RUNNING HEAD: Depression and autobiographical memory

Autobiographical memory and hierarchical search strategies in depressed and non-depressed participants

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Abstract

**Background:** There is a growing body of literature showing individuals with depression and other trauma-related disorders (e.g., posttraumatic stress disorder) recall more overgeneral and less specific autobiographical memories compared to normal participants. Although the mechanisms underlying overgeneral memory have been quite clear, the search strategy operated within the autobiographical knowledge base, at time of recollection, requires further exploration. The current study aimed to examine the hierarchical search sequence used to recall autobiographical memories in depressed and non-depressed participants, with a view to determining whether depressed participants exhibited truncated search strategies.

**Methods:** Thirteen depressed and an equal number of non-depressed participants retrieved 15 memories each, in response to 15 commonly used cue words. Participants reported with the first memory that entered in their mind. All memory descriptions were recorded and later transcribed verbatim for content analysis.

**Results:** Depressed participants produced shorter descriptions of their memories and were less likely to recall positive memories than non-depressed participants. Non-depressed participants were more likely to commence retrieval by accessing lifetime period knowledge followed by general event and event specific knowledge, whereas depressed participants showed a tendency to terminate retrieval at the general event level.

**Conclusions:** It is concluded that depressed participants do adhere to the same hierarchical search strategy as non-depressed participants when retrieving specific
autobiographical memories, but that they terminate their search early, resulting in over general memories.

Keywords:

Autobiographical memory, depression, hierarchical search, knowledge-base
Autobiographical memory and hierarchical search strategies in depressed and non-depressed participants

Background

Since first reported by Williams and Broadbent [1], research interest has focused on examining memory retrieval in people with depression, who have consistently demonstrated a tendency to recall more general, and less specific autobiographical memories [2, 3, 4, 5]. Specifically, over-general recall has been related to failure to recover from depression [6], severity of depression [7], and is over-represented in suicide attempters relative to control participants [8, 1], even when controlling for depression [9]. This pattern of recollection is consistent across studies irrespective of the methods used to initiate the retrieval process (i.e. free recall or cued recall), and has been observed in adults, college students [10] and children [11]. Research indicated that overgeneral memory (OGM) is a vulnerability factor for depression and posttraumatic stress disorder (PTSD). It predicts the onset and/or recurrence of depression and PTSD [12, 13] and a worse course of depression [14, 15 for a meta-analytic review]. In early studies, it was also revealed deficiencies in social problem solving [16] and feelings of increased hopelessness [17] to be associated with OGM.

In considering an explanation for these findings, the majority of researchers rely on the view of memory retrieval proposed by Conway and Pleydell-Pearce [18]. This model proposes that memory retrieval operates in a hierarchical fashion, whereby semantic associations are retrieved first, followed by generic descriptions and ending in specific and detailed recall. It has been proposed that in individuals with depression, the failure to recall specific autobiographical memories is the result of a truncated search strategy - that
is a failure of hierarchical search strategies whereby individuals retrieve information early in the hierarchy but fail to retrieve specific examples or events [18].

According to Conway and Pleydell-Pearce, the memory hierarchy contains knowledge with varying specificity: lifetime period knowledge, general event knowledge and event specific knowledge [18]. ‘Lifetime periods’ are the most general, most abstract, or most inclusive types of knowledge and denote time periods typically measured in units of years (e.g. Living with ‘X’; It happened during our liberation struggle in 1971). ‘General events’ represent more specific types of event knowledge typically measured in units of months, weeks, and days. General events are normally composed of event memories which are either repeated or temporarily extended and thus lack temporal specificity (e.g. first day at work, working in the office, suffering from tonsillitis). In contrast, specific events, or ‘event specific knowledge’, refer to memories of events that occur at one specific point in time and are typically measured in units of seconds, minutes or hours (e.g. one of them came very close to me, slapped my face and asked my name).

In people who are depressed, it is proposed that the search for specific autobiographical memories is interrupted, and the typical process of accessing life event information, general events and then event specific knowledge is terminated early. Three hypotheses have been proposed that are summarized in a model called CaR-FA-X to explain how this search may be truncated in depressed individuals: *capture and rumination* (CaR) hypotheses, *functional avoidance* (FA) hypothesis and *impaired executive control* (X) hypothesis [19]. More recent findings supporting this model have been thoroughly discussed by Sumner [20]. According to the impaired executive control hypothesis, retrieval processes require oversight by the central executive, and working
memory capacity to initiate and maintain the search within the autobiographical knowledge structure [18]. Interfering with these processes, by distracting attention or overloading working memory, leads to early termination of search strategies and non-specific, over-general autobiographical memories [2].

