Expressions of Anger during Advising on Life Dilemmas Predict Suicide Risk Among College Students

Abstract

Research has demonstrated a relationship between anger and suicidality, while real-time authentic emotions behind facial expressions could be detected during advising to hypothetical protagonists in life dilemmas. This study aimed to investigate the predictive validity of anger expressions during advising for suicide risk**.** Besides advising on life dilemmas (a friend's betrayal, a friend's suicide attempt), 130 adults completed the suicidal scale of the mini-international neuropsychiatric interview. Participants' anger during advice-giving was measured 29 times per second by artificial intelligence-based software Facereader7.1. The results showed that anger was a significant predictor of suicide risk. Increased anger during advising was associated with higher suicide risk. In contrast, there was no significant correlation between suicide risk and duration or length of advising. Therefore, measuring micro expressions of anger with AI-based software may help detect suicide risk among clinical patients in both traditional and online counselling contexts and help prevent suicide.

Keywords: suicide; facial expression; affective disorders; anger; micro expression

Introduction

Suicide is the second leading cause of death in young people aged 15-29 years (World Health Organization, 2019). A previous study revealed that the prevalence of suicidal ideation among 1097 Chinese college students was 21.42 % (Yang et al., 2019). Moreover, individuals at risk of suicide may disguise their suicidal attempts in therapy (Blanchard & Farber, 2016), while people around them may ignore their "silent cry for help" (Maple et al., 2019). Therefore, the detection of suicide risk in a natural ecological situation by a covert and objective method is vital for suicide prevention among college students.

Detection of suicide risk may be improved by assessing individuals' expressions of anger during daily advising. Previous studies have demonstrated that real-time authentic emotions behind facial expressions could be evoked when advising on others' life dilemmas and measured by expression analysis technology (Hu et al., 2017, 2019, 2021). The advising paradigm was modelled on the 'empty chair' technique developed in Gestalt therapy that has been empirically demonstrated to be of therapeutic value despite its artificiality (Paivio & Greenberg, 1995; Wagner-Moore, 2004). When advising a hypothetical protagonist, participants could take the protagonist's perspective and empathize with the protagonist (Hu et al., 2018).

On the other hand, irritability and lack of anger control were common emotional disorders among individuals who had attempted suicide (Ammerman, et al., 2015; Baud et al., 2009; Giegling et al., 2009; Hawkins et al., 2014). A survey among 5692 adults revealed that expressions of anger (orally or behaviorally) could predict lifetime suicidality (Hawkins & Cougle, 2013). Intolerable emotional pain, especially anger, was regarded as a motivational force behind the act of suicide (Lehnert, et al., 1994). Moreover, anger and anger expression could damage interpersonal relationships and

increase painful and provocative events, which in turn increases suicide risk (Hawkins et al., 2014).

Taken together, we hypothesized that expressions of anger when advising on others' life dilemmas (e.g., interpersonal conflicts) should be a significant predictor of suicide risk. When advising on others' life dilemmas, individuals could visualize themselves in the life dilemmas and feel the anger just as the protagonists in the life dilemmas could, while individuals with higher suicide risk are more easily irritated, just as they would be in their own life dilemmas (Ammerman et al., 2015; Baud et al., 2009; Giegling et al., 2009; Hawkins et al., 2014).

Besides, we explored whether there was any gender difference in micro expression of anger. Previous studies suggested that males were more likely to show anger than females (Brody, Hall, & Stokes, 2018). However, there is no study on the gender difference in expressions of anger among individuals with suicide risk to our knowledge. It could be that women conceal anger more than men because the expression of anger is less acceptable for women. Nevertheless, the expression analysis technology may reveal the anger concealed, and thus there should be no gender difference in expressions of anger. Micro expressions, which last less than 100 milliseconds and thus barely noticed by the naked eye, were first discovered by Ekman et al. in the 1960s when examining films of psychiatric patients who had concealed "either plans to commit suicide or hallucinations" (Ekman, 2003). Nevertheless, gender was regarded as a potential confounder, considering the potential correlation between suicide risk and gender (Evans et al., 2016; Hawton, 2000).

