

BACKGROUND

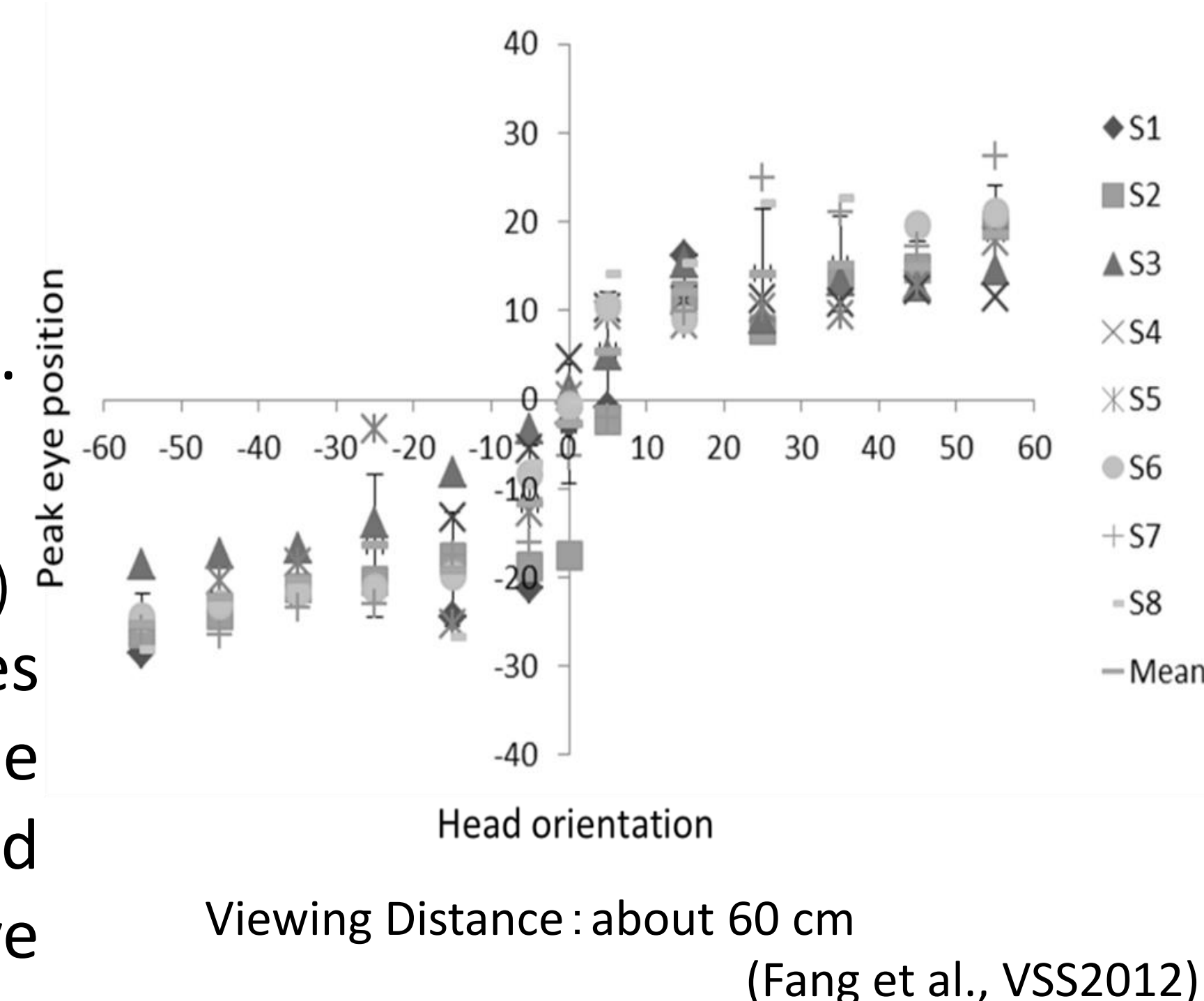
Eye position distribution depending on head orientation