The functional avoidance hypothesis suggests that people retrieve over-general memories as a method of avoiding negative affect [21]. Specifically, retrieval of detailed, especially negative, memories is thought to cause distress, and thus retrieval of over-general memories is negatively reinforced. Supporting this, retrieval of negative events has been found to produce less distress in those who tend to recall over-general memories, and less specific memory retrieval is associated with a repressive coping style [22].

Finally, capture and rumination, the tendency to dwell upon events and thoughts, is considered to be one reason for over-general memory retrieval [23], and may operate in two ways. First, in line with the central executive hypothesis, rumination may monopolise working memory capacity, limiting the availability of resources required to extract specific memories [19]. Secondly, people tend to ruminate about things that concern them. When asked to retrieve memories in response to cue words, these cue words map onto the current concerns of individuals rather than prompting a search for a new memory [24]. This mapping of cues and concerns results in retrieval of abstract, self-related knowledge rather than specific memories [25]. Consequently, rumination results in more recall of negative self-referent memories [26], while rumination about negative events has been shown to lead to more over general memories than positive rumination [27].
Rather than working as separate processes, these three processes may work together to produce over-general autobiographical memory among people with depression. As limited attention and rumination are often present in depression it is probable that in a depressed individual, rumination facilitates mapping of cue words onto concerns of the individual and monopolises working memory capacity. Thus the cue word is mapped to the concern rather than activating a new search for a specific memory, and working memory capacity is compromised, limiting the resources available to conduct a search for a specific event. Coupled with a desire to avoid negative affect and limit intrusive memories, the search for specific memories tends to be terminated at an early stage in the search hierarchy.

Over-general recall has several consequences for depressed individuals. Most notably, over-general memories have been related to impaired problem solving ability and ability to generate solutions to potential future events [8, 19], a concern given the emphasis of coping skills and problem solving in many psychological treatments for depression. However, although ample studies have investigated the specificity of autobiographical memory in depressed patients, and have examined the roles of rumination, affect regulation and attention in the relationship between over-general memory and depression, few studies have examined the sequencing of memory retrieval exhibited by depressed individuals, to determine whether they retrieve information in the hierarchical fashion proposed by Conway and Pleydell-Pearce [18]. Specifically, while non-clinical participants have been shown to access life time period knowledge, followed by general event knowledge and event specific knowledge when retrieving an autobiographical memory [28], it is unclear whether depressed individuals also access memories in this
manner, or whether the search sequence differs. Understanding how depressed individuals access the knowledge hierarchy may aid in developing more effective methods of enhancing recall of specific memories, and of facilitating effective problem solving in this population.

The present study aimed to compare depressed and non-depressed participants in relation to retrieval of autobiographical memories. Specifically we expected that 1) depressed participants would retrieve more general and less specific autobiographical memories than non-depressed participants; 2) depressed participants would report more negative than positive memories relative to the non-depressed group; 3) depressed participants would terminate their retrieval search earlier in the search hierarchy than non-depressed participants.

**Methods**

*Participants*

Thirteen depressed patients (7 females, 6 males) and 13 non-depressed individuals (9 females, 4 males) participated in the study. The depressed group consisted of 8 outpatients and 5 in-patients at a large metropolitan hospital in Kuala Lumpur. Twenty five patients were initially invited to participate but 12 declined. All patients were diagnosed by a hospital psychiatrist as meeting the DSM-IV criteria for major depressive disorder [29]. The non-depressed participants were recruited through advertisements posted at a large university campus in Selangor, Malaysia, which invited interested individuals to contact the researchers if they wished to participate in a study regarding how people recall memories for personal events. The mean age of depressed participants was 36.00
years (ranging from 19-61 years) while the mean age of non-depressed participants was 36.53 years (ranging from 19-61 years).

