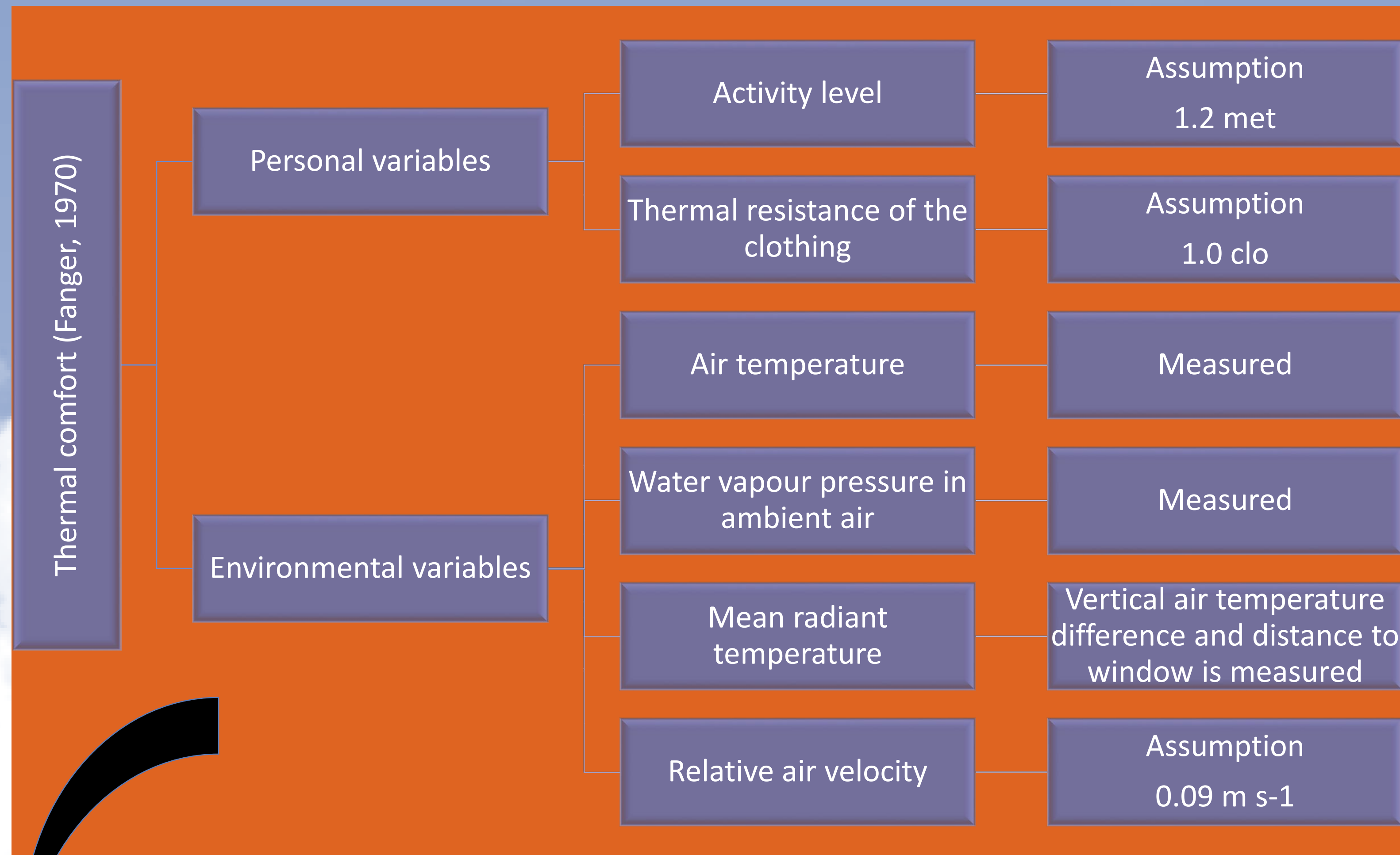


# Quality and satisfaction of thermal comfort in Dutch offices

## 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 <sup>-1</sup> )	CO <sub>2</sub> (ppm)
NPR-CR 1752 (1999)	22.0 ± 1.0	30-70			0,15
	22.0 ± 2.0				0,18
	22.0 ± 3.0				0,21
NEN-EN-ISO 7730 (2005)	22.0 ± 1.0	60	<2		0,15
	22.0 ± 2.0				0,18
	22.0 ± 3.0				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 <sub>a</sub> )	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 <sub>o</sub> )					
Indoor temperature at desktop height (Θ <sub>a</sub> )	0.305***	-0.232**	-0.302***		
Indoor humidity					
Vertical air temperature difference					
Distance between the occupant and the nearest window	-0.152**				
Carbon dioxide concentration					
Age					
Gender		0.230**		0.191**	