

# Depression as Indicator of Emotional Regulation: Overgeneral Autobiographical Memory

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**Abstract** Autobiographical memory encompasses our recollection of specific, personal events. In this study, we investigate the relationship between emotion and autobiographical memory, focusing on two broad ways in which these interactions occur. First, the emotional content of an experience can influence the way in which the event is remembered. Second, emotions and emotional goals experienced at the time of autobiographical retrieval can influence the information recalled. We examined the specificity of undergraduate students in autobiographical memory retrieval. Undergraduate students (N=64) completed the Autobiographical Memory Test (J.M.G. Williams & K. Broadbent, 1986), psychological state; depression (Center for Epidemiological Studies – Depression, Radloff, 1977), present affective (Positive Affective and Negative Affective Schedule, Watson et al., 1988) as well as personal factors; life orient (Life Orient Test, Scheier & Carver, 1985), self-awareness (Core Self Evaluation Scale, Judge et al., 2003), social factor (Social Support, Sarason et al., 1983). Results showed that individuals with depression were significantly less specific in retrieving negative experiences, relative to control groups of low depression. This result was restricted to negative memory retrieval, as participants did not differ in memory specificity for less emotional experiences. These results show that repressors retrieve negative autobiographical memories in an overgeneral way, possibly in order to avoid retrieving negative experience.

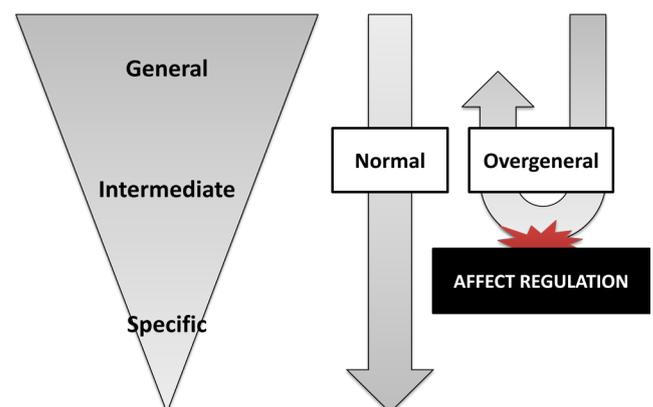
**Keywords** Autobiographical Memory, Story Grammar, Overgeneral Memory, Emotion, Depression

## 1. Introduction

Autobiographical memory (Conway & Pleydell-Pearce, 2000) encompasses our recollection of specific personal events. Autobiographical memory is affected by the emotional status of the person recollecting the memory and the content of the experience. Past research found that there are differences in autobiographical memory between people who have emotional disorders and those who do not. For example, Williams & Broadbent (1986) focused on people who attempted suicide, Rose Addis & Tippett (2004) on patients with Alzheimer disease and Williams et al. (2007) on people with emotional disorders. These studies concluded that autobiographical memory manifests differently in people with emotional disorders than in those with normal emotional health. They revealed that autobiographical memory in patients with disorders seems to be overgeneralized.

The overgeneral memory refers to a tendency to retrieve memories only in generalized ways. People exhibit an

inability to retrieve specific memories. Some research explained that these people want to avoid remembering the previous painful experience, which is called affect regulation, so they describe their memories in abstract and general (Raes et al, 2003). If this retrieving style continues long term, people can suffer mnemonic interlock, destroying the indices for memory retrieval (Williams, 1996).



**Figure 1.** The flow of memory retrieval in overgeneral memory: Overgeneralized memory retrieval does not follow the ordinary process, which cannot retrieve general, intermediate, then specific memory in turn. General and intermediate memories are cycled through again and again

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There was little research focusing on people without specific emotional disorders. Our research is interested in the autobiographical memory of people capable of normal life and how the results are related to the psychological status of each person. We hypothesize that if people suffering from an emotional disorder overgeneralize their autobiographical memory, then people without disorder can show similar results to those with disorders. This means that the autobiographical memory is not just a measurement to determine whether a person has a disorder or not, but a result of psychological status. It also supports previous research stating that we can predict disorders from autobiographical memory test (Kuyken & Brewin, 1995; Peeters et al., 2002; Hermans et al., 2008).

