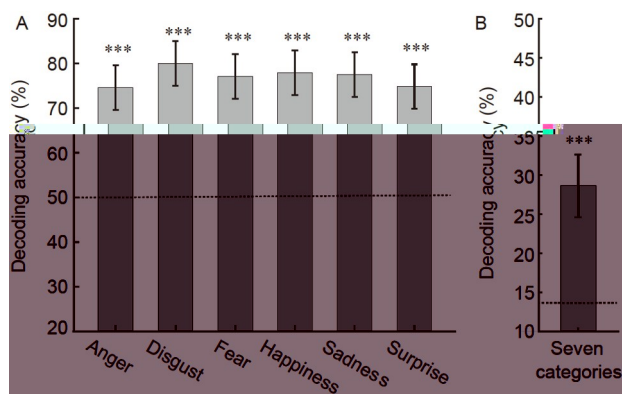


C L

H
2021;F H ,2021;G .,2021).C
(B .,2007),
(. .,2003),
(H ,2010).

*C (F F , : @ . . ; , M ., 2003). I ,

FC- F, P -
 A- FC-
 (A -
 C, 2018; I, 2020;
 2020; ., 2021). C (P, 2012).
 N
 FC
 M PA
 FC
 FC
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 M PA
 I
 I
 FC
 H
 O (D, 2006),
 (L, 2018),
 F (F) FC
 (M I) N
 A- M PA
 I
 A-
 M PA (N, 2011).
 I A- M PA, FC- M PA FC
 A FC- M PA
 G A, 2022; P, 2018; (P, 2021;
 ., 2019). F
 FC
 FC
 ., 2019). B FC- M PA, L (L, 2022)
 . (, 2022)
 112
 112
 85 (20) 61 ()
 24) FC
 A
 (F 1A),
 (F 1B). A
 F 1A,
 (50%) (, 11 =7.57,
 <0.001, C =2.19; , 11 =11.29, <0.001,
 C =3.26; , 11 =10.41, <0.001, C
 =3.00; , 11 =5.58, <0.001, C =1.61;
 , 11 =7.31, <0.001, C =2.11;
 11 =7.80, <0.001, C =2.25).
 28.16%,



A FC . A, A -

. B, A

EM ; ***, <0.001 (- -).

D. $\Delta \text{LM} = 0.001$ (0.001).

($t_{11}=10.00$, $p<0.001$, $C=2.89$) (14.29%).

FC

NFC

FC, . F - FC

;

([Liu et al., 2016](#)). FC -

F 2 -

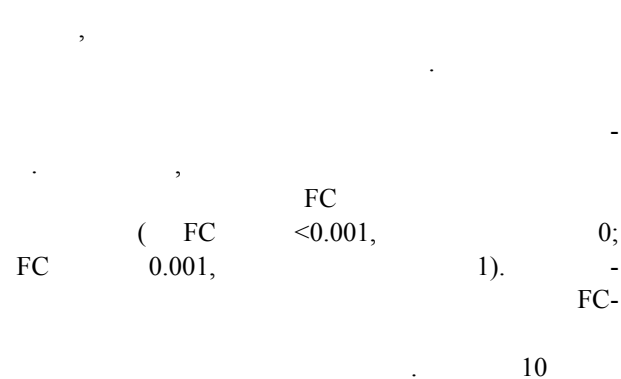
$$\mathbf{F} = \mathbf{F}(\mathbf{r}, \mathbf{v}, t), \quad (\text{F} \quad 2\text{C})$$

FC () ;

2008; P ≤ 0.001 ; A ≤ 0.001 , 2010).

[illegible]

(Liu et al., 2018; Wang et al., 2012).



10, B, N

5, 10, 30, 50, 70, 90, 112 FC

), 7 () , 6 (AN-

O A
(6,66 =5.31, <0.001, $r^2=0.33$). H , -
(30,330 =0.72,

$=0.859$, $t^2=0.06$). I

2.43, $\beta = 0.033$, $C = 0.70$; $\beta = 0.037$, $C = 0.68$; $\beta = 0.73$; $\beta = 1.02$; $\beta = 2.02$, $\beta = 0.069$, $C = 0.58$),



E (D), (E), (F) . FC (A), (B), (C), (D), (E), (F) . N 1

10

E	N	E	N
	(),	F	(L),
	(),		(),
	(),		(),
A	(),	H	(),
	(),		(),
	(),		(),
	(L),		(),
	(),		(),
	(L),	I	(),
	(),		(),
	(L),		(L),
D	(),		(),
	(),		(L),
	(L),		(),
	(L),		(),
	(L),		(L),
	(L)		(),
A	(),	-	(L),
	(),		(),
	(L),		(),
	(L),		(),
F	(),		(),
	(L),		(L),
	(L),		(L),
	(),		(),
	(),		()

FC A -

(10 .30, 11 =2.71, =0.021, C =0.78; 10 .50, 11 =2.28, =0.044, C =0.66; 10 .70, 11 =2.48, =0.030, C =0.72; 10 .90, 11 =2.41, =0.041, C =0.67; 10 .112, 11 =2.18, =0.052, C =0.63).

