

AR Makes You Sick: Evidence and Quantification of Visual-Vestibular Conflicts in Augmented Reality —Supplementary Material—

Category: Research

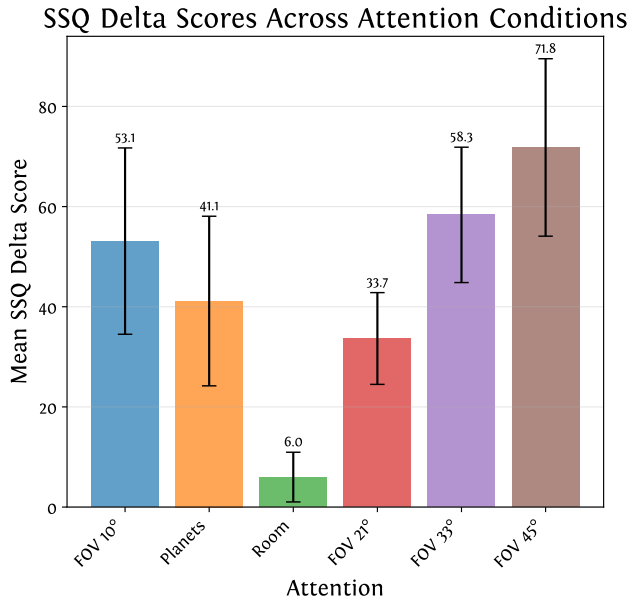


Figure 1: A bar chart showing the mean change in SSQ score (before to after) across attention conditions in the experiments. Participants exhibited the lowest SSQ score when they focused on the physical room, and the virtual planets condition yielded sickness levels that are comparable to those measured during the FOV reduction experiment.

1 PARTICIPANT RECRUITMENT, EXCLUSIONS, AND EARLY TERMINATIONS

Experiment 1 A total of 22 participants were recruited. 2 were excluded from analysis because they did not exhibit any measurable increase in cybersickness over the session, leaving 20 participants in the reported dataset. A further 2 participants chose to end a session before completing all 20 trials due to discomfort. Their responses up to the point of withdrawal are retained, as they remain valid measurements of symptom onset.

Experiment 2 Of 33 participants recruited, 9 were excluded for showing no measurable cybersickness response and 4 ended at least one session early due to discomfort while remaining in the dataset, yielding the 24 participants reported in the main text.

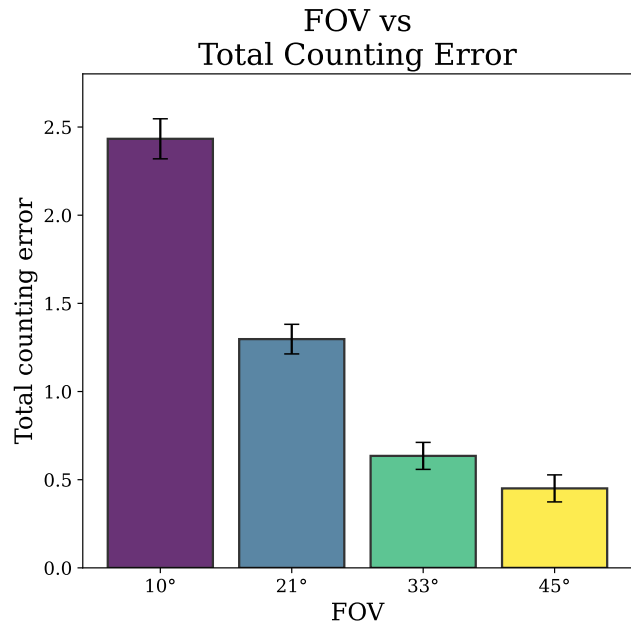


Figure 2: A bar chart showing the average counting error per condition, pooled across all participants (N=24). Bars indicate standard error. Participants consistently scored higher on the painting counting task when the FOV of the HMD was larger.