We investigated the relationship between emotion and autobiographical memory, focusing on two broad ways in which these interactions occur. First, the emotional content of an experience can influence the way in which the event is remembered. Second, emotions and emotional goals experienced at the time of autobiographical retrieval can influence the information recalled.

## 2. Methods

We examined the relationship between reduced specificity in autobiographical memory retrieval. The subjects of the experiment were undergraduate students (N=64) enrolled in "Introduction to Cognitive Science" class for the 2014 fall semester in Konkuk University, Korea. The participants consisted of 39 men and 25 women and their age distribution between 20 and 29, except for one participant who was 30 years old. 30 subjects were liberal arts majors and the other 34 majored in sciences.

After their midterm exams, they first completed their psychological state; depression (Center for Epidemiological Studies – Depression, Radloff, 1977), present affective (Positive Affective and Negative Affective Schedule, Watson et al., 1988) as well as personal factors; life orient

(Life Orient Test, Scheier & Carver, 1985), self-awareness (Core Self Evaluation Scale, Judge et al., 2003), social factor (Social Support, Sarason et al., 1983).

In the following week, they completed the Autobiographical Memory Test (Williams & Broadbent, 1986). We presented the cue words, '행복' (HAENG-BOK means happy), '가책' (GA-CHAEEK means guilty), '신발' (SIN-BAL means shoes), '행운' (HAENG-UN means lucky), '죽음' (JUK-UM means death), '음악' (UM-AK means music) in order of positive, negative, and neutral connotations. Participants were given one minute for each cue word to write down an episodic memory.

After the tests, we differentiated the autobiographical memories by Marshall's story grammar (Marshall, 1983), analyzing it as descriptive statistics, frequencies and t-test using SPSS 22.0.

### Story grammar

Story grammar was made for students to help them to understand literatures. It consists of 5 parts, character, setting, beginning, middle and end. We developed the idea that by analyzing the AMT data using Marshall's story grammar format, overgeneral memory among the participants would be distinguishable. We considered that the overgeneral memory would be more concentrated on the earlier parts of story grammar than the latter part because they cannot follow the ordinary process of memory retrieval, general, intermediate step without specific (Conway, 2005).

### Measurement

#### (i) LOT (Life Orientation Test)

To determine whether a person is optimistic or pessimistic, Scheier & Carver (1985) invented LOT. LOT is a closed-question set of personal positive or negative characteristics. Each question has a 0-4 scale and the degree of scores means that the intensity of agree or disagree. 0 is strong disagree, 1 is disagree, 3 is agree, and 4 is strong agree.

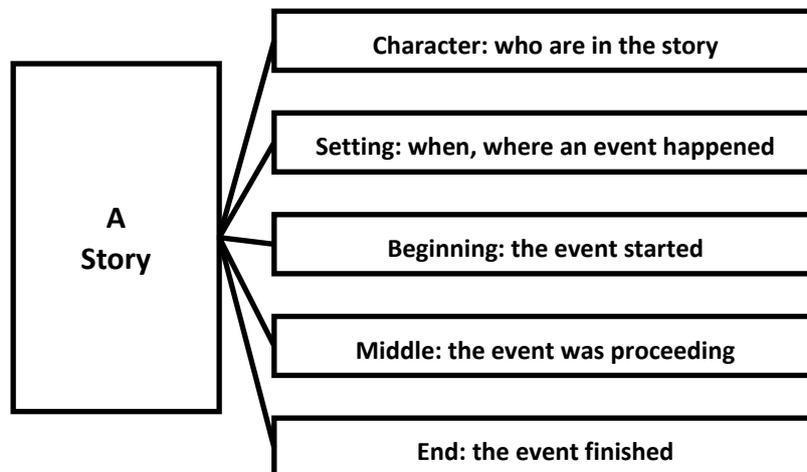


Figure 2. N. Marshall's Story grammar: a story can be divided into 5 parts

When calculating the sum of LOT, questions number 2, 6, 7, 10, which are filler questions, were not included. Items 3, 8, 9, 12 were reverse coding. The range of the score is 0 to 32. If a person scores more than 17 points, he or she is considered optimistic. If a person scores less than 17 points, he or she is considered pessimistic.

