

• 研究前沿(Regular Articles) •

McGurk

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McGurk 效应(麦格克效应)是典型的视听整合现象, 该效应受到刺激的物理特征、注意分配、个体视听信息依赖程度、视听整合能力、语言文化差异的影响。引发 McGurk 效应的关键视觉信息主要来自说话者的嘴部区域。产生 McGurk 效应的认知过程包含早期的视听整合(与颞上皮质有关)以及晚期的视听不一致冲突(与额下皮质有关)。未来研究应关注面孔社会信息对 McGurk 效应的影响, McGurk 效应中单通道信息加工与视听整合的关系, 结合计算模型探讨其认知神经机制等。

McGurk 效应; 视听言语感知; 视听整合; 多感觉整合
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(multisensory integration) , , (Stein & Stanford, 2008; , 2011; , 2009) , (Ross, Saint-Amour, Leavitt, Javitt, & Foxe, 2007)—— McGurk (McGurk effect / McGurk illusion) (McGurk & MacDonald, 1976) (audiovisual integration) , “ (“ga” “ba” “da”), (lipreading) (Summerfield, 1992; , 2006; , 2013) (, , 2005) “

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McGurk (Gurler et al., 2015; Mallick et al., 2015; Wilson, Alsius, Paré, & Munhall, 2016) “McGurk” (Alsius et al., 2018; Tiippana, 2014)

McGurk (Rosenblum, Yakel, & Green, 2000; Ujiié, Asai, & Wakabayashi, 2018) (Magnotti, Mallick, & Beauchamp, 2018)

3 McGurk

3.1 McGurk

McGurk (Jordan & Sergeant, 2000), (Jordan & Thomas, 2011), (Munhall, ten Hove, Brammer, & Paré, 2009), (continuous flashing suppression, CFS, Fang & He, 2005; Tsuchiya & Koch, 2005) (Palmer & Ramsey, 2012) (Wilson et al., 2016) (MacDonald, Andersen, & Bachmann, 2000) (Thomas & Jordan, 2002) (Jordan & Thomas, 2011; Ujiié, Asai, & Wakabayashi, 2015) (Jordan, McCotter, & Thomas, 2000), (Jordan & Sergeant, 2000) (Thomas & Jordan, 2002),

McGurk (Magnotti, Mallick, & Beauchamp, 2018) (Munhall, ten Hove, Brammer, & Paré, 2009), (continuous flashing suppression, CFS, Fang & He, 2005; Tsuchiya & Koch, 2005) (Palmer & Ramsey, 2012)

(MacDonald et al., 2000), 20 (Jordan & Sergeant, 2000), (Jordan & Thomas, 2011),

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McGurk (Palmer & Ramsey, 2012) (Wilson et al., 2016) (MacDonald, Andersen, & Bachmann, 2000) (Thomas & Jordan, 2002) (Jordan & Thomas, 2011; Ujiié, Asai, & Wakabayashi, 2015) (Jordan, McCotter, & Thomas, 2000), (Jordan & Sergeant, 2000) (Thomas & Jordan, 2002),

McGurk (Munhall, ten Hove, Brammer, & Paré, 2009), (continuous flashing suppression, CFS, Fang & He, 2005; Tsuchiya & Koch, 2005) (Palmer & Ramsey, 2012)

McGurk (Palmer & Ramsey, 2012) (Wilson et al., 2016) (MacDonald, Andersen, & Bachmann, 2000) (Thomas & Jordan, 2002) (Jordan & Thomas, 2011; Ujiié, Asai, & Wakabayashi, 2015) (Jordan, McCotter, & Thomas, 2000), (Jordan & Sergeant, 2000) (Thomas & Jordan, 2002),

McGurk (Palmer & Ramsey, 2012) (Wilson et al., 2016) (MacDonald, Andersen, & Bachmann, 2000) (Thomas & Jordan, 2002) (Jordan & Thomas, 2011; Ujiié, Asai, & Wakabayashi, 2015) (Jordan, McCotter, & Thomas, 2000), (Jordan & Sergeant, 2000) (Thomas & Jordan, 2002),

McGurk (Palmer & Ramsey, 2012) (Wilson et al., 2016) (MacDonald, Andersen, & Bachmann, 2000) (Thomas & Jordan, 2002) (Jordan & Thomas, 2011; Ujiié, Asai, & Wakabayashi, 2015) (Jordan, McCotter, & Thomas, 2000), (Jordan & Sergeant, 2000) (Thomas & Jordan, 2002),

