Appendix A :

The VR Eye-Tracking Cognitive Assessment (VECA) system includes 10 cognitive tasks covering six cognitive domains: attention, abstraction, calculation, execution, memory, and recall. The detailed steps, instructions, and areas of interest (AOI, yellow boxes) for each task are as follows.

Figure 1: Memory Recall Task (Questions 1, 11): The user is required to understand the instructions within 3 seconds (Question 1, Figure a), remember three exercises within 8 seconds (Question 1, Figure b), and recall and fixate on these exercises separately within 8 seconds at the end of the assessment (Question 11, Figures c-e).

Figure 2: Attention Task (Question 2): The user must understand the instructions within 3 seconds (Figure a) and track a rocket within 12 seconds (Figure b). Figure c shows the expected gaze trajectory.

Figure 3: Abstract Thinking Task (Question 3): The user must understand the instructions within 3 seconds (Figure a). They then have 8 seconds to identify the outlier object and fixate on the correct answer (Figures b and c).

Figure 4: Calculation Task (Question 4): Before performing calculations on two numbers, the user is given two 8-second intervals to count specific objects (Figures a-d). They are then required to fixate on the correct answer within 8 seconds (Figures e and f).
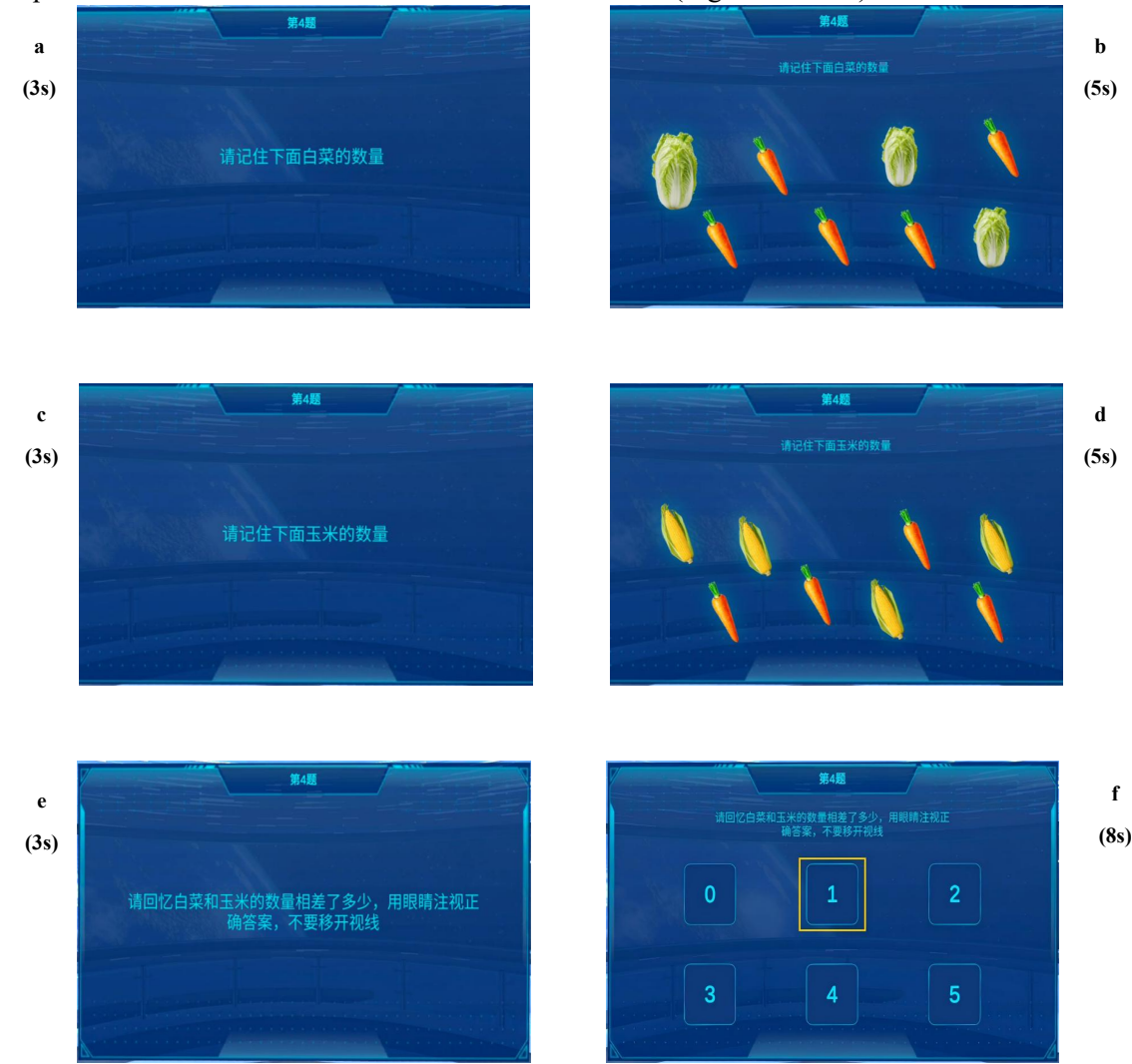
Figure 5: Calculation Task (Question 5): Before performing calculations on two numbers, the user is given two 5-second intervals to count specific objects (Figures a-d). They are then required to fixate on the correct answer within 8 seconds (Figures e and f).
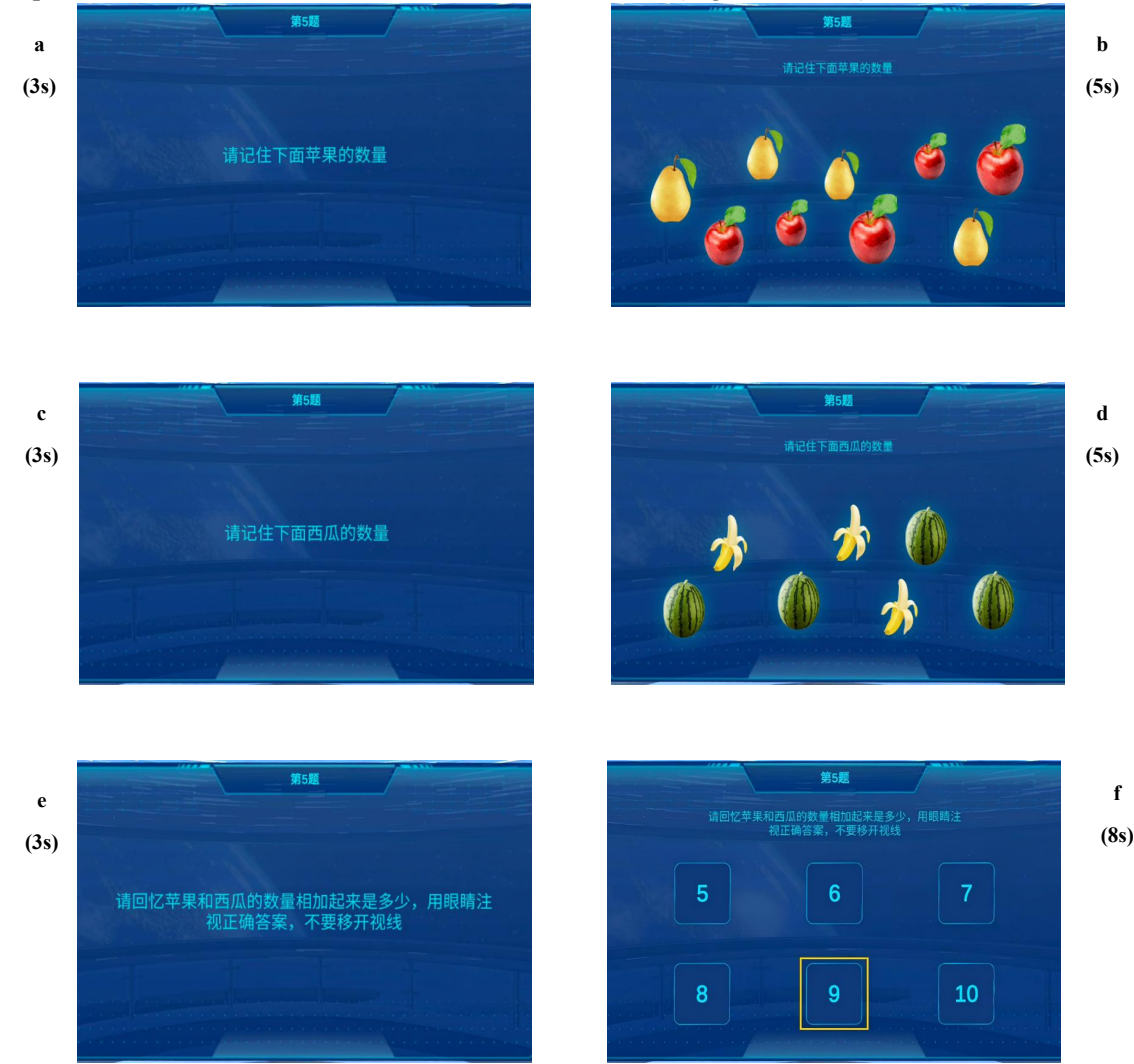
Figure 6: Calculation Task (Question 6): Before performing calculations on two numbers, the user is given two 5-second intervals to count specific objects (Figures a-d). They are then required to fixate on the correct answer within 8 seconds (Figures e and f).

