

# Perceived degree of crowding and quality of public transportation: The importance of including the third gender

Malte Petersen, Catharina Wasic & Mandy Dotzauer  
German Aerospace Center

 Institute of  
DLR Transportation Systems

 SAFIRA

## Introduction

### Background

- Public transport (PT) needs to be tailored to the needs of all passengers in order to achieve a significant shift from private car use to PT use.
- Crowding has shown to be one of the major aspects leading to a deterioration of PT travel experience (Cox et al., 2006; Cantwell et al., 2009; Evans & Wener, 2007).

### Approach of this study

- QR-codes displayed inside PT vehicles in the federal states of Berlin and Brandenburg leading to an online survey



### Objectives of the study

- Investigate the effect of perceived degree of crowding (PDC) in PT vehicles on different aspects of trip quality with a large sample.
- Analyze the influence of gender identity on PDC and trip quality via a statistically matched subsample.

### Survey

- Assessment of PDC inside the vehicle as well as different aspects of trip quality



## Method

### Matching procedure

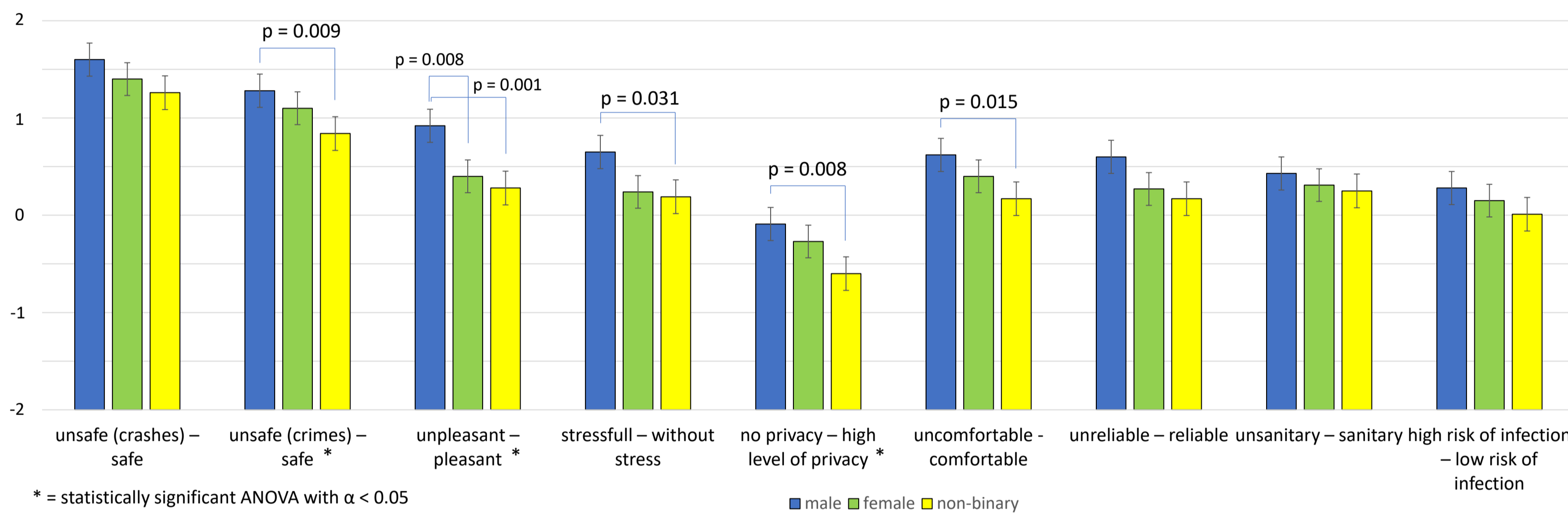
- Matching via the variables „age“ and „frequency of PT use“, resulting in 3 groups (male, female, non-binary) with a sample size of  $n = 89$  each

### Sample information

	Whole sample	Subsample
Sample size	2071	267
Gender		
male:	56.4%	33.3%
female:	38.7%	33.3%
non-binary:	4.9%	33.3%
Mean age	32.42 (12.02)	31.37 (13.11)
Frequency of PT use		
almost daily:	66.1%	68.5%
several times a week:	24.0%	25.1%
about once a week:	5.5%	4.1%
about once a month:	3.0%	2.2%
< once a month:	1.4%	0%

## Results

### Means and standard errors of the 3 gender identity groups for different aspects of trip quality (-2 = neg. pole, 2 = pos. pole)



### Correlation of PDC and aspects of trip quality

Factor	$r_{ws}$	$r_m$	$r_f$	$r_{nb}$
unsafe (crashes) – safe	-0.37	-0.30	-0.37	-0.52
unsafe (crimes) – safe	-0.33	-0.23	-0.35	-0.47
unpleasant – pleasant	-0.61	-0.68	-0.75	-0.77
stressful – without stress	-0.63	-0.60	-0.68	-0.76
no privacy – high level of privacy	-0.61	-0.65	-0.74	-0.70
uncomfortable – comfortable	-0.66	-0.64	-0.73	-0.70
unreliable – reliable	-0.41	-0.29	-0.48	-0.61
unsanitary – sanitary	-0.38	-0.49	-0.42	-0.38
high risk of infection – low risk of infection	-0.52	-0.48	-0.58	-0.56

$r_{ws}$  = correlation whole sample,  $r_m$  = correlation male,  $r_f$  = correlation female,  $r_{nb}$  = correlation non-binary

### Semantic differential of aspects of trip quality for different degrees of crowding perception



## Discussion

### Summary

- Trip quality was evaluated worse by female participants compared to male participants and worst by non-binary participants compared to the other groups
- Significant differences in aspects of trip quality were observed between male and female or male and non-binary participants, but never between female and non-binary participants.
- Non-binary participants felt significantly less secure, perceived less pleasantness, more stress, and lower comfort and privacy during the trip than male participants.
- Evaluation of all aspects of trip quality was moderately to strongly correlated with PDC for all groups even though it was slightly higher for non-binary participants for most of the quality aspects.
- For low (0 – 33) or moderate (34 – 66) PDC only small differences in the assessment of trip quality were found while especially for high PDC (67 – 100) the negative impact on the trip quality was salient for all groups.

### Conclusion

- The goal of a sustainable transport system with more people using PT can only be achieved if PT is tailored to the needs of all potential future passengers.
- This study showed that persons with non-binary gender identity experienced a lower trip quality especially for aspects of personal security, stress, and privacy and are more affected by crowded PT vehicles.
- A reason for this might be that marginalized groups are more likely to fear and experience assaults or hostility in crowded environments.
- The results highlight the necessity for increasing the general awareness of needs of marginalized groups and implementing further methods to increase security and privacy in public transportation.

## Literature

Cantwell, M., Caulfield, B., O'Mahony, M. (2009). Examining Factors that Impact Public Transport Commuting Satisfaction. *Journal of Public Transportation*, 12 (2), 1-21.  
Cox, T., Houdmont, J. & Griffiths, A. (2006). Rail passenger crowding, stress, health and safety in Britain. *Transportation Research Part A*, 40, 244-258.  
Evans, G. & Wener, R. (2007). Crowding and personal space invasion on the train: Please don't make me sit in the middle. *Journal of Environmental Psychology*, 27, 90-94.

## More Information

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