Turkish Journal of Psychology, December 2019, *34*(84), 88-92 DOI: 10.31828/tpd1300443320180905m000011

Summary
Comparison of Contexts of Survival, Happiness and Death With Respect To Memory Functions

Filiz Sayar

Sivas Cumhuriyet University

Nairne and colleagues showed that when processed in terms of their survival values, unrelated stimuli (words, etc.) led to better performance than other traditional deep encoding conditions (such as self-encoding, self-referencing, pleasantness and imagery) (Nairne & Pandeirada, 2008a, Nairne & Pandeirada, 2008b; Nairne, Pandeirada, & Thompson, 2007; Nairne & Pandeirada, 2010; Nairne & Pandeirada, 2016). This memory superiority is defined as *survival processing effect*. Nairne & Pandeirada (2008b) assert that if our memory system evolved by processing fitness-relevant information and was shaped by natural selection, our memory should bear traces of ancestral inheritance. According to their survival processing paradigm, words evaluated for relevance to survival condition have retrieval advantages over the same words evaluated for relevance to moving, pleasantness and self-reference conditions. Their results suggest that our memory systems are more likely tuned to recall survival-relevant information for fitness-related purposes; therefore this survival-based processing results in superior retrieval.

The mnemonic benefit of survival processing and its generalization was demonstrated in a number of studies (Burns, Hart, Griffith, & Burns, 2013; Kang, McDermott, & Cohen, 2008; Nairne, 2014; Nairne, 2015; Nairne & Pandeirada, 2008b; 2008; Nairne, Pandeirada, Gregory, & VanArsdall, 2009; Nairne, Pandeirada, & Thompson; Otgaar, Smeets, & Van Bergen, 2010; Weinstein, Bugg, & Roediger, 2008). In the literature, there is an agreement about the ultimate explanation of adaptive memory, referring to why our memory evolved (and evolves) through the purpose of adaptation and is selectively tuned to fitness-relevant information. On the other hand, there are different points of view to explain the proximate mechanism of survival advantage. In some theoretical explanations, it was suggested that the survival process effect is not due to the evolutionary context but to some general memory-enhancing processes (Burns, Burns, & Hwang, 2011; Howe & Otgaar, 2013; Kroneisen & Erdfelder, 2011; Otgaar, Jelicic, & Smeets, 2014). These general memory-enhancing processes are elaborative and distinctive processing, item-specific processing, relational processing, etc.

On the other hand, Otgaar & Smeets (2010) reported that survival processing increases not only true recall but also false recall, especially in the survival condition. According *to the fuzzy-trace theory* (Brainerd, Reyna, & Ceci, 2008), correct recall is based on verbatim memory traces while false recall is based on restructuring traces of meaning. High numbers of false recall emerges in survival context because survival processing is a process based on general meaning.

Parallel to the findings about survival processing effect, it is suggested that death awareness has also memory advantage as a deep encoding condition (Hart & Burns, 2012). When thoughts of death compared with watching TV, dental pain and paralysis, it was observed that experimental manipulations, which revealed one's own death awareness, that is, *mortality salience*, resulted in memory superiority in both intentional and unintentional learning conditions. In other words, elaboration provided with thoughts of death is cause of the memory superiority in survival context.

According to Burns and colleagues; because the survival scenario reveals thoughts of death, it leads to memory advantage, and the mortality salience and the survival processing have overlapping proximate mechanisms and have memory superiority over other encoding conditions (Burns, Hart, & Kramer, 2014a; Burns, Hart, Kramer, & Burns, 2014b; Hart & Burns, 2012).

