Distinct neural substrates for the perception of real and virtual visual worlds

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Virtual environments have been frequently used for training and skill improvement. However, do real and virtual worlds engage the same

Stimuli and procedure

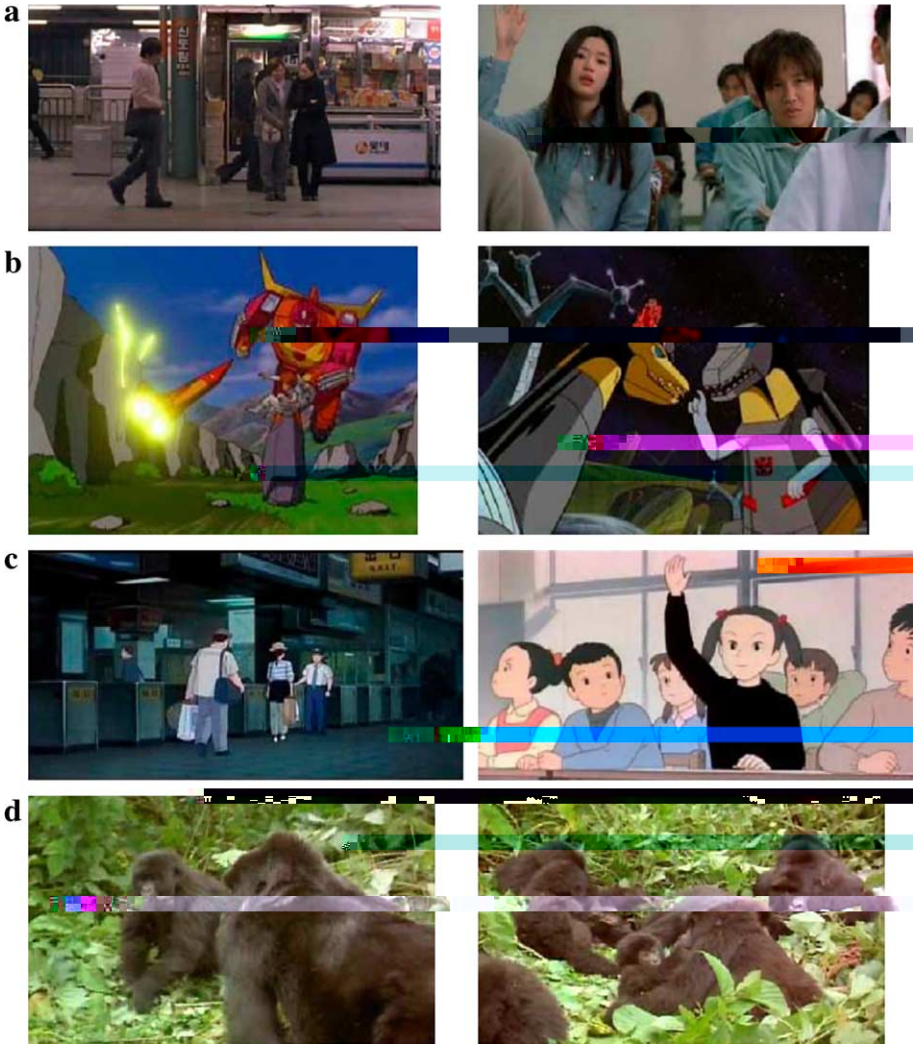
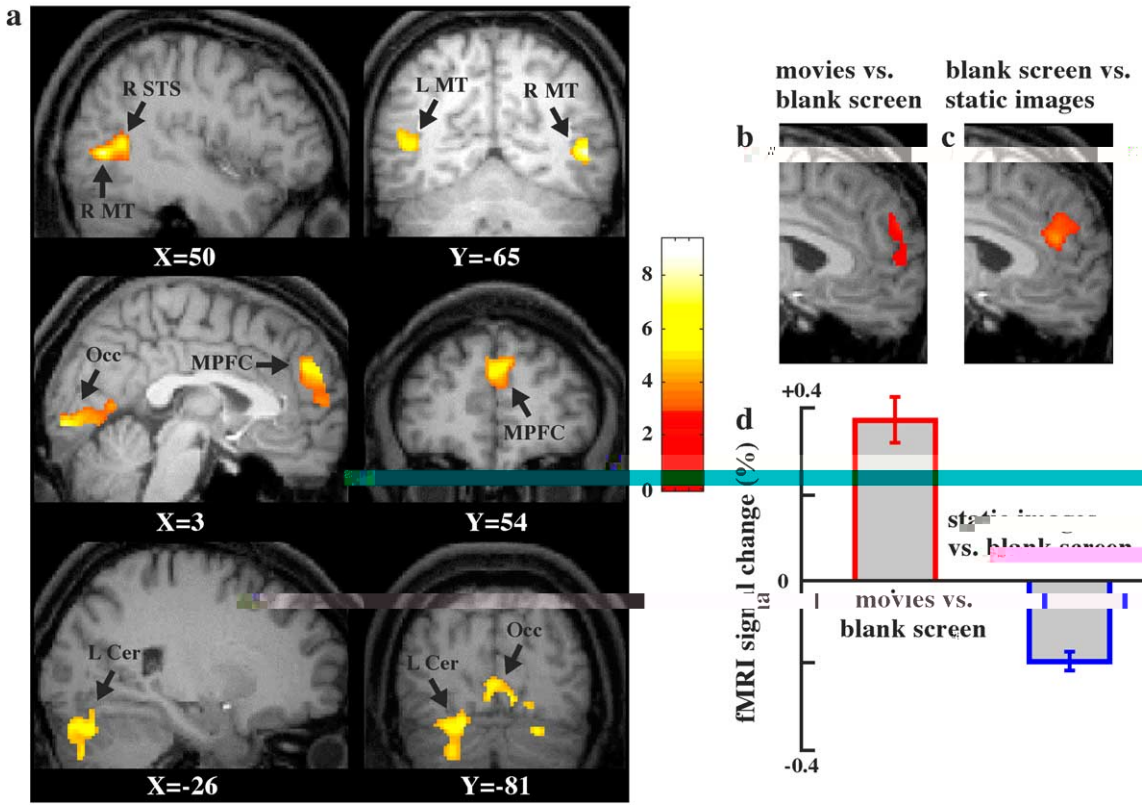
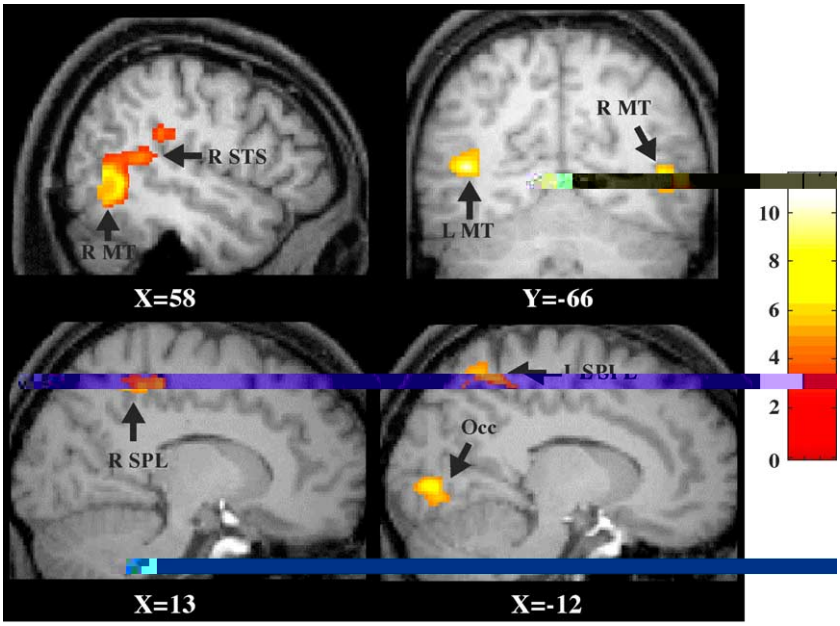