◆ Visual search

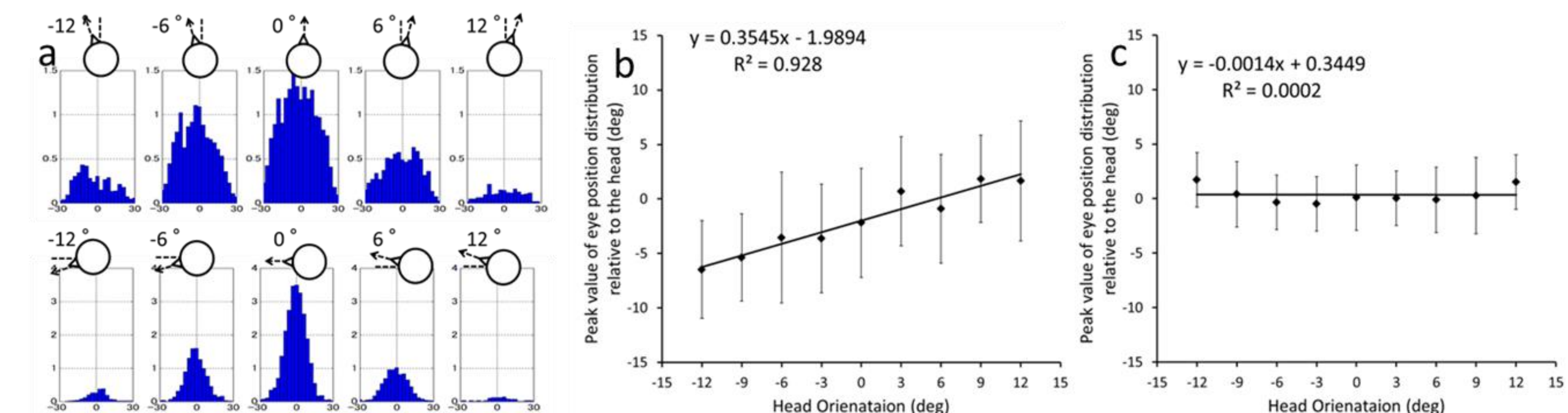
(360° display: viewing distance 60 cm)
 Horizontal head orientation biases eye position toward the same direction with head (Fang et al., VSS2012).

◆ Static natural scene viewing

(56 deg x 42 deg: viewing distance 136 cm)
 Horizontal head orientation biases eye position toward the same direction with head; Vertical head orientation does not influence eye position distribution.