Figure 7: Executive Function Task (Question 7): The user is required to identify and fixate on a train among various vehicles within 8 seconds (Figures a-c).

Figure 8: Short-Term Memory Task (Question 8): The user must remember the shape of a given image within 8 seconds (Figures a and b). They are then given 8 seconds to recall and fixate on the target (Figures c-e).
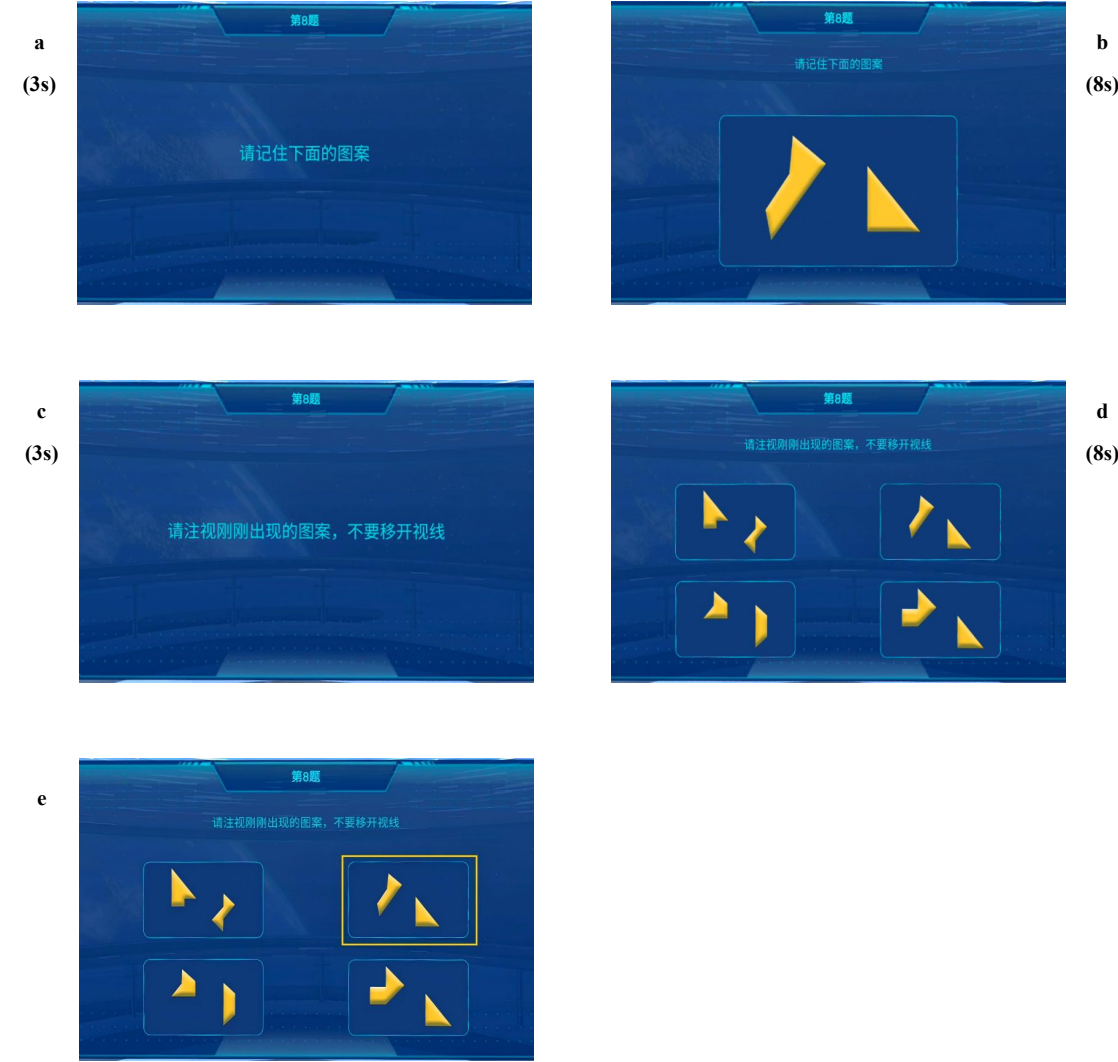
