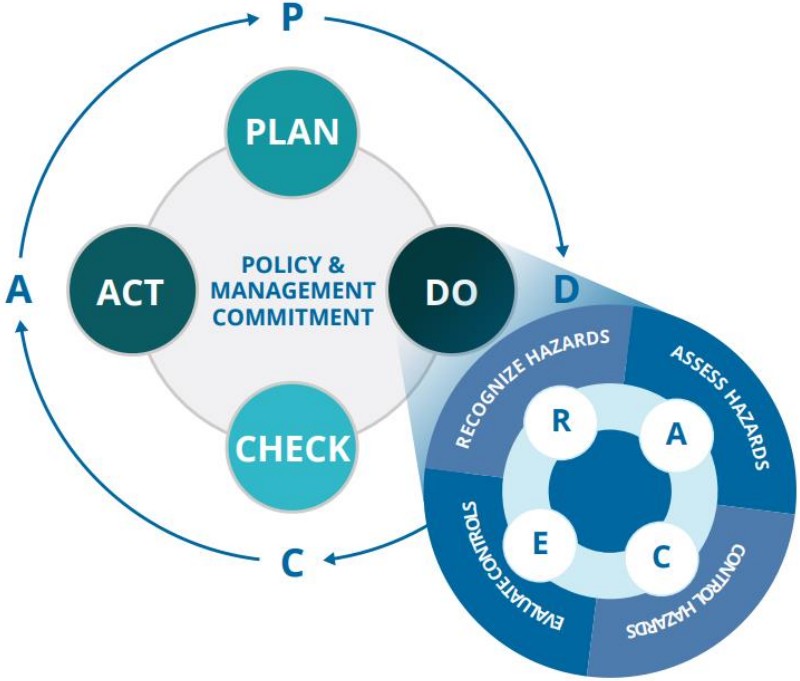
Workers:

- reporting MSD hazards in the workplace;
- working safely and following safe work practices;
- using the provided devices and personal protective equipment for the job at hand;
- participating in health and safety and MSD prevention programs established for the workplace.

RECOMMENDATIONS

MSD Prevention Guideline for Ontario: 10 Step Process

PLAN	STEP 1: Management Commitment
	STEP 2: Worker Participation
	STEP 3: Create a Process and Prepare
DO	STEP 4: Hazard ID & Risk Assessment
	STEP 5: Prioritize & Set Goals
	STEP 6: Implement Controls
	STEP 7: Education & Training
CHECK	STEP 8: Evaluate Program
	STEP 9: Report Results
ACT	STEP 10: Review Program



How to include MSD Prevention into a Health and Safety Program

<https://www.msdpreservation.com/resource-library/view/how-to-include-msd-prevention-into-the-health-and-safety-program.htm>



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Recommendations for Employers



1. Management commitment and leadership

- Create Policy - organizational commitment to MSD prevention for hybrid workers
- Set clear expectations around hybrid work arrangements (i.e., distribution of work between workplace and home, work hours, tasks, deadlines, etc.)
- Focus on positive organizational culture with open communication
- Provide workers with the supports required to perform their tasks safely

Recommendations for Employers



2. Worker Participation

- **Train and empower employees to:**

- Be aware of MSD hazards in computer-based work at home and in the office
- Report hazards and symptoms (i.e., pain/discomfort) early
- Control hazards through optimal set up and best practices

3. Develop a process to support hybrid workers

- **Create a process for hazard identification, assessment and control**

- MSD hazard identification checklist (i.e., [WSPS Home Office Workstation Checklist](#))
- Reference the [Quick Start Guideline – Office](#) to identify and control MSD hazards
- Establish process for implementing controls, such as equipment and training on work methods

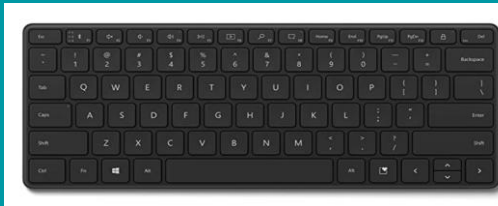
Potential Controls for MSD Hazards - Mobile Computing Devices

Consider equipment that can be transported and used at multiple work locations:

Foldable laptop/tablet riser



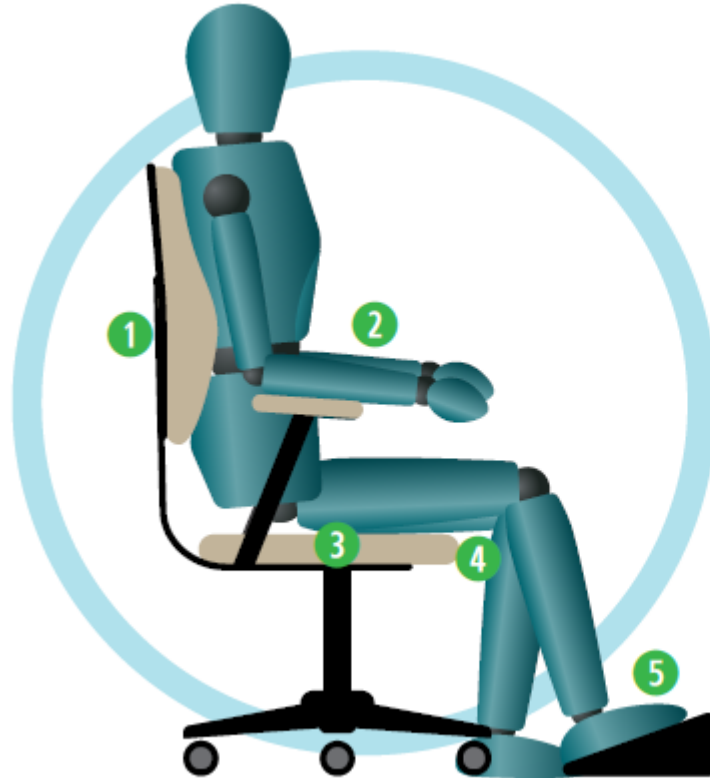
Compact keyboard



Wireless mouse



Potential Controls for MSD Hazards - Support the Body

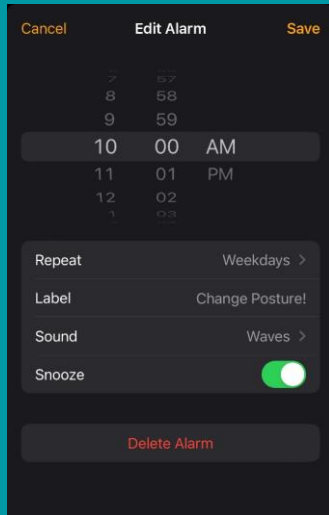


- ① BACK (LUMBAR) SUPPORT
- ② FOREARM SUPPORT
- ③ THIGH SUPPORT
- ④ SPACE BEHIND KNEES
- ⑤ ELEVATED FOOT REST

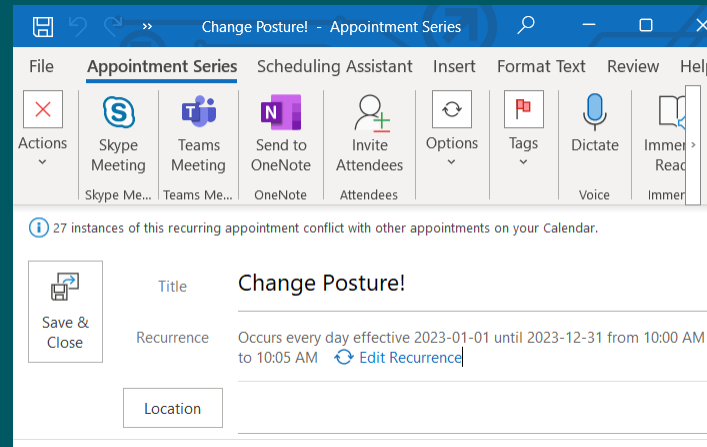
Potential Controls for MSD Hazards - Movement

Set reminders to take posture breaks and move!

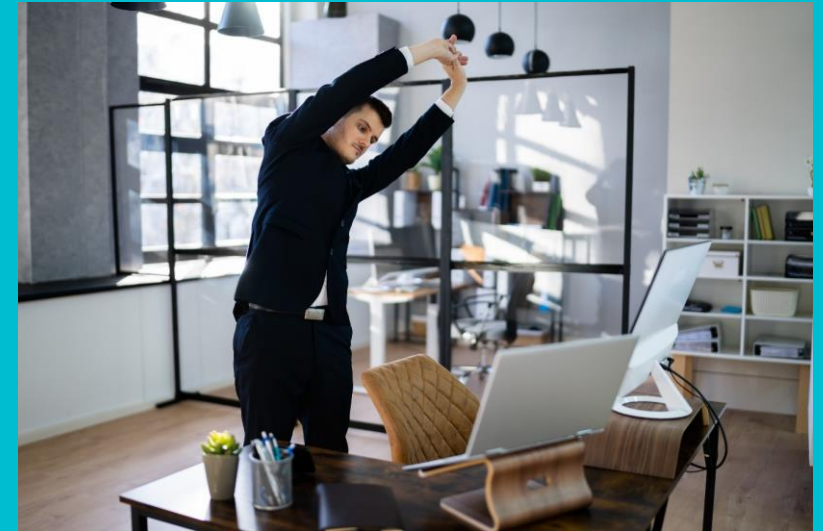
Phone Notifications



Computer Program Settings



Daily stretch break program (virtual/in-person)




Recommendations for Hybrid and Remote Workers

For anyone working in multiple locations:

- Reference resources for optimal device set up and work methods
 - [Quick Start Guideline – Office](#)
- Choose a workspace which suits your needs
 - Set up equipment and supports as recommended to adopt optimal postures
- Report MSD hazards and symptoms (i.e., pain/discomfort) early to allow for intervention

Quick Start Guideline: Office



STEP 1: Set Chair Height
Knees and hips should be at 90° angles (thighs horizontal; lower legs vertical). Feet should be flat on the floor.

STEP 2: Set Chair Settings
Adjust backrest and seatpan such that the low back is well supported and there is no contact between the seat pan and back of the knees.

STEP 3: Set Desk Height
Adjust desk height to be at or slightly below elbow height.

STEP 4: Set Your Desk
Have your forearms approximately horizontal, with your wrists straight and not bent back. The keyboard should be at about elbow level with the mouse close to the side of the keyboard to prevent side reaching.

STEP 5: Set Monitor Height
The top of the computer screen should be at or below eye level and about an arm's length away.

Introduce regular breaks and pauses into work. Stretching can help too.

- Free, online resource, 8-poster series
- Provides guidance on setting up a computer workstation and best practices

<https://www.msdpredvention.com/Quick-Start-Guideline-Office.htm>



Free Resources

- **Musculoskeletal Disorder (MSD) Prevention Guideline for Ontario**

(www.msdpreservation.com)

- **Healthy and Safe telework: Technical Brief.** Geneva: World Health Organization and the International Labour Organization, 2021

(<https://www.who.int/publications/i/item/9789240040977>)

- **CRE-MSD Events Page:** Past Webinars and Events

(<https://cre-msd.uwaterloo.ca/events>)

THANK YOU!

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