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Non-sympathetic FRN responses to drops in others' stocks

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Previous neuroeconomic studies have observed that people display sympathetic neural responses toward others' misfortunes. We argue that the reverse emotions, such as gloating or *schadenfreude*, may also emerge in certain circumstances. To examine this theory, we recorded feedback-related negativity (FRN) toward others' large or small gains or losses in a stock market context. We adopted the framework of social distance, according to which we hypothesized that because others in the stock market are far away, unidentified, and indistinct, people would show less sympathy or even *schadenfreude* toward others' large losses. The results indicated that FRN at Fz was significantly less negative when observing larger decreases in others' stock, indicating that others' large losses are not unexpected negative events in the stock market and suggesting the existence of *schadenfreude.* Our research contributes to the understanding of social neurofinance by demonstrating the *schadenfreude* effect in relation to the stock market. This study also provides new information regarding the relationship between FRN and the social emotions that form the expectations of gain and loss.

Keywords: Event-related potential; Feedback-related negativity; Sympathy; *Schadenfreude*; Social neurofinance.

The current body of work in neuroeconomics suggests that humans are highly empathetic and even altruistic toward others' negative feedback outcomes. For example, Yu and Zhou (2006) observed similar feedback-related negativity (FRN) patterns when people are faced with their own gains and losses and the gains and losses of others. As FRN is generally elicited toward unexpected negative outcomes, Yu and Zhou concluded that such findings indicate an observational learning effect whereby similar neural mechanisms underlie the evaluation of one's own and others' feedback outcomes.

However, an investigation of the literature reveals that this may be far from the truth. When facing others' losses, human beings may either feel sympathy or feel negative, unsympathetic emotion such as *schadenfreude* (pleasure in others' misfortunes). The feeling of *schadenfreude* has been demonstrated both in neural (Takahashi et al.,

we know crying over his loss, we feel sympathy; however, a loss suffered by a stranger living far away may elicit less sympathy. This circumstance suggests the distance effect. In the current study, we

Koenigs & Tranel, 2007). The current research contributes to our understanding of brain responses to financial outcomes although the brain mechanism of financial decision-making remains unknown. Second, the participants in the current research were all students and thus may be inexperienced in financial markets. Future research should examine the current findings among actual stockholders or fund managers to increase external validity.

The present study contributes to the literature on social neurofinance. Moreover, we suggest that the notion of FRN as a reflector of negative surprise should be applied to research on social emotions because social emotions play important roles in determining expectancy. We call for more research into this specific area of finance in future neuroeconomic investigations.

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