McGurk (Palmer & Ramsey, 2012) (Wilson et al., 2016) (MacDonald, Andersen, & Bachmann, 2000) (Thomas & Jordan, 2002) (Jordan & Thomas, 2011; Ujiié, Asai, & Wakabayashi, 2015) (Jordan, McCotter, & Thomas, 2000), (Jordan & Sergeant, 2000) (Thomas & Jordan, 2002),

McGurk (Soto-Faraco & Alsius, 2009),
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 (Quinto, Thompson, Russo, (), McGurk
 & Trehub, 2010) ()
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 Ryherd, & Landi, 2018) McGurk ,
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 (Alsius, Navarra, Campbell, & Soto-Faraco,
 2005) ,
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 Navarra, & Soto-Faraco, 2007)
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 (Munhall, Gribble, Sacco,
 & Ward, 1996; Stevenson, Zemtsov, & Wallace,
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 (Proverbio, Massetti, Rizzi, & Zani, 2016)
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 & O'Malley, 1995) (Walker, Bruce, McGurk
 , McGurk (Moro & Steeves, 2018),
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 , (de Gelder , (McGurk
 & Vroomen, 2000) , McGurk),
 McGurk , (Sekiyama,
 , Soshi, & Sakamoto, 2014)
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 3.2 McGurk) , McGurk
 McGurk () (autism spectrum disorder, ASD)

McGurk (Stevenson et al., 2012)——
 (de Gelder, Vroomen, & van der Heide, 1991) ASD
 (autism spectrum quotient, AQ),
 AQ McGurk AQ (Ujiie et al., 2018), AQ McGurk (Ujiie et al., 2015),
 de Gelder (1991) McGurk (Hockley & Polka, 1994; McGurk & MacDonald, 1976),
 McGurk (Rouger, Fraysse, Deguine, & Barone, 2008) 4~5 McGurk (Burnham & Dodd, 2004; Rosenblum et al., 1997)
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 (Bayard, Colin, & Leybaert, 2014) McGurk McGurk
 (Moro & Steeves, 2018), McGurk McGurk
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(Hisanaga, Sekiyama, Igasaki, & Murayama, 2016; Sekiyama & Tohkura, 1993)

(Sekiyama, 1997)

Feng, Zhou, Zhou, & Beauchamp, 2015)

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McGurk

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McGurk ("ga" "ba"), "tha",

"da" "th" "da" (Burnham & Dodd, 2018)

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(Brancazio & Miller, 2005)

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4 McGurk

4.1 McGurk

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(Gurler et al., 2015)

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et al., 2016)

(Hisanaga

McGurk

, (Buchan & Munhall, 2012)

McGurk (Hisanaga et al., 2016; Paré, Richler, ten Hove, & Munhall, 2003; Wilson et al., 2016)

McGurk McGurk Paré (2003), McGurk

, McGurk 10°~20°, McGurk (), 60°, McGurk

McGurk

(1) Buchan Munhall (2012); Gurler (2015); Paré (2003) (), () (2)

Gurler (2015) Buchan Munhall (2012), Wilson (2016) McGurk (), McGurk (Jordan & Thomas, 2011)

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oddball McGurk

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ERP , (

200~300 ms), McGurk

(mismatch negativity, MMN) (Saint-Amour, De Sanctis, Molholma, Ritter, & Foxe, 2007) MMN

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McGurk-MMN McGurk-MMN

(Colin et al., 2002; Colin, Radeau, Soquet, & Deltenre, 2004; Eskelund, MacDonald, & Andersen, 2015) McGurk

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2017) oddball MEG

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160 ms 270 ms), Gamma

(Kaiser, Hertrich, Ackermann, Mathiak, & Lutzenberger, 2005) Gamma

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oddball), McGurk

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800 ms, McGurk

Beta ,

Beta (Lange,

Christian, & Schnitzler, 2013),

McGurk

oddball MEG , McGurk

Gamma ,

(Kaiser et al., 2005) ,

McGurk

(Soto-Faraco & Alsius, 2009) ,

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4.3 McGurk

McGurk

(functional magnetic resonance imaging, fMRI)

(transcranial magnetic stimulation,

TMS) MEG

(superior temporal cortex)

; (inferior frontal cortex)