Burns et al., (2014a) reported that when the survival and dying scenarios are closely matched on several dimensions and possible congruency effects are controlled, high memory performance is equally achieved in both conditions. In parallel, Bugaiska, Mermillod, & Bonin (2015) found that modern survival and death

Address for Correspondence: Asst. Prof. Filiz Sayar, Sivas Cumhuriyet University, Faculty of Letters, Department of Psychology, 58140 Sivas.
E-mail: sayar.flz@gmail.com

scenarios have higher level of recall than the ancestral scenario (Experiment 2); when the ancestral survival scenario was compared with the death row scenario, in both cases the same level of recall was observed (Experiment 3). In this sense, it was claimed that the death scenario results in memory superiority by revealing more thoughts of death than the survival scenario.

On the other hand, Klein (2014) compared survival condition with death condition by presenting a scenario in which the participants were asked to imagine themselves to be dying. Therefore, while there was no difference between the death and the pleasantness conditions, the survival condition was found to have memory superiority over other conditions. In this context, the findings of Klein (2014) showed that thoughts about death increase level of recall but do not reach the same level of recall in survival context, and as a result both mechanisms have different structural mechanisms.

According to Burns, Hart, & Kramer (2014a), his death scenario was not considerably thematic, detailed and concrete as the standard survival scenario, so Klein (2014) obtained different results. They suggest that when survival and death scenarios are matched in terms of concreteness, detail and complexity, the survival advantage will cease to exist.

There are other studies showing that enhancement effect of thinking about death on recall is less effective than thinking about survival. Bell, Röer & Buchner (2013) indicated that evaluating words for relevance to survival increases recall performance more than evaluating for relevance to death (Experiment 3). These results suggested that survival effect and mortality salience are independent processes.

In this context, the main aim of the current research is to compare ancestral survival scenario with death and happiness scenarios. The present research also aims to test the criticism of Burns et al. (2014a) about death scenario used by Klein (2014). For this purpose, short death & happiness scenarios, and detailed and concrete death & happiness scenarios were compared with the standard survival scenario.

On the other hand, we do not have enough knowledge about how happiness scenario will draw a conclusion. In this context, we do not know how thoughts of happiness will create a memory effect against the thoughts of survival. Regarding this issue, it is suggested that negative emotions can not explain the advantage of survival. Bell et al. (2013) observed that when comparing survival scenarios with suicide scenarios involving negative feelings, the highest recall performance was found in the survival condition.

Butler, Kang, & Roediger (2009), suggested that recollection is better if there is a congruency between the nature of the items and their type of processing. In other words, items are usually found to be more relevant to the scenario in the survival condition and not surprisingly, this leads to more successful remembering. On the other hand, the memory advantage of the survival condition was found even when the words were not relevant to for the scenario (Kang et al., 2008; Nairne & Pandeirada, 2011). The congruency effect between words and scenarios in the current research was also examined.

Moreover, false memory is also addressed in the current study. False recall was examined with short and longer scenario versions in of survival, happiness, death, and pleasantness conditions. In addition, the recall precision for each participant was calculated by looking at the total correctly recalled word count and the total recalled word count (true + false) ratio. Recall precision is thought to reflect actual memory performance.

The research hypotheses are as follows: 1. The highest level of recall will be obtained in survival condition (in both experiments). 2. The fact that death and happiness scenarios are not as detailed as survival scenarios, will not remove survival memory advantage. 3. In survival condition, more false recall will be observed than other conditions. 4. The highest score in ratings will be obtained in pleasantness condition. 5. No significant difference will be obtained in recall precision. All experiments to test these hypotheses were compared with the conditions of survival, death, happiness, and the pleasantness. While Klein's (2014) death scenario was used in Experiment 1, Burns et al.'s (2014a) death scenario was used in Experiment 2. A short happiness scenario was given in Experiment 1, while a more detailed happiness scenario was used in Experiment 2. The happiness scenario was created by the researcher. At the end of the experiments, the participant was given a surprise free recall test.

EXPERIMENT 1

Method

Participants. A total of 261 university students (166 women, 95 men) participated voluntarily in the study. Ages ranged from 17-27 ($M = 21.13$, $SD = 2.04$). Participants who reported having neurological or psychological disorders, and recently using drugs related to these conditions were not included in the sample. The written consent of all participants was obtained using an Informed Consent Form.

