Short assessment scale to assess motion sickness in automated driving: Motion Sickness Task Tolerance (MSTT) Scale

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1 Current version of the scale (2022/07/06)

How severe are your symptoms concerning motion sickness at this moment?

unbearable drive must be terminated	**10**
not tolerable activity needs to be stopped	**9**
	8
	7
uncomfortable activity can be performed with limitations	**6**
	5
	4
harmless activity can be performed without limitations	**3**
	2
	1
not noticeable	**0**

2 Instructions

- Please use ‘not noticeable’, if you do not experience any specific symptoms of motion sickness at this moment in time.
- Please use the category ‘harmless’ (ratings 1-3), if you experience mild symptoms of motion sickness. However, the level of motion sickness still allows you to stay fully engaged in the non-driving related task (NDRT).
- Please use the category ‘uncomfortable’ (ratings 4-6), if you experience a level of motion sickness that diminishes NDRT engagement (e.g., attention is increasingly drawn to the symptoms of motion sickness).
- Please use the category ‘not tolerable’ (ratings 7-9), if the symptoms cause you to temporarily interrupt or terminate the NDRT. However, it would still be possible to continue the drive looking outside.
- Please use ‘unbearable’ (rating 10), if you want/need to terminate the complete drive because of severe symptoms of motion sickness.

3 Background information

- The scale measures the currently perceived symptoms of motion sickness.
- Purpose: spontaneous and repeated assessment of the current user state during a motion sickness inducing test drive (e.g., administered every 2 minutes). Ideally, the instrument should be complemented by more detailed pre-drive/post-drive questionnaires that focus on individual symptoms of motion sickness. Examples are the MSAQ (Gianaros et al., 2001) or SSQ (Kennedy et al., 1993).
- The 10-step scale with 5 categories was adopted from well-known scales to assess controllability or criticality of driving situations (cf. Neukum et al., 2008 or Tscharn et al., 2018)
- In contrast to already available short-scales like FMS (Keshavarz & Hecht, 2011) or MISC (Bos et al., 2005) the MSTF scale includes criteria that relate discomfort categories to the ability to perform visual non-driving related tasks (NDRT).
- The scale can also be used to determine and monitor threshold for abortion of trials for ethical reasons (e.g., avoidance of ratings above 6).

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5 References

Bos, J.E.; MacKinnon, S.N.; Patterson, A. (2005). Motion sickness symptoms in a ship motion simulator: effects of inside, outside, and no view. Aviat Space Environ. Med., 76 (12), pp. 1111-1118

Gianaros, P. J., Muth, E. R., Mordkoff, J. T., Levine, M. E., & Stern, R. M. (2001). A questionnaire for the assessment of the multiple dimensions of motion sickness. Aviation, space, and environmental medicine, 72(2), 115.

Kennedy, R. S., Lane, N. E., Berbaum, K. S., & Lilienthal, M. G. (1993). Simulator sickness questionnaire: An enhanced method for quantifying simulator sickness. The international journal of aviation psychology, 3(3), 203-220.

Keshavarz, B., & Hecht, H. (2011). Validating an efficient method to quantify motion sickness. Human factors, 53(4), 415-426.

Neukum, A., Ufer, E., Paulig, J., & Krüger, H. P. (2008). Controllability of superposition steering system failures. Steering tech.

Tscharn, R., Naujoks, F., & Neukum, A. (2018). The perceived criticality of different time headways is depending on velocity. Transportation Research Part F: Traffic Psychology and Behaviour, 58, 1043-1052.