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500

.7( )-

Methods

Observers

(± SD = 21.6 ± 2.0)

Apparatus

. (2014).
-3
(, 1997) 21 .
: 2,048 × 1,536 ,
0.19 ( ) × 0.19 ( ) , 75 ;
: 1,024 × 768 , 0.38
( ) × 0.38 ( ) , 120 .
50 / ^{2}.
8- -
.
1 .

Stimuli

(1)
. (2014).
5° (= 3
/°, SD = 0.29°, = 0.47, =
, - - = 4λ).
5°
(= 1.5 /°, SD = 0.29°,
= 36° 126°, = 0.47,
).
.

Procedure

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.
200 .

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20

1.5 2 ,

Eye movement control

(,
, ,)

(2°
).

( ).

5.4%

1 (1;
2
). 94.4% ± 3.6% (SD)
4°

Results

Experiment 1: Vernier learning through short-staircase training and its transfer with double training

(1),

1 .

( ).

(1).

−0.049, 95% ( ) −0.075,
−0.023[,

t(7) = −4.466, p = 0.003, ’ d = −1.58,

, (1 −
/) × 100,

(2014;
1), 36.31%, 95%
5.78%, 66.85%[,
35.83%, 95% 9.71%, 61.94%[,
(1 ,).

F(1, 7) = 10.58, p = 0.014, $\eta^2 = 0.602$,
, F(1, 7) = 0.003, p = 0.96, $\eta^2 < 0.001$.

(1),
27.43%, 95% 14.58%, 40.28%[,
20.86%, 95% 5.80%,
35.92%[,

F(1, 7) = 17.65, p = 0.004, $\eta^2 = 0.716$,
, F(1, 7) = 5.36, p = 0.054, $\eta^2 = 0.433$.

(2014) (2014)

(1 . 1 ,).

Experiment 2: Vernier learning through long-staircase training and its transfer with double training

(2).

(2014),

(2)
−0.013, 95% −0.028, 0.002[,

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Figure 2. The training and transfer effects after double training with long-staircase Vernier training and multiple short-staircase orientation training at the same location. (a) Left: The staircase-by-staircase changes of Vernier thresholds at the training (open symbols) and transfer (solid symbols) locations. The red line is the loglinear fit of the Vernier thresholds at the training location. Right: Individual (gray dot) and mean (open circle) slopes of loglinear fits of the Vernier learning functions with long-staircase training. (b) Left: The session-by-session Vernier threshold changes at the training (open symbols) and transfer (solid symbols) locations when the first-staircase thresholds were used to represent session thresholds. Right: Individual (gray dot) and mean (open circle) percentage improvements at training and transfer locations. Each pair of gray dots connected by a gray line indicate a different observer's data. (c) Left: The session-by-session Vernier threshold changes at the training (open symbols) and transfer (solid symbols) locations when the geometric means of all staircases in the corresponding pretraining and posttraining sessions were used to represent session thresholds. Right: Individual (gray dot) and mean (open circle) percentage improvements at training and transfer locations. Each pair of gray dots connected by a gray line indicate a different observer's data. The error bars represent 95% CIs.

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’ (2014)
. , -
$F(1, 9) = 14.48$, $p = 0.004$, $\eta^2 = 0.617$,
, $F(1, 9) = 2.98$, $p = 0.118$, $\eta^2 = 0.249$,
(2 ,). p (p = 0.118)
(n = 10; n = 6
& ,). , (η² = 0.249),
(,
2014), . , ,
- .
, ,
’ -
,
−2.21%, 95% −17.58%, 13.16%[,
−2.23%, 95% −13.04%, −8.58%[,
- , $F(1, 9) = 0.223$, $p = 0.648$, $\eta^2 = 0.024$, , $F(1, 9) < 0.000$, $p = 0.997$, $\eta^2 < 0.001$.

Discussion

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(2014)
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& , 1993).
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(1).
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(2). (& , 1997;
, , & , 1997).
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Keywords: perceptual learning, Vernier discrimination, transfer, double training

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31470975 ( ) 31230030 ( ).

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