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A Cognitive Task as an Emotion Regulation Technique during the Public Speech Task：Effects of the Distraction
スピーチ課題における感情統制技法としての認知作業 ― 注意転換の効果 ―

Saea Iida†, Naho Ichikawa†, Hideki Ohira†, Kazumi Kohmura††

飯田沙依亜†，市川奈穂†，大平英樹†，甲村和三††

Abstract　The purpose of this study was to examine effects of cognitive distraction on emotion regulation during a speech task. We used crypt-arithmetic puzzles as a distraction task, and measured subjective emotional states, autonomic responses such as heart rate (HR), skin conductance level (SCL), and speech performance. Sixteen normal healthy participants were divided into a control group and a distraction group randomly. As results, the distraction group showed lower subjective anxiety before the speech, lower HR during the speech, and subjective perception of speech performance was higher compared to control group. To summarize these results, the distraction had immediate suppressive effects on anxiety-like emotional responses during the speech. We discussed these results from the point of the role of cognitive distraction on emotion regulation.

1. Introduction

Emotions are quite important for us to cope flexibly with the changing world. However, not every emotion is appropriate for every situation. So we have to try to regulate our emotions or emotional responses to satisfy social demands.

Many emotion regulation strategies have been proposed in prior studies. There are many situations in which especially down-regulation of negative emotions linked with the upcoming event is necessary or favorable, such as waiting at the dentist's or preparing for a public appearance. A strategy to achieve this is thought to be the cognitive distraction (Erk, Abler, Walter, 2006). However, there are a few studies that examined the effect of cognitive distraction in social situations for healthy participants.

The distraction as an emotion regulation strategy is often defined as focusing attention away from the emotion and its causes onto pleasant or neutral stimuli that are engaged enough to prevent the mind from wandering back to the source of negative emotion (Baumeister, 1991; Nolen-Hoeksema, 1991; Pyszczynski & Greenberg, 1987; Tice & Baumeister, 1993). Many studies used this distraction, as an intervention for emotional disorder, depression, phobia, and so on. Most of those studies showed relief of symptoms. Thus, the distraction is clearly beneficial for helping therapeutically. However the mechanism of the distraction is not clear yet. The mechanism of the distraction is needed to be clarified not only for searching effective treatments of some clinical symptoms but also for illustrating the mechanism of emotion regulation.

Emotion regulation comprises a heterogeneous set of processes by which “individuals influence which emotions they have, when they have them, and how

†　Nagoya University, Government of the Environmental Studies (Nagoya)

†† Aichi Institute of Technology, Center for General Education (Toyota)

they experience and express these emotions" (Gross, 1999). Moreover, Gross (2002) has described two cognitive strategies used in volitional emotion regulation: distraction and reappraisal. This distraction is often called "cognitive distraction." The distraction was distinguished by the way in which participants move their attention from target behavior to the distraction task, and the character of the task which is used as a distraction task. The word, cognitive distraction, is defined by two things. One is that the cognitive distraction should be for achieving some goals, and participants distract their attention from the target task deliberately. This kind of cognitive distraction was districted from self-induced distraction, intrinsic distraction. The other is that the distraction task defined here should be a cognitive task, not a behavioral or emotional task. In this study, referring to the latter definition, we defined cognitive distraction as focusing attention onto the cognitive task that should be engaged enough to prevent the mind from wandering back to the source of negative emotion. Whereas cognitive distraction refers to the effort to selectively attend to non-emotional (or emotionally less disturbing) aspects of a situation, reappraisal consists in deliberately and cognitively interpreting or reinterpreting emotional stimuli or an emotional situation in non-emotional (or emotionally less disturbing) terms. These phenomenological differences suggest that some distinct neurobiological mechanisms underlie distraction and reappraisal. However, it has also been asked whether or not reappraisal is not simply a form of self-distraction (McRae, Ochsner, Gross, & Gabrieli, 2002). As described above, we need to think of the cognitive distraction in order to examine the mechanism of emotion regulation.

