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Trips Down Memory Lane: Recall Direction Affects the Subjective Distance of Past Events

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Recall Direction Affects the Subjective Distance of Past Events

by

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Abstract

The subjective temporal distance of a past event – how close or far away it feels – is influenced by numerous factors apart from actual time. The present studies extend research on subjective distance by exploring the experience of remembering autobiographical events as part of a stream of related events. It is proposed that a key determinant of subjective distance is the temporal direction in which events are recalled. Five experiments supported the hypothesis that people feel closer to a target event when they recall a stream of related events in a backward direction (i.e., a reverse-chronological order ending with the target event) rather than a forward direction (i.e., a chronological order beginning with the target event). In Study 1, relative to those engaged in forward recall, students engaged in backward recall felt closer to the day they found out they were accepted into University. The effect of recall direction on subjective distance was replicated in the next two studies and possible alternative accounts, such as recency (Study 2) and anchoring (Study 3), were ruled out. In Study 4, students engaged in backward recall perceived less change had occurred since the target event and felt closer to it than those engaged in forward recall. Study 5 provides evidence for the proposed mediational account. The effect of recall direction was mediated by participants' perceptions of change in their lives. Backward recall created the impression that relatively little had changed since the target event which, in turn, made the event feel closer. Implications for research on the subjective experience of remembering autobiographical events are discussed.

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Personal memories are often recalled spontaneously in sequences. For example, many of us have experienced some variation of the following, rather unpleasant, flow of recollections. You are lying in bed and, despite being very tired, find yourself tossing and turning over an embarrassing remark that you made earlier that day. By association, a series of other embarrassing moments in your life – social blunders in your freshman year, dancing solo at the high school prom, adolescent pranks and pratfalls – now spring vividly to mind. Before long, you are clenching your teeth in horror as a particularly egregious social blunder that you thought was long forgotten now feels as if it happened only yesterday. The purpose of the present research was to examine the phenomenal experience of remembering a personal event in the context of a series of related events. I was particularly interested in people's perception of the temporal distance of recalled events. I propose that, as the example suggests, the subjective distance of a past event may be altered when it is recalled as part of a sequence, and that a key determinant of subjective distance is the temporal direction in which the string of events is recalled.

The Subjective Distance of Recalled Events

Broadly speaking, the present research can be situated within an emerging body of work in social and cognitive psychology that explores the experiential aspects of autobiographical memories (for reviews see Libby & Eibach, 2007; Robinson & Swanson, 1990). Whereas traditional research on autobiographical memory focused on the contents of memory, researchers in this area are beginning to examine systematically

the subjective experiences that accompany a memory. An overarching theme is that the very same autobiographical memory can have markedly different consequences – for people's sense of identity, feelings, judgments, and behaviors – depending on how it is experienced. Research has explored the determinants and consequences of several experiential aspects of memories. Schwarz, Bless, Strack, Klumpp, Rittenauer-Schatica, and Simons (1991), for example, studied the ease with which information is recalled and how the recalled information is used to make judgments. In one study, participants were asked to recall either 6 or 12 examples of assertive behaviors. Relative to those who had to recall 12 examples, participants found remembering 6 examples to be quite easy and subsequently rated themselves to be more assertive. The classic work of Nigro and Neisser (1983) on memory perspective is another example of research that focuses on the experiential aspect of remembering. Participants in one study were asked to focus on either the feelings associated with each episode or the objective circumstances surrounding it. Nigro and Neisser found that participants experienced more first-person memories (i.e., memories recalled from one's original perspective) when focused on feelings, whereas they experienced more third-person memories (i.e., memories recall from an observer's perspective) when focused on objective circumstances. Extending Nigro and Neisser's work, Libby and Eibach (2002) asked people to recall past behaviors that were either conflicting or consistent with their current self-concepts. When remembering conflicting past behaviors, participants were more likely to experience third-person memories. In contrast, past behaviors that were consistent with the participants' current self-concepts were most likely recalled from a first-person perspective. The common thread underlying these and other similar lines of research is

that *how* people remember appears to be just as important as *what* they remember (Libby & Eibach, 2007).

The present research targets an experiential aspect of memory that has received considerable research attention in recent years: subjective temporal distance (Ross & Wilson, 2002; Wilson & Ross, 2003). The subjective temporal distance of a recalled event refers to the extent to which it feels near or distant in time. Although subjective distance may be related to the actual passage of time, the subjective experience of time can also diverge considerably from clock or calendar time (e.g., Block, 1989; Ross & Wilson, 2002; Vohs & Schmeichel, 2003). An autobiographical event that happened long ago (e.g., an embarrassing incident) could sometimes seem like it happened only yesterday. Subjective distance may affect how past events are construed, as psychologically distant events may be construed at higher levels and thus seem more abstract and meaningful than psychologically close events (Liberman, Trope, McCrea, & Sherman, 2007). Furthermore, subjective distance can determine the impact of a remembered event on people's current feelings and self appraisals (Wilson & Ross, 2001, 2003). An embarrassing moment that feels close could make a person clench in horror but one that feels far enough away might seem trivial or even humorous in retrospect.[1] Judgments of subjective distance may also have important interpersonal consequences. For example, Wohl and McGrath (2007) examined the influence of subjective distance on people's willingness to forgive. It was found that victims of interpersonal transgressions were more likely to grant forgiveness to the transgressors (i.e., less likely to seek revenge) if the transgressions were perceived to be psychologically distant.

Given the psychological importance of subjective distance, researchers have

sought to identify factors that affect it. These factors include characteristics of the rememberer such as self-esteem (Ross & Wilson, 2002) and cultural background (Ross, Heine, Wilson, & Sugimori, 2005), as well as characteristics of the event being remembered such as its valence (Ross & Wilson, 2002) and the vividness of any images associated with it (McTeer & Wilson, 2003). Table 1 summarized the key findings from this series of papers. Also, of particular relevance to the present work, the subjective distance of an event may be affected by people's perceptions of changes in their lives since the event occurred (Libby & Eibach, 2002; Schwarz & Strack, 1991; Wilson & Ross, 1998). Focusing on major milestones (e.g., religious conversion, birth of a child) and more minor ones (e.g., a new hairstyle, starting a new school year) that happened since a past event can increase the psychological distance of the event.

The present work extends existing research on subjective distance by exploring the temporal dynamics involved when people recall a series of autobiographical memories. It is important to study memories recalled in sequences because, as the opening example illustrates, thematically related autobiographical events (e.g., embarrassing moments) tend to be recalled together in clusters or streams (Barsalou, 1988; Brown, 2005; Brown & Schopflocher, 1998), wherein memories of one event may spontaneously conjure up recollections of an earlier one (Skowronski, Walker, & Betz, 2004; Winograd & Soloway, 1985). In a study by Brown and Schopflocher (1998), participants recalled autobiographical memories in a procedure called *event cuing*. The event cuing procedure asks participants to respond to each memory cue with another related autobiographical memory. For example, a participant might first recall suffering a serious injury and when this autobiographical event was later presented by the

experimenter as a memory cue, the participant is likely to recall another related personal event (e.g., going to the hospital to visit a friend). Brown and Schopflocher (1998) concluded that related autobiographical events are often organized in clusters and recalled together. This conclusion suggests that previous research on subjective distance, which has typically asked participants to appraise a single, individual episode, might not be representative of the variety of remembering that occurs in naturalistic contexts. Furthermore, by studying sequences of recalled events, it is possible to extend our understanding of the determinants of temporal distance to include a broader range of contextual factors. That is, we are able to explore not only the qualities of a single recalled event that affect subjective distance, but also dynamic relations between the event and the series of related events in which it is recollected. I sought, in particular, to determine whether the direction in which people traveled through a series of personal memories may affect the subjective distance of a given memory.

Recall Direction: Forward vs. Backward

Given that events are sometimes recalled within a stream of memories, it follows that the order or direction in which the events are recalled can vary. In many situations, such as in narratives and social discourse, events tend to be remembered in forward chronological order (McAdams, 2006; Skowronski & Walker, 2004). In other situations requiring less structured thought, however, people might begin recalling more recent events first (Crovitz & Schiffman, 1974) and then gradually travel backwards in time as they are reminded of older ones.