FC A -

FC- A -

FC- A- FC M PA

M PA ,

FC-

A-

FC- 112

(<0.01, B) A-

112 (<0.01, B

M PA A-

FC-

H ,

(F 5). M ,

FC A (F 5A, : 11 =2.74,



E . D . I
FC- . #, <0.07; *, <0.05; **, <0.01 (- -). E EM .

=0.019, C =0.79; : 11 =6.90, <0.001, 10
 C =1.99; : 11 =6.89, <0.001, C =1.99; - - , F 5B -
 : 11 =2.95, =0.013, C =0.85; FC- -
 11 =3.63, =0.004, C =1.05; : 11 =4.51, A-
 <0.001, C =1.30). N , (F 5B, : 11 =5.72, <0.001, C =1.65;

2013; M M PA A (H , 2021).

A (L , 2017; L , 2020; , 2022).

-

(, 2022). H ,

. A FC-

(L , 2018; P -G -

: $t_{11}=3.71$, $p=0.003$, $C=1.07$; : $t_{11}=6.81$, $p<0.001$, $C=1.96$; : $t_{11}=5.16$, $p<0.001$, $C=1.49$; : $t_{11}=6.81$, $p<0.001$, $C=1.92$; : $t_{11}=5.01$, $p<0.001$, $C=1.45$). I , A- (($t_{11}=15.32$, $p<0.001$, $C=4.71$). O , FC A .

O FC- F , -

F , -

-

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. F , FC

(A , 2008). B , . H
FC , ,
 , , C , ,
 , , N . H ,
FC . F ,
 , N C
(C ., 2016). FC (., 2019). F ,
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 . D FC ,
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 , . F
FC 12
FC
(C ., 2021; H , 2010; ., 2014; ., 2016). . I ,
 , EM
 (5) (- - :
 10 <0.001). F (I -
 , 2020).
 ,
 . H ,
 , B FC F
FC . O FC . O
FC . I A
 . P O ,
FC- . F
FC
25
(P ., 2012).
 , F ,
 ;
 P (, C . O 18 24)
 . A
(, 2010). ,
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 ,
(H , 2012)
(H ., 2019), P

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 (12
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 (. , , , ,
)
 (., 2019). A
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 , M
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 12.5²).
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 (: 60 H ;
 1024 768)
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 8 6.3 .

$$E = \frac{1}{2} \left(\frac{10}{A} + \frac{10}{B} \right) \left(\frac{1}{F} + \frac{1}{A} \right) \cdot E$$

2

P

- M I
P M I

3.0

-

EPI

(64

; =2000 ; E=30 ; =90 ;

FO =224 224 ; =112 112; =

2 ; =0.2 ; G APPA =2;

=2). A 1- - 3D

$$: 1 \quad 1 \quad 1 \quad).$$

PM8 (C, D, L, M, N, K) (., 2016).

$$\begin{array}{c} \text{O} \\ \vdots \\ \text{M I} \\ f: fMRI_sequence(t_1-t_2) \rightarrow k, \end{array} \quad (1)$$

FC

FC N) J

(, 2016).

() 36

()

85 61

FC

FC

$$\rho_{i,j,p,w} = \frac{(y_{i,s} - \tilde{u}_{i,w})(y_{j,s} - \tilde{u}_{j,w})}{\sqrt{(\sum_{s=S_p}^{S_p+2} (y_{i,s} - \tilde{u}_{i,w})^2)(\sum_{s=S_p}^{S_p+2} (y_{j,s} - \tilde{u}_{j,w})^2)}}, \quad (5)$$