In this study, we tried to answer the following two questions. First, can the distraction be used as an emotion regulation strategy for healthy volunteers? Unfortunately, some studies have suggested that the distraction from the feared stimulus may inhibit fear reduction by strengthening avoidance and escape behavior (e.g. Andrews, Crino, Hunt, Lampe, & Page, 1994), even though healthy participants have automatic self control systems for emotions (Fitzsimons & Bargh, 2004). This effect is called "reverse effect", which has generally been known as unexpected negative effects that the distraction induced. However, these studies asked participants to look back and report their experience on the questionnaires. So their results might be included that ex-post facto evaluation. Although human share with animals a primitive neural system for processing emotions, unlike other animals, humans have the unique ability to control and modulate instinctive emotional reactions through intellectual processes such as reasoning, rationalizing, and labeling our experiences (Hariri, Bookheimer, Mazziotta, 2000). In some other experimental studies, even though they didn't have enough ecological validity, they showed the distraction can inhibit the emotions (Kalisch, Wiech, Herrmann, and Dolan, 2006). To answer this question with some experimental data, we used a public speech task as an emotion induction task and examined the effect of the cognitive distraction. Most of the Japanese people give a wide berth to the public speech, so that they have to control their negative emotion such as the anxiety or strain to do the public speech well. And the public speech is also something that can't be easily avoided, because most of the public speech situations are job related (Ayres & Hopf, 1993). So this task would be thought as our most near affairs and as an extension of our daily lives. We hypothesized that the cognitive distraction would inhibit the anxiety induced by the public speech task. Moreover, thinking of the negative effect of the distraction suggested by the prior studies （DiBartolo, Frost, Dixon, & Almodovar, 2001; Hunt, 1998; Steil & Ehlers, 2000）, we examined recovery stages a little bit longer (30min)

Secondly, if the distraction showed inhibition of the speech anxiety in this study, how can the distraction realize such effects in the public speech task? In other words, on what and when does the distraction effect directly in the speech task? To think of this second question, we measured self reports of anxiety, physiological responses, and speech performance because individuals are probably not aware of their feelings or motivations, which, in turn, affect behavior and physiology (Wright and Kirby, 2001). For the psycho-physiological responses, we used the heart rate (HR) and skin conductance level (SCL). Both of them are often used as the indices of the emotional arousal.

However, in the speech task, it is often said that HR correlated with the anxiety, and SCL correlated with the strain (Tremayne & Barry, 2001). From the aspect of the biological mechanism, as they are governed by different nervous system, many studies of emotion regulation used these indices together. From above, since HR and SCL have been shown to be independent (e.g. Lacey, Kagan, Lacey, & Moss, 1963), by using both measurements, the informative results would be given. In fact, Gross and his colleagues have shown the different behavior of these indices between some emotion regulation strategies (e.g. Gross & Levenson, 1997). Moreover, we divided the whole experiment into several stages in order to examine the time course of distraction effect.

2. Method

2・1 Participants

Twenty-six normal healthy graduate and undergraduate students (6 male, 20 female) volunteered to take part in the study. The mean age of them was 24 years (range 22-28; SD 2.0). None of them had a history of major neurological or psychiatric disorders. Each subject gave enough informed consent. Participants were randomly assigned to one of two groups, which were the distraction group and the control group. 13 participants were in each group. Fortunately, the perceptions of difficulty against the public speech task were the same between two groups. The results of introspection report showed no significant differences between the groups in the average score of the degree of proficiency in the speech.

2・2 Measurements

2・2・1 Psychological measures

The anxiety as the emotional experience was measured by the State-Trait Anxiety Inventory (STAI; Spielberger, Gorsuch, Lushene, 1970; Japanese version; Shimizu & Imae, 1981). Participants rated on a 4-point scale (1, not at all; 2, somewhat; 3, moderately so; 4, very much so). 20 items composed this inventory. And STAI-S score was derived from multiplying the mean score of all items by 20. So the range of the score was 20-80. Participants worked on this inventory 8 times, between experimental stages.