Materials

*Autobiographical memory test by cue words.* This technique utilised the cued-recall paradigm first used by Galton [30] and later adopted by Williams and Broadbent [1] in which memory retrieval was cued by words commonly used in everyday life. Fifteen words from five categories (common locations, general objects, positive emotions, negative emotions, and significant others) were chosen from lists of words used in previous autobiographical memory studies [31]. The words were: restaurant, beach, cinema (common locations); car, chair, telephone (general objects); happy, success, satisfaction (positive emotions); sad, guilty, regretful (negative emotions); and father, mother, friends (significant others). The words were administered in Bahasa Malaysia (Malaysian language), and presented in a random order to participants.

*Beck Depression Inventory* (BDI). The BDI [32] consists of 21 forced choice items. Participants were asked to mark the items that best described how they felt the previous week. This test was given to the non-depressed participants only to make sure that they were not showing any depressive symptoms. The participants scoring above 20 (indicating moderate depression) were excluded from participating in the non-depressed sample.

Procedure

Before commencement of data collection, the project received clearance from the Postgraduate Office at the Faculty of Islamic Revealed Knowledge and Human Sciences, International Islamic University Malaysia. All participants were tested individually by the
second author. All patients were tested at the hospital, while the non-depressed group were tested at the university campus. After providing written consent, participants completed the Autobiographical Memory Test. Each participant was presented with one cue word at a time, and asked to bring to mind a specific memory the word reminded them of. The participants were informed that a specific memory refers to a personally experienced event that happened at a particular time (within one day) and place, and were told the event could be important or trivial. They were also indicated that memories could be retrieved from any points of their life, but not from the recent month. Particular examples were given to clarify what the term “specific” means; retrieving information such as “I jog every morning in the park” in response to the cue word “park” would not be appropriate as it does not contain any specific time. However, a response such as “Two days after we moved to our new house, I, along with my wife, went to the nearest park for a morning walk and surprisingly saw there one of my childhood friends approaching me and smiling” would be suitable. In order to ensure participants were able to understand their tasks correctly, they completed two practice trials at the beginning in which two neutral items (“bread” and “grass”) were used. If necessary, additional practice trials were arranged until the participants were successful in retrieving a specific memory. Upon the data collector’s satisfaction on the participant’s ability to retrieve specific memories, the experimental trials started. In each trial, when the participants had a memory in mind they were asked to verbally describe the memory; descriptions were tape-recorded.

Participants were given one minute to retrieve a specific memory after each cue word was presented. If participants did not recall a memory in the given time, the next word
was presented. Once a memory was retrieved there was no time limit on describing the memory. Total testing time for a participant (both depressed and non-depressed) averaged between one and one-and-a-half hours.

Results and discussion

Three hundred and ninety memory descriptions produced by the participants were transcribed verbatim from tape recordings. The transcribed memory descriptions were examined for ‘elements’ such as, lifetime period knowledge (LTP), general event knowledge (GE), event specific knowledge (ESK), thought (TH), mix information (MIX), and other knowledge (OTR) (see Haque and Conway for similar categorization [33]). Lifetime period knowledge refers to the elements in which most general and most abstract time periods of participants’ past events are recalled. This knowledge was expressed in a unit of years or decades that had a clear beginning and end (e.g. “It happened when I was studying at University”). General event knowledge represents the memory elements in which general, but less abstract time periods are mentioned. This type of knowledge is described in unit of weeks or months (e.g. “After graduation I travelled with my friend”). Event specific knowledge refers to the elements in which sensory/perceptual information associated with a memory was recalled. Detailed information regarding people, object, action and places are reported in this type of element (e.g. “Then….we saw a child about 7 years old by the road. We asked her what had happened and she told us that her mother was sick and they did not have money to go to the doctor and get medication”).
The ‘thoughts’ category refers to the elements in which beliefs or conjectures were recalled, rather than specific or general information (e.g. “I feel I was the most stupid student in Cairo um…I mean in my class”). The ‘mix’ information category refers to the element in which various types of thoughts and information are recalled (e.g. “My father was pleased by such a gift because the person who presented it was actually his disciple and now became the administrative head of our district”). The ‘other’ category refers to the elements in which no information associated with thought, lifetime period knowledge, general event, and event specific knowledge are reported. The coding for these six types of knowledge was completed by the second author and an external rater. A total of 50% memory protocols were given to these two raters for establish coding consistency. A very high level of consistency was observed as they agreed on 90% of the cases. The disagreements on the remaining protocols were resolved through discussion.

