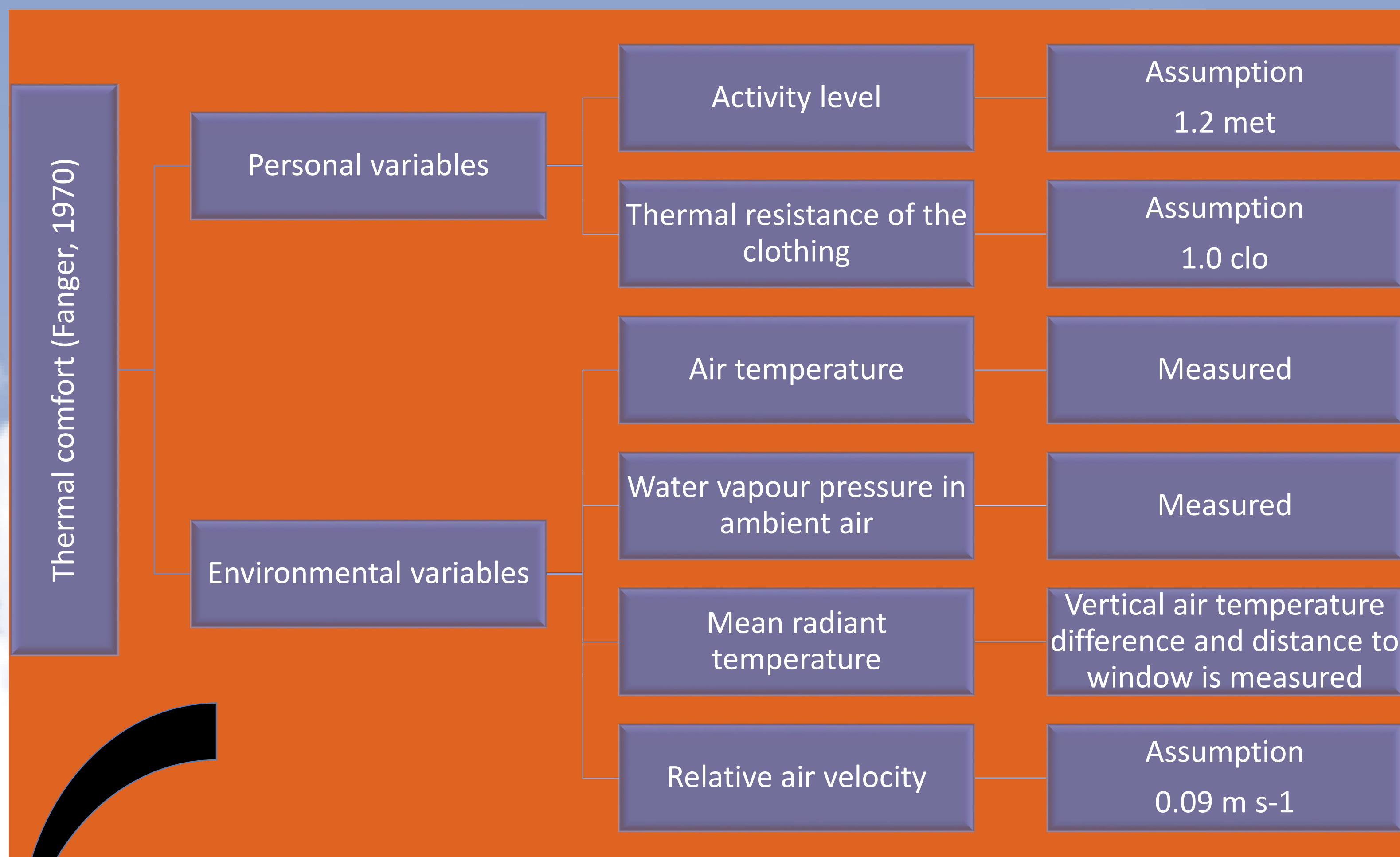


Quality and satisfaction of thermal comfort in Dutch offices

Theory



Objects



	n=182	
	Value for Building LG n=151	Value for Building PS n=31
Mean age (s.d.)	47.3 (10.8) years	38.7 (9.4) years
Sex	Male 41%	Male 26%
	Female 59%	Female 74%

- ✓ Two modern Dutch office buildings (local government, private sector)
- ✓ Buildings meets all Dutch building standards
- ✓ Building type HVAC
- ✓ Windows can not be opened

Research method



260 first year students of the School of Facility Management collected the measurements at the workstation of the office worker under supervision of the researcher

An Atal ENV-MB350NV temperature sensor, humidity sensor, carbon dioxide sensor and a ruler were used to collect data

The occupant completed an 18-item satisfaction questionnaire

Standards

Source	Indoor temperature (°C)	Humidity (%)	Vertical air temperature difference (°C)	Mean air velocity speed (m s ⁻¹)	CO ₂ (ppm)
NPR-CR 1752 (1999)	22.0 ± 1.0	30-70		0,15	460
	22.0 ± 2.0			0,18	600
	22.0 ± 3.0			0,21	1190
NEN-EN-ISO 7730 (2005)	22.0 ± 1.0	60		<2	0,15
	22.0 ± 2.0			<3	0,18
	22.0 ± 3.0			<4	0,21
NEN-EN 15251 (2007)	21.0	30-50			750
	20.0	25-60			900
	19.0	20-70			1200
		>70<20			<1200

Results

Temperature	Indoor temperature at desktop height (Θ _a)	Total	Grading temperature	% Satisfied	% Dissatisfied
19			11	6.09	55
20			27	6.70	70
21			50	5.38	50
22			53	5.47	60
23			30	4.93	50

Environment Results
The recorded indoor temperature was between 18 and 24°C
In 97% of the cases the humidity percentage was categorized in category I (30-50%)
In 94% of the cases the vertical air temperature difference was between 0-2°C
In 95% of the cases the carbon dioxide concentration was categorized < 850 ppm

Conclusion

This study indicates that an indoor temperature higher than 22°C might be too warm for office workers in The Netherlands during wintertime and that application might influence workers' satisfaction negatively

Regression analyses	β Scale too warm (α= 0.77)	β Scale too cold (α= 0.79)	β Grading temperature	β Scale air quality (α= 0.64)	β Grading air quality
Outdoor temperature (Θ _o)					
Indoor temperature at desktop height (Θ _a)	0.305***	-0.232**	-0.302***		
Indoor humidity					
Vertical air temperature difference					
Distance between the occupant and the nearest window					
Carbon dioxide concentration					
Age					
Gender			0.230**		0.191**