Fig. 1. Illustrations of stimuli used in Experiment 1. (a) Examples of visual scenes. (b) Examples of Cartoon pictures (Fig. 1b) depicting visual scenes (i.e., pictures with background settings) and Cartoon pictures (Fig. 1c) depicting visual scenes (i.e., pictures with background settings). (c) Examples of visual scenes. (d) Examples of Cartoon pictures depicting visual scenes.



. 3. B ai ac iva i sass ci a w i vi w i u vi cli f u a s i al vis u al sc s. (a) T c as w u vi cli a a s ai ic i s. T u l s f a ca a al sis f 12 s ub j c s w i s f a s s iv s ub j c . C i a s a sc i wi f c T ai l a ac s s . T c l u s i ic a s sca l z va u s. Ac iva i s w s v i i l a al T a s i T , cci j a l c x (cc), C, a l f c l u (C). () T C ac iva i i c as w u vi cli a l a k sc (c a 6, 60, 23, $Z = 3.35$, $P < 0.001$, u c c). (c) T C ac iva i i c as w l a k sc a a s ai ic i s f vi cli (c a 8, 40, 13, $Z = 5.04$, $P < 0.001$, c c). ( ) a f T s a l c a s wi s a a si C cl u s . T f T s a l s w l a i l a v i v x l c a s si C cl u s i . 2 a i c ii s f wa c i vi cli , s a ic i s a l a k sc s. l a iv wa c i l a k sc s, wa c i vi cli ic as f T s a l s w as wa c i s a ic i s c as f T s a l s i C cl u s.



. 4. T l u s a i f l a i ac iva i s i c as w ca s f - u a s a a s a ic i s. Ac iva i s w s v i i l a al T a s i T , i l cci j a l c x (cc), a l f a su i i a l l u l ( ).

such as , sound, a clu w icli u
a iv siuli, w wul xpc ccss ass ci wi
l w-l v l au s sa i C ii s C a A. T
c as f iv vis a sa ic i s s w
bil a al ac iva i f T a s i T (c a
−50, −66, 7, Z = 4.90, P < 0.001, c c , a 55, −62, 8, Z
= 4.62, P < 0.001, c c), cci ji l c x (c a
−22, −93, 8, Z = 4.11, P < 0.001, c c), a l f
si s us (c a a 39, −60, −13, Z = 4.57, P < 0.02,
c c , s . 5). N w was als bil a al ac iva i f
(c a −10, −55, 60, Z = 4.11, P < 0.01, c c ,
a 28, −61, 49, Z = 3.92, P < 0.01, c c), si il a
ass ci wi u c s. w v , ac iva i i
C c bll was sv i C ii C, ic i
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fac s, s a x a u al ac iva i is qui (us
a w is al., 1998).