(ii) SS (Social Support)

The measurement consists of 27 questions that measure the recognition of social support and the satisfaction in that social support (Sarason *et al.*, 1983). It is be divided into 2 parts; the first part requests to list all people related to the questions, and the second asks to rate their satisfaction when they are with those people.

(iii) CSES (Core Self-Evaluation Scale)

The measurement consists of 12 questions (Judge *et al.*, 2003). Most of questions ask such as: “When I do something, I usually succeed.”, or conversely, “I’m full of doubt about my competence.” It scales 1 (strong disagree) to 5 (strong agree) and vice versa for negative questions. The strong agree means a more positive self-regard and the weaker agree indicates a less positive self-regard.

(iv) PANAS (Positive and Negative Affect Schedule)

PANAS consist of 10 positive affection (interested, excited, strong, enthusiastic, proud, alert, inspired, determined, attentive, and active) and 10 negative affection (distressed, upset, guilty, scared, hostile, irritable, ashamed, nervous, jittery, and afraid) (Watson *et al.*, 1988). All of participants require scoring the questionnaires based on the intensity of each emotion. 1 is assigned to “very slightly or not at all”, and 5 is assigned to “extremely”.

(v) CES-D (Center for Epidemiological Studies – Depression)

As the measurement for depression, this consists of 20 questions. Developed in 1977, it has been widely used in

epidemiological studies (Radloff, 1977). The special characteristic of these questions is that they measure the intensity of depression symptoms during specific periods. Each question is scored from 0 to 3; therefore the range of overall score is 0 to 60. The higher score means the depression is more severe. Radloff suggested the cut-off point at 16, while Cho *et al.* (1993) suggested 21 for epidemiological studies for Koreans.

(vi) AMT and Story grammar (Autobiographical Memory Test)

We counted the number of sentences and words in each autobiographical memory. After that, with a story grammar, the autobiographical memory was divided by sentences that fit with each story grammar format, manually. The specific results will be presented in story grammar information section.

### 3. Results

#### General Information

##### Participants

Most of participants were in 20s and university students. 19 (29.69%) students were 20 years old, 13 of them (20.31%) 21 years old, 6 of them (9.38%) 22 years old, 8 of them (12.5%) 23 years old, 5 of them (7.81%) 24 years old, 5 of them (7.81%) 25 years old, 5 of them (7.81%) 26 years old, 2 of them (3.13%) was 27, and only one of them (1.56%) 30 years old student. The mean and standard deviation of ages was 22.31 and 2.36, respectively. This allows for a group of well controlled samples in terms of how much depression they feel dependent to their age.

Participants were distributed evenly by gender and department. There were 39 (60.94%) men and 25 (39.06%) women. 31 (48.44%) students were major in liberal arts while the others (51.56%) were major in science.

**Table 1.** Psychological Status of the undergraduate students

Characteristic	N*	%	Mean (SD)	Range
LOT			22.3125 (2.2412)	14-25
Optimistic (>17)	50	78.125		
Pessimistic (<17)	8	12.5		
Neutral (=17)	6	9.375		
SS			51.0159 (9.5047)	26-93
Family			17.6191 (6.4394)	4-60
Friend			16.7619 (3.6087)	6-20
Significance			16.6349 (3.0759)	8-20
CSES			42.1406 (7.5863)	22-60
PANAS				
Positive			33.5938 (6.5918)	22-50
Negative			28.8281 (7.6294)	15-46
CES-D			26.6349 (12.2070)	5-50
Depression (>=21)	41	65.0794		
Non-depression (<21)	22	34.9206		

\*N is the number of people

Given the culture, we were worried about the distribution that gender is strongly related to department vice versa, but fortunately, they were not biased. Men who majored in art were 17, whereas majored in science were 22. Women who majored in art were 14 and in science were 11.

