

Investigating Total Exposure to WMSD Risks: The Roles of Occupational and Non- occupational Factors

Alan Hedge

Cornell University, Dept. Design & Environmental
Analysis, Ithaca NY 14850

Mary Rudakewych & Lisa Weitz

State of New Jersey, Division of Employee Services
Trenton, NJ 08625

Hedge, A, Rudakewych, M., and Valent-Weitz, L. (2002) Investigating total exposure to WMSD risks: the roles of occupational and non-occupational factors. Proceedings of the Human Factors and Ergonomics Society 46th Annual Meeting, Sept. 30-Oct. 4, Baltimore, MD: 1325-1329.

Models of WMSDs

- **Ecological models**

- view WMSDs as consequence of interaction between physical demands and work-organization demands (Sauter & Swanson, 1996; Amick III et al., 1999)



Hedge, A, Rudakewych, M., and Valent-Weitz, L. (2002) Investigating total exposure to WMSD risks: the roles of occupational and non-occupational factors. Proceedings of the Human Factors and Ergonomics Society 46th Annual Meeting, Sept. 30-Oct. 4, Baltimore, MD: 1325-1329.

Models of WMSDs

- **Total Exposure model**

- views MSDs as consequence of work and non-work demands on the body

$$\text{WMSD} = f(\text{WMSD risks} + \text{non-occupational MSD risks})$$

Research Study

- Subjects – 403 full-time office workers (195 women; 208 men) at NJOIT
- Workstations – all workers at workstations equipped with:
 - Negative-slope keyboard tray with 2-tier mouse platform
 - Ergonomic chair
 - Anti-glare filter, document holder, footrest
- Workers – all trained with 3 hours ergonomics course

Procedure

- One year after ergonomic intervention, all completed and extensive self-report survey on:
 - MSDs
 - Work activities
 - Non-work activities:
 - home computer use
 - domestic activities (gardening, home maintenance)
 - hobbies (knitting, crocheting, needlepoint)
 - sports (volleyball, tennis, golf, racquetball)

Results

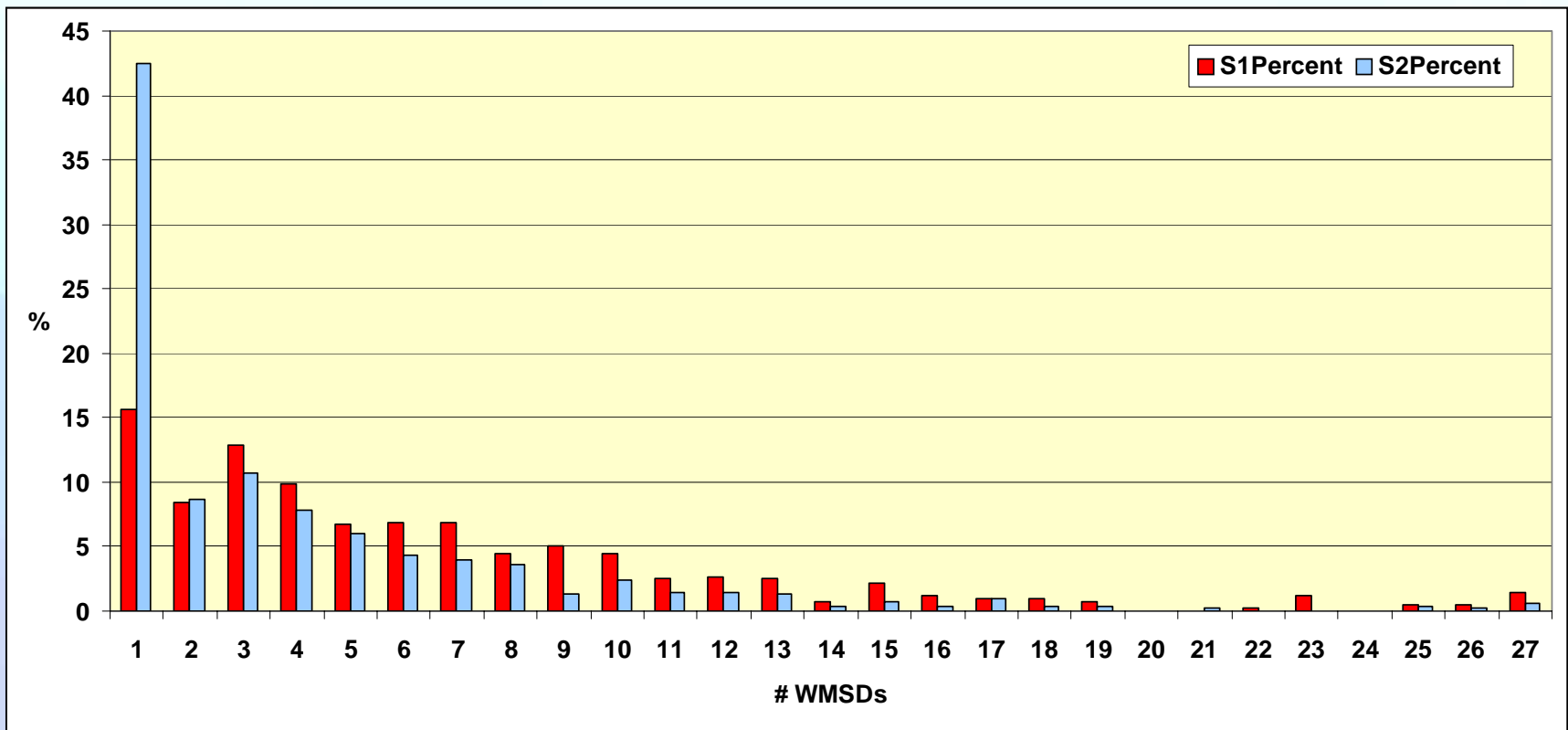
- 31.7% of sample (126 people) participated in at least 1 of the 11 non-work activities
 - 52 participated in single activities
 - 38 in 2 activities
 - 21 in 3 activities
 - 12 in 4 activities
 - 3 in 5 activities

