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Reward makes the rhythmic sampling of spatial attention emerge earlier

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Abstract

( ) (<2) (.,) ( ) (2–3) (120) -

Keywords

Introduction

“ ”

(, 1 0). ( ) ( ), ( ). ( ) (., < 300). (, & , 2010 , 2000 & , 1 4 & , 2005). ( ), ( ) ( ) , .

✉ 104

1 5 , 100 71,

2 , ,

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4 , , ,

5 , , ,

6 , , ,

7 / , , ,

Material and method

Participants

Design and procedure

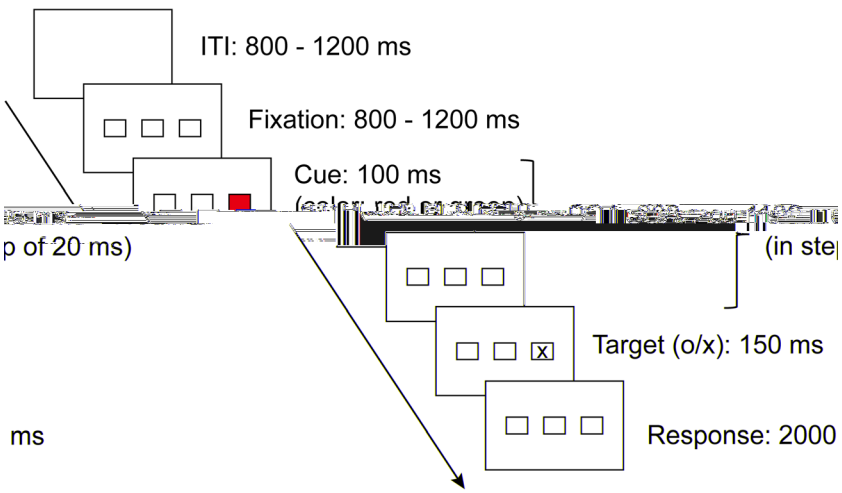

Fig. 1

10 1

(., 2016 & , 2012).

46 200 1,100 20 50 . 440 200 10 (. ., 0) (. ., 45), (., 2011), ( ). ( ). 1,760 20 .

Data analyses

200 (- , - , - ,) (. ., -) . 1,

6.

(. 2– 4),

Filtering analysis

(, , - , 10 - ,) 0–2 - (., 2014). (- , - , - ,) , 10 ( ) . 2 (.) 2 (.) 46 (200–1,100) - ( ) - 0–2 . - ( ), , - (& , 2007). < .05 (-), (1) . , ( ). , - . - ( ) . 5,000 , (. .,). - - . < .05.

Time-frequency analysis

(0–2)

(,

4), 1 25 1

1,000 ,

< .05

FFT analysis and cross-correlation analysis

(. .,

)

/ , –12 (–12).

(,).

(,

(,

, & , 2010

., 2017).

FFT analysis

(,

),

1,000

< .05

Cross-correlation analysis

(,)

( ).

1,000 ,

< .05

(1,000)
5%
1,0003( )-3(<)-15 (1 4(05 5) --151 6(306(15 (-.( )-32)-5 0-1.
(, 1 74)
( ).

$$= \sqrt{\frac{-1}{}\sum_{=1}\left(\; -\; - \right)^{2}}$$

Phase coherence analysis

(2–3)
(.)
(,
) . (2–3)
(’)
(,200)
(- , - ,
, - ,). 2–3
(, , 4),
1 25 1 .

( )
0. ( )
(& , 1 5).

Results

( ) 7.27 (0.3).
(-
1.33 0.36 , 2.26 0.
, 1.47 0.40 , 2.15 0. 5)
. 1. ,
.

Reward modulation on RT time courses at low-frequency (0–2 Hz)

2 2 46 , 0–2
(-
, −0.034 , 0.003), (1, 21) 10. ,
.003, η^2 0.34, , (45, 45) 6. , <
.001, η^2 0.250, (-
, 0.00 , −0.03), (1, 21) 4.25,
.052, η^2 0.16 . ,
, (1, 21) 6.10, .022, η^2 0.225,
, (45, 45) 1.57,
.010, η^2 0.070,
, (45, 45) 11.34, < 0.001, η^2 0.351,
, (45, 45) < 1.
(10)
(0–2)
(. 2). (0–2)
(.,)
200 2 0 (, <
.05, , 5 , -
< .001),
(.,)
4 0 1,0 0 (, < .05,
, 31 , - <
.001).
(, 2000 & , 2005).