2・2・2 Autonomic responses

HR and SCL data were recorded using an MP-100 psycho-physiological monitoring system (BioPac Systems, Santa Barbara, CA). For each subject, Ag/AgCl electrodes filled with isotonic NaCl unibase electrolyte were attached to the right side of the neck and inner surface of the left forearm for heart rate measurement, and to the volar surface of the second phalanx of the forefinger and the middle finger of the left hand for skin conductance level measurement. HR and SCL were measured continuously throughout the experimental session and analyzed offline using Acknowledge software (BioPac Systems, Santa Barbara, CA). Measures of HR and SCL were averaged over 10minutes intervals. We set 5Hz high-pass filter for recording SCL, and the sampling rate for recording both responses was 1000Hz.

2・2・3 Speech performance

The Speech Performance was also measured to examine the effect of the cognitive distraction on the performance of this task. The Perception of Speech Performance measure (PSP; Rapee & Hayman, 1996) is used. This is a 17-item (5 global items and 12 specific items) measure that employs a 1 to 4 Likert-type scale. This measure was used to rate public-speaking performance by the speakers and by observers. The PSP has been shown to have adequate internal consistency (Rapee & Lim, 1992), and to allow for adequate rates of agreement between untrained observers (Rapee & Hayman, 1996). The PSP was scored such that higher scores indicate more nervous or less skilled speech performance. For observer score, two independent raters, who were blind to the purposes of the study, rated the participants' speech performance from the video. Each rater received meeting once to discuss the meanings of various measures and asked to rate one participants' speech performance as a minimal training ($\alpha = .68$).

2・3 Tasks

2・3・1 Public Speech Task (Anxiety induction task)

In this study, the public speech task was used for anxiety induction task. The simulated public speaking test is an experimental method of inducing anxiety in human participants that was originally developed by McNair et al. (1982). In this task, the participant was requested to prepare a speech for 10 minutes and then spoke in front of a video camera for 10 minutes. Participants were asked to make a speech about what they were most interested in and the performance was recorded on the videotape.

2・3・2 Cognitive Distraction Task

In this study, one of the puzzle tasks was used for the distraction task. This puzzle task was one of the crypt arithmetic puzzles. These problems require finding a unique digit assignment to each of the letters of a word addition so that the numbers represented by the words add up correctly (see Hogg & Huberman, 1993). Without any hints, it becomes so difficult that no participants could complete this puzzle task in 10 minutes.

2・4 Procedure

This experimental session composed of 5 stages; baseline (10 min), speech preparation (10 min), rest (10 min), speech (10 min), and recovery (30 min). After the measuring baseline data for psychophysiology indices, the participants were informed that they would be asked to give a speech where they would be recorded by a video-camera, and that the theme of the speech was “I’m very interested in….” Then the participants were given 10 min to prepare for their speech. In the rest period, the participants in the control group were asked to just wait for 10 min for machines to be set up, whereas the distraction task was conducted for the distraction group. After rest period, 10 min speech was held. After the speech period, the participants were asked to stay calm for 30min. At a later date, the participants were asked to evaluate their speech performance by PSP with videotape, in which their speech performance was recorded.

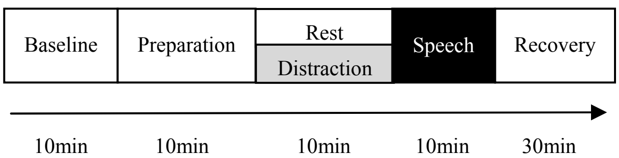

Figure1 Protocol of the experiment

2・5 Experimental design

A 2 x 7 mixed model factorial design was employed for physiological indices and a 2 x 8 mixed model factorial design for subjective reports. The distraction (yes or no) served as the two between–group factor and the experimental stages (baseline, preparation, distraction/rest, speech, recovery1, recovery2, recovery3; before baseline, before preparation, before distraction/rest, before speech, after speech, after 10 minutes, after 20 minutes, after 30 minutes) served as the within-group factor.