Non-work Activities

Activity	N	Weekly Mean hrs.	Weekly Max. Hrs.
Home computing	78	5.7	35
Gardening	34	4.4	24
Home repair	30	5.4	22
Golf	17	3.9	23
Needlepoint	13	2.8	9
Tennis	10	0.9	4.5
Crocheting	9	0.9	7
Knitting	8	0.9	7
Racquetball	8	0.3	2
Volleyball	8	0.2	1.5

Hedge, A, Rudakewych, M., and Valent-Weitz, L. (2002) Investigating total exposure to WMSD risks: the roles of occupational and non-occupational factors. Proceedings of the Human Factors and Ergonomics Society 46th Annual Meeting, Sept. 30-Oct. 4, Baltimore, MD: 1325-1329.

Frequency Distribution for WMSDs pre and post ergonomic intervention



Hedge, A, Rudakewych, M., and Valent-Weitz, L. (2002) Investigating total exposure to WMSD risks: the roles of occupational and non-occupational factors. Proceedings of the Human Factors and Ergonomics Society 46th Annual Meeting, Sept. 30-Oct. 4, Baltimore, MD: 1325-1329.

Results

- All respondents categorized into those who do participate (RA) and those who do not participate (NRA) in potentially risky non-work activities.
- Overall difference in WMSDs:
 - RA = 4.4 symptoms
 - NRA = 2.7 symptoms
 - (63% risk increase; $p=0.001$)

Results

- After ergonomic intervention overall WMSDs not correlated with:
 - Days per week of computer use
 - Hours per day of computer use
 - Use of keyboard, mouse or both
 - Wearing corrective lens (glasses, contact lens)
 - # times getting out of chair

Non-occupational MSD Risks

Activity	N	Mean # WMSDs		% increase	P
		NRA	RA		
Home computer use	78	2.9	4.4	51.7%	0.009
Gardening	55	2.9	5.2	79.3%	0.004
Crocheting	5	3.1	9.6	209.6%	0.001
Needlepoint	6	3.2	5	56.3%	0.03