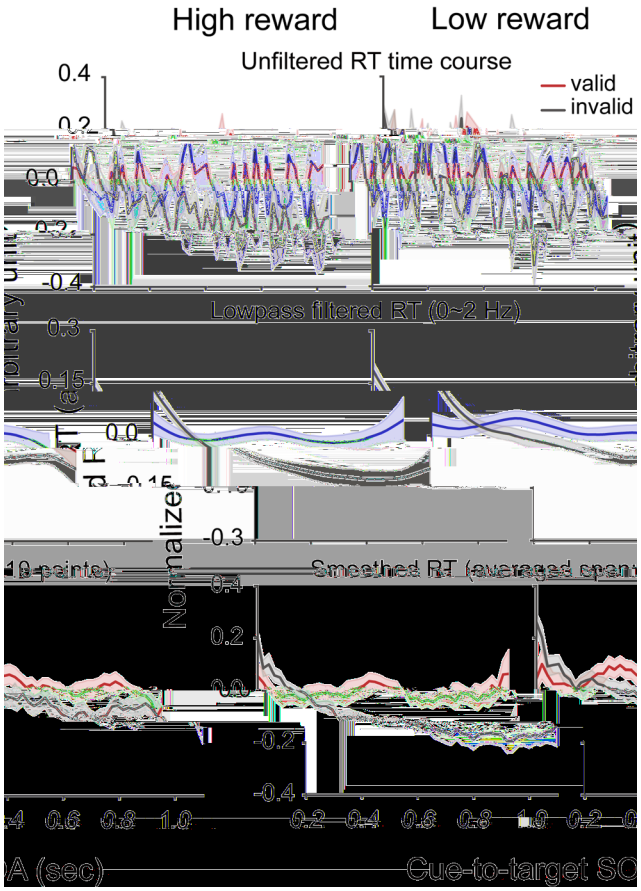

Fig. 2 ( ) (22).
, (,) (,
) , 0–2 -
(,) -
( ), (10) - (,
) - (,)

(200–2 0) (4 0–1,0 0). ,
2 (.). 2 (.)
.
, (1, 21) .6 , .00 ,
η^2 0.2 .
(.,)
- - ,
(1, 21) −1.46, .166,
(.,) -
(0.104) - (0.05), (1, 21) 2.50,
.01 . ,
-

Table 1

(200–2 0)	3 1	63	404	77	3 7	6	401	70
(4 0–1,0 0)	3 4	7	3 1	73	3 7	77	3 1	75

(−0.106) - (−0.045), (1, 21) −4. 1, < .001, - (, −0.003 , 0.013), (1, 21) −0. , .3 3. (. .,) (1).

Periodic alpha power inhibition in the cue-valid condition relative to the cue-invalid condition

(0–2) - , (. 3) - ( ). (. ., - ,) (. 3 , 4). (−12) / - (2–3 . 4, , < .05). - , (2–3) (. 4, , 22, .071),