T C ii , w ass ss w c i f u a
s i a viua l visua l w l ac iva si il a ba i s
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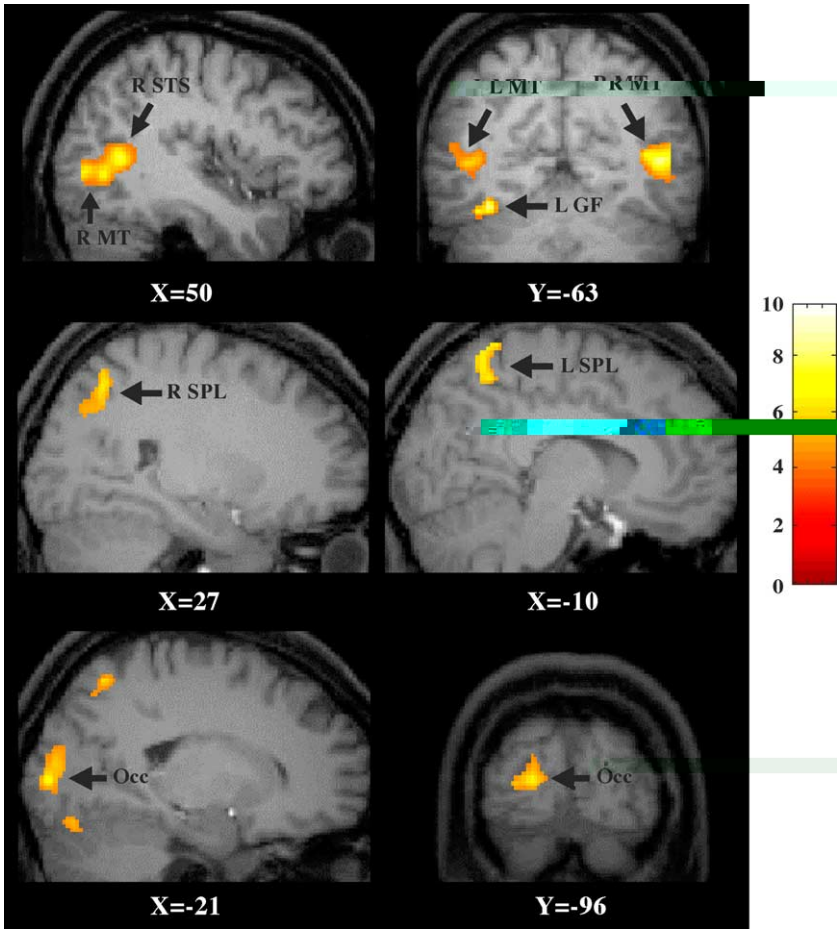
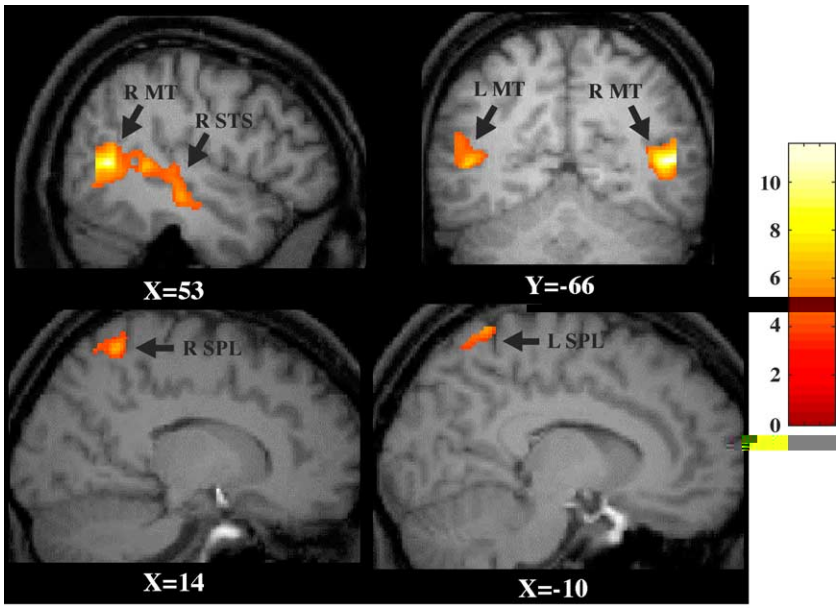
). f a c was ai c as la iv sa ic i s
x ac f cli . T c as f u a c a s
a sa ic i ss w bil a al ac iva i i T a
s i T (c a −51, −66, 7, Z = 4.66, P < 0.001,
c c , a 55, −60, 8, Z = 5.23, P < 0.001, c c),
T (c a −63, −43, 15, Z = 4.85, P < 0.001, c c ,
a 64, −38, 19, Z = 5.00, P < 0.001, c c), a
(c a −4, −50, 52, Z = 3.18, P < 0.04, c c , a 20,
−49, 61, Z = 4.35, P < 0.03, c c , s . 6), si il a
s sv f c a cli f a ici al c a ac s.
w v , was ac iva i i C
c bll . T su l s i ica a is cu i w
c ac i s a vi w i c a s, a l ss f w
c a s ic a ici al c a ac s u a s; i
c as, C a c bll w au a ic ll
i c ic i f visual a li . A a i -f-
i s a al sis c i a was s C
ac iva i ass ci wi vis cli f u a bi s la iv
c a cli f u a -u a s (t = 6.00 a
4.75, s c iv l, P < 0.001), w as i i al ac iva i
i C was sv w c a cli f u a a
-u a s.



. 5. B ai ac iva i ass ci wi vi wi iv vis u a s. Ac iva i s w sv i il a al T a s i T, l f cci ji al
c x (cc), l f si s ( ), a l f a su i i al ul ( ).