112

H -O), $\tilde{u}_{i,w}$

FC

FC

$$X_t^k = (\rho_{i,j,p,w})_{i,j}, \quad (6)$$

, =1, ,112. X_t^k FC

112 112

FC

112

FC

FC

$$\begin{aligned} x_t^k &= \text{linearly}\{lowhalf(X_t^k)\} \\ &= \text{linearly}\{(\rho_{i,j})_{i,j(i>j)}\} \\ &= (\rho_{2,1}, \rho_{3,1}, \dots, \rho_{112,1}, \rho_{3,2}, \dots, \rho_{112,111}), \end{aligned} \quad (7)$$

FC

:

$$X^k = \{x_t^k | t = 1, \dots, n\}, X^k \subseteq \mathcal{Q}^k, \quad (8)$$

FC

O

FC

FC

(F 6D)

$$\begin{aligned} \text{Train} &= \{(x_l, k) | l = 1, \dots, n_1\}, x_l \in X^k, \\ \text{Test} &= \{(x_q, k) | q = 1, \dots, n_2\}, x_q \in X^k, \end{aligned} \quad (9)$$

FC

F

(L , 2011).

CA

G

G

$$i(x_t) = \sum_{k \neq c} p(k|x_t)p(c|x_t)$$

$p(k|x_t)$
FC

() FC

; ()

CA

; () F

P

3.8

=G

=0.0,

=2,

()=40,

=1.

A-

A-

FC-
FC-

A-

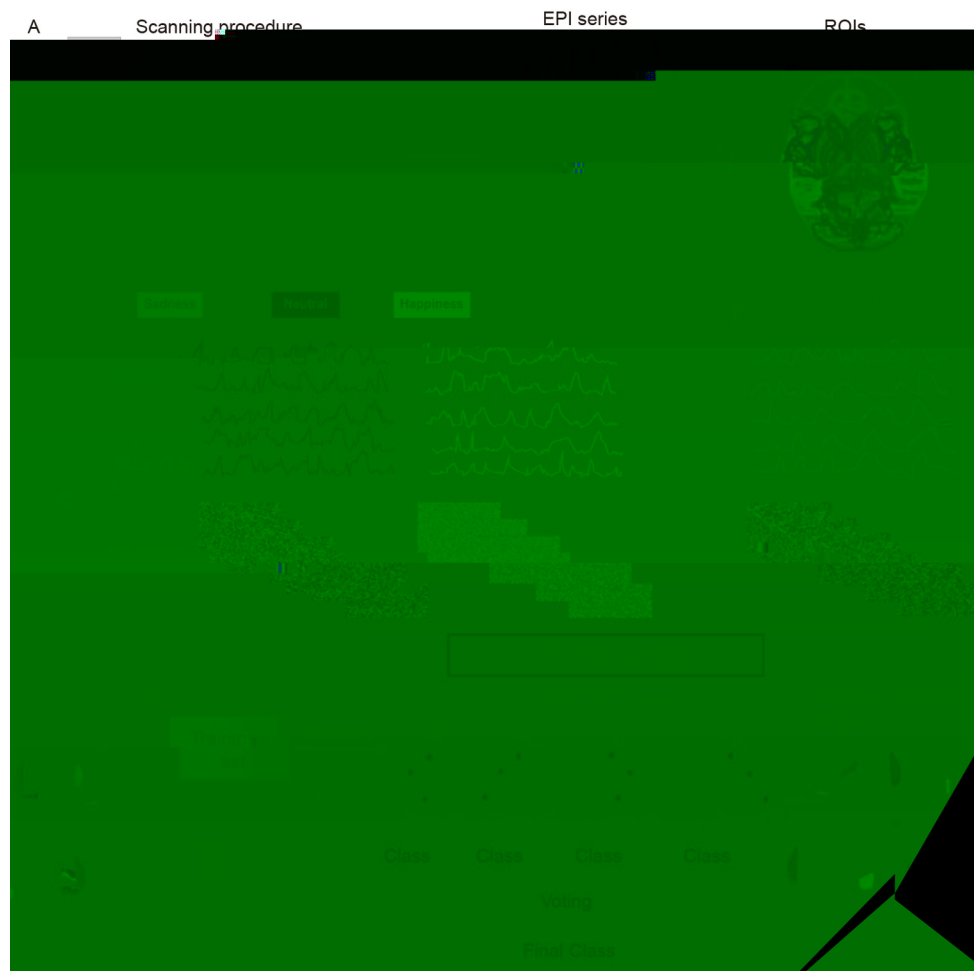
F , 112

H -O :