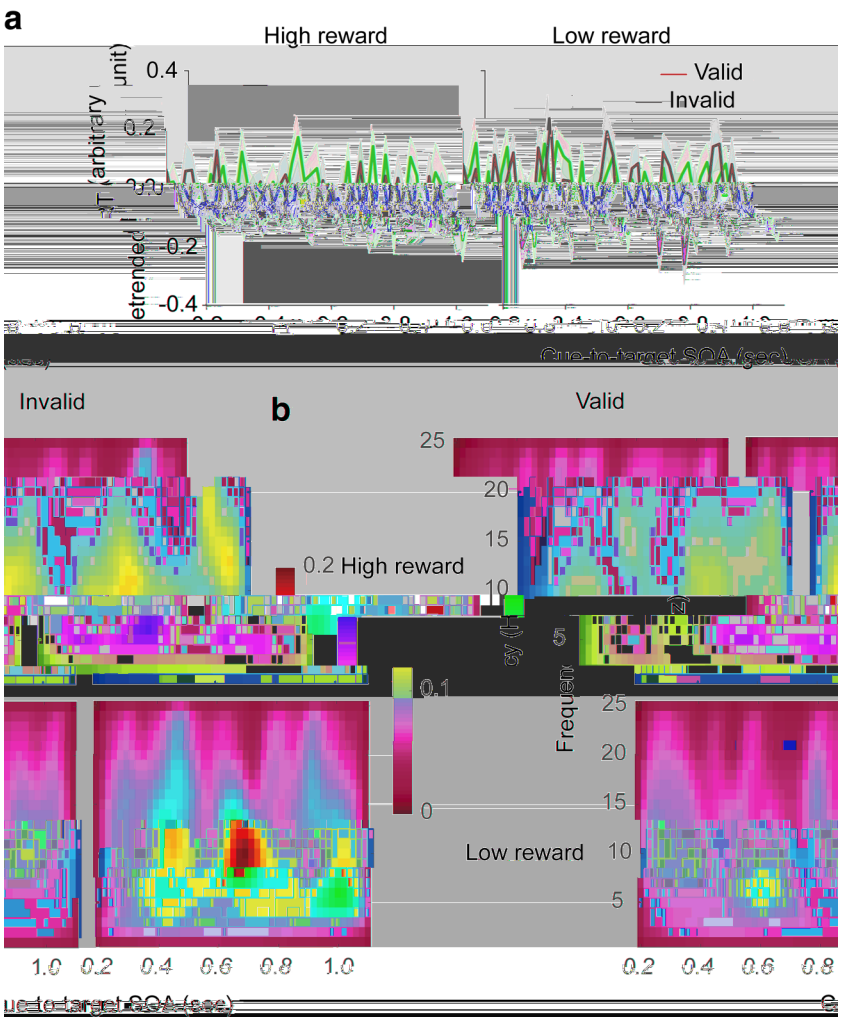

Fig. 3 1 . **b** (22) (200–1,100) (1–25). . **a** (22)). ( ) ( ) ( ) ( ) - ( ) - ( )

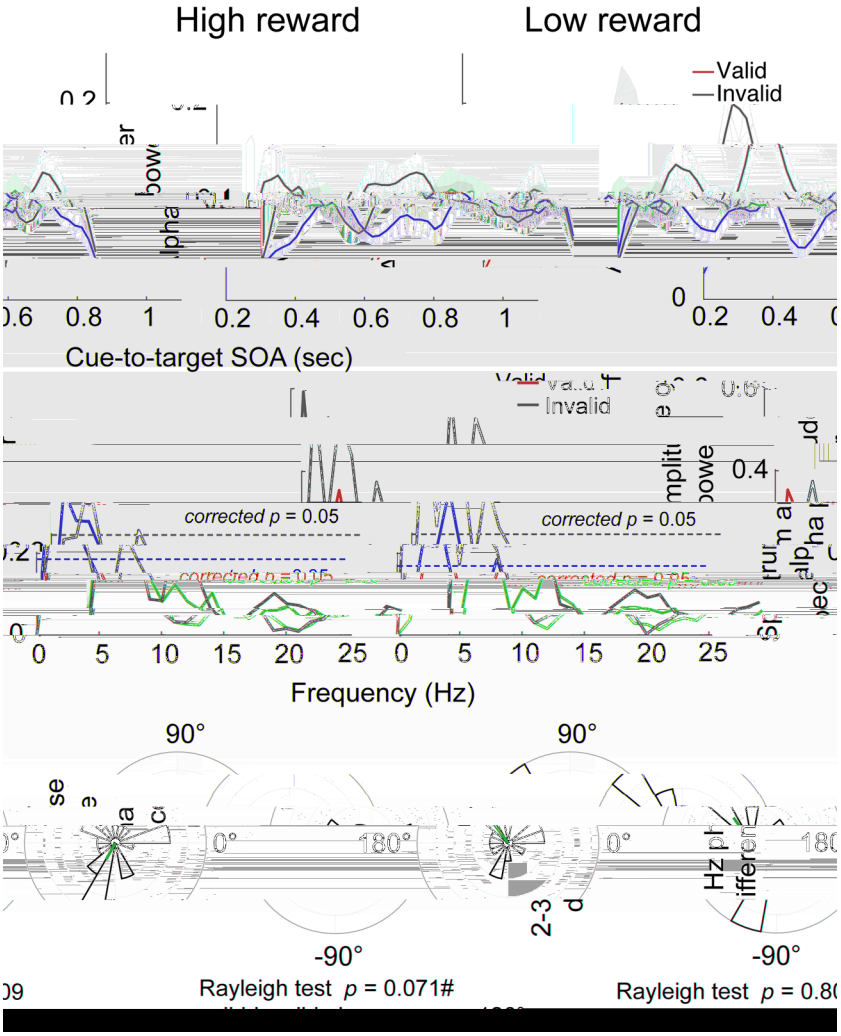
High reward
Low reward
Valid
Invalid
Cue-to-target SOA (sec)
corrected p = 0.05
corrected p = 0.05
Frequency (Hz)
90°
0°
180°
-90°
Rayleigh test p = 0.071#
Rayleigh test p = 0.8