2・6 Statistical analysis

For psychological measures, prior to statistical analysis, the mean STAI-S scores were calculated for each sampling point, which was between experimental stages. These data were analyzed using repeated measures analyses of variance. The Huynh-Feldt epsilon correction factor was used where appropriate.

For autonomic responses, prior to statistical analysis, the mean values of HR, SCL data were calculated for each experimental stage. The recovery stage was divided in 3 stages each 10 minutes. These data were analyzed using repeated measures analyses of variance (ANOVAs). The Huynh-Feldt epsilon correction factor was used where appropriate.

In cases where significant interaction effect, or main effects were found in the ANOVAs, post hoc analyses using Bonferroni tests were conducted to examine which combinations of data points differed significantly.

Speech performance was analyzed using unpaired t-test with between-subjects factor of the distraction (yes or no).

3. Results

3・1 Psychological measures

The significant interaction effect was shown ($F(4.64, 106.77) = 2.52$, $p < .05$) and main effect of experimental stages was also significant ($F(4.64, 106.77) = 46.32$, $p < .01$). This showed that the speech task was held in appropriate manner. The difference between groups was shown in the before speech stage ($p < .05$) and the recovery2, recovery3 stages ($p < .10$) by post-hoc analysis. They all indicated lower anxiety in distraction group than in control group (see Figure 2).

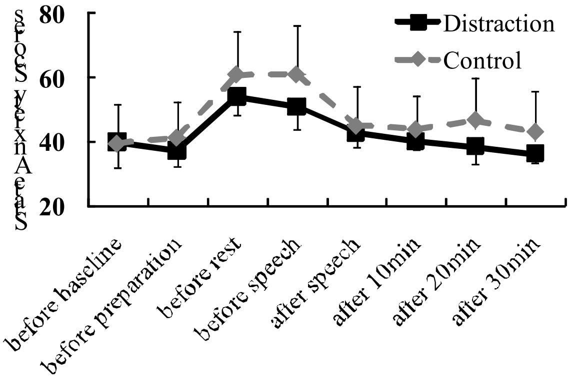

Figure 2 Self-reported anxiety using STAI scores for before baseline, preparation, rest and speech, after speech, 10min, 20min and 30min for distraction vs. control group, with standardized error bars

3・2 Autonomic responses

The significant interaction effect was shown in both heart rate and skin conductance level ($F(3.90, 93.51) = 2.82, p < .05$; $F(3.62, 86.93) = 2.56, p < .05$) and also the main effect of experimental stages was shown in both measures ($F(3.90, 93.51) = 56.82, p < .01$; $F(3.62, 86.93) = 17.28, p < .01$).

From the results of both measures in the control group, it was confirmed that the autonomic responses were measured appropriately. As shown in the prior studies, the peak was shown in the speech stage, and that was significantly higher than other stages. As for heart rate, the degree of increase was also similar to prior studies (e.g. Mauss et al., 2003; Schwerdtfeger, 2004).

Focusing on the effects of distraction, from the results of post hoc analyses, heart rate was lower in the speech stage in the distraction group ($p < .05$; see Figure 3), and skin conductance level was higher in the recovery2 and recovery3 stages in the distraction group ($p < .05$; see Figure 4).

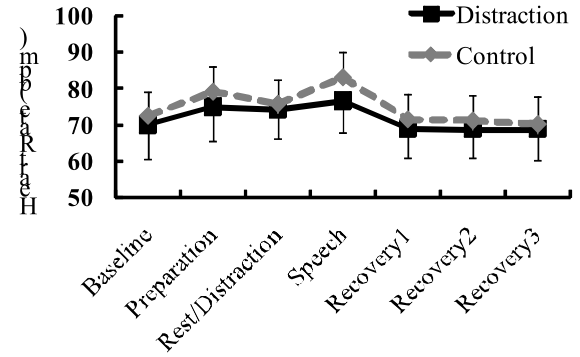

Figure 3 Actual physiological activation of distraction vs. control group as measured by heart rate for baseline, preparation, rest/distraction, speech, recovery1, recovery2 and recovery3, with standardized error bars