Materials. A list of 32 words (for example, doctor, shirt, hammer) was used in the experiment. The words used were selected words from the updated Battig and Mon-

Table 1. The Results of post hoc Analyses in Experiment 1

Free Recall (Bonferroni)	Ratings (Games-Howell)	False Recall (Games-Howell)	Net Accuracy Games-Howell)
M_{i-j} = 2.12, p < .01, S>H	M_{i-j} = .52, p < .001, S>H	M_{i-j} = .38, p < .05, S>P	M_{i-j} = .04, p < .01, P>MS
M_{i-j} = 2.08, p < .01, S>MS	M_{i-j} = .64, p < .001, S>MS	M_{i-j} = .45, p < .05, MS>H	M_{i-j} = .03, p = .07, P=S
M_{i-j} = 1.62, p < .05, S>P	M_{i-j} = .34, p < .01, P>S	M_{i-j} = .56, p < .01, MS>P	M_{i-j} = .02, p = .32, P=H
M_{i-j} = .05, p = 1.00, MS=H	M_{i-j} = .86, p < .001, P>H	M_{i-j} = .27, p = .34, S=H	M_{i-j} = .01, p = .87, H=S
M_{i-j} = .46, p = 1.00, P=MS	M_{i-j} = .98, p < .001, P>MS	M_{i-j} = .18, p = .73, MS=S	M_{i-j} = .03, p = .18, H=MS
M_{i-j} = .51, p = 1.00, P=H	M_{i-j} = .12, p = 1.00, H=MS	M_{i-j} = .11, p = .79, H=P	M_{i-j} = .01, p = .87, H=S

Note. Survival (S), Happiness (H), Mortality Salience (MS), Pleasantness (P)

tague norms (Van Overschelde, Rawson, & Dunlosky, 2004) that Nairne et al. (2007) used. Each item was selected from among the most typical members of 32 categories (such as fabric type, metal or sport type). The list was consisted of words that each word was selected from each category. The mean number of letters of all the words is 7, ranging from 4 to 9; the mean number of syllables is 3, ranging from 2 to 4. All the words have average word frequency. At the end of the research, a surprise free recall test was applied.

Procedure. All subjects were tested individually. In this research, the survival processing paradigm of Nairne et al. (2007) was used. Accordingly, participants were randomly assigned to four scenario conditions (survival, mortality salience, happiness and pleasantness). The participants in the survival, mortality salience or happiness conditions evaluated each word for relevance to given scenarios, while participants in the pleasantness condition evaluated each word for its degree of pleasantness.

Scenarios and directions used in Nairne et al., (2007), Klein (2014) and Burns et al., (2014a) were used in current study and they were translated into Turkish. The translation was assisted by faculty members of the English Language and Literature department. The happiness scenario was created by the researcher.

The same word list was used in every condition of the research. After reading a scenario by the researcher, participants were asked to evaluate each word displayed on the computer screen in terms of a 5-point Likert-type scale (1 = totally irrelevant, 5 = most appropriate). The scores of the participants were recorded by the researcher.

Participants completed a digit-recall task after evaluations of the word list. On this task, ten numbers from 0 to 9 was presented for 1 s each on computer screen and participants were asked to remember the numbers as they were presented. The digit-recall task proceeded for approximately 2 min. Lastly, a surprise free-recall task given and participants were asked to remember and write the words within 5 minutes. The final recall phase proceeded for 5 min.

Results

Free recall: One-way analysis of variance (ANOVA) was conducted with a significance level of .05. The free recall scores were calculated according to the number of correctly remembered words. The main effect of coding was observed to be significant, F (3, 257) = 5.81, p < .01, η^2 = .30.