McGurk ,

(Beauchamp et al., 2010; Miller & D'Esposito, 2005; Nath & Beauchamp, 2012)

fMRI , McGurk ,

McGurk ,

(Jones & Callan, 2003) McGurk

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50% (McGurk),

(left superior temporal sulcus, ISTS) , McGurk ,
 McGurk , (inferior frontal gyrus,
 (Nath & Beauchamp, 2012) 6~12 IFG) (McGurk)
 (Nath, Fava, & Beauchamp, IFG McGurk
 2011) , Beauchamp (2010) McGurk
 fMRI STS, TMS IFG ,
 STS , TMS STS (Nath & Beauchamp, 2012)
 , McGurk , McGurk ,
 , Marques, McGurk , IFG
 Lapenta, Merabet, Bolognini Boggio (2014) — (anterior cingulate
 (transcranial direct current stimulation) cortex, ACC) (Fernández et al., 2017)
 STS, Beauchamp (2010) McGurk
 EEG , Saint-Amour (2007)
 McGurk-MMN , Gau Noppeney (2016)
 MEG McGurk ,
 , McGurk Fernández (2017)
 , (left superior temporal , Gau Noppeney (2016) fMRI
 gyrus) Beta , McGurk
 (Keil, Müller, Ihssen, & Weisz, 2012)
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 STS (voxels) McGurk)
 , STS , (left inferior frontal sulcus, IIFS)
 STS , () ,
 () Fernández (2017)
 () McGurk (McGurk)
 (Zhu & Beauchamp, 2017) , , IIFS ,
 McGurk , STS (McGurk)
 (Fernández (2017) —Fernández
 McGurk) (2017) McGurk , IFG
) McGurk ,
 STS McGurk McGurk
 , McGurk (1)
 (Fernández et al., 2017; Gau & Noppeney, Fernández (2017)
 2016; Nath & Beauchamp, 2012) McGurk (2016) McGurk ; Gau Noppeney
 fMRI (Jones) McGurk (2)
 & Callan, 2003) MEG fMRI
 (Kaiser et al., 2005) ,

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 Noppeney (2016) IFS, , ()
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5.1 McGurk

(multivoxel pattern
 analysis, MVPA), McGurk
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 (Strand et al., 2014)

— (Macsweeney,
 et al., 2000) ,
 (Macsweeney, et al., 2002) ,
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5.2 McGurk
 McGurk Mcaçrk , ú

McGurk) , “ada” (McGurk)

McGurk (, “ada” (

EEG fMRI) , “aba” “ada”)

McGurk “aba” “ada”)

EEG fMRI , McGurk ,

“aba” “ada” ,

(Lüttke, Ekman, van Gerven, & de Lange, 2016) , McGurk

NED ,

(D) (σ) (T) McGurk

McGurk ,

(“ba”

“ga” “da”)

(“bait” “gate” “date”,

(model of causal inference in multisensory speech Alsius et al., 2005, 2007) ,

perception, Magnotti & Beauchamp, 2017) , McGurk ()

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McGurk ; , “ ” ,

McGurk McGurk

McGurk McGurk

Alsius (2018) McGurk

McGurk

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5.4 McGurk , 2 ;

McGurk ,

McGurk McGurk ,

McGurk “ ” (

McGurk) , McGurk

McGurk ,

McGurk (1)

McGurk ,

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McGurk McGurk ,

(Bertelson et al., 2003) , (2) McGurk

McGurk (“aba” “aga” McGurk

“ada”) , “aba” ,

- McGurk (Alsuis et al., 2018; Tiippana, 2014) (3)
- McGurk (Alsuis et al., 2018) (4)
- McGurk (Alsuis et al., 2018) (1)
- McGurk (Fernández et al., 2017) (1)
- McGurk (Strand et al., 2014) (2)
- McGurk (Lüttke, Ekman, van Gerven, & de Lange, 2015) (3)
- McGurk (Van Engen et al., 2017)
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The influential factors and neural mechanisms of McGurk effect

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Abstract: The McGurk effect is a typical audiovisual integration phenomenon, influenced by characteristics of physical stimuli, attentional allocation, the extent that individuals rely on visual or auditory information in processing, the ability of audiovisual integration, and language/culture differences. Key visual information that leads to the McGurk effect is mainly extracted from the mouth area of the talker. The McGurk effect implicates both audiovisual integration (which occurs in the early processing stage and is related to the activation of superior temporal cortex) and the conflict of the incongruent audiovisual stimuli (which occurs in the late processing stage and is related to the activation of inferior frontal cortex). Future studies should further investigate the influence of social factors on the McGurk effect, pay attention to the relationship between unimodal information processing and audiovisual integration in the McGurk effect, and explore the neural mechanisms of McGurk effect with computational modeling.

Key words: McGurk effect; audiovisual speech perception; audiovisual integration; multisensory integration