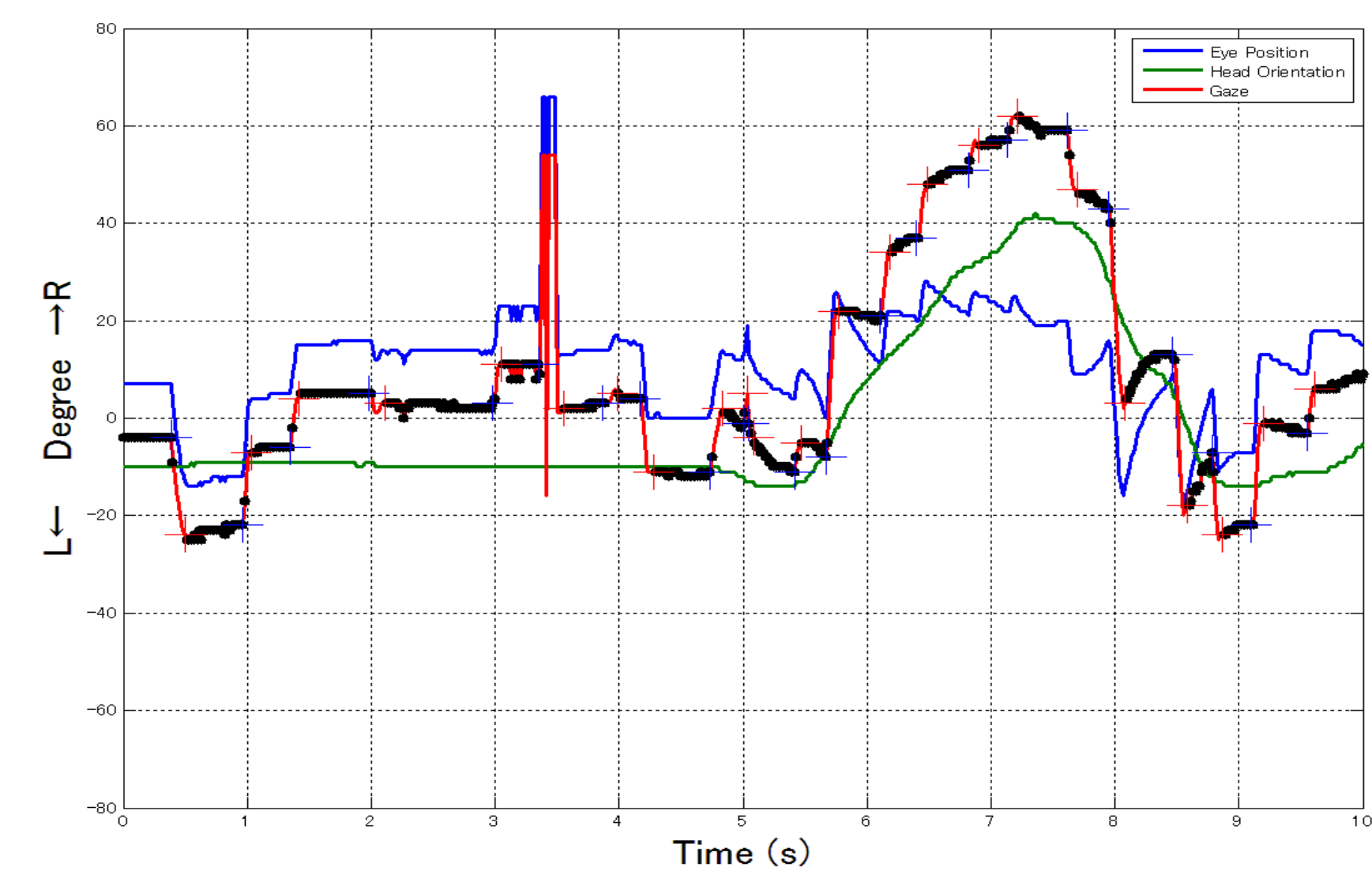


(Nakashima et al., APCV2012)



PURPOSE

- To investigate the eye-head coordination while viewing movies in a high-resolution display (189 x 110 cm).
- To investigate whether the viewing distances/size can influence the eye-head coordination.