Ratings: According to ANOVA results, it was observed that the main effect of condition was significant, F (3, 257) = 52.53, p < .001, η^2 = .54.

In addition, 5 (ratings: 1, 2, 3, 4 and 5) x 4 (coding condition: survival, happiness, mortality salience and pleasantness) ANOVA obtained in order to determine whether the words given high evaluation scores are remembered more frequently. The results showed that the main effect was significant, F (1, 257) = 8.49, p < .01, η^2 = .26, and a significant linear trend was observed in terms of evaluation scores & coding condition interaction, F (1, 257) = 24.79, p < .001, η^2 = .36.

False recall: Before applying any statistical analysis, outliers were excluded from data. According to ANOVA results, it was found that the main effect of study condition was significant, F (3, 241) = 5.77, p < .01, η^2= .23.

Recall preicison: It was calculated by dividing total number of correctly recalled words by total number of recalled words (correct + incorrect). The results of ANOVA showed that the main effect of the coding condition was significant, F (3, 240) = 4.75, p < .01, η^2 = .24.

The results of post doc analyses are in the Table 1.

EXPERIMENT 2

In this experiment, modified versions of the happiness and mortality salience scenarios that used in the first experiment was compared with those presented in conditions of survival and pleasantness in the first experiment.

Method

Participants. A total of 260 university students (169 women, 91 men) participated voluntarily in the study. Ages ranged from 18-27 (M = 21.40, SD = 1.93). In this experiment, different participants from the first experiment were recruited.

Materials. The words and materials used in the first experiment were used.

Procedure: The modified versions of the happiness and mortality scenarios presented in the first experiment were used with the same procedure as in the first experiment.

Results

Free recall: The main effect of the study condition was observed to be significant, F (3, 256) = 9.12, p < .001, η^2= .31.

Ratings: When the results of ANOVA were examined, it was observed that the main effect of study condition was significant, F (3, 256) = 45.07, p < .001, η^2 = .53.

In addition, 5 (ratings: 1, 2, 3, 4 and 5) x 4 (coding condition: survival, happiness, mortality salience and pleasantness) ANOVA obtained in order to determine whether the words given high evaluation scores are remembered more frequently. As a result, the main effect was significant, F (1, 256) = 1.12, p = .29, η^2 = .28 and a significant linear trend was observed in terms of evaluation scores & coding condition interaction, F (3, 256) = 17.15, p < .001, η^2 = .35.

False recall: After the extreme values were excluded from data, according to ANOVA results, it was found that the main effect of study condition was significant, F (3, 246) = 2.58, p < .05, η^2= .19.

Recall precision: The results of ANOVA showed that the main effect of the coding condition was not significant, F (3, 246) = 2.37, p = .07, η^2= .24.

The results of post doc analyses are in the Table 2.

Discussion

When the current research findings were examined, the memory advantage of survival condition over the other conditions emerged in both experiments, as expected. In this context, while the present study supports the results of Klein (2014) and Bell et al. (2013); it appears that results are in contrast to the results of Hart and his colleagues (Burns et al., 2014a; Burns et al., 2014b; Hart & Burns, 2012). The presentation of a detailed and concrete death scenario does not result in a memory advantage over the survival condition. The current research supports the results of Bell et al. (2013) and Klein (2014), showing that survival and mortality salience have no overlapping mechanism.

Table 2. The Results of post hoc Analyses in Experiment 2

Free Recall (Bonferroni)	Ratings (Games-Howell)	Net Accuracy (Games-Howell)
M_{i-j} = 2.45, p < .001, S>H	M_{i-j} = .42, p < .001, S>H	M_{i-j} = .41, p < .05, S>P
M_{i-j} = 2.52, p < .001, S>MS	M_{ij} = .53, p < .001, S>MS	M_{i-j} = .18, p = .71, S=H
M_{i-j} = 1.62, p < .05, S>P	M_{ij} = .34, p < .001, P>S	M_{i-j} = .18, p = .72, S=MS
M_{i-j} = .08, p = 1.00, H=MS	M_{i-j} = .75, p < .001, P>H	M_{i-j} = .00, p = 1.00, H=MS
M_{i-j} = .91, p = .60, P=MS	M_{i-j} = .87, p < .001, P>MS	M_{i-j} = .24, p = .22, H=P
M_{i-j} = .83, p = .79, P=H	M_{i-j} = .11, p = .61, H=MS	M_{i-j} = .24, p = .26, MS=P