#### Psychological Status

The psychological status, LOT, SS, CSES, PANAS, CES - D, of the undergraduate students is presented in table 1.

#### Story Grammar Information

The statistics of autographical memory test by story grammar is presented in table 2.

**Table 2.** Story grammar information of the undergraduate students

	Characteristic		N*	Mean (SD)	Range
HAPPY	SG Info.**	Character	51	0.7969 (0.7803)	0-5
		Setting	100	1.5625 (1.2456)	0-7
		Beginning	72	1.125 (0.7015)	0-3
		Middle	67	1.0469 (0.8807)	0-4
		End	84	1.3125 (0.7099)	0-3
	Text Info.***	#Sentence	376	5.875 (1.8982)	2-12
	#Word	2,606	40.7188 (15.4154)	10-91	
GUILTY	SG Info.	Character	54	0.8438 (0.5696)	0-2
		Setting	90	1.4063 (1.0346)	0-5
		Beginning	70	1.0938 (0.6354)	0-3
		Middle	66	1.0313 (0.7340)	0-4
		End	83	1.2969 (0.7904)	0-3
	Text Info.	#Sentence	363	5.6719 (1.9023)	1-13
	#Word	2,484	38.8125 (12.7763)	8-67	
SHOES	SG Info.	Character	55	0.8594 (0.4998)	0-2
		Setting	86	1.3438 (0.8399)	0-5
		Beginning	74	1.1563 (0.5108)	0-3
		Middle	86	1.3438 (0.8012)	0-3
		End	77	1.2031 (0.6709)	0-3
	Text Info.	#Sentence	378	5.9063 (1.4770)	2-10
	#Word	2,626	41.0313 (13.4093)	11-67	
LUCKY	SG Info.	Character	41	0.6406 (0.6007)	0-2
		Setting	88	1.375 (0.9172)	0-5
		Beginning	70	1.0938 (0.4261)	0-2
		Middle	76	1.1875 (0.8522)	0-4
		End	81	1.2656 (0.6956)	0-3
	Text Info.	#Sentence	356	5.5625 (1.6122)	0-10
	#Word	2,516	39.3125 (14.5677)	0-84	
DEATH	SG Info.	Character	65	1.0156 (0.6040)	0-4
		Setting	105	1.6406 (1.3958)	0-6
		Beginning	57	0.8906 (0.4753)	0-2
		Middle	58	0.9063 (0.7912)	0-3
		End	76	1.1875 (0.8706)	0-4
	Text Info.	#Sentence	361	5.6406 (1.6170)	1-10
	#Word	2,655	41.4844 (13.0469)	3-63	
MUSIC	SG Info.	Character	53	0.8281 (0.4897)	0-2
		Setting	86	1.3438 (0.8768)	0-5
		Beginning	68	1.0625 (0.4672)	0-3
		Middle	74	1.1563 (0.7393)	0-4
		End	74	1.1563 (0.6719)	0-3
	Text Info.	#Sentence	355	5.5469 (1.4021)	1-9
	#Word	2,558	39.9688 (12.1485)	5-67	

\* N is the number of sentences or words.

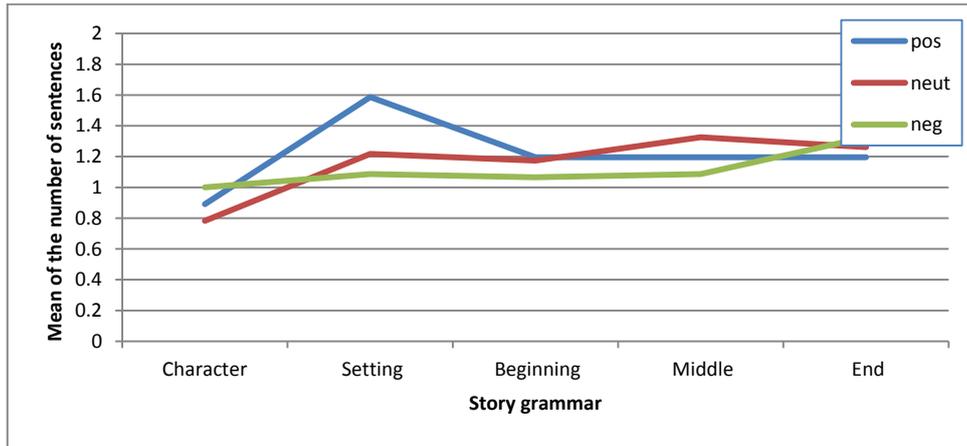
\*\* SG Info. means story grammar information.