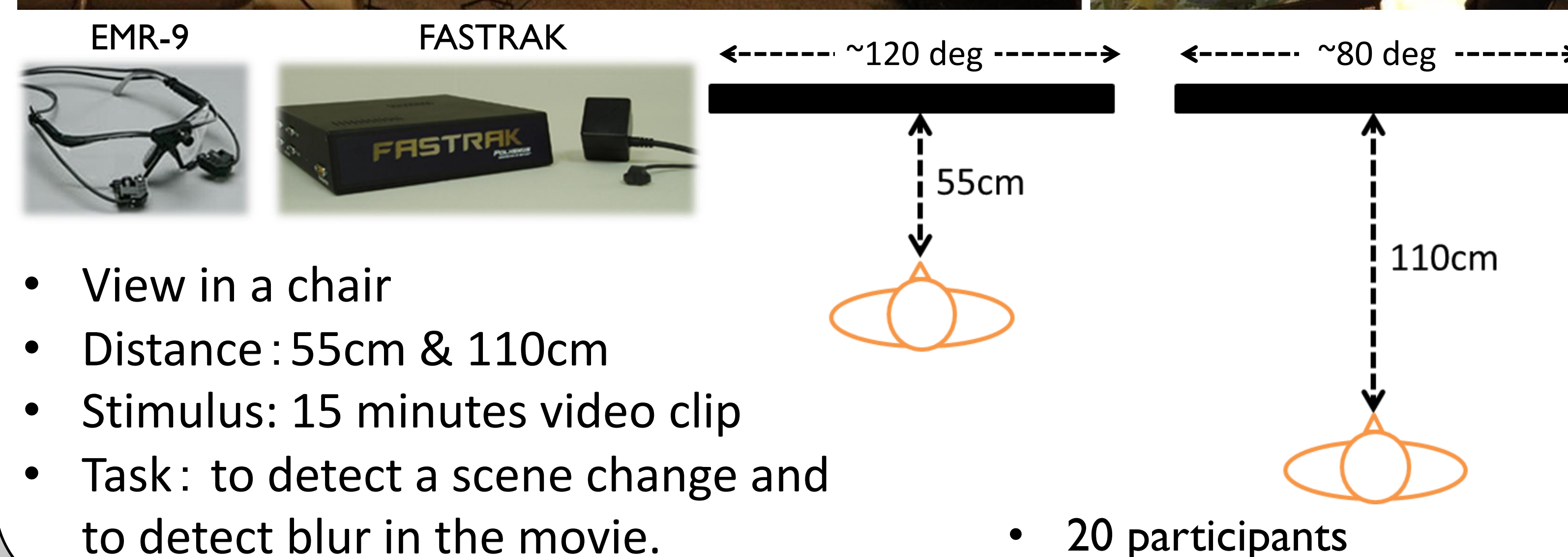
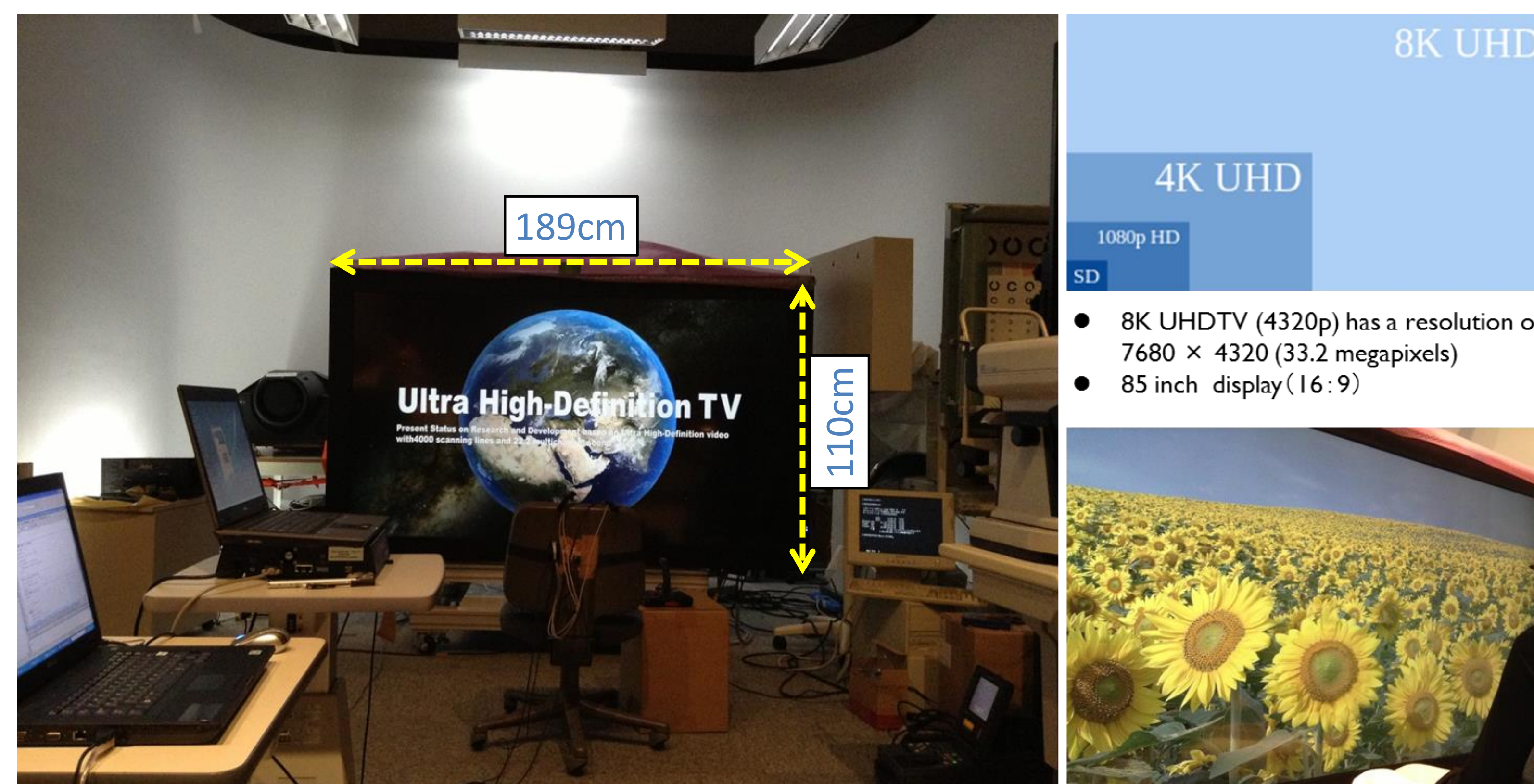