Note. Survival (S), Happiness (H), Mortality Salience (MS), Pleasantness (P)

When Klein (2014) compared to the standard survival scenario of Nairne et al. (2007) with the death scenario in which participants were asked to imagine themselves to be dying, the recall advantage was not obtained for the death condition. According to Klein, survival and death processes have different neurocognitive mechanisms. On the other hand, Burns et al. (2014) suggest that the standard survival scenario is more concrete, detailed and complex than the death scenario used by Klein (2014) and so, when both scenarios are made similar in terms of concreteness and complexity, the survival advantage will disappear.

When Burns et al. (2014a) matched survival and death scenarios in terms of some basic dimensions (such as elaboration, concreteness, etc.) and congruency, they found no difference between both conditions. These results supported the idea that survival and death processes have a possibility of overlapping mechanism.

In parallel with the above-mentioned studies, in the present research, the survival and pleasantness conditions were compared with two different death scenarios from survival scenario in terms of concreteness and complexity. At the same time, the happiness scenario was presented in two different ways like the death scenarios. The results showed that any significant difference was not found between the death and happiness scenarios and that in both experiments the survival condition had the memory superiority.

When the conditions of death and happiness were compared, the similar recall performance was obtained in both experiments. In this sense, these results support the notion that emotion is not effective in explaining the survival processing (Bell et al., 2013).

The results of current research are consistent with the findings of Howe & Otgaar, 2013; Nairne et al. (2007, 2008, 2008a, 2008b, 2010), and Kroneisen & Erdfelder (2011). Accordingly, survival processing increases discrimination and elaboration of words, thus resulting in encoding richness, by creating more thoughts about the practical use of stimuli compared to the other conditions.

The highest false recall was observed in the mortality salience condition when the shorter and less elaborated death and happiness scenarios were used. Thus, imagination of being dying was more likely caused more numbers of false recall than imagination of being happy or survived. We can explain this by uncertainity of death. The first response of people towards death awareness is strong suppression response (Pyszczynski, Greenberg, & Solomon, 1999). Because the mortality salience scenario used in the second experiment was more concrete and more elaborated, it did not result in more memory errors. The results of current study suggest that, unlike the results of Otgaar & Smeets (2010), the highest false recalls do not occur in survival context. Furthermore, it was observed in the present research that survival memory superiority disappeared when recall precision was measured. These results are consistent with the results of Otgaar and Smeets (2010) that they measured net accuracy.

Moreover, the highest rating scores were obtained in the pleasantness condition, whereas the highest recall performance was obtained in the survival condition. In this sense, no congruity effect was found and this result is not consistent with the results of Butler et al. (2009). The present research seems consistent with the results of Nairne et al. (2007).

As a result, it was observed that the survival process effect appeared in both experiments. On the other hand, no significant difference was found between death and happiness conditions in both experiments. The current results also show that processes of survival and mortality have different mechanisms, and that emotion may not explain the survival processing. The ambiguous death scenario caused more false recall than the concrete and more detailed death scenario. As opposed to this, the happiness scenario with concrete and rich details caused more memory errors than the ambiguous happiness scenario. These results are interpreted in the context of the *fuzzy-trace theory*, *affect-as-information approach* and *stimulus diffusion theory*. Contrary to congruity effect, the words that had the highest or lowest scores were recalled more frequently. Lastly, no significant difference was found in terms of recall precision.