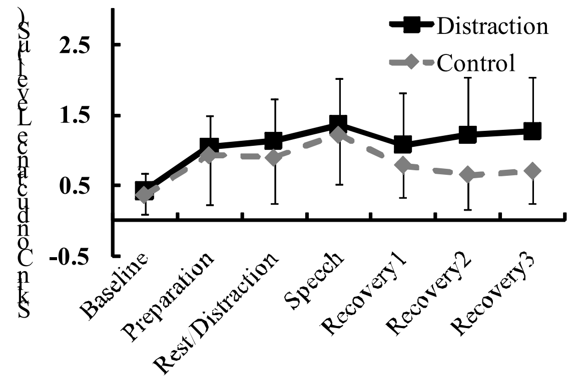

Figure 4 Actual physiological activation of distraction vs. control group as measured by skin conductance level for baseline, preparation, rest/distraction, speech, recovery1, recovery2 and recovery3, with standardized error bars

3・3 Speech performance

There was no significant difference between groups in observer scores for speech performance ($t(24) = .47$, n. s.; see Figure 5 right) . However, in the speaker (self) scores, distraction group showed significantly lower scores than control group ($t(24)=2.13, p < .05$; see Figure 5 left). The PSP was scored such that higher scores indicate more nervous or less skilled speech performance so this result showed that the participants in the distraction group percept their own speech better than that participants in the control group percept theirs.

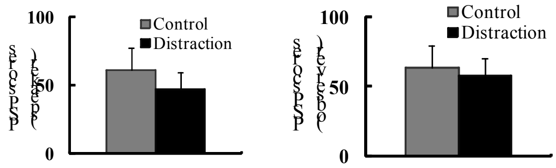

Figure 5 Perception of the speech performance by speaker (left) and observer (right) for distraction vs. control group, with standardized error bars

3・4 Correlations

Significant positive relations are found between STAI scores (before speech) and HR (during Speech; *r*= .24), HR (during speech) and PSP scores (by observer; *r*= .46), and negative relations between SCL (during recovery) and PSP scores (by speaker; *r*=-.43). According to these results, for the participants who felt less anxiety before the speech, the lower HR during speech was recorded, and the speech perception by observers was better. And if the SCL during recovery was higher, the speech perception by self went worse.

4. Discussion

In this study, we examined the effects of the cognitive distraction as an emotion regulation strategy on the public speech task. Predictably, cognitive distraction could inhibit speech anxiety and it was associated with better subjective perception of speech performance. The state anxiety scores (STAI-S score) before the public speech were lower in the distraction group in which the participants engaged in the cognitive puzzle task between preparation stage and speech stage, compared to those in control group. The HR was lower in the speech stage in the distraction group, and it also reflects that anxiety seemed to be lower compared to the control group. From these results, cognitive distraction could inhibit both experience of anxiety and anxiety-like physiological responses. In the emotion studies, the emotion was thought to be reflected in the four aspects of functioning independently based on the complex mechanism (Siegler, 2006). That is, internal feeling states (i.e. the subjective experience of emotion), emotion-related cognitions (e.g. thought reactions to a situation), emotion-related physiological processes (e.g. heart rate, hormonal, or other physiological reactions), and emotion-related behavior (e.g. actions or facial expressions related to emotion). For many theorists, a defining feature of emotion is response coherence (e.g. Ekman, 1972, 1992; Lazarus, 1991; Levenson, 1994; Scherer, 1984; Tomkins, 1962). This refers to the coordination, or association, of a person's experiential, behavioral, and physiological responses as the emotion unfolds over time. Despite the commonness of the response coherence postulate, empirical evidence bearing on this postulate is quite limited (Mauss, Levenson, McCarte, Wilhelm, & Gross, 2005). The data, in which both experience and physiological response inhibited, was suggestive when they are looked at from this standpoint as shown in this study. Unfortunately, according to the observer score of the speech, the cognitive distraction couldn't effect on the performance of the speech. However, the participants in the distraction group evaluated their own performance more positive than those in the control group. Comparing with the usual speech situation without cognitive distraction, the participants in the distraction group feels less anxiety experiencially and physiologically during speech and self-monitoring of this difference might effect on the speech perception by self. These results should also support the inhibitory effect of the cognitive distraction on speech anxiety during the speech task.