Specificity of Recollection

The means and standard deviation scores for depressed and non-depressed participants on lifetime period knowledge, general event knowledge, event specific knowledge, thought, mix and others are shown in Table 1. The findings of $t$-tests revealed significant differences for lifetime period, $t(313)=4.06$, $p<0.001$, general event, $t(313)=2.61$, $p<0.001$, event specific knowledge, $t(313)=6.38$, $p<0.001$, and thought, $t(313)=3.52$, $p<0.001$). Depressed participants reported less lifetime period knowledge, general event knowledge and event specific knowledge than the non-depressed participants. However, depressed participants were more likely to report thought components than the non-depressed participants.

(Table 1 about here)
The amount of information recalled by participants was calculated by counting the number of LTP, GE, ESK, TH, MIX, and information under OTR category as produced by the participants. Independent groups t tests showed a significant difference, $t(388)=4.05$, $p < 0.001$, with depressed participants ($M=2.94$, $sd = 0.82$) being less elaborative in their memory descriptions than the non-depressed participants ($M=4.24$, $sd = 0.99$). The memory content was also examined to see whether the depressed patients had a tendency to recall memories containing elements that were predominantly of positive or negative nature. All memories were classified and placed under one of the three categories: positive (e.g., success, satisfaction), negative (e.g. personal failure, accidents), and neutral memory (i.e. no positive or negative connotations). A fourth category was also added for trials in which participants failed to retrieve a memory. This categorization was completed by the second author and an external rater. To check coding consistency, 50% of the memory protocols were given to them. A very high level of consistency was noted, showing agreement on 98% of the memory protocols. A few disagreements were resolved through discussion. A Chi-square test of independence revealed a significant association between participant group and type of memory recalled, $\chi^2(3, N = 390) = 17.83$, $p<0.001$ (see Table 2).

Depressed participants recalled significantly fewer positive memories than non-depressed participants (standardised residual = -2.6), however no significant differences were observed in recall of negative, neutral or no memories. Within group analyses with chi square goodness of fit revealed the depressed group to report significantly fewer positive memories (residual = -27.8) and significantly more negative memories (residual = 31.3)
relative to the other categories, $\chi^2(3, N = 195) = 38.85, p<0.001$. Similarly the non-depressed participants were also likely to recall more negative memories (residual = 18.3), and less likely to fail to recall a memory (residual = -12.8) compared to the other memory categories, $\chi^2(3, N = 195) = 12.49, p<0.01$.

**Accessing the autobiographical knowledge base**

To investigate whether the two groups differed in their sequence of retrieval, 206 of 315 memories were selected (77 from patients and 129 from non-depressed controls). Memories were selected on the basis that they were described with some elaboration and contained more than one type of knowledge. Each memory was coded according to the sequence of retrieval (e.g., LTP→GE→ESK; LTP→ESK; LTP→GE; GE→ESK; and GE→LTP). To examine the consistency of coding, the second author and an external rater coded 30% of the memory protocols. A very high level of consistency was observed as the two raters agreed on 95% of the cases. The disagreements were resolved through discussion. Consider the following three memories that were categorized either as having LTP→GE→ESK, LTP→GE or LTP→ESK sequence.

1. **LTP→GE→ESK sequence**: When my mother was still alive, I wanted to kill her because she was suffering from cancer (LTP). Um….before she passed away I made a mistake to her (GE). It was the Mother’s Day…and I had a guilty feeling by seeing that my mother was taking medicine on her own (ESK). (recalled by a depressed patient in response to the cue Guilty).

2. **LTP→GE sequence**: I first visited Washington D.C. in the USA with my colleagues in 1984 (LTP). The first restaurant we visited at Washington was a
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Chinese restaurant (GE). (recalled by a non-depressed participant in response to the cue Restaurant).

3. LTP->ESK sequence: I never had a birthday party in all my life because I was born in January…..in which month the school was always open (LTP). One day, I wanted to buy a dress for my birthday, but my mother said “one day someone will celebrate for you” (ESK). (recalled by a depressed patient in response to the cue Happy).

Retrieval sequence was dependent on group, $\chi^2(4, N = 206) = 24.97$, $p<0.001$. Specifically, the depressed participants were less likely to follow the traditional LTP→GE→ESK sequence (standardised residual = -2.8), and more likely to terminate the search at the general level (LTP→GE; standardised residual = 2.6).