Fig. 4

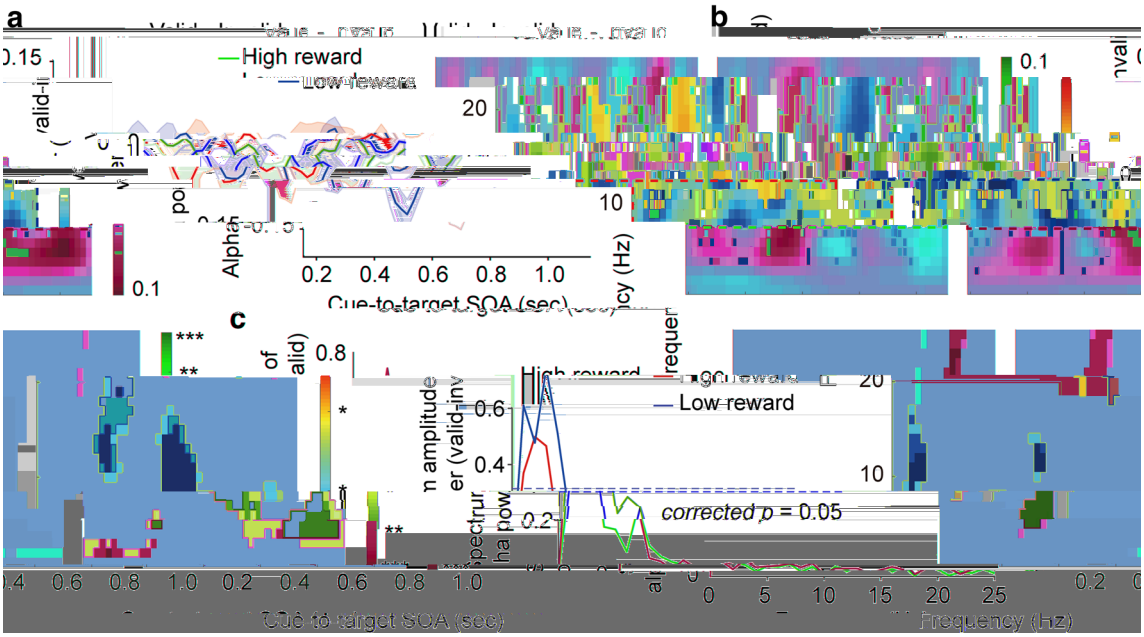

Fig. 5 . **a** (22) . ( ) ( ) . * < .05 ( ). ** < .05 ( ). *** < .05 ( ). **b** (22) (12) 1 . **c** (< .05) ( ). ( )

(, < .05 . 6,),

Periodic alpha pulses emerged earlier under higher reward

(–) . 7 120 420 , (–) - (, < .05, . 7_). 120 420 , - (. 7_,). 120-

(–) (. 7 , , 22, .365).. , (–) (–) (–) (3 , . 7 , , < .05, -). (–) - (. _). - (2–4) - 200–400 , 500–700 (.). - , - .