To further illustrate the distinction between forward and backward recall, consider how it was operationalized in the present studies. Participants who engaged in forward

recall first remembered a specific target event (e.g., the day they were accepted into University) and then described in chronological order several other events they had experienced between the target event and the present. In contrast, participants who engaged in backward recall first remembered a very recent event and then gradually moved in reverse chronological order down memory lane until they reached the target event. Participants were then asked to rate how close or distant the target event seemed.

Note, then, that forward recall is similar to the kind of remembering that occurs in narrative and in social discourse wherein people tend to begin their narratives with an important event and then move forward chronologically (Fromholt & Larsen, 1991; McAdams & Bowman, 2001). Research on the narrative structures of autobiographical memory suggests that people tend to tell their life stories in chronologically coherent narratives (McAdams, 2004; Singer & Blagov, 2004). Narrators often start with an event that happened when they were younger and then move on to describe how that event, along with subsequent ones, helped to shape the kind of people they would become. However, this is not to say that there exists a linear, forward chronology of past events that is coded and directly represented in memory (Friedman, 1993, 2004; Thompson, Skowronski, Larsen, & Betz, 1996) or that people always remember a series of events in forward chronological order. When people are prompted to "tell stories", their recall style may be affected by certain social and linguistic conventions that govern the act of "story telling" (Skowronski & Walker, 2004). Thus, forward recall might be most likely to occur in situations where remembering takes place in the form of story telling or social discourse.

In situations demanding less structured and coherent thought, people might often

begin recalling more recent events first, and then travel backward down memory lane. There is some empirical evidence to suggest that recent memories often do come to mind before earlier ones. Crovitz and Schiffman (1974) asked participants to think of the first autobiographical event that came to mind when they saw cue words such as *table,* and then to date the event they remembered. Most of the memories participants spontaneously recalled were from very recent time periods. Similarly, in observing the content of her own stream of autobiographical memories, Linton (1986) noticed that recent memories were accessed readily and "may arise unbidden in daily life" (*p.* 63). Once a recent memory has been activated, it is likely to serve as a cue for the recall of an earlier event (e.g., remembering the White Sox winning the World Series in 2005 may remind baseball fans of the Red Sox winning in 2004). I suggest that this type of backward time travel, when it occurs in succession, may elicit subjective experiences and impressions that are very different from those in forward recall.

By comparing participants' judgments about a target event across the two methods of remembering, researchers can gain insight into the psychological consequences of recall direction. Previously, researchers have taken a similar approach to study various memory processes. Whitten and Leonard (1981), for example, examined the effect of forward versus backward cuing on university students' ability to recall the names of their teachers from Grades 1 through 12 and found that backward cuing (recalling the most recent teachers first) generated more accurate recall than forward cuing (recalling the teachers in chronological order).Whitten and Leonard suggested that backward cuing might have been more effective because the initial recall of more recent teachers helped the recall of more distant ones. In forward recall, participants must

remember the most distant (and most difficult) names first without cues and thus were less successful. Geiselman and Callot (1990), in the context of crime witness interviews, asked participants to recall the action details of a crime in either a forward or backward order and found that backward recall produced more accurate information when the crime followed an atypical script. This finding suggests that when people engage in forward recall, they are likely to generate a recall script in their own minds. When the script of the actual event does not match the recall script, people are especially prone to false recall. Anderson and Conway (1993) also varied the order in which the details of a specific autobiographical event is recalled but found no reliable difference between forward versus backward recall in terms of the amount of information participants generated. These aforementioned studies of directed recall have typically focused on people's ability to recall facts or events accurately. To the best of my knowledge, however, no research has examined the impact of recall direction on experiential aspects of autobiographical memories.

Effects of Recall Direction on Subjective Distance: The Role of Perceived Change

How might the direction of recall influence people's judgments concerning the subjective distance of a past event? It is proposed that an event will seem closer in time when people engage in backward recall (wherein they move backward from the present toward the event) rather than forward recall (wherein they move forward from the event toward the present, in chronological order). This effect is expected because backward recall may lead people to form a momentary impression that relatively little has changed in either themselves or their circumstances since the event occurred, which will, in turn, lead them to experience the event as relatively close in time. The theoretical rationale for

these proposals is outlined below.

Forward and backward remembering could create very different impressions in people about how much they have changed across time. When people recall a series of autobiographical events in a forward narrative, one of the more commonly expressed themes is that of personal growth (Pals, 2006). The narrator often starts with a significant early episode and continues with how he or she has grown, learned, and improved since that time (McAdams, 2004; Bauer, McAdams, & Sakaeda, 2005). As a rememberer moves forward in time from one event to the next, increasingly fuller and more recent self-concepts are likely to be activated. A fitting analogy would be that autobiographical events are the puzzle pieces that go into one's current identity; when the puzzle is completed (i.e., at the end of forward recall), the rememberer might look at the whole picture and realize how much it has grown from just a few initial pieces. Thus, forward remembering appears to have a progressive, additive quality that may contribute to perceptions of self-change. In contrast, backward remembering seems to have a regressive, subtractive quality. As the rememberer recalls earlier and earlier events, older and more rudimentary self-concepts may temporarily be activated. In backward recall, the pieces of one's current identity are peeled away; instead of zooming out to view the whole picture, the rememberer zooms in on increasingly fewer and fewer pieces. As a result, people engaged in backward recall might not appreciate how much they have grown since a particular time in the past, and may feel a momentary impression that they have not changed very much as individuals.

In addition to these differences involving people's self-conceptions, forward and backward remembering could create different impressions of how much has happened

since a past event. Whereas forward remembering emphasizes the cumulative progression of events, backward remembering emphasizes the undoing and dismantling of one's personal history. For example, imagine parents recalling the births of their three children. In forward recall, the birth of each child is remembered in chronological order. As the parents move forward from the birth of their first child to later ones, their personal history becomes increasingly rich and up-to-date. Thus forward recall appears to be a process that involves the rebuilding of personal history, and could create the impression that more events had happened. In contrast, backward recall involves the gradual decomposition of personal history. As rememberers mentally transport themselves to more distant stops in the past, they must temporarily undo many of the subsequent events that have happened in reality to reinstate the appropriate historical contexts. For example, when parents relive in their minds the birth of their first child, they must reinstate the personal historical context of that time period, one that does not include the births of their younger children. This mental "undoing" of subsequent events in backward recall could create a momentary impression that relatively little has happened since a particular past event. In summary, relative to forward remembering, backward remembering is hypothesized to decrease the amount of change that people perceive in themselves and their circumstances.

Such differences in the perception of change are important in the present context because of their implications for judgments of subjective distance. People's judgments of temporal distance are influenced by a number of experiential heuristics or cues (e.g., Brown, Rips, & Shevell, 1985; Faro, Leclerc, & Hastie, 2005; Vohs & Schmeichel, 2003) and one cue that may be particularly compelling is people's sense of how much change has occurred in their lives since a particular past event (Thompson, Skowronski, & Lee,

1998). Consistent with this reasoning, Skowronski et al. (2004) suggested that the self might serve as a source of implicit knowledge about time: If "the self as I am now" is seen as very different from "the self as I was then", then one might feel like a considerable amount of time must have elapsed. Along similar lines, Libby and Eibach (2002) found that people felt more psychologically distant from past events (as evidenced by their tendency to visualize the event from a third-person perspective), if their self-concept had changed since the event. Similarly, as noted previously, people feel further away from a past event when they are reminded of changes in their life circumstances since the event (Schwarz & Strack, 1991; Wilson & Ross, 1998). Thus, if backward recall creates the momentary impression that little has changed since a past event – in oneself and one's circumstances – this would make the event seem closer.