(Table 3 about here)

Within group analyses revealed the non-depressed participants were most likely to progress through the LTP→GE→ESK sequence (residual = 21.2), and least likely to skip general event knowledge by using a LTP→ESK sequence (residual = -22.8) relative to the other sequence options, $\chi^2(4, N = 129) = 59.10$, $p<0.001$. Although within group differences were also observed in the depressed participants, $\chi^2(4, N = 77) = 34.49$, $p<0.001$, this group were most likely to utilise the LTP→GE sequence (residual = 15.6), and least likely to use a LTP→ESK sequence (residual = -11.4).

A substantial amount of research suggests that depressed individuals are impaired in their ability to recall specific autobiographical memories, showing a tendency to be over-general in their recall [2, 3, 4, 1]. According to Conway and Pleydell-Pearce, individuals access specific autobiographical memories utilising a hierarchical search strategy,
accessing life time period knowledge first, then general event knowledge and finally event specific knowledge [18]. While this holds true for non-depressed individuals [28], it has been proposed that depressed individuals terminate their search for specific memories early in this hierarchical search. While depressed individuals have previously been shown to report more general level information than non-depressed individuals, to date the sequence in which depressed individuals access autobiographical memories has not been directly tested. This study aimed to examine the search strategies used by depressed and non-depressed individuals to determine whether depressed individuals adhered to the sequential hierarchical search as proposed by Conway and Pleydell-Pearce [18].

Consistent with previous studies, our results revealed that depressed participants retrieved fewer memories overall, and their descriptions of events were shorter than the descriptions produced by the non-depressed participants. The results also revealed that depressed participants were less likely to retrieve specific event knowledge, and that memories were less likely to be positive in nature. In a novel result for this field, and offering support for Conway and Pleydell-Pearce’s model, the depressed participants also showed impairments in their ability to move sequentially through the hierarchy of the knowledge base in order to construct an autobiographical memory. The non-depressed participants retrieved autobiographical memories by first accessing the most abstract knowledge (lifetime periods) followed by less abstract general event knowledge and most specific event knowledge (LTP→GE→ESK). However, while depressed participants began their search by accessing lifetime period knowledge, their search was more likely
to terminate at general event knowledge from the intermediate level of the hierarchy (LTP→GE). We constructed a visual model to portray these findings (Figure 1).

(Figure 1 about here)

Impaired executive control and rumination may explain the tendency for depressed participants to terminate their search early, and thus report less specific autobiographical memories, a finding which mirrors previous findings in this field [3, 34, 4, 1, 5]. Intrusive cognitions about past events are important determinants of over-general recall as they consume working memory capacity [34]. Consequently, although beginning their search by accessing lifetime period knowledge and general event knowledge, limited executive control capacity inhibits the ability to continue the search for event specific knowledge. Intrusions also promote rumination about the past and one’s self, and as previously mentioned, result in more abstract self-referent memories, rather than specific memories appropriate to the cue word [26, 25]. As the depressed participants produced more thought elements in their memory descriptions than non-depressed participants it seems plausible that such thoughts would interrupt the retrieval of specific memories.

Although depressed participants reported fewer positive memories relative to the non-depressed group, both depressed and non-depressed participants were more likely to recall negative than positive memories. Although older adults tend to show a bias toward recalling positive events, numerous studies have shown that younger adults demonstrate a negativity bias [35]. Although spanning a wide age range, the majority of our participants were relatively young, thus a negativity bias is not unexpected. Further research would benefit from an examination of how the hierarchical search for autobiographical memories is affected by aging.
While further understanding of the search strategy used by depressed participants to recall autobiographical memories is important, the results of the study must be viewed in light of the study’s limitations. First, the two groups were recruited based on the presence or absence of major depressive disorder. Yet the two samples may also differ on other variables central to the relationship under investigation. Consideration of individual difference factors, such as rumination, would be informative in future studies examining the sequencing of autobiographical recall. Second, this study did not examine whether positive and negative memories were recalled in a similar fashion across the two groups. Previous research has noted differences in retrieval time for positive and negative memories [8], however examination of whether recall of positive or negative memories are retrieved following the same hierarchical sequence would inform future research in this area. Further, examination of how attention, rumination and affect regulation may differentially affect the search sequence would also be informative. It is possible, for example, that rumination impairs the ability to access lifetime period knowledge, limited working memory capacity impedes access to general event information and that functional avoidance of negative affect might limit access to event specific knowledge.