This study adopted the advanced software Facereader 7.1, measuring facial expressions 29 times per second and capturing potential micro expressions by participants. Despite the questioning of Darwin's (1872/2002) evidence for the

universality of emotional expressions (Barrett et al., 2016, p. 21), facial expressions of anger are generally a universal signal of one's internal emotion of anger across different cultures and social groups (Barrett et al., 2016, p. 774-775); in contrast, anger expressions of other forms (orally or behaviourally) may differ significantly across different cultures and social groups (Barrett et al., 2016, p. 774-775), which is challenging for diagnosis. Moreover, the measurement of real-time facial expression with a sampling rate of 29 Hertz could detect micro expressions unnoticed by the naked eye, a useful sign of concealed emotion (Ekman, 2003). Indeed, a previous study applying the advising paradigm revealed that adults could show facial expressions of disgust when advising against suicide with polite words (Hu et al., 2021). Taken together, our measurement of anger (i.e., real-time measurement of facial expressions with a high sampling rate) should be more consistent across different social cultural contexts and less susceptible to social desirability effects, compared with measuring other forms of anger expressions.

Hypothesis

Expression of anger when advising on others' life dilemmas should be a significant predictor of suicide risk.

Methods

This study was performed in line with the principles of the Declaration of Helsinki. The ethics committee at the Institute of Psychological Sciences, Hangzhou Normal University approved all procedures used in the current study. Informed consent was obtained from all the participants after the nature of the procedures had been fully explained. Software G*Power 3.1 performed a power analysis to obtain a power of .80 to detect an average effect size (i.e., $r = 0.21$) over 100-years of social psychology (Richard, Bond, & Stokes-Zoota, 2003) at the standard .05 alpha error probability (i.e.,

the correlation between gender and anger, between gender and suicide risk, between anger and suicide risk is assumed to be 0.21). For a multiple regression analysis with two predictors (random model, one-tail), a sample size of 129 is required.

Participants

Altogether, 130 (103 females and 27 males) Chinese undergraduates at the Hangzhou Normal University aged 18 to 26 (M = 20.84, SD = 1.98) volunteered to participate in this study after seeing a campus advertisement. One participant's performance was not validly videotaped and thus was not included in the following facial expression analysis. All participants were physically healthy native Chinese speakers. They all had a normal or corrected-to-normal vision. Participants were each paid 20 RMB (about 3 US dollars) to participate in the study.

Material

Advising vignettes

"Betrayal of a friend": "The school psychological counseling center was visited by a student named Xiao Li (a pseudonym), who said that his good friend Xiao Lin (a pseudonym) had betrayed him. Xiao Li told Xiao Lin many of his secrets, but Xiao Li found that Xiao Lin told others about the secrets, and so he was very upset."

"Suicide attempt": "The school psychological counseling center was visited by a student named Xiao Zhao (a pseudonym) who had attempted suicide. He broke up with his girlfriend last year and has failed many examinations."

These scenarios were based on the previous studies in which participants' real emotions could be evoked during hypothetical advising to the protagonists (Hu et al., 2017, 2018, 2021).

Suicide risk module

The Chinese version of the Suicide risk module of the Mini International

Neuropsychiatric Interview (MINI) includes six questions that assess suicidal risk (e.g., "Within the past month, did you think you would be better off dead or wish you were dead?", "In your lifetime, have you ever attempted suicide action?"). A previous study among 1478 major affective disorder patients consecutively examined in 13 mental health centers in China showed that the score of MINI was significantly positively correlated to depressive episodes with suicidal ideation and attempts (Chen et al., 2014).

Procedure

Before the study, we explained our study's nature and ensured participants that their personal information would be kept confidential. Psycho-toolbox presented all the materials and instructions in Matlab 2016 on a laptop. The participants completed the study individually in a quiet and adequately illuminated laboratory room. The participants were sitting in an armchair, with a camera set about 30 cm away from their faces.

Participants were instructed that the study sought to explore how people analyze, reason, and predict events with limited information. After reading the vignettes, the participants responded verbally to the following questions in order:

Question 1: Have you ever experienced or talked to someone about similar issues?

Question 2: How do you think things will develop next?

Question 3: Why do you think things are going to develop like this?

Question 4: What do you think the final result will be?

Question 5: "What do you think he should do in this situation?" for Vignette 1 or "Imagine this student was your friend, what would you want to say to him? Please record a video for him." for Vignette 2.

These questions were based on previous studies applying the wise advising paradigm which could evoke real-time authentic emotions behind facial expressions

when advising on others' life dilemmas (Hu et al., 2017, 2018, 2021). For these questions, participants were told not to speak until they had reflected upon the questions thoroughly and felt ready to begin. In order to mimic a natural situation, no time limit was set for the participants' responses. The duration of the participants' responses ranged from 9.68 to 216.59 seconds (M = 41.31 seconds, SD = 26.62 seconds) for vignette 1, 6.51 to 248.25 seconds (M = 58.32 seconds, SD = 37.61 seconds) for vignette 2. The experimenter left each participant alone in the laboratory room after the Psycho-toolbox program began to run automatically in Matlab to make participants feel more comfortable and less constrained in completing the task.