Table 1: SSQ scores by condition for Experiment 1 and Experiment 2

Participant	SSQ Before Fov 10	SSQ After Fov 10	SSQ Delta Fov 10	SSQ Before Planets	SSQ After Planets	SSQ Delta Planets	SSQ Before Room	SSQ After Room	SSQ Delta Room	SSQ Before Fov 21	SSQ After Fov 21	SSQ Delta Fov 21	SSQ Before Fov 33	SSQ After Fov 33	SSQ Delta Fov 33	SSQ Before Fov 45	SSQ After Fov 45	SSQ Delta Fov 45
1234	0.0	33.66	33.66	0.0	26.18	26.18	0.0	18.7	18.7	0.0	56.1	56.1	0.0	18.7	18.7	0.0	18.7	18.7
1243	0.0	93.5	93.5	7.48	11.22	3.74	3.74	0.0	-3.74	3.74	11.22	7.48	0.0	59.84	59.84	11.22	130.9	119.68
1324	0.0	71.06	71.06	7.48	97.24	89.76	0.0	11.22	11.22	0.0	86.02	86.02	0.0	108.46	108.46	0.0	93.5	93.5
1342	0.0	33.66	33.66	0.0	18.7	18.7	0.0	18.7	18.7	0.0	14.96	14.96	0.0	7.48	7.48	0.0	0.0	0.0
1423	3.74	0.0	-3.74	0.0	123.42	123.42	0.0	127.16	127.16	0.0	11.22	11.22	0.0	7.48	7.48	0.0	37.4	37.4
1432	0.0	18.7	18.7	0.0	29.92	29.92	0.0	0.0	0.0	0.0	29.92	29.92	0.0	41.14	41.14	0.0	22.44	22.44
2134	0.0	0.0	0.0	0.0	37.4	37.4	0.0	3.74	3.74	0.0	18.7	18.7	0.0	0.0	0.0	0.0	48.62	48.62
2143	0.0	100.98	100.98	0.0	93.5	93.5	0.0	11.22	11.22	0.0	52.36	52.36	0.0	97.24	97.24	0.0	100.98	100.98
2314	11.22	71.06	59.84	3.74	89.76	86.02	0.0	56.1	56.1	3.74	89.76	86.02	3.74	71.06	67.32	3.74	59.84	56.1
2341	22.44	74.8	52.36	7.48	63.58	56.1	3.74	22.44	18.7	3.74	71.06	67.32	33.66	59.84	26.18	26.18	78.54	52.36
2413	3.74	119.68	115.94	0.0	82.28	82.28	0.0	22.44	22.44	18.7	37.4	18.7	0.0	0.0	0.0	0.0	41.14	41.14
2431	0.0	7.48	7.48	0.0	26.18	26.18	0.0	0.0	0.0	37.4	93.5	56.1	0.0	56.1	56.1	0.0	157.08	157.08
3124	0.0	86.02	86.02	0.0	52.36	52.36	0.0	41.14	41.14	0.0	41.14	41.14	3.74	26.18	22.44	7.48	29.92	22.44
3142	14.96	78.54	63.58	29.92	104.72	74.8	0.0	44.88	44.88	0.0	29.92	29.92	14.96	41.14	26.18	0.0	97.24	97.24
3214	3.74	29.92	26.18	3.74	14.96	11.22	3.74	3.74	0.0	26.18	44.88	18.7	14.96	97.24	82.28	3.74	26.18	22.44
3412	0.0	67.32	67.32	26.18	71.06	44.88	33.66	18.7	-14.96	0.0	52.36	52.36	0.0	71.06	71.06	14.96	130.9	115.94
4123	0.0	0.0	0.0	0.0	22.44	22.44	0.0	0.0	0.0	0.0	7.48	7.48	0.0	0.0	0.0	3.74	22.44	18.7
4213	0.0	18.7	18.7	0.0	71.06	71.06	0.0	14.96	14.96	0.0	37.4	37.4	0.0	22.44	22.44	0.0	44.88	44.88
4231	7.48	37.4	29.92	7.48	22.44	14.96	7.48	18.7	11.22	7.48	37.4	29.92	11.22	52.36	41.14	0.0	56.1	56.1
4321	29.92	37.4	7.48	0.0	67.32	67.32	14.96	7.48	-7.48	26.18	48.62	22.44	11.22	86.02	74.8	3.74	67.32	63.58