Although some previous studies (Baumeister, Heatherton, & Tice, 1994; Fichman, L., Koestner, R., Zuroff, D.C., & Gordon, L., 1999) have suggested that the distraction can also produce a reverse effect, and dependence on distraction itself, we couldn't see such negative data through all experimental stages, even in the recovery stage. Most of the prior studies often examined the effect of the distraction in the dual task paradigm. So if they distract their attention from the target task to the distraction task, they feel some difficulty to achieve the goal of the target task. However, our participants engaged in the distraction task between the preparation stage and the speech stage, so the distraction task didn't disturb the speech task directly and they didn't lose their achievement goal. Oikawa (2003) showed one's confidence in being able to regulate one's moods, concentration on distraction, and clarification of goals are important factors in whether a distraction is effective. And the distraction is used to reduce the intention of the feeling temporally to enhance the effect of the other intervention (Johnstone & Page, 2004; Kamphuis &Telch, 2000). To be careful for attention back to the problem, distraction might not be about trying to escape or avoid a feeling.

We thought the burning point of the effect of cognitive distraction on speech task shown through the whole experimental session was the rest/cognitive distraction period, in which participants in the distraction group engaged in the cognitive task. Erk, Abler, Walter (2006) suggested that the cognitive distraction are effective only on the anticipatory emotions. Likewise, the cognitive distraction in this study seemed to inhibit the anticipatory speech anxiety. The puzzle task inhibited anticipatory anxiety so that the participants in distraction group didn't feel anxiety so high before the speech stage. As Behnke and Beatty (1981) showed that speech anxiety was closely linked to heart rate and the perception about the speech during the speech. Distraction group in this study had less subjective anxiety compared to control group. Even in the beginning of speech, HR in distraction group didn't increase as high as that of control group and there was significant positive correlation between HR and STAI scores. We showed the data that cognitive distraction can inhibit anticipatory anxiety before the speech and anxiety like physiological responses during the speech. However, thinking of the correlation data and the prior studies, such effect that shown in the speech stage might be the chain effect of the anticipatory anxiety inhibition.

In the recovery stages, the cognitive distraction affected skin conductance level and STAI scores. For STAI scores in the recovery stage, data might show the acceleration of the recovery and it could be explained by the lower anxiety during speech; speech task induced anxiety less for the participants in the distraction group so that it was easy for them to recover. Although we expected that cognitive distraction would inhibit the SCL during speech, there was no difference between distraction and control group during the speech, and it was significant only in the recovery stage, which is about 20min after the speech stage. The higher SCL was observed in the distraction group. Interpreting the meaning of this behavior of SCL as a sustained response from the speech stage, this behavior might be the reverse effect of the distraction. The correlation data between SCL during recovery stage and self PSP scores supported this explanation. The participants in distraction group engaged in both the puzzle task and the public speech task. This difference of the task load might effect on sustention of higher SCL in distraction group compared to that in control group. In order to clear such behaviors of SCL, more examination will be needed in the future.

To conclude, the cognitive distraction can be used effectively as an emotion regulation strategy, at least for the public speech situation. Moreover, we couldn't confirm the reverse effect of the distraction that prior studies suggested. In fact, the cognitive distraction could inhibit both experience and physiological responses clearly, even though that is difficult to achieve by the other emotion regulation strategies, such as cognitive suppression or reappraisal. This showed that the study of the distraction is not important only for enhancing the usability of an effective intervention technique but also for thinking the mechanism of the emotion regulation. From prior studies and this study, the distraction can inhibit the emotions, especially anticipatory emotions. To know better about the distraction, we need to solve the question, why and how the distraction can inhibit anticipatory emotions or other emotions.

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