Figure 9: Short-Term Memory Binding Task (Question 9): The user must remember the combination of shape and color of a given image within 8 seconds (Figures a, b). They are then given 8 seconds to recall and fixate on the target (Figures c-e).
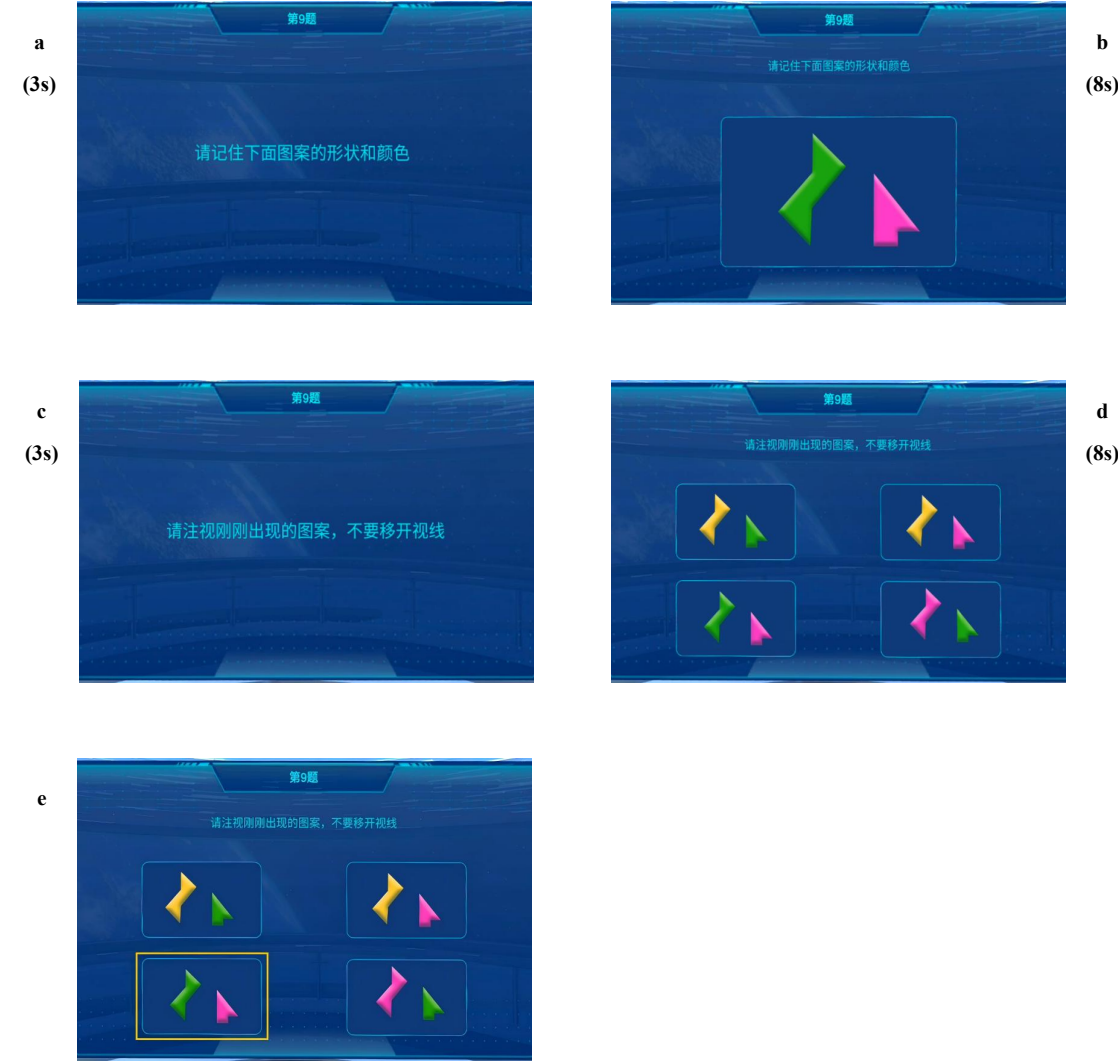
Figure 10: Short-Term Memory Binding Task (Question 10): The user must remember the combination of shape and color of a given image within 8 seconds (Figures a, b). They are then given 8 seconds to recall and fixate on the target (Figures c-e).