The Present Studies

The present research tested two hypotheses derived from the above theoretical analysis. First, when people recall a target event along with a sequence of related events, engaging in backward recall, rather than forward recall, will lead people to feel closer to the target event. Second, the effect of recall direction will be mediated by people's perception of how much change has occurred in their lives – both in themselves and their circumstances – since the past event. Specifically, relative to forward recall, backward recall should lead people to perceive that less has changed since the past event which, in turn, should lead them to feel closer to the event.

I conducted five experiments in which first year undergraduates recalled a target event (e.g., being accepted into university) along with a series of related events that had occurred between the target event and the present. To test the primary hypothesis, I

varied the direction in which participants recalled the series of events, and then assessed the subjective distance of the target event. Additional control conditions were introduced to address potential alternative interpretations involving recency (Study 2), anchoring (Study 3) and coherence (Study 4). In addition, I measured (Studies 1, 4 and 5) perceived change and examined its role as a mediator between recall direction and subjective distance. For the sake of convergent validity, across studies I varied the target event, the number and nature of the intervening events, and the procedure for manipulating recall direction. Table 2 is a summary of all of the present studies.

Study 1

This study provided an initial test of the impact of recall direction on subjective distance. Participants engaged in either forward or backward recall of a series of specified events that occurred between the day they were accepted into university (the target event) and the day they participated in the study. Participants then judged the subjective distance of the day they were accepted into university. It was expected that backward recall would make the target event seem closer than would forward recall.

Method

Participants

Participants were 84 first-year students (66 females) at Wilfrid Laurier University (WLU) who participated in exchange for course credit in their introductory psychology class.

Procedure

Participants arrived at the laboratory in small groups and were seated at individual cubicles to complete a questionnaire that contained the experimental manipulations and

measures (see Appendix A). Participants were asked to think about the day they were accepted into WLU (the target event), as well as a series of intervening events they had experienced between the day of the target event (May, 2006) and the day they participated in the study (October, 2006). The intervening events were specified: High school graduation in June, Canada day weekend in July; saying goodbyes to friends and family in August; the first day of classes in September; and the first time they received grades in October. Participants were asked to briefly describe what they remembered about each of the events in the order they were presented. To manipulate recall direction, participants were randomly assigned to recall the events in either a forward or backward direction. In the forward recall condition, participants recalled the events in the order they actually occurred (i.e., the target event, high school graduation, Canada day, etc). In the backward recall condition, participants recalled the most recent event first (i.e., receiving their first grades in October), and then continued moving backwards in time until they reached the target event.

After recalling the series of events, participants rated how close or far away the target event felt, by placing a mark on a 171-millimetre line with endpoints labelled "feels like yesterday" and "feels very far away" (for a similar measure, see Ross & Wilson, 2002). In addition, participants completed two subsidiary measures that assessed their affective appraisal of the target event. They rated the extent to which they currently felt happy and proud about the target event (1 = *Not at all*, 9 = *Extremely*). These items were included to address the possibility that effects of recall direction may reflect participants' affective appraisals of the target event. Finally, participants assessed their perception of how much change had occurred since the target event. They rated the extent

to which they felt they had changed as individuals and the extent to which they felt a lot had happened (1 = *Not at all*; 9 = *To a great extent*) since the target event.

Results and Discussion

In each study, preliminary analyses performed with gender as a factor yielded no significant effects and thus gender is not discussed further. Participants' ratings of the subjective distance of the target event were entered into a one-way ANOVA, with recall direction (forward vs. backward) as the between-subjects factor. As expected, participants felt closer to the target event in the backward recall condition ($M = 74.88$, $SD = 44.74$) than in the forward recall condition ($M = 97.33$, $SD = 45.54$), $F(1, 82) = 5.19$, $p < .05$. The same analysis performed on the affective appraisal items yielded no significant effects. Participants in the backward and forward conditions did not differ in the extent to which they felt happy ($M = 7.31$, $SD = 1.74$ vs. $M = 7.23$, $SD = 1.54$), or proud ($M = 7.51$, $SD = 1.61$ vs. $M = 7.53$, $SD = 1.56$) about the target event, Fs(1, 82) < 1, *ns*. Participants' ratings on these items were not significantly correlated with their ratings of subjective distance, rs(82) < -.20, *ns*.

Participants' ratings on the two perceived change items were also entered into a one-way ANOVA, with recall direction as the between-subjects factor. Unexpectedly, participants in the backward and forward conditions did not differ in the extent to which they felt they had changed as individuals ($M = 7.60$, $SD = 1.43$ vs. $M = 7.00$, $SD = 1.98$) or that a lot had happened ($M = 6.14$, $SD = 2.00$ vs. $M = 5.80$, $SD = 2.17$), Fs (1, 82) < 2, *ns*. Even more surprisingly, ratings on these two measures were not significantly correlated with the ratings of subjective distance, $r(82) < -.08$, *ns*., and $r(82) < -.01$., *ns*., respectively. The means for all measures, by recall condition, are reported in Table 3.

Table 4 presents the intercorrelations among all measures. In Table 5, the correlations are broken down by recall direction.

The results supported the primary hypothesis that engaging in backward recall, rather than forward recall, would cause participants to feel subjectively closer to a past event. However, the results offered no evidence for the proposed psychological mechanism through which the direction of recall might have affected judgments of subjective distance as no significant result was obtained from the two items designed to assess participants' perception of change since the target event. In hindsight, the positioning of these two items (especially given their theoretical importance) was not very well conceived. Specifically, they were placed after items that ask participants to re-focus on how happy and proud they felt *now*. As a result, whatever momentary impressions of reduced change backward recall had created in the participants might have been negated. As it stands, one could argue that the observed difference between backward and forward recall was due to a number of factors other than people's perception of how much change had occurred since the target event. One particularly plausible account is that the effect of recall direction on subjective distance is merely a type of recency effect. Participants engaged in backward recall remembered the target event just before judging its subjective distance, and thus the event may have felt close because it was still fresh in their minds. Before providing evidence for the proposed role of perceived change in subsequent studies, Study 2 offers a replication of the primary finding while ruling out recency as a potential alternative account.

Study 2

As in Study 1, participants were asked to remember the day they were accepted

into University as the target event. In addition to remembering other subsequent life events, participants also remembered life events that had happened prior to the target event. This way, the target event is no longer the first or the last event in the recall sequence and the amount of elapsed time between participants' recall of the target event and their judgments of its subjective distance should be equivalent across conditions. Thus, any observed effect of recall direction on subjective distance could no longer be interpreted as merely a recency effect.

Method

Participants

Participants were 26 first-year students (17 females) at Wilfrid Laurier University (WLU) who participated in exchange for course credit in their introductory psychology class.

Procedure

Participants were seated at individual cubicles and given a short questionnaire (see Appendix B). All participants were asked to think about the day they were accepted into WLU (the target event), as well as 3 intervening events they had experienced between the day of the target event (May, 2006) and the day they participated in the study (October, 2006). These events were specified: High school graduation in June, saying goodbyes to friends and family in August; and the first day of University classes in September. Participants also recalled 3 specified events they had experienced prior to the target event: First day of high school; their 16th birthday; and the day they submitted their University applications. Participants were asked to briefly describe what they remembered about each of the events in the order they were presented. To manipulate

recall direction, participants were randomly assigned to recall the events in either a forward or backward direction. In the forward recall condition, participants recalled the events in the order they actually occurred (i.e., first day of high school…the target event…first day of University classes). In the backward recall condition, participants recalled the most recent event first (i.e., first day of University classes), and then continued moving backwards in time until they have remembered all the specified events. In all, participants remembered 7 autobiographical events and, regardless of recall direction, the target event was always the 4th event in the recall sequence. After recalling the series of events, participants completed the same subjective distance measure used in Study 1.

Results and Discussion

Participants' ratings of the subjective distance of the target event were entered into a one-way ANOVA, with recall direction (forward vs. backward) as the between-subjects factor. Again, participants felt closer to the target event in the backward recall condition ($M = 70.38$, $SD = 36.91$) than in the forward recall condition ($M = 100.92$, $SD = 35.51$), $F(1, 24) = 4.62$, $p < .05$. Thus, the primary finding from Study 1 was replicated.