\*\*\* Text Info. means the information of text data.

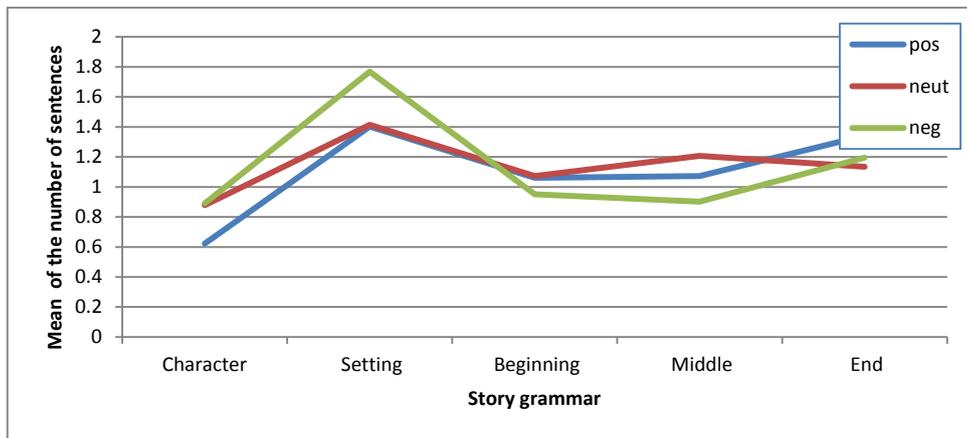
**Table 3.** Psychological status statistics between two groups

Characteristic		N*	Mean (SD).	<i>t</i> or <i>F</i> -value	
LOT	Depressed ( $\geq 21$ )	41	19.4634 (2.2704)	$T = 1.645, p = .105$	
	Non-depressed ( $< 21$ )	22	18.5000 (2.1101)		
CSES	Depressed	41	39.4634 (7.3895)	$T = -5.628, p = .000$	
	Non-depressed	22	47.6364 (4.1352)		
PANAS	Pos.**	Depressed	32.2195 (6.9768)	$T = -2.464, p = .017$	
		Non-depressed	36.3636 (4.9909)		
	Neg.***	Depressed	31.6585 (7.3879)		$F = 5.755, p = .000$
		Non-depressed	23.1818 (4.2944)		
SS	Total	Depressed	49.3902 (9.0440)	$T = -1.891, p = .063$	
		Non-depressed	54.0455 (9.8051)		
	Family	Depressed	16.5854 (3.5212)	$T = -1.769, p = .082$	
		Non-depressed	19.5455 (9.6349)		
	Friend	Depressed	16.3902 (4.1284)	$F = -1.317, p = .193$	
		Non-depressed	17.4545 (2.2830)		
	Sig.****	Depressed	16.7525 (4.0978)	$F = -.381, p = .705$	
		Non-depressed	17.0455 (2.0581)		

\* N is the number of people.  
 \*\* Pos. is the sum of positive items in PANAS.  
 \*\*\* Neg. is the sum of negative items in PANAS.  
 \*\*\*\* Sig. means perceived significant personnel.



**Figure 3.** The mean of the number of story grammar in non-depressed



**Figure 4.** The mean of the number of story grammar in depressed

**Depressed vs. Non-depressed**

We divided the result by CES-D with cut-off point as 21 (Cho et al., 1993). We defined “Depressed” if the sum of CES-D score was equal or above the cut-off point. Less than 21 point was defined as “Non-depressed.”