The camera videotaped the participants' frontal-view facial expressions throughout their responses. Previous studies have confirmed the reliability and validity of expression analyses by Facereader among Chinese participants (Chentsova-Dutton & Tsai, 2010; Hu et al., 2017, 2018, 2021). Following the procedure in previous studies, the "East Asian" face model was used as the training model for this study. Based on the embedded artificial intelligence, Facereader7.1 measured every frame of the videotaped facial expressions (29 times per second) during responses to the last question in each scenario, calculating the probable occurrence of six basic emotions (i.e., joy, sadness, anger, fear, surprise, disgust). The system first identified and located the face in each frame of the video (about 41.7 milliseconds per frame); and then automatically measured basic facial Action Units (AU) in the Facial Action Coding System (FACS)—a comprehensive, compositional, and anatomically-based facial muscular movement analysis system (Ekman & Rosenberg, 1997). Finally, the values of basic emotions were averaged across all the frames for each video.

The participants finished the tasks in both vignettes. Afterward, the participants finished the suicide risk module. Contact information for registered

counselors/psychologists was provided in case any participants needed such a service as a result of participating in this study (to our knowledge, none did). SPSS24 was used for the following data analyses.

Results

Suicide risk of the 129 participants ranged from 0 to 20 (M = 2.05, SD = 4.50). Altogether 35 (27.1%) participants' suicide risk scores were higher than 0. The descriptive statistics of the length, duration, and basic emotions of advising in each life dilemma and their correlations with suicide risk are shown in Table 1.

No significant correlation of suicide risk with duration or length of advising

Shapiro-Wilk tests revealed that the distribution of suicide risk was not normal, $p < .010$. Therefore, Spearman correlation analyses were conducted. There was no significant correlation of suicide risk with duration of advising or verbal length of advising (See Table 1 for details).

Significantly positive correlation between suicide risk and anger during advising

Spearman correlation analyses revealed that the expressions of anger were significantly positively correlated with suicide risk, both *rho*s> 0.19, both $p < .050$; None of the other emotions had significant correlations with suicide risk, all $p > .050$. (See Table 1 for details). The value of anger when advising on the life dilemma "betrayal of a friend" was significantly positively correlated with that when advising on the other life dilemma "suicide attempt", *rho* = 0.66, $p < .001$, 95% *CI* = [0.53, 0.76]. Therefore, these two measures of anger were averaged to get an average value of anger during advising. Spearman correlation analysis revealed that the average value of anger was significantly positively correlated with suicide risk, *rho* = 0.21, $p = .015$, 95% *CI* = [0.04, 0.38].

No significant gender difference in anger or suicide risk

Independent samples Mann-Whitney U tests revealed no significant gender difference in expressions of anger or suicide risk, both $p > .290$. Therefore, gender was not considered in the following regression analysis, following the professional recommendation in statistical control (Carlson & Wu, 2012).

Anger predicted suicide risk

Linear regression analysis with the average value of anger as the sole predictor was conducted on the score of suicide risk. The model was significant, $F(1, 127) = 6.00$, $p = .016$. Anger was a significant predictor of suicide risk, $B = 0.091$, *95%* confidence interval of $B = [0.017, 0.16]$, $t = 2.45$, $p = .008$ (one-tail).

Discussion

The results supported our hypothesis that expression of anger during advising on others' life dilemmas was a significant predictor of suicide risk. Anger could both serve as an adaptive function and lead to negative consequences. The expression of anger exhibits a sense of deterrence, which acts as a form of self-protection (Harmon-Jones & Harmon-Jones, 2016). However, it could also damage interpersonal relationships when dealing with interpersonal conflicts, and thus increase suicide risk (Hawkins et al., 2014; Park et al., 2017). In contrast, there was no significant correlation between suicide risk and duration or length of their advising. Therefore, it may be more helpful to focus on facial expressions during advising, instead of more obvious cues of advising (e.g., duration, length) among college students.

There was no significant gender difference in expressions of anger. It could be because the females in our study did not feel the need to conceal anger when advising on a stranger's life dilemmas. Alternatively, the female participants did conceal their anger more than the male participants. However, the sampling rate (i.e., 29 Hz) of facial expressions in this study was high enough for tracking and measuring the micro

expressions of anger (lasted less than 100 milliseconds) (Ekman & Friesen, 2003, p. 5) by the female participants. If this is true, then the expression analysis technology adopted in this study should be vital for detecting concealed anger among adults with suicide risk.