The present results suggest that the effect of recall direction on subjective distance cannot be explained by a recency interpretation. The effect persisted even though there was an equal delay and an equal number of autobiographical events between participants' recall of the target event and their judgments of subjective distance across the two conditions. I contend that the effect of recall direction on subjective distance is due to the process of moving forward or backward through the series of intervening events and that it is unlikely to be explained as a merely a recency effect.

A possible limitation of the first two studies is that they do not demonstrate definitively that the effect of recall direction was due to the process of moving forward or backward through the series of intervening events. It may be argued that the results have more to do with starting points, or ending points, than with the direction of recall. For instance, the observed pattern of results may be due to an anchoring effect. Anchoring effects occur when people's judgments are biased by arbitrary starting values for which they fail to adjust sufficiently (Tversky & Kahneman, 1974). According to this account, participants engaged in backward recall started by remembering more recent events and thus were anchored to judge the target event as being closer in time. Note that such anchoring interpretations are not entirely straightforward, as the presumed anchor (the recent event) was not in any way presented as a starting point for the judgment at hand, and it is not clear why the initial event recalled should anchor judgments any more than the last event recalled. Nevertheless, Study 3 addresses this alternative account and provides more definitive evidence that the present finding is indeed related to the process of moving through a series of events in a particular temporal direction.

Study 3

I again manipulated recall direction and assessed the subjective distance of the target event (being accepted into university), but also made a number of procedural changes. First, instead of specifying a standard set of intervening events, participants were allowed to generate their own, idiosyncratic series of events. One of the potential methodological concerns from the first two studies was the use of a standard series of events. Although an advantage of using standard events is that it allows recall direction to be manipulated independent of recall content, a potential disadvantage is that the

procedure may not capture processes involved in naturalistic memory, wherein the autobiographical events that come to people's minds are often cued by other events they are contemplating (Winograd & Soloway, 1985).

Second, I varied not only the direction of recall, but also whether or not participants recalled a series of events that intervened between the target event and the day of the study. Some participants were asked to recall three intervening events while others were not asked to recall any intervening event. The inclusion of the intervening events manipulation serves the purpose of addressing the anchoring interpretation mentioned previously. According to the anchoring interpretation, recall direction would affect subjective distance whether or not participants recalled any intervening events. In contrast, the proposed account implies that the effect of recall direction is due to the process of moving through the intervening events in different directions, and thus should only occur when intervening events are recalled.

Method

Participants

Participants were 58 first-year students (48 females) from an undergraduate psychology class at WLU who participated for course credit.

Procedure

Participants arrived at the laboratory in small groups (2 to 4 people) and were seated at individual tables to complete the recall procedure. Initially, participants' attention was directed to a projection screen that displayed a blank timeline with the left endpoint labelled "the day you were accepted into WLU" and the right endpoint labelled "today". Instructions then differed between the intervening events conditions. In the three

intervening events condition, participants were informed that an arrow would appear and move slowly along the timeline. They were instructed to recall, while pacing their thoughts with the animated arrow, three life events they had experienced along the timeline. To manipulate recall direction, the animated arrow moved slowly across the timeline either from left to right (forward recall condition) or from right to left (backward recall condition). The arrow took three minutes to travel the length of the timeline, and during this time participants briefly listed their thoughts about each of the three events they recalled.

In the zero intervening events condition, participants were asked to recall and list their thoughts only about the events at each end of the timeline. In the forward-recall condition, participants recalled the target event first, followed by the day of the study. In the backward-recall condition, participants thought about the day of the study first and then about the target event. Participants then rated the subjective distance of the target event, and their affective appraisal of the event, using the same items as in Study 1 and 2. See Appendix C for instructions and measures presented to the participants.

Results and Discussion

One participant did not list the specified number of intervening events and was excluded from the analyses. Thus the final sample consisted of 57 participants. To test the primary hypothesis, the ratings of subjective distance were submitted to a 2(recall direction: forward vs. backward) X 2(number of intervening events: three vs. zero) between-subjects ANOVA. There was not a main effect of recall direction, $F(1, 53) = 2.36$, $p > .1$, or intervening events, $F(1, 53) < 1$, *ns*. However the analysis revealed a nearly significant Recall Direction x Intervening Event interaction, $F(1, 53) = 3.78$, $p <$

.06, and an examination of the relevant means and contrasts yielded considerable support for the hypothesis (See Table 6). Within the three intervening events condition, backward recall led participants to feel closer to the target event than did forward recall, $t(53) = 2.36$, $p < .05$. Within the zero intervening events condition, the effect of recall direction was not observed, $t(53) < 1$, *ns*. Thus the hypothesis that recall direction would affect subjective distance only in the three intervening events condition was supported.

The same ANOVA performed on participants' affective appraisals yielded no significant effects, all Fs < 1.8, *ns*. Thus, again, there was no evidence that the effect of recall direction on subjective distance was attributable to differences in how positively the target event was perceived. These null effects involving the affective appraisal items are somewhat surprising because feeling closer to a positive event should presumably make participants happier and prouder. One plausible reason for the null effect is the way in which the questionnaire items were worded. In hindsight, it might have been better to simply ask participants how happy they are now, rather than how happy they are specifically about being accepted into WLU. The latter wording might have caused participants to use a number of heuristics (e.g., their beliefs about how happy they *ought* to be), aside from how they really felt, to answer the questions.

In summary, the results of Study 3 offered convergent support for the hypothesis that backward recall would lead participants to feel closer to the target event than would forward recall. The results also helped rule out the anchoring account. The anchoring account would have predicted an effect of recall direction regardless of whether participants recalled events intervening between the target event and the most recent event. Instead, the results suggest that the effect of recall direction involves a process of

moving in different directions through a series of intervening events.

In the following two studies, perceived change was measured directly again to further assess its relation to subjective distance. This time, as an improvement over Study 1, the perceived change items were administered more immediately after the memory exercise.

Study 4

As in the previous studies, participants were asked to judge the subjective distance of the day they were accepted into WLU after traveling either forward or backward through a series of intervening events. They were also asked to rate how much change they felt had occurred since the target event. It was hypothesized that, relative to those engaged in forward recall, participants engaged in backward recall would not only report feeling closer to the target event, but would also have the impression that less had changed since the event.

Method

Participants

Participants were 47 first-year students (33 females) from an undergraduate psychology class at WLU who received course credit for their participation.

Procedure

The procedure was similar to that of the three intervening events condition in Study 3. Participants were again presented with a blank time interval with the left endpoint labeled "the day you found out you were accepted into WLU" and the right endpoint labeled "today". They received the same instructions as in Study 3, except that participants were now allowed to recall as many intervening events as they wished, as

long as they paced themselves with the animated arrow that was moving from either left to right (forward recall condition) or right to left (backward recall condition). The animated arrow again took three minutes to travel the entire length of the timeline, and participants briefly listed their thoughts about each event they recalled.

After the recall procedure, participants rated the subjective distance of the target event using the same scale described previously. Next they completed two items that assessed their perception of how much change had occurred since the target event. They rated the extent to which they felt a lot had happened, and they had changed as individuals (1 = *Not at all*; 9 = *To a great extent*), since the target event. See Appendix D for all of the instructions and measures presented to the participants.

Results and Discussion

The ratings of subjective distance were entered into a one-way ANOVA, with recall direction (forward vs. backward) as the between-subjects factor. Replicating the main finding from the previous studies, participants felt closer to the target event in the backward recall condition ($M = 82.52$, $SD = 43.25$) than in the forward recall condition ($M = 108.41$, $SD = 44.06$), $F(1, 45) = 4.12$, $p < .05$.