To our knowledge, the differential effect of these three processes on the hierarchical search sequence has not been directly examined. Finally, although our results suggest that depressed individuals are impaired in their ability to systematically search through the knowledge hierarchy to access specific autobiographical memories, it is also possible that depressed participants gave up their search at an intermediate level as they found it difficult or tiring to proceed further. Given the length of the testing session, and the fact
that fatigue is commonly associated with depression, future studies should attempt to control for such a possibility.

**Conclusions**

Despite the above limitations, the current study provides preliminary support for the notion that depressed individuals do attempt to access specific autobiographical memories following the hierarchical search strategy outlined by Conway and Pleydell-Pearce [18]. However, these participants are more likely to terminate the search at an intermediate level (general event knowledge), thus producing OGM in response to a request for specific autobiographical memories. Confirmation that the same hierarchical search sequence is attempted in both depressed and non-depressed individuals opens the way for future research to examine specific elements of the sequence in both participant groups.

**Authors’ contributions**

SH and EJ conceived the overall project, finalized study design and analysed the data together with PH and RK. PH and RK helped in data interpretation and all four authors were involved in finalizing the manuscript.
References

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Table 1. Mean (and standard deviation) scores for depressed and non-depressed participants on memory elements

| Memory elements                  | Depressed Mean ± sd | Non-Depressed Mean ± sd | Mean difference |
|----------------------------------|---------------------|-------------------------|----------------
| Event specific knowledge         | 0.40 ± 0.92         | 1.41 ± 1.99             | 6.39***        |
| General event knowledge          | 0.95 ± 1.05         | 1.25 ± 1.22             | 2.61***        |
| Lifetime period knowledge        | 0.22 ± 0.48         | 0.44 ± 0.58             | 4.06***        |
| Thought                          | 0.55 ± 0.91         | 0.27 ± 0.64             | 3.52***        |
| Mixed knowledge                  | 0.37 ± 0.71         | 0.44 ± 0.75             | 0.90           |
| Others                           | 0.41 ± 0.83         | 0.41 ± 0.78             | 0.19           |

***p<0.001
Table 2. Counts and percentages of positive, negative and neutral memories for depressed and non-depressed participants.

<table>
<thead>
<tr>
<th>Group</th>
<th>Memory Type</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Positive</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Negative</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Neutral</td>
<td></td>
</tr>
<tr>
<td></td>
<td>No memory</td>
<td></td>
</tr>
<tr>
<td>Depressed</td>
<td>21 (10.77%)</td>
<td>80 (41.02%)</td>
</tr>
<tr>
<td>Non-depressed</td>
<td>53 (27.18%)</td>
<td>67 (34.36%)</td>
</tr>
<tr>
<td>Total</td>
<td>74</td>
<td>147</td>
</tr>
</tbody>
</table>
Table 3. Counts and percentage of the knowledge sequences as produced by depressed and non-depressed participants.

<table>
<thead>
<tr>
<th>Retrieval sequence</th>
<th>Participant type</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Depressed</td>
<td>Non-depressed</td>
</tr>
<tr>
<td>LTP → GE → ESK</td>
<td>8 (10.4%)</td>
<td>47 (36.4%)</td>
</tr>
<tr>
<td>LTP → ESK</td>
<td>4 (5.2%)</td>
<td>3 (2.3%)</td>
</tr>
<tr>
<td>LTP → GE</td>
<td>31 (40.3%)</td>
<td>21 (16.3%)</td>
</tr>
<tr>
<td>GE → ESK</td>
<td>24 (31.2%)</td>
<td>45 (34.9%)</td>
</tr>
<tr>
<td>GE → LTP</td>
<td>10 (13%)</td>
<td>13 (10%)</td>
</tr>
<tr>
<td>Total</td>
<td>77 (100%)</td>
<td>129 (100%)</td>
</tr>
</tbody>
</table>

LTP = life time period knowledge; GE = general event knowledge; ESK = event specific knowledge
Figure 1. Schematic representation of knowledge search sequence by (a) normal (specific memory) and (b) depressed participants (over general memory).