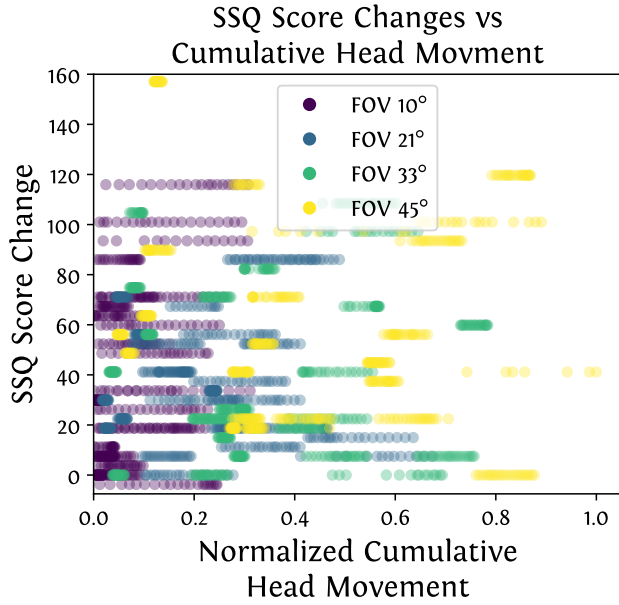


Figure 3: A scatter plot showing the normalized cumulative head motion plotted against changes in SSQ score over the sessions. Results are plotted for all conditions and all participants (N=24). The spread of points indicates that there is no correlation between head movement and SSQ score changes. Outliers (defined by 1.5 times the interquartile range below the first quartile or above the third quartile) have been removed.

Table 2: SSQ total scores by FOV condition (before/after) and deltas for Experiment 2 (windowed content with varying FOV levels).

Participant	SSQ Before Fov 10	SSQ After Fov 10	SSQ Delta FOV 10	SSQ Before Fov 21	SSQ After Fov 21	SSQ Delta FOV 21	SSQ Before Fov 33	SSQ After Fov 33	SSQ Delta FOV 33	SSQ Before Fov 45	SSQ After Fov 45	SSQ Delta FOV 45
1234	0.0	33.66	33.66	0.0	56.1	56.1	0.0	18.7	18.7	0.0	18.7	18.7
1243	0.0	93.5	93.5	3.74	11.22	7.48	0.0	59.84	59.84	11.22	130.9	119.68
1324	0.0	71.06	71.06	0.0	86.02	86.02	0.0	108.46	108.46	0.0	93.5	93.5
1342	0.0	33.66	33.66	0.0	14.96	14.96	0.0	7.48	7.48	0.0	0.0	0.0
1423	3.74	0.0	-3.74	0.0	11.22	11.22	0.0	7.48	7.48	0.0	37.4	37.4
1432	0.0	18.7	18.7	0.0	29.92	29.92	0.0	41.14	41.14	0.0	22.44	22.44
2134	0.0	0.0	0.0	0.0	18.7	18.7	0.0	0.0	0.0	0.0	48.62	48.62
2143	0.0	100.98	100.98	0.0	52.36	52.36	0.0	97.24	97.24	0.0	100.98	100.98
2314	11.22	71.06	59.84	3.74	89.76	86.02	3.74	71.06	67.32	3.74	59.84	56.1
2341	22.44	74.8	52.36	3.74	71.06	67.32	33.66	59.84	26.18	26.18	78.54	52.36
2413	3.74	119.68	115.94	18.7	37.4	18.7	0.0	0.0	0.0	0.0	41.14	41.14
2431	0.0	7.48	7.48	37.4	93.5	56.1	0.0	56.1	56.1	0.0	157.08	157.08
3124	0.0	86.02	86.02	0.0	41.14	41.14	3.74	26.18	22.44	7.48	29.92	22.44
3142	14.96	78.54	63.58	0.0	29.92	29.92	14.96	41.14	26.18	0.0	97.24	97.24
3214	3.74	29.92	26.18	26.18	44.88	18.7	14.96	97.24	82.28	3.74	26.18	22.44
3241	0.0	48.62	48.62	0.0	33.66	33.66	0.0	14.96	14.96	0.0	41.14	41.14
3412	0.0	67.32	67.32	0.0	52.36	52.36	0.0	71.06	71.06	14.96	130.9	115.94
3421	14.96	26.18	11.22	26.18	97.24	71.06	0.0	104.72	104.72	14.96	104.72	89.76
4123	0.0	0.0	0.0	0.0	7.48	7.48	0.0	0.0	0.0	3.74	22.44	18.7
4132	0.0	71.06	71.06	0.0	41.14	41.14	0.0	22.44	22.44	0.0	71.06	71.06
4213	0.0	18.7	18.7	0.0	37.4	37.4	0.0	22.44	22.44	0.0	44.88	44.88
4231	7.48	37.4	29.92	7.48	37.4	29.92	11.22	52.36	41.14	0.0	56.1	56.1
4312	7.48	11.22	3.74	0.0	0.0	0.0	0.0	7.48	7.48	0.0	18.7	18.7
4321	29.92	37.4	7.48	26.18	48.62	22.44	11.22	86.02	74.8	3.74	67.32	63.58