Next, participants' ratings of perceived change were examined. The two items designed to measure perceived change were significantly correlated, $r(46) = .41$, $p < .01$, and thus were averaged to create an index of perceived change. Scores on this index were entered into the one-way ANOVA. As hypothesized, participants perceived less change since the target event when they engaged in backward recall ($M = 6.34$, $SD = 1.62$) than when they engaged in forward recall ($M = 7.25$, $SD = 1.33$), $F(1, 45) = 4.37$, $p < .05$.[2] The means for all of the dependent measures, including the two individual items of

perceived change, are broken down by condition and displayed in Table 7.

Although the effect on perceived change is consistent with my theoretical analysis, an alternative interpretation is that participants in the forward recall condition found the memory exercise easier than did those in the backward recall condition and thus were able to generate more intervening events. To test this possibility, I counted the number of events that each participant recalled. There was no difference between the forward ($M = 8.96$, $SD = 2.96$) and backward recall conditions ($M = 9.27$, $SD = 3.55$), $F(1, 45) < 1$, *ns*. Thus, even though participants in both conditions recalled the same number of intervening events, those in the backward recall condition felt that less change had occurred.

The amount of change perceived by participants was, as implied by our theorizing, correlated with their rating of subjective distance, $r(45) = .44$, $p < .01$. Within each condition, the respective correlations between subjective distance and perceived change was $r(23) = .52$, $p < .05$ in the backward condition and $r(20) = .20$, *ns*. in the forward condition. Although the difference in the magnitude of the correlations across the two conditions was not significant ($z < 1$, *ns*.), the pattern suggests that participants in the backward recall condition were perhaps relying more heavily on their perceptions of change to judge subjective distance.

Regression analyses were then conducted to test the hypothesis that participants' ratings of perceived change mediated the effect of recall direction on subjective distance. Subjective distance was first regressed on recall direction (0 = *backward recall*, 1 = *forward recall*) and then on the index of perceived change. Results are displayed in Figure 1. The effect of recall direction on subjective distance, $t(45) = 2.03$, $p < .05$, was

attenuated and became non-significant after the ratings of perceived change were entered, $t(44) = 1.26$, *ns*, and the effect of perceived change controlling for recall direction was significant, $t(44) = 2.74$, $p < .01$. This pattern of results suggests that the effect of recall direction on subjective distance was mediated by participants' impression of how much had changed since the target event ($z = 1.66$, $p < .10$, by Sobel test on the unstandardized coefficients). Although the analyses met the basic conditions for mediation established by Baron and Kenny (1986), they should be interpreted with caution because of three reasons. First, the mediator variable was measured after the dependent variable. Second, the correlation between the mediator and the dependent variable was only significant in the backward recall condition. Typically, significant correlations should be observed in both conditions. Third, in testing the alternative model in which subjective distance is the mediator and perceived change is the dependent variable, a similar pattern of mediation was also revealed. The effect of recall direction on perceived change, $t(45) = 2.09$, $p < .05$, was attenuated and became non-significant after the ratings of subjective distance were entered, $t(44) = 1.35$, *ns*, and the effect of subjective distance controlling for recall direction was significant, $t(44) = 2.74$, $p < .01$. Note, however, that this alternative model is less well-understood than the hypothesized model. Without considering perceived change as a potential mediator, it is unclear how recall direction may have directly affected subjective distance. I contend that this is an important advantage the proposed model has over the alternative model.

In summary, the main finding from the first three studies was replicated: Relative to those engaged in forward recall, participants engaged in backward recall again reported feeling closer to the target event. Additionally, backward rememberers perceived

less change in their lives since the target event and, as expected, their ratings of perceived change were positively and significantly correlated with their ratings of subjective distance. Although these results further suggest that perceived change may play an important role, a limitation of the present study is that the proposed mediator was measured after the ratings of subjective distance. Study 5 addresses this limitation and further extends the present findings.

Study 5

Several objectives guided the design of Study 5. First, there may be some concerns about the generalizability of the present findings beyond the standard target event (being accepted into university) featured in the first four studies. Thus, participants were asked to choose an autobiographical event from their high school days as the target event and to nominate their own set of intervening events. This approach should ensure a diverse sampling of events and offer further convergent evidence for our thesis. Second, the proposed mediating variable, perceived change was measured prior to subjective distance.

Finally, the recall direction manipulation was expanded by including a condition where participants recalled the intervening events in a randomly selected, non-linear order. This non-linear control condition not only provides a baseline for interpreting the effects of recall direction, it also helps to rule out one remaining alternative interpretation. Conceivably, the effects of recall direction are due to differences in the coherence of the sequence of remembered events. Most definitions of coherence involve events unfolding in a forward direction, with causal connections between them (Habermas & Bluck, 2000; McAdams, 2006). Thus, by definition, backward

remembering creates a less coherent sequence of memories than does forward remembering. Admittedly, I did not have a strong theoretical basis for expecting that decreased coherence should lead events to seem closer together. In fact, there is evidence that seeing causal relations between events (a key feature of coherence) leads the events to seem closer together in time (Faro, Leclerc, & Hastie, 2005). Nevertheless, in light of the conceptual relations between recall direction and coherence, it was prudent to test whether the present findings could be explained solely by differences in coherence. The non-linear control condition tests this possibility because it disrupts the coherence of the sequence but does not involve recalling events in a successive, backward direction. If the effect of recall direction was due to coherence per se, then the forward condition should differ from both conditions where coherence was disrupted (i.e., the backward and non-linear conditions). In contrast, the present account predicts that the forward condition should differ from only the backward condition.

Method

Participants

Participants were 54 first-year students (44 females) from an undergraduate psychology class at WLU who received course credit for their participation.

Procedure

The present study consisted of two parts: a mass-testing session in which the participants listed several memorable life events from their high school days, and a laboratory session where the manipulation of recall direction and the key dependent measures were administered (See Appendix E).

Part 1: Events Selection. As part of a mass-testing session conducted at the

beginning of semester, participants were asked to briefly describe a memorable positive event (i.e., one that made them feel happy or proud) from their high school days, to provide a title for the memory episode, and to indicate the year and month it occurred. These events later became the designated target events in the laboratory session. Next, participants were asked to remember, title, and date five other notable events that had happened to them *since* the target event. These events later became the intervening events to be recalled during the laboratory session. Participants were informed that they would be invited to the laboratory later in the school term to tell the researchers more about the events they had nominated.

Part 2: Laboratory Session. Before the laboratory session, the experimenter retrieved the list of events that each participant had generated and, on 6 individual sheets of paper, wrote the title and date of the target event as well as the five intervening events. The order in which the six events were presented to participants (i.e., the order in which the six sheets of paper were arranged) constituted our manipulation of recall direction. In the forward recall condition, the target event was presented first and followed by the five intervening events arranged in chronological order (from most distant to most recent). In the backward recall condition, the intervening events were arranged in reverse-chronological order (from most recent to most distant) and followed by the target event. In the non-linear condition, the target event and the intervening events were arranged and presented in a randomly selected, non-linear order (e.g., most recent event, 5^{th} most recent event, 2^{nd} most recent event, target event, 4^{th} most recent event, 3^{rd} most recent event).[3] Participants in each condition were asked to think about the events (and briefly jot down their thoughts) in the order they were presented. After recalling the series of

events, participants rated the extent to which a lot had happened since the target event, the extent to which they had changed as individuals, and the subjective distance of the target event.

Results and Discussion

Participants nominated a wide variety of positive target events (e.g., winning an award in basketball, quitting smoking, and getting an A in math). The average age of the events was 2 years and 8 months and this did not differ across the three recall conditions $F(2, 51) < 1$, *ns*. The actual age of the event did not correlate with participants' ratings of subjective distance, $r(51) = .01$, *ns*, and it was not a significant covariate in any of the analyses discussed below.

I first examined participants' ratings of how much change had occurred since the target event. As expected, scores on the two measures of perceived change were significantly correlated, $r(52) = .46$, $p < .01$, and thus were combined into an index of perceived change. A one-way ANOVA (forward vs. backward vs. non-linear) performed on this index revealed a significant omnibus effect of recall direction, $F(2, 51) = 4.99$, $p < .05$. Subsequent contrast analyses indicated that participants perceived less change when they engaged in backward recall ($M = 6.50$, $SD = 1.48$) than when they engaged in either forward recall ($M = 7.50$, $SD = 1.03$), $t(51) = 2.46$, $p < .05$, or non-linear recall ($M = 7.70$, $SD = 1.11$), $t(51) = 2.92$, $p < .01$. There was no difference in perceived change between the forward and non-linear conditions, $t(35) < 1$, *ns*.