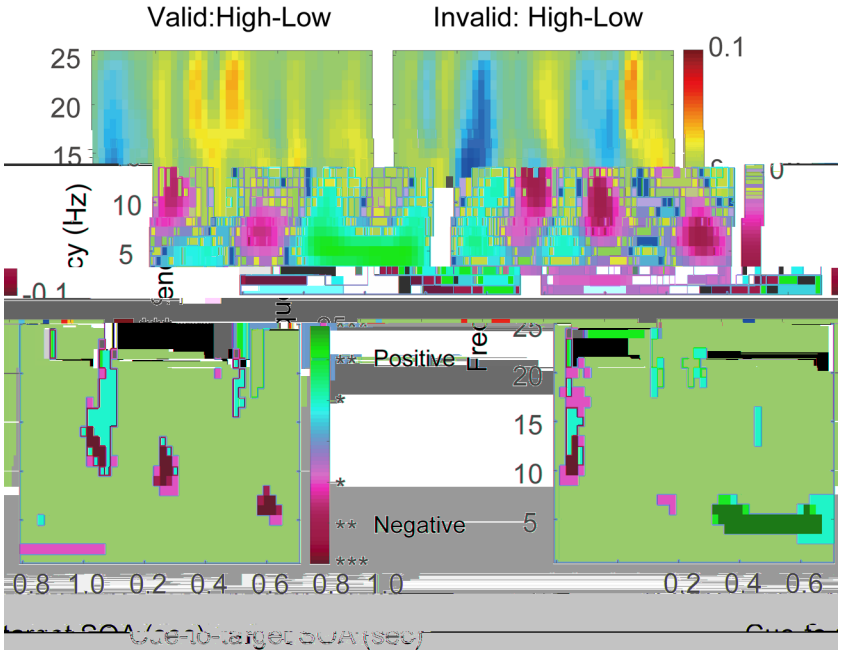

Fig. 6 - . (22) - ( ) ( ) . . * < .05 ( ). ** < .05 (- - -). *** < .05 (- - -). . ( )

/ (1–3 , 22,). - - (, 22,).

Discussion

(200–2 0 ,) (4 0–1,0 0 ,) , , , ( ) - 2–3 . , (120) (0–2) (., 2010 , 2000 , 1 0 & , 1 4 & , 2005). - (., 2014). (& , 2014 & , 2007 & , 2013 & , 2013 ., 2005). , - - (& , 2014 , & , 2000 & , 2013). (. .,) 2–3 . - . (2014). ,

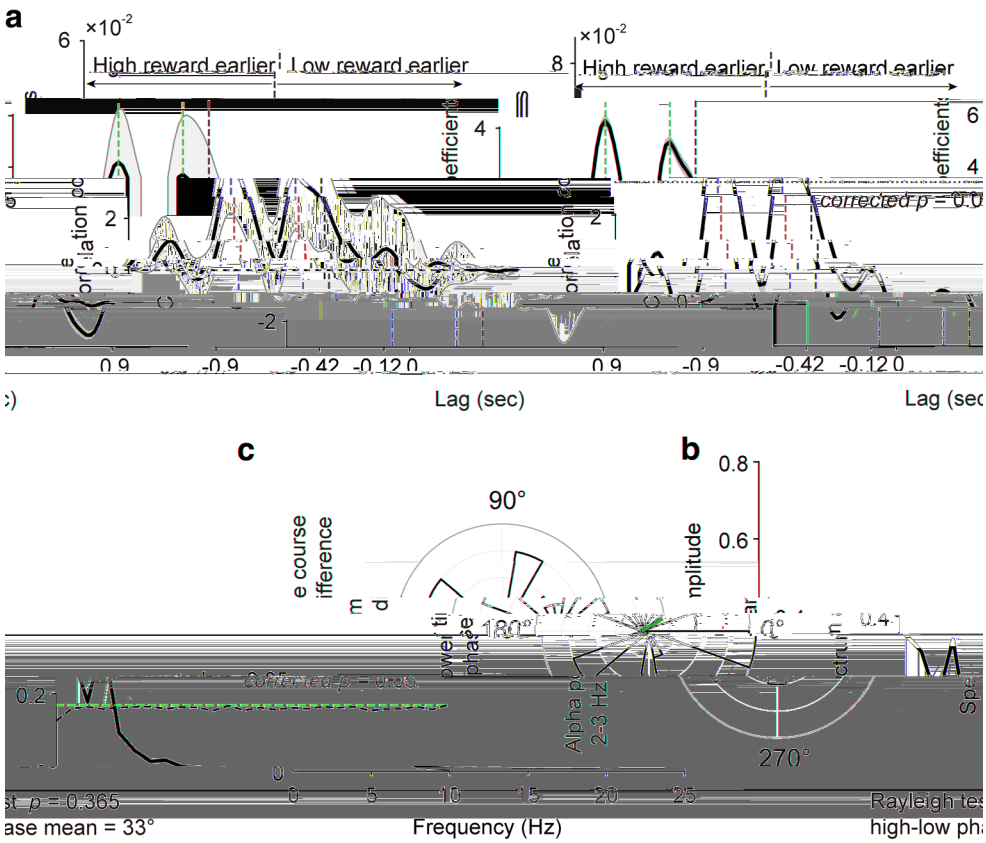

Fig. 7

. **a**

( ).