Our study was consistent with previous studies in which individuals attempting suicide showed more anger (Hawkins & Cougle, 2013; Hawkins et al., 2014). Overall, this study demonstrates that measuring anger during advising could help detect suicide risk among college students. The average duration of the advising in our paradigm was less than one minute. Therefore, psychologists could detect suicide risk among clients in clinics with standardized questioning within a short time.

Analyzing expressions during hypothetical advising may also help individuals with suicide risk realize what makes them angry. The scenarios we chose in this study (e.g., betrayal of a friend) were probably related to real-life dilemmas that evoke anger among participants with suicide risk. Future studies could investigate if the correlation between anger and suicide risk exists for advising in other real-life scenarios. Certain life dilemmas may make individuals with higher suicide risk angrier while other dilemmas may not. Understanding the latent causes of anger may help individuals with suicide risk better control their anger and understand their needs in life, which may help them cope with life dilemmas critical for them.

Consistent with the previous study (Yang et al., 2019), the prevalence of suicide risk was high among Chinese college students (i.e., 27.1%). At least one out of five participants in our study had thought about suicide before. Our findings may help counselors detect suicide risk among students. A previous study has demonstrated that micro expression training software (i.e., the FACE) significantly improved participants' ability to recognize expressions of anger (Curtis, 2020). Therefore, it is possible to

improve counselors' ability to detect suicide risk with training in recognizing micro expressions of anger.

Limitations

"No matter how many instances of white swans we may have observed, this does not justify the conclusion that all swans are white" (Popper, 2005, p. 4). Likewise, this is a single empirical study that cannot prove the universal statement that "expressions of anger during advising on life dilemmas predicts suicide risk". More studies are needed to test if the correlation between expressions of anger and suicide risk exists when some factors (e.g., ethnicity and age of the individuals with suicide risk, scenarios of advising) have changed. Moreover, the correlation of suicide risk with the average value of anger was not strong (i.e., *rho* = 0.21). Future studies could investigate if the correlation between anger and suicide risk should be stronger among higher-risk populations than college students.

Conclusion

Expressions of anger during advising on life dilemmas were associated with higher suicide risk among college students. Therefore, we could focus on the expressions of anger during daily advising for detecting suicide risk, which is prevalent among college students. The "advising paradigm" could be applied in traditional psychiatric clinical situations as well as in online counseling. For example, social distancing and isolation have been associated with increased risk of mental disorders during the COVID-19 pandemic; and a large proportion of mental health assistance occurs through online technology such as videoconferencing (Carlo et al., 2021), providing opportunities for recording and analyzing clients' facial expressions. Nevertheless, future studies should explore the relationship between individuals' suicide risk and their facial expressions of anger when advising on other life dilemmas.

Disclosure of conflict of interest

The authors declare there are no conflicts of interest.

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Table 1. Correlations with suicide risk and descriptions about the participants' advising

Variable	*rho*	*Min*	*Max*	*Mean*	*SD*
Anger_Betrayal	0.26**	0.58	73.49	12.34	12.27
Anger_Suicide	0.19*	0.71	67.92	12.96	11.04
Contempt_Betrayal	-0.04	0.06	31.57	5.57	6.36
Contempt_Suicide	0.05	0.16	34.6	4.46	5.34
Disgust_Betrayal	-0.08	0.37	47.14	10.66	9.17
Disgust_Suicide	-0.08	0.88	38.71	10.21	8.74
Fear_Betrayal	-0.14	0.1	66.05	8.6	10.42
Fear_Suicide	-0.09	0.68	63.42	9.46	10.82
Joy_Betrayal	0.01	0.2	67.77	10.22	13.51
Joy_Suicide	-0.05	0.25	70.91	10.32	13.22
Sadness_Betrayal	-0.15	1.17	68.82	20.19	14.82
Sadness_Suicide	-0.09	1.37	70.2	16.15	12.61
Surprise_Betrayal	-0.01	0.8	61.96	12.45	10.83
Surprise_Suicide	-0.02	1.11	68.13	14.75	13.06
Duration(second)_Betrayal	0.01	9.68	216.59	41.31	26.62
Duration(second)_Suicide	0.09	6.51	248.25	58.32	37.61
Length(character) _Betrayal	0.03	122	1505	484.81	291.76
Length(character)_Suicide	0.03	15	1269	205.19	168.55

(Note: rho, spearman correlation with suicide risk; *, $p < 0.05$; **, $p < 0.01$; _Betrayal, advising on a friend's betrayal; _Suicide, advising on suicide attempt)