$$\overline{W} = (w_1, w_2, \dots, w_{112}), \quad (11)$$

\overline{W}

A



$$x_{v_i} = w_i * X, \quad (12)$$

$$x_v = (x_{v_1}, x_{v_2}, \dots, x_{v_j})_{j \leq 112}, \quad (13)$$

M I
(,
H ,
,
M PA
, M I
FC-

- A , . (2008). F , , N 18, 166 172.
- A , , C , M.N. (2018). B , , C 22, 258 269.
- B , B.M., J , , F , M. (2017). N 153, 168 178.
- B , L.F., B -M , F., D , L., , L., , C , A 2, 73 83.
- C , L., F , , P , J., G , D., P , J , L., , C , B 1, 10645.
- C , J., D D , D., N , J., G , H , G., M -P , L. (2021). C 36, 47 58.
- C , J., , L., , P , (2021). D 64, 938.
- C , M., I , , C , C., , (2021). JN 41, 2684 2702.
- D , D., H , M.M. (2018). C , P N A 115, 1692.
- D , , F., F , B., Q , B., D , B.C., B , D., B , L., D , A.M., M , P., H , B., (2006). A M I N I 31, 968 980.
- E , P. (1992). A C E 6, 169 200.
- F , F., H , H. (2021). C L 64, 843 846.
- G , B.L., , C., , N., K , A., G , J., B , P. (2021). N H B 5, 1203 1213.
- H , . (2012). M 16, 458 466.
- H , L., K , M., (2015). N I 114, 275.
- H , , C , J., , F., , D. (2019). B A 5, 1.
- H , M., , A , E.A., P.A., C , D., C , M., D P , D , G , G.H., G -C , J., (2013). D N I 80, 360 378.
- I , , H , L., M , , C , C., C , M. (2020). C 24, 25 38.
- J , F., J , H., G , , , C , J., A., N , (2022). M I MEG N I 254, 119131.
- K , P.A., L B , K. (2016). D C 20, 444 455.
- L , G., M , B.H., L , D., G , P. (2011). D G N I 56, 497 507.
- L , , L , B., , J., , G., L., , P., , B. (2017). D , H B M 38, 3113 3125.
- L , , L , B., L , , P. (2018). M , F H N 12, 94.
- L , , L , B. (2020). C - F N 14, 567797.
- L , C., , , G , , , J. (2018). I JN M 609, 71 80.
- L C., L., , , 3- (2020). D C N 9 179.
- J., , F., L., , , J., D., M., C , Q., , D. (2018). A C 61, 1420 1424.
- , F.C., N , I , L , A.D. (2003). F A B N 3, 207 233.
- N , , K , K.N., N , J.L. (2011). E P -G M 56, 10.
- P , K. (2020). A B F 227, 673 684.
- P , P., , A., P , P., H , J. (2012). D C B 8, 1002441.
- P , L., A , (2010). E N N 11, 773 782.
- P , L. (2018). C O B 19, 19 25.
- , H., E , L.F., G , I.P., P., , M., N , J. (2018). C A N 12, 471 482.
- , H., G , E., , D., M , H., J , I.P., , M., N , L. (2022). C N I 247, 118800.
- , H., G , A., J , I.P., L , J., , P., H , , M., N , L. (2016). D C C 26, 2563 2573.
- , , L , C.H., K , D. (2016). E N I 133, 111 128.
- , G. (2010). ? 25 29 310, 222. , , , P., C , (2020). EEG IEEE A C 11, 532 541.
- , C.J., , E.C. (2012). C N 125 1087.
- , D., I , J.P. (2020) : A (1990 2012) (2017 2018) N I 221, 117164.
- , N., , J., L , A.C., M C , , N , M., H , A., M , D.J., , A., C , B.J., N , C. (2009). N P 168, 242 249.
- , , C , J., B., , H , L. (2021). M , , C L 64, 879 896.
- , K., H , (2010). N J

- C N 22, 2864-2885.
 , , , O., M , A.N. , , : - . N (2014). P N A 119. , .D., , N., .F. (2016). DPABI: , , F , , C , , , . (2016) & (-) . N - 14, 339-351.
 M 37, 3685-3697. , G., , M., L , J., , G., , D., , . (2021). DGCNN: EEG IEEE A C : 10.1109/ AFCC.2021.3051332. , H., J , , N , , C , C., L , N., , L.G. (2016). F - . N I 130, 77-90. , , P , A., G , J.J., M , . (2019). D : , , . J N 39, 7155-7172. , , , M , , , K., B , C., C , D. (2020). - - : A . N I 220, 117111.
- N 46, 2030-2038.
 , D., L , , J , . (2020). M I . C L 63, 410-418.

:// . /10.1007/ 11427-022-2206-3.