Next, participants' ratings of subjective distance were entered into the one-way ANOVA. The analysis revealed a significant omnibus effect of recall direction, $F(2, 51) = 3.57$, $p < .05$. Subsequent contrasts indicated that participants felt closer to the target

event in the backward recall condition ($M = 73.35$, $SD = 42.01$) than in the forward recall condition ($M = 111.84$, $SD = 40.98$), $t(51) = 2.67$, $p < .05$. The non-linear condition ($M = 91.17$, $SD = 40.98$) fell in between and did not differ significantly from either of the other two conditions, $ts < 1.46$, *ns*. The means for all of the dependent measures, including the two individual items of perceived change, are broken down by condition and displayed in Table 8.

Of theoretical importance, participants' ratings of subjective distance and their scores on the index of perceived change were significantly correlated, $r(52) = .32$, $p < .05$. Within each of the three conditions, the respective correlation between subjective distance and perceived change was $r(15) = .65$, $p < .01$ in the backward condition, $r(17) = .04$, *ns*. in the forward condition, and $r(16) = -.03$, *ns*, in the non-linear condition. These differential correlations suggest that, relative to those in the other two conditions, participants in the backward recall condition may have relied more heavily on their perceptions of change to judge subjective distance.

I conducted regression analyses to test the hypothesis that the effect of recall direction on subjective distance was mediated by participants' ratings of perceived change. Subjective distance was first regressed on recall direction (0 = *backward recall*, 1 = *forward recall*) and then on the index of perceived change. Results are displayed in Figure 2. The effect of recall direction on subjective distance, $t(34) = 2.78$, $p < .01$, was attenuated and became non-significant after the ratings of perceived change were entered, $t(33) = 1.79$, $p > .08$, and the effect of perceived change controlling for recall direction was significant, $t(33) = 2.39$, $p < .05$. This pattern of results suggests that the effect of recall direction on subjective distance was mediated by participants' impression of how

much had changed since the target event ($z = 2.67$, $p < .01$, by Sobel test on the unstandardized coefficients). These analyses, however, should again be interpreted with caution. First, similar to Study 4, the correlation between the mediator and the dependent variable was only significant in the backward recall condition. Second, in testing the alternative model in which subjective distance is the mediator and perceived change is the dependent variable, a similar pattern of mediation was again revealed. The effect of recall direction on perceived change, $t(34) = 2.49$, $p < .05$, was attenuated and became non-significant after the ratings of subjective distance were entered, $t(33) = 1.37$, *ns*, and the effect of subjective distance controlling for recall direction was significant, $t(33) = 2.39$, $p < .01$.

In summary, the results supported the hypotheses. First, relative to participants in the forward recall condition, those in the backward recall condition felt closer to the target event. Thus, findings from the previous studies were once again replicated, this time with self-nominated target events. Second, the effect of recall direction on subjective distance appears to be mediated by how much change participants perceived had occurred since the target event. Recalling a series of events in a backward direction led participants to feel that relatively little had happened since the target event which, in turn, led them to feel close to the event. In addition, the addition of a non-linear control condition addressed the possibility that the effects of recall direction were attributable solely to backward remembering being less coherent than forward remembering. According to this account, the non-linear condition should have differed significantly from the forward recall condition, but the results did not support this prediction.

General Discussion

"If one can go north, one can turn around and head south; equally, if one can go forward in imaginary time, one ought to be able to turn around and go backward".

-- Stephen Hawking, A Brief History of Time.

The human mind is a powerful time machine unbounded by the arrow of real time. At a moment's notice, we are able to choose a time and place from the past and revisit it in our minds. We might sometimes prefer to go back to a significant personal event that happened years ago, and then construct a forward and progressive narrative of things that had happened since that time (McAdams, 2006). At other times, we might remember more recent events first and then meander slowly down memory lane to more ancient ones. The present research suggests that how one chooses to travel through time – and in particular the direction of the trip – can have important psychological consequences. Across five studies with varying methodologies, there was converging evidence that people come to feel closer to a target event when they recall a stream of related events in a backward direction (i.e., a reverse chronological order ending with the target event) rather than a forward direction (i.e., a chronological order beginning with the target event). The studies included control conditions to ensure that the effects of recall direction were not due to recency (Study 2) or anchoring (Study 3) effects or to differences in coherence (Study 5). Moreover, Studies 4 and 5 provided direct support for the hypotheses concerning the role of perceived change. Recalling a series of events in a backward direction led participants to perceive that relatively little had changed – in themselves and their circumstances – since the target event which, in turn, led them to feel closer to the event.

One aspect of forward recall merits comment: The rememberer must initially

move back in time to locate the target event before moving forward gradually through the series of intervening events. It may seem surprising that effects of recall direction emerge, given that forward recall begins with an initial movement backward in time. I suggest, however, that any dismantling of personal history that might possibly result from the initial backward movement would then be rebuilt as rememberers moved gradually forward in time. Furthermore, although speculative, the initial backward movement that initiates forward recall may be qualitatively different from the process of gradual, incremental remembering that characterizes backward recall. When individuals initially locate the distant past event, there is likely to be a clear and dramatic shift from their current personal circumstances and self concepts to those that belong to the distant past. Thus the differences between now and then should be particularly salient and lead individuals to appreciate that considerable change has occurred. In contrast, gradually moving backward through a succession of remembered events, and making stops in between to relive the events, should make the shift from the present to the past target event less dramatic and the perceived difference between now and then less palpable. In summary, even though forward recall requires an initial movement back in time, I believe this is quite different from the gradual, backward recall of a series of events. The present findings are consistent with this interpretation. In particular, the results of Study 3 indicated that simply leaping backward or forward in time between a distant event and the present did not produce the same effect as stepping gradually through a series of intervening events.

The present studies are the first to examine the impact of recall direction on experiential aspects of memory, and the findings make several contributions to the extant

literature on autobiographical memory. First, the findings expand our understanding of factors that influence judgments of subjective distance. This understanding is important because, as noted previously, feelings of subjective distance can often moderate the psychological impact of a recalled event (Wilson & Ross, 2003). Second, the present findings extend the scope of research examining experiential aspects of memory by asking participants to remember and evaluate a stream of related memories. Given that people often recall thematically related streams of events (Brown, 2005; Skowronski et al., 2004; Winograd & Soloway, 1985), the present research helps to capture a broader range of naturalistic memory processes, including the kinds of sequential, dynamic remembering that occurs spontaneously in everyday life. The findings illustrate that novel insights can be gained when researchers study people in the act of remembering multiple events and examine the interplay among related memories. Third, and more generally, the research attests to the value of studying not only the content of people's memories, but also the phenomenal qualities. Participants in the present studies were asked to remember the very same target events; yet depending on the temporal dynamics of recall, those events came to be perceived quite differently. These findings contribute to an emerging literature emphasizing that *how* individuals remember a past event may be as consequential as *what* they remember (Libby & Eibach, 2007; Robinson & Swanson, 1990; Wilson & Ross, 2003).

The present findings may have a number of practical implications, particularly in contexts where people seek to alter the perceived distance of previous events. In clinical settings, for example, therapists may sometimes wish to help distressed individuals feel closer to their past successes. The present findings suggest that a therapist could elicit

memories of other, more recent events first, and then gradually lead clients backwards in time toward a significant positive event. Similar backward recall strategies could be implemented by politicians to persuade constituents that past achievements happened only recently, by coaches to increase the perceived closeness of past victories, and by teachers to highlight students' previous academic accomplishments.