■ Typical eye, head and gaze movements.

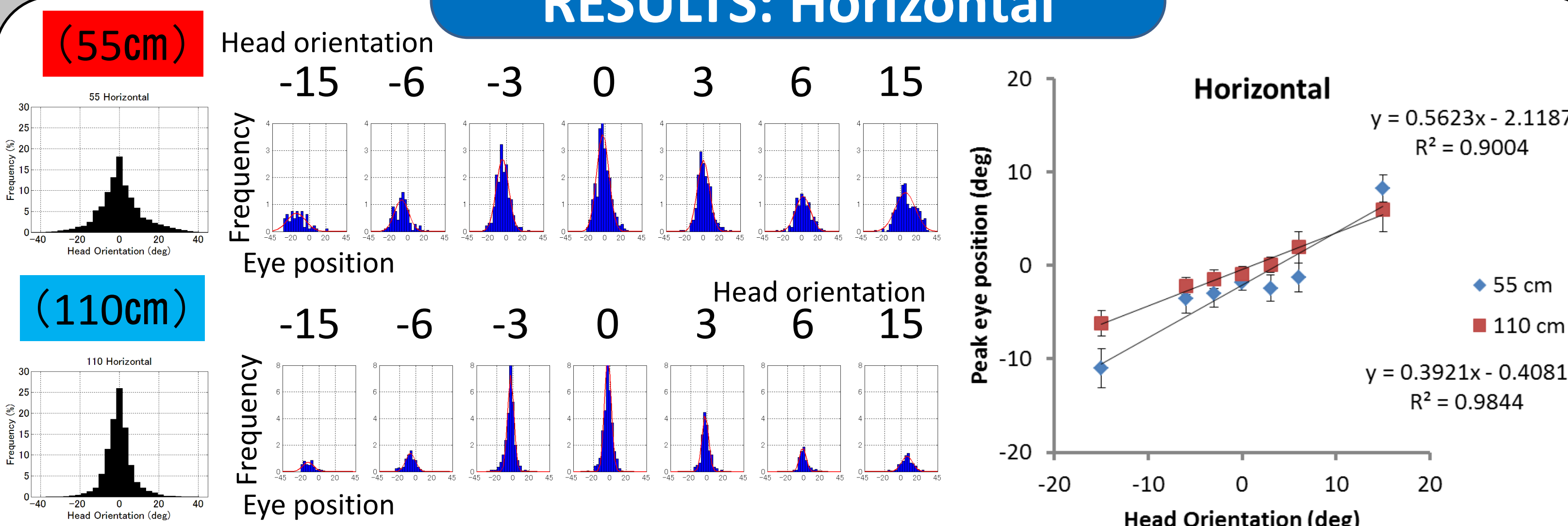
- Eye position (relative to the head)
- Head orientation (relative to the chest)
- Gaze = Eye + Head