*Difference in Psychological Status*

There was a significant difference in positive items in PANAS for depressed (M = 32.2195, SD = 6.9768) and non-depressed (M = 36.3636, SD = 4.9909);  $t(61) = -2.464$ ,  $p=0.017$ . Also, Negative items in PANAS were reported for depressed (M=31.6585, SD=7.3879) and non-depressed (M=23.1818, SD=4.2944);  $F(60.524)=5.755$ ,  $p=0.000$ .

Depressed felt like getting less supports (M=49.3902, SD=9.0440) from their environments than non-depressed (M=54.0455, SD=9.8051);  $t(61)=-1.891$ ,  $p=0.063$ . The difference was outstanding in social support scale from family that depressed (M=16.5854, SD=3.5212) reckon themselves to get less supports than non-depressed (M=19.5455, SD=9.6349);  $t(61)=-1.769$ ,  $p=0.082$ .

*Difference in Story grammar*

While the story grammar of non-depressed seemed evenly distributed, the story grammar of depressed concentrated on setting part, more fluctuating than that of non-depressed.

*Story grammar difference in words*

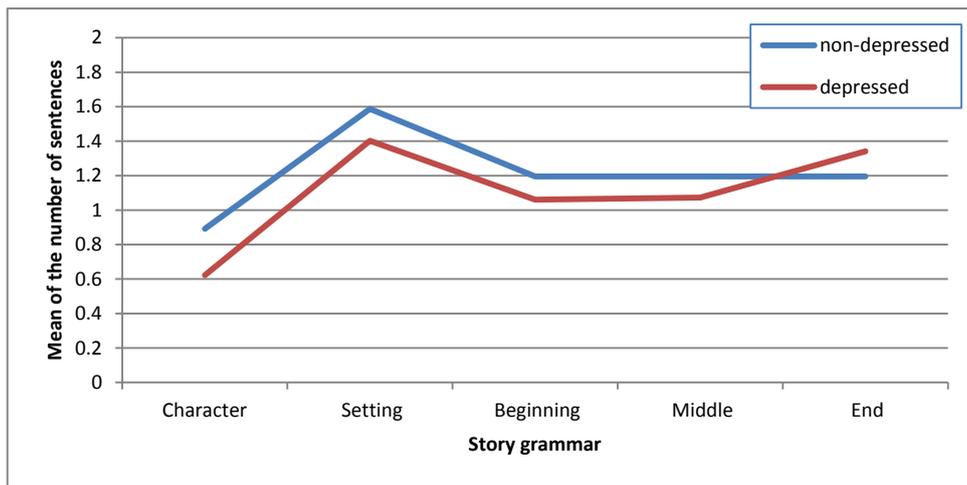
While the distribution of story grammar in positive and neutral words revealed similar tendency between depressed and non-depressed, the difference was outstanding in negative words. Depressed tended to say even more words in setting part than non-depressed.

*OGM (overgeneralized memory) in Depression*

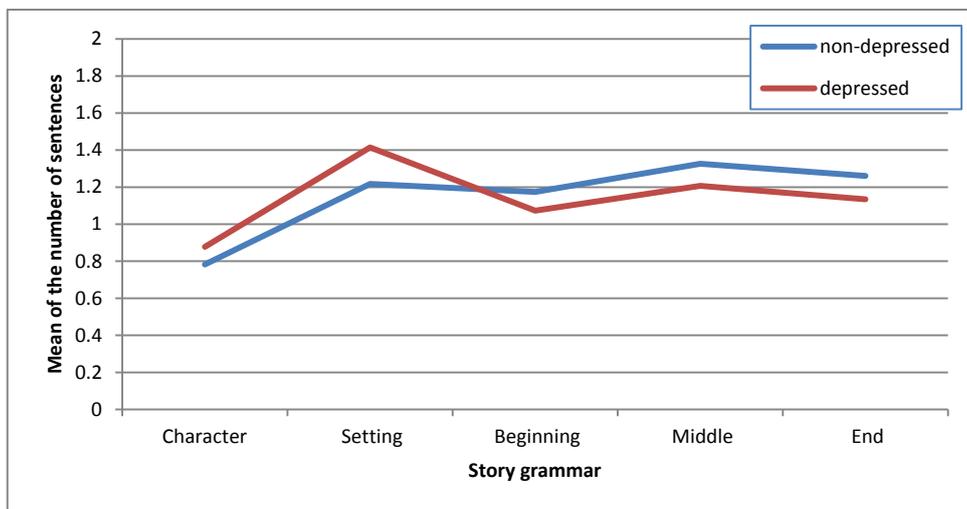
To observe overgeneralized memory, we introduced a variable called OGMpoint, which means the ratio of the number of setting and beginning part to middle and end part in story grammar. We defined OGMpoint as follows:

$$OGMpoint = \frac{\#SG_{setting} + \#SG_{beginning} + \epsilon}{\#SG_{middle} + \#SG_{end} + \epsilon} \quad (1)$$

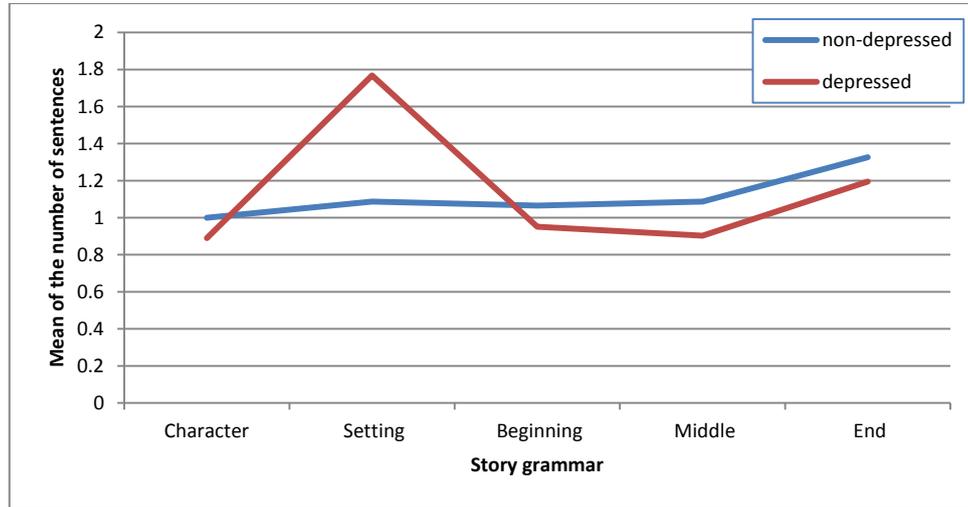
where  $\epsilon$  is small number to prevent the value from dividing by zero.



**Figure 5.** The mean of the number of story grammar in positive words



**Figure 6.** The mean of the number of story grammar in neutral words



**Figure 7.** The mean of the number of story grammar in negative words

**Table 4.** Story grammar analysis between two groups

Characteristic		N*	Mean (SD)	T or F-value
HAPPY OGMp.**	Depressed (>=21)	41	0.3911 (0.2132)	$T = -.335, p = .739$
	Non-depressed (<21)	22	0.4563 (0.2265)	
GUILTY OGMp.	Depressed	41	0.4430 (0.2400)	$T = .798, p = .428$
	Non-depressed	22	0.3661 (0.2432)	
SHOES OGMp.	Depressed	41	0.4077 (0.1829)	$F = 1.612, p = .113$
	Non-depressed	22	0.3550 (0.1677)	
LUCKY OGMp.	Depressed	41	0.3856 (0.2254)	$F = 1.562, p = .126$
	Non-depressed	22	0.3629 (0.1140)	
DEATH OGMp.	Depressed	41	0.5211 (0.2596)	$F = 1.917, p = .060$
	Non-depressed	22	0.4478 (0.2606)	
MUSIC OGMp.	Depressed	41	0.4283 (0.1998)	$T = .365, p = .717$
	Non-depressed	22	0.3636 (0.1152)	
POS. OGMp.	Depressed	41	0.3721 (0.1622)	$T = .298, p = .766$
	Non-depressed	22	0.4022 (0.1236)	
NEG. OGMp.	Depressed	41	0.4795 (0.1810)	$F = 2.310, p = .030$
	Non-depressed	22	0.3876 (0.1617)	
NEUT. OGMp.	Depressed	41	0.4160 (0.1508)	$T = 1.122, p = .266$
	Non-depressed	22	0.3563 (0.0895)	

\* N is the number of people.