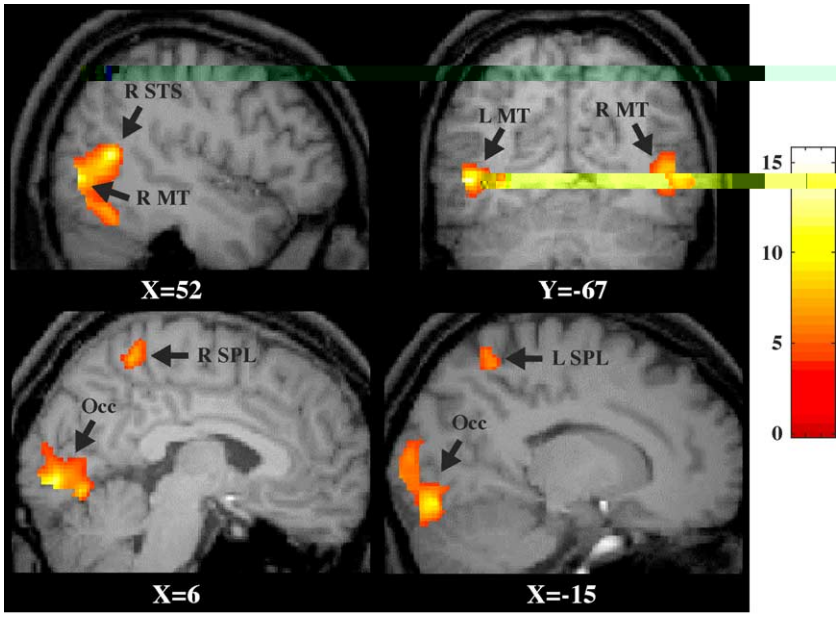


. 6. lus ai ai ac iv ai si c as w cs s u a sa a sai ic i s. Ac iv ai s w s v i il a l T a s i T a l a i l u l ( ).

T ass ss i C a c ll u ac ivi i s a s ci ic ll i v l v i c i u a s u a i al s i w l, i C ii, w a sa u f su j c s wa c u vi cli s a ic ill as wa k i a i i l s c s i sa ic i s s i a (. 1). T c as w vi cli f ill as a sa ic i s s w il a l ac iv ai i T a s i T (c a −51, −66, 3, $Z = 5.70$, $P < 0.001$, c c , a 51, −73, 2, $Z = 5.39$, $P < 0.001$, c c), i l cci i l c x (c a −2, −91, −2, $Z = 5.74$, $P < 0.001$, c c), a (c a −14, −53, 61, $Z = 4.31$, $P < 0.001$, c c , a 6, −44, 57, $Z = 4.39$, $P < 0.03$, c c , s . 7). w v, was i l ac iv ai i C c ll u .

Discussion

u c i al u i i s vi i a cl s u wa w c iv c a ac s wi i c su cc ssiv v si al a vi u al w l s. A u f c a as w ac iv a all c ii s wi vi a ca cli , l a iv



. 7. lus ai ai ac iv ai si c as w vis a i al si al vis u al sc sa a sai ic i s. Ac iv ai s w s v i il a l T a s i T , i l cci i l c x (cc), a l a su i al l u l ( ).

vi wi sa ic i sw i sci l u s. T is ssi l a l sa as i f x s isi v l s i f ai w as al sa as i w vi wi l l's v aviu i al visual w l s ai l u i v l f C. T is, w v, s cl a ii i u w k.

T s su x s i i a was i ai i i su is c as i cc s ac i sass u as c s(all a l., 2002; a a ia all, 2004). W s w f a u all ic u i Ca c ll u v w w si vi w u a si al sc s, u w ac iv sa s i viua l vi s. c, c i f al a viua l visua l w l sc a i wi isic u al su s s. T isic u al a u c i al c ss s f i c ivi si al a viua l w l s a c ju li i ic f viua l visua l vi- s ai i (i l a Ca li, 1999). u i i s s a u a ai s ssi l u c i, w w i ac wi al i v a li, i a w f w w vi w i ac wi a ic ic a ac s sa ic sci l siu li a l f sp u a a ai a a l v avi u f ca c a ac sa si s wi al , w ic ssi l c s ai s sci li ic f ca s au l vi w s.

Acknowledgments

T is w k was su f N i al Nu al ci c u ai f Ci a (jc 30225026 a 30328016), i is f cic a Tc l f Ci a (jc 2002CCA01000), i is f uca i f Ci a (02170), ica sac Cu cil ( ), a al ci ( ).

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