MATERIALS & METHODS

- Ultra High-Definition Television

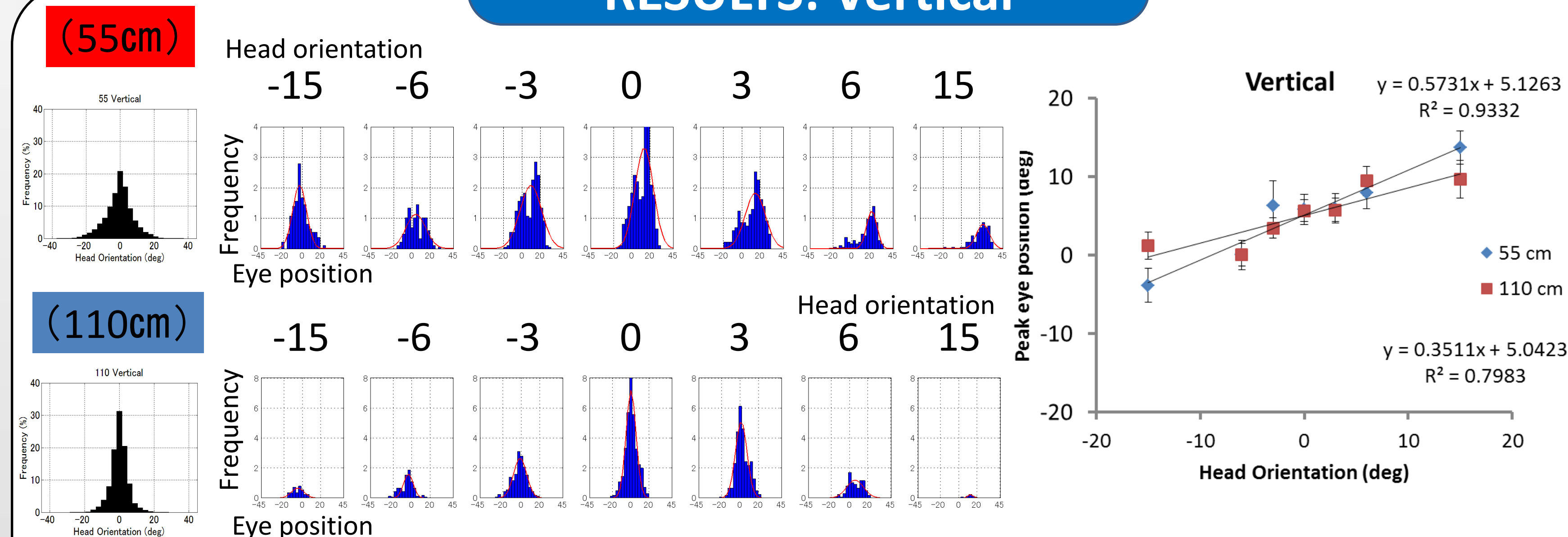


RESULTS: Horizontal



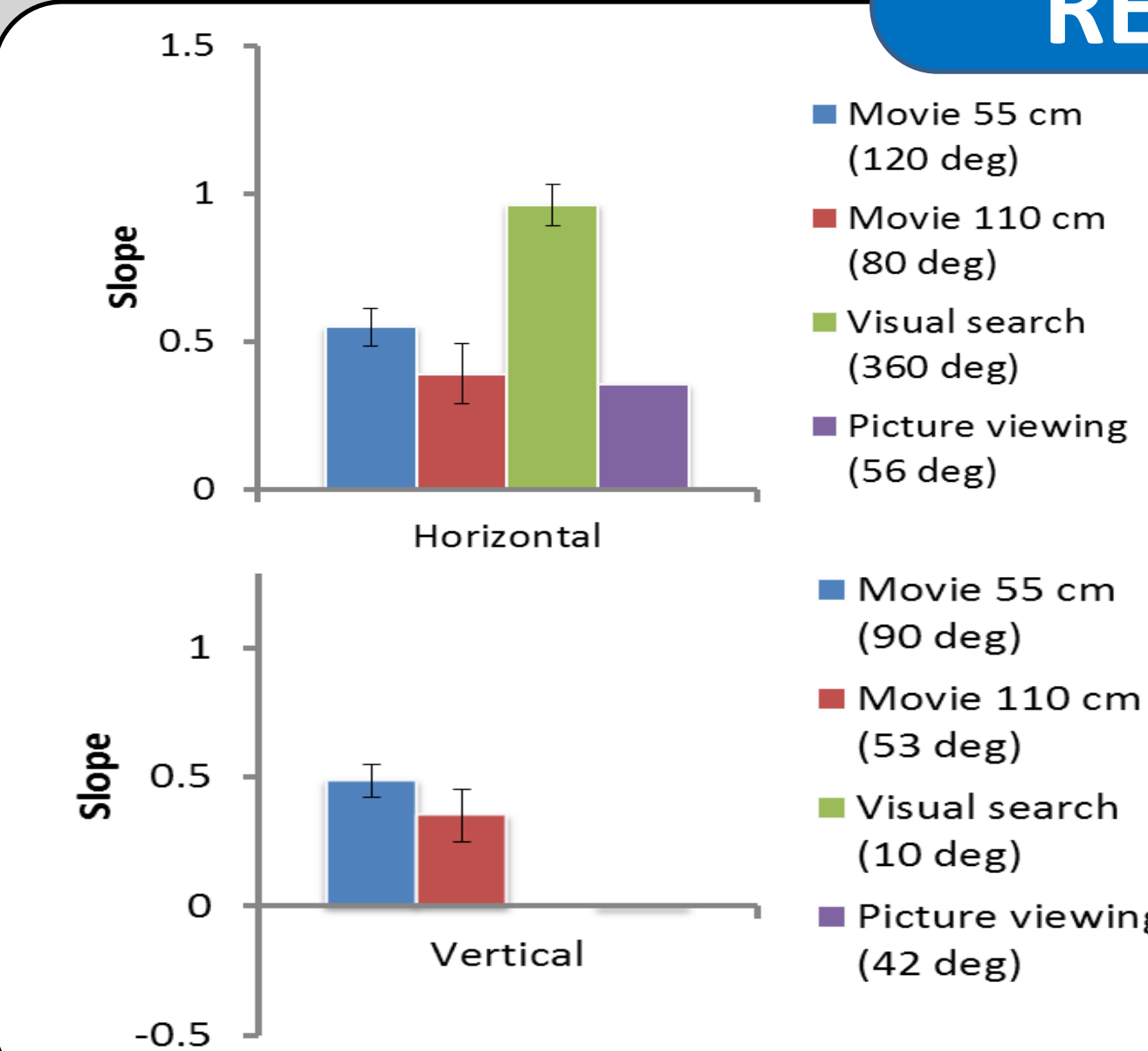
- ✓ Head orientation biases eye position toward the same direction with head.
- ✓ Head orientation effect on eye distribution (slope) was not different significantly between the two viewing distances (paired t-test, $t(19)=1.18$, $p=0.25$);
- ✓ Head moved more widely (standard deviation of head distribution) with a 55 cm viewing distance than with a 110 cm distance (paired t-test, $t(19)=5.76$, $p<.001$).

RESULTS: Vertical



- ✓ Head orientation biases eye position toward the same direction with head as for the horizontal direction, inconsistently with static stimuli.
- ✓ Head orientation effect on eye distribution (slope) was not different significantly between the two viewing distances (paired t-test, $t(19)=1.01$, $p=0.33$);
- ✓ Head moved more widely (standard deviation of head distribution) with a 55 cm viewing distance than with a 110 cm distance (paired t-test, $t(19)=4.35$, $p<.001$).

RESULTS: Head effect



- ✓ **Horizontal:** Head orientation effect on eye distribution (slope) in the visual search experiment with 360 degree display is significantly larger than that in the others.
- ✓ **Vertical:** Slope in the present study with movies is significantly larger than in the other experiments with static stimuli.

CONCLUSION

- We found similar eye-head coordination effect with high resolution movies to that with static images in the horizontal direction.
- The eye-head coordination process is suggested to function even in the vertical direction in the present experiment, inconsistently with previous studies.
- The head orientation effect on eye distribution was not different significantly between the two viewing distances.
- There are possible reasons why the present result differed from the previous ones:
 - Movie vs. stationary scene
 - The viewing angle in vertical.
 - Ultra High-Definition TV with high resolution.

References

- Fang, Y., Nakashima, R., Matsumiya, K., Tokunaga, R., Kuriki, I., Shioiri, S. (2012). Eye position distribution depends on head orientation. VSS, Naples, USA.
- Nakashima, R., Fang, Y., Matsumiya, K., Tokunaga, R., Kuriki, I., Shioiri, S. (2012). Eye position distribution depends on head orientation in natural scene viewing. APCV, Incheon, Korea.