\*\* OGMp. means OGMpoint.

We consider the number of character part unimportant because the number is relevant to how many characters are in the story not to the specificity of an event. Hypothesizing that the specificity of an event is described in latter part of the story if the retrieval follows the ordinary process, we included setting part to earlier part of the story, and then observed overgeneralized memory. As a result, the higher OGMpoint means the more generalized memory.

For a small  $\epsilon$ , we assigned it to  $\frac{1}{\#SG}$ , for weighting OGMpoint if the sum of the number of story grammar is high but concentrated on setting and beginning part.

We could observe a significant difference in OGMpoint between depressed ( $M=0.4795$ ,  $SD=0.1810$ ) and non-depressed ( $M=0.3876$ ,  $SD=0.1617$ ) in negative words;  $F(55.287)=2.310, p=.030$ .

## 4. Conclusions

We examined the relationship between emotion and autobiographical memory: First, the emotional content of an experience can influence the autobiographical memory. Second, the psychological status can also influence the

autobiographical memory. We hypothesized that the difference would be distinguishable from the specificity of autobiographical memory, so we split the autobiographical memory by N. Marshall's story grammar format. We used CES-D with cut-off point 21 to divide undergraduate students into two groups, "depressed" and "non-depressed". We defined OGMpoint to observe overgeneralized memory.

The result shows that depression is strongly related to other psychological status; depressed people felt less core-self evaluation than non-depressed in CSES. Also, they were less positive, and more negative in PANAS. SS results indicate that they couldn't feel enough supports from their environments. Next, we observed differences in story grammar. When people who scored high in CES-D recalled negative experience, they tended to more focusing on setting and beginning part of the story grammar than the others, getting high scores in OGMpoint, which means overgeneralized their memories are. But the tendency was not shown in positive and neutral memories. Therefore, we can explain the results as affect regulation to avoid retrieving negative experience.

There are several weak points in our experiment methods: First, even though the participants are in 20s, enjoying their current campus life, their CES-D scores were too high when compared to other experiments. Approximately over half of subjects were depressed. The reason seems that the time when we gave them questionnaires was the following week from mid-term exam. Second, three of the participants were foreigner so their writing skill was scanty. We could regard them as outlier. However, we could not distinguish that the autobiographical memory of others looked overgeneralized because of depression or poor writing skills. Plus, a student insincerely responded to some questionnaire. Third, the OGMpoint should be complemented. The original formula had a probability to be divided by zero, which would be regarded as an error (or blank) in SPSS. Therefore, we introduced  $\epsilon$  to avoid the error. However, the calculation can be greatly different by  $\epsilon$ . If  $\epsilon$  is too big, the calculation error will be increased. If  $\epsilon$  is too small, the value of OGMpoint will be huge, and then it will destroy the overall characteristics of OGMpoint. There has been no reference and previous research to deal with autobiographical memory as story grammar format. A contribution of this research is the first approach to formulate the overgeneral memory using combination of autobiographical memory with story grammar. If the methods are modified and improved through additional research, it will be powerful approach to define the relationship between overgeneral memories and affect regulation.

Even though the results does not fit perfect with previous research when considering the case of '가책'(GUILTY). Despite '가책'(GUILTY) was negative word, it doesn't seem to be overgeneralized. We can interpret this as the guilty experience are not strong enough to regulate the affect of participants more than '죽음'(DEATH).

We can overcome those weakpoints by increasing data and improving our early approach. Further research will be

able to introduce other type of story grammar and find which story grammar is appropriate for representing autobiographical memory as story grammar format. Different formulation defining OGMpoint from story grammar could be suggested.

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