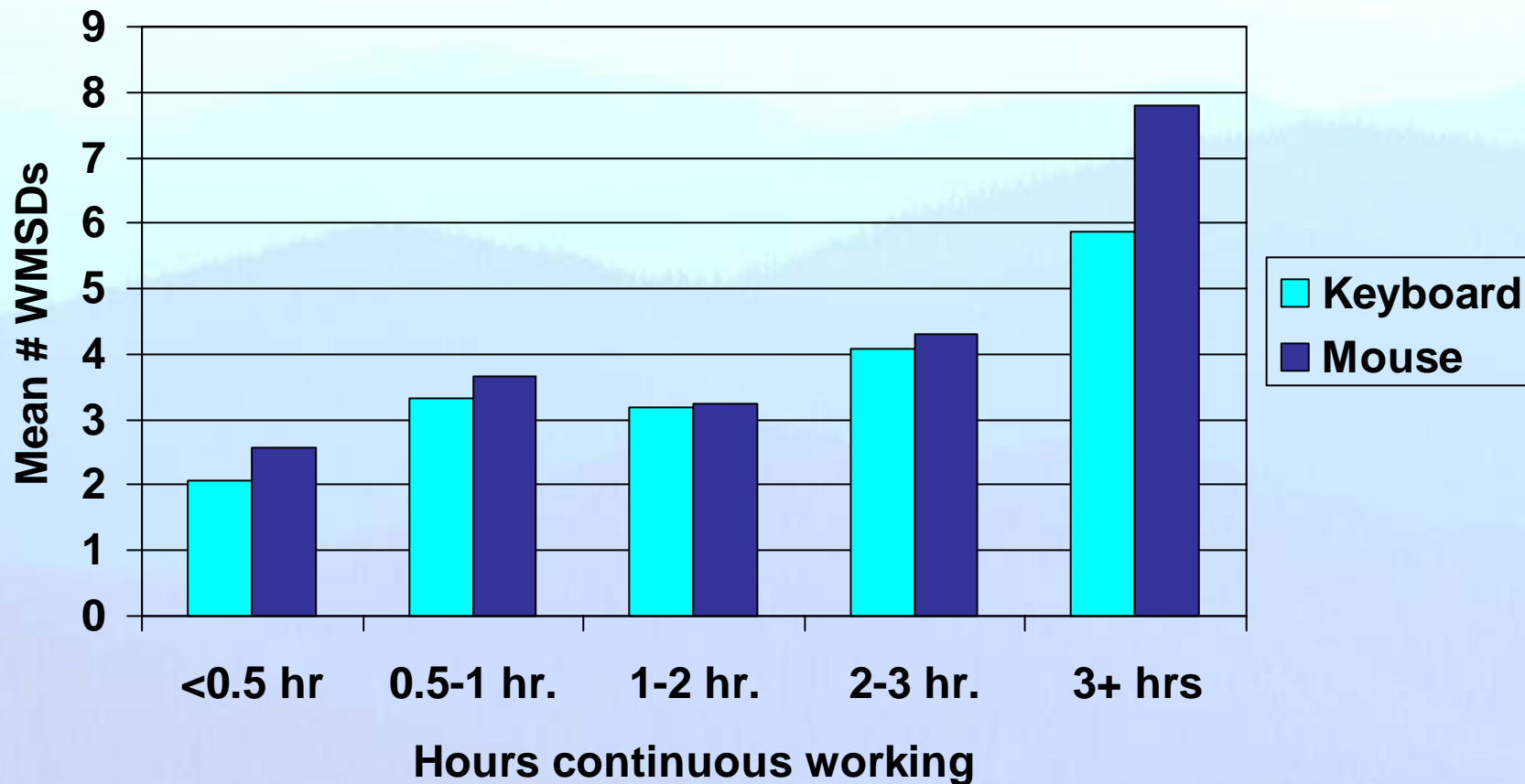
Hedge, A, Rudakewych, M., and Valent-Weitz, L. (2002) Investigating total exposure to WMSD risks: the roles of occupational and non-occupational factors. Proceedings of the Human Factors and Ergonomics Society 46th Annual Meeting, Sept. 30-Oct. 4, Baltimore, MD: 1325-1329.

Activities Not Associated with WMSDs

Activity	N	Mean # WMSDs	
		NRA	RA
Knitting	3	3.1	5
Golf	19	3.2	4.5
Tennis	2	3.2	1.8
Racquetball	2	3.2	2
Volleyball	3	3.2	1

Hedge, A, Rudakewych, M., and Valent-Weitz, L. (2002) Investigating total exposure to WMSD risks: the roles of occupational and non-occupational factors. Proceedings of the Human Factors and Ergonomics Society 46th Annual Meeting, Sept. 30-Oct. 4, Baltimore, MD: 1325-1329.

WMSDs, Duration of Working without a Rest Break



Hedge, A, Rudakewych, M., and Valent-Weitz, L. (2002) Investigating total exposure to WMSD risks: the roles of occupational and non-occupational factors. Proceedings of the Human Factors and Ergonomics Society 46th Annual Meeting, Sept. 30-Oct. 4, Baltimore, MD: 1325-1329.

Conclusions

- Non-work activities can contribute to WMSDs
- After an ergonomic intervention residual WMSDs may be amplified by non-work activities
- Home computer use and gardening may significantly elevate MSD risks
- Participation in certain sports may reduce MSD risks
- Models of WMSDs should incorporate certain non-work activities in estimating risks
- Results are suggestive not definitive, and further work is warranted.

Acknowledgements

- Thanks to Laurie Golding of NJOIT for assistance in data coding and verification