( ) (< .05)

. **c** 2–3

. 2–3

(22) (.) ( )

.05 ( ) 5%

. (.

1 . **b**)

(., 200 ., 2011 ., 201 ., (., 2016 ., 2013 2014 ., 2016). , , & , 2015 & , 2012 ., 2014). ,

(., (2–3) . 2014).

(., 2011 ., 2017 & , 2017 ., 2007 ., 201 ., 2006 ., 201), (, , , & , 200 , ( ) , & , 2015). ,

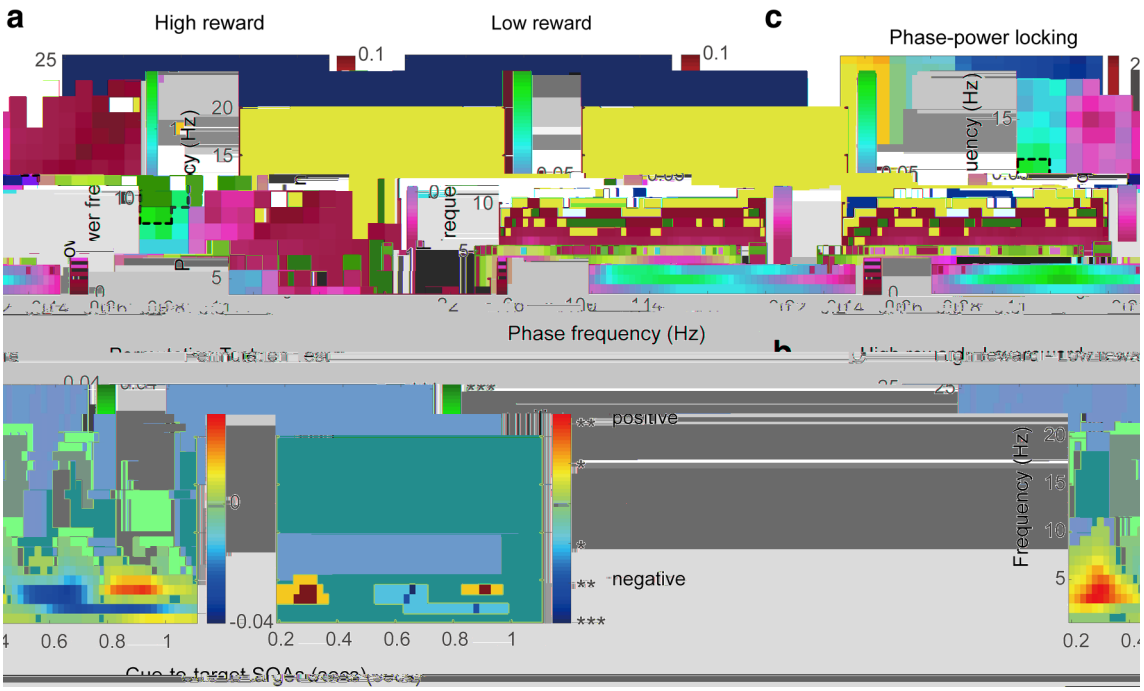

Fig. 8 **a** (22) . * < .001 ( ). ** < .001 ( ). *** < .001 ( ). **c** (–12) (1–3) (22) . **b** (22) < .05. ( )

(., 201 , , , & , 2015 ., 201), (2–3) (120) (–) (. ., 200–400-). ( ), (–12) (1–3) (., 201 ., 2015 , & , 200), (., 201 ., 201) (. .,) (. .,) (., 2014

Supplementary Information

// /10.375 / 13414-020-02226-5.

Acknowledgement

(. 31 61133012).

Open practices statement

// ./4 /.

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, . (1 0). , *32*(1), 3–25. .. // , /10.10 0/ 0033555 00 24 231

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, ., & , , . (2013). , *24*(12), 236 –237 . .. // , /10. 1177/0 567 76134 0743

_ , . ., , ., _ , . ., , ., & _ , . . (200). , *21*( ), 1536–154 . .. // , /10.1162/ . 200 .21125

_ , . ., _ , ., , ., , . ., _ , ., & , . . (2005). , *1* (12), 1 55–1 65. .. // , /10.10 3/ 1 4 , 5 2/ _ 0&, 79 -2 66.0 16332-1.175 _ 273(,)-2 2( )63( )-333(1 ( )-2