One noteworthy limitation of the studies is that they examined only positive autobiographical events, and thus it can only be speculated as to whether the effects would generalize to negative target events. On the one hand, the proposed psychological effects of recall direction are relatively independent of the characteristics of the target event being remembered and thus they may generalize to negative events. On the other hand, it is possible that recalling negative events would elicit a host of other psychological processes, such as motivation to keep the events at arm's length (Ross & Wilson, 2002; Wilson & Ross, 2003), that could override effects of recall direction. This remains an important question for future research. More generally, it is worth noting that the chosen research strategy was to examine effects of recall direction while controlling for other known determinants of subjective distance (e.g., the valence and actual distance of the event, the emotional significance of the event, characteristics of the rememberers). It will be important for future research to examine how recall direction may combine with these and other factors to influence individuals' feelings of subjective distance.

Future research should also explore whether there are other mechanisms through which recall direction affects perceived change. One notable possibility involves framing effects (Tversky, 1977). Although in both the forward and backward recall condition, participants were asked to judge perceived self-change the same way (e.g., how much

have you changed since the time of the target event?), they might have spontaneously framed the question differently depending on the direction of recall. At the end of forward recall, participants might have asked themselves, "how similar am I now to myself back then?" Whereas at the end of backward recall, participants might have asked themselves "how similar is this past self to who I am now?" According to Tversky, when the referent has more rich and prominent features, people are more likely to perceive similarity (i.e., less change). Thus, Tversky's theory would have predicted the observed pattern of results. In the comparison judgment of "how similar I am now to myself back then" (forward recall), the current self is the subject and the past self is the referent. Assuming that the current self has more rich and prominent features than a distant past self (Dunning & Madey, 1995), participants are more likely to perceive differences. In the comparison judgment of "how similar is this past self to who I am now" (backward recall), the past self becomes the subject and the current self becomes the referent. Thus, framing effects may be one possible mechanism through which recall direction could have led to differences in perceived self-change.

Another possibility is that the process of mentally "undoing" intervening events in backward recall might prompt rememberers to generate subtractive counterfactual thoughts (e.g., what if it didn't happen?). As Dunning and Parpal (1989) demonstrated, life events framed as subtractive counterfactuals tend be judged as less significant than if they were framed as additive counterfactuals (e.g., what if it happed?). Perhaps participants engaged in backward recall perceived the intervening events they recalled to be less significant and, as a result, perceived less change..

Future research should also examine whether recall direction influences other

types of memory-related judgments, such as people's ability to date past events accurately. Although such time estimates are distinguishable from people's feelings of subjective closeness (see endnote 1), it seems likely that processes that affect feelings of closeness may sometimes also guide time estimates. The present findings imply that engaging in backward recall could amplify the "telescoping" bias found in past research, wherein people judge past events to have occurred more recently than they actually did (Thompson et al., 1988). In a similar manner, researchers could examine effects of recall direction on several other memory qualities that have been linked with temporal distance, such as the ease of retrieval, the vividness, and the imagery associated with a memory (Libby & Eibach, 2007).

The present research focused on people's appraisals of past events but it also has potential implications for how people evaluate future events. Some future events or goals such as finding a job or buying a home can be unpacked into multiple steps. It will be interesting to see whether thinking about those steps in a forward or backward order would affect how people evaluate the target goal in terms of its subjective distance and attainability, as well as the extent to which they are motivated to reach it. Another interesting question is whether perceived change (this time between current and future selves) would remain one of the key mechanisms involved. One plausible, albeit speculative, alternative hypothesis is that forward and backward unpacking might activate different regulatory foci (Higgins, 1998). Unpacking in a forward direction towards the future goal might prime a promotion focus, which subsequently could make the goal seems closer or more motivating. Whereas unpacking in a backward direction away from the future goal might prime a prevention focus that makes the goal seem

further away or less attractive.

Finally, whereas the present research examined consequences of recall direction, another challenge for future research is to identify the determinants of forward vs. backward recall. Although I have presented examples and illustrations of backward and forward recall, it would be valuable for researchers to identify systematically the contexts in which these memory processes occur. A plausible hypothesis is that in situations involving narration and social discourse, a series of events would most likely be retrieved and remembered in forward chronological order for the sake of coherence (McAdams, 2006; Skowronski & Walker, 2004). In other situations where memories are allowed to flow more freely without the constraints of social or linguistic conventions, instances of backward recall may be more frequent. There may also be individual differences that predict one's inclination for a particular recall direction. For example, older adults might have a stronger preference for forward remembering, given their penchant for telling life stories to young members of their social groups (Schacter, 1996). Such hypotheses await an empirical test in studies that treat recall direction as the dependent variable. By continuing to explore both the psychological determinants and consequences of recall direction, researchers will gain a richer understanding of how people travel down memory lane, the routes they follow, and how they feel at the end of the journey.

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Notes

[1] Terms such as "subjective temporal distance" have sometimes been used by memory researchers examining people's best estimates of when, or how long ago, an event actually occurred (e.g., Friedman, 1993; Thompson, Skowronski, Larsen, & Betz, 1996). Although such judgments are indeed subjective, in the sense that individuals can differ in the responses they generate, they refer to an objective quantity and their accuracy can be assessed. In contrast, we have conceptualized subjective distance, in accordance with an emerging body of research (e.g., Libby & Eibach, 2007; Ross & Wilson, 2002; Wilson & Ross, 2001), as the experiential feeling of how close or distant a past event seems. These feelings are fully subjective – there is no right or wrong response – and are conceptually distinct from time estimates. A person can know that an event happened years ago, yet feel like it was more recent.

[2] The pattern of results does not change when the two items that make up the index are examined separately.

[3] We used several different non-linear orders to ensure that any effects were not an artefact of a particular ordering of events. However we did not include all possibilities. Of all the permutations that were possible with six events, some were more non-linear (e.g., 3, 4, 2, target, 5, 1) than others (e.g., 1, target, 2, 3, 4, 5). We identified four of the most non-linear combinations (3, 4, 2, target, 5, 1; 1, 5, 2, target, 4, 3; 2, 5, target 3, 4, 1; 1, 4, target 3, 5, 2) and selected randomly from these.

Table 1

Factors known to affect subjective distance

Paper	Factors Studied	Main Finding(s)
Ross & Wilson (2002)	Self-esteem Valence of the target event	Self-esteem X Valence Interaction: High self-esteem participants felt closer to positive events, but also further from negative events,than did low self-esteem participants.
McTeer & Wilson (2003)	Vividness of the target event	Events rated high in vividness were judged to be subjectively closer
Ross, Heine, Wilson, & Sugimori (2005)	Culture (Japanese vs. Canadian) Valence of the target event	Culture X Valence Interaction: Canadians felt closer to positive than to negative events. Japanese felt equidistant from positive and negative events.

Table 2

Summary of Studies 1-5

	Independent Variables	Dependent Variables	Hypothesis	Hypothesis Supported?
Study 1	Recall Direction: Forward vs. Backward	Subjective Distance	Forward > Backward	Yes
		Happy	----------	----------
		Proud	----------	----------
		Self-Change	Forward > Backward	No
		"A lot happened"	Forward > Backward	No
Study 2	Recall Direction: Forward vs. Backward	Subjective Distance	Forward > Backward	Yes
Study 3	Recall Direction: Forward vs. Backward X Intervening Events: Zero vs. Three	Subjective Distance	Recall Direction X Intervening Events Interaction effect	Yes
		Happy	----------	----------
		Proud	----------	----------
Study 4	Recall Direction: Forward vs. Backward	Subjective Distance	Forward > Backward	Yes
		Perceived Change	Forward > Backward	Yes

Study 5	Recall Direction: Forward vs. Non-linear vs. Backward	Subjective Distance	Forward > Non-linear > Backward	Yes
		Perceived Change	Forward > Non-linear > Backward	Yes
			Significantly mediates the effect of Recall Direction on Subjective Distance	Yes

Table 3

Means and Standard Deviations for the dependent measures in Study 1 by recall direction

Measure		Recall Direction	
		Forward	Backward
Subjective Distance	*M*	97.33_a	74.88_b
	SD	44.54	44.74
Happy	*M*	7.23_a	7.31_a
	SD	1.54	1.74
Proud	*M*	7.53_a	7.51_a
	SD	1.56	1.61
Self-Change	*M*	5.80_a	6.14_a
	SD	2.17	2.00
"A lot happened"	*M*	7.00_a	7.60_a
	SD	1.98	1.43
	n	43	43

Note. Within row, means that do not share a common subscript letter differ significantly ($p < .05$).

Table 4

Correlations among the dependent measures in Study 1

	Sub. Dist.	Happy	Proud	Self-Change	"A lot Happened"
Sub. Dist.		-.14	-.20	.01	.08
Happy			.69*	.04	.20
Proud				.08	.16
Self-Change					.54*
"A lot happened"					

Note. * $p < .05$

Table 5

Correlations among the dependent measures in Study 1 by Recall Direction

	Sub. Dist.	Happy	Proud	Self-Change	"A lot happened"
Backward ($n = 41$)					
Sub. Dist.		-.08	-.14	.12	.24
Happy			.74*	.06	.02
Proud				.13	.05
Self-Change					.55*
"A lot happened"					
Forward ($n = 43$)					
Sub. Dist.		-.20	-.28	.05	.05
Happy			.63*	.01	.34*
Proud				.03	.25
Self-Change					.53*
"A lot happened"					

Note. * $p < .05$

Table 6

Subjective Distance by Recall Direction and Number of Intervening Events (Study 3)

		Recall Direction	
Intervening Events		Forward	Backward
Zero	*M*	87.40_{a}	91.80_{ab}
	SD	47.42	45.36
	n	15	12
Three	*M*	104.50_{a}	66.83_{b}
	SD	29.82	36.53
	n	15	15

Note. Higher values indicate greater subjective distance. Within columns and rows, means that do not share a common subscript letter differ significantly ($p < .05$).

Table 7

Subjective Distance and Perceived Change by Recall Direction (Study 4)

Measures		Recall Direction	
		Forward	Backward
Subjective Distance	*M*	108.41_a	82.52_b
	SD	44.06	43.25
Perceived Change	*M*	7.25_a	6.34_b
	SD	1.33	1.62
Self-Change	*M*	7.14_a	6.43_a
	SD	1.65	2.06
"A lot happened"	*M*	7.55_a	6.52_b
	SD	1.41	1.94
	n	22	25

Note. Higher values indicate greater subjective distance and perceived change. Within rows, means that do not share a common subscript letter differ significantly ($p < .05$).

Table 8

Subjective Distance and Perceived Change by Recall Direction (Study 5)

		Recall Direction		
Measures		Forward	Control	Backward
Subjective Distance	*M*	111.84_{a}	91.17_{ab}	73.35_{b}
	SD	40.98	46.60	42.01
Perceived Change	*M*	7.50_{a}	7.70_{a}	6.50_{b}
	SD	1.03	1.11	1.48
Self-Change	*M*	7.16_{a}	7.28_{a}	6.29_{a}
	SD	1.42	1.60	1.53
"A lot happened"	*M*	8.00_{a}	8.17_{a}	6.76_{b}
	SD	.88	.99	1.01
	n	19	18	17

Note. Higher values indicate greater subjective distance and perceived change. Within rows, means that do not share a common subscript letter differ significantly ($p < .05$).

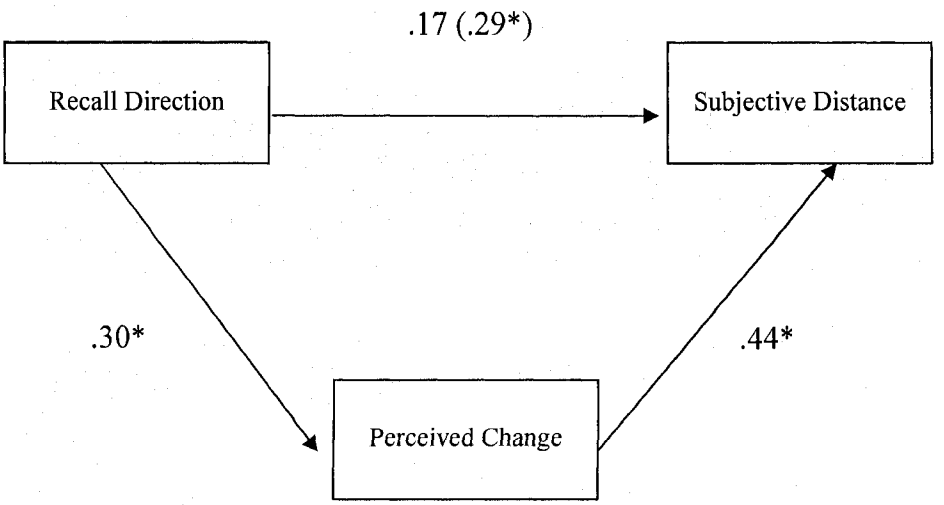


Figure 1. Mediation of recall direction on subjective distance in Study 4. Recall direction was dummy-coded (0 = *backward*, 1 = *forward*). Path coefficients are standardized regression coefficients. The value in parenthesis is the coefficient for the effect of recall direction on subjective distance, without controlling for perceived change. $*p < .05$, $**p < .01$

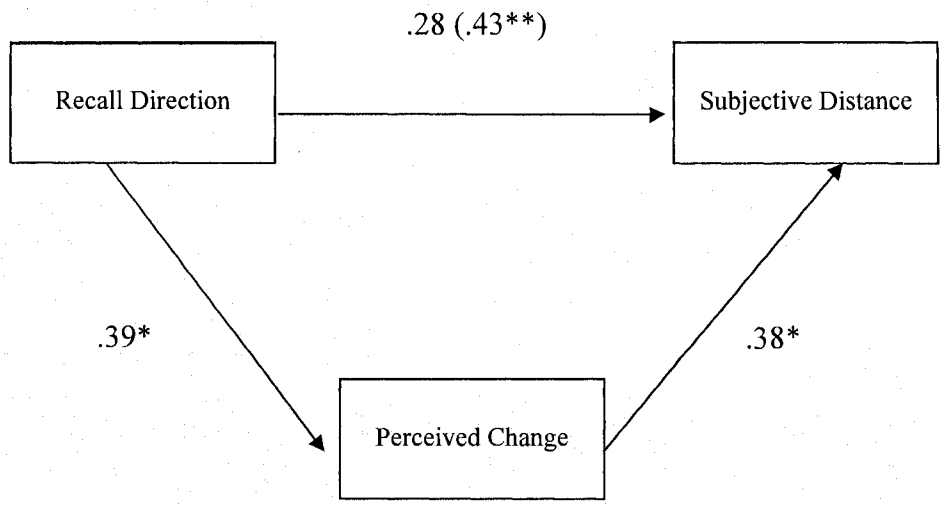


Figure 2. Mediation of recall direction on subjective distance in Study 5. Recall direction was dummy-coded (0 = *backward*, 1 = *forward*). Path coefficients are standardized regression coefficients. The value in parenthesis is the coefficient for the effect of recall direction on subjective distance, without controlling for perceived change. *$p < .05$, **$p < .01$

Appendix A

Materials used in Study 1

RESEARCH QUESTIONNAIRE: Life Events Study
Researchers: Dr. R. Buehler & Kent Lam

In our research, we are interested in examining how people remember past events.

This questionnaire will ask you to think about a positive event from the past: getting accepted into University. It will also ask you to list some of your thoughts and to answer some questionnaire items.

Questionnaire Instructions:

1. Please read and answer the questions in the order they are presented (answer all of the questions on a page before moving on to the next page).

2. Your responses will be kept completely confidential.

Background Information:

1. Age: _____

2. Sex (circle one): M F

Remembering a life event from the past (Forward)

Most students remember the day when they find out that they have been accepted into University. Later on, we will ask you to answer several questions about the day when you found out that you were accepted into WLU. What we would like you to do now is to think about other life events that have happened to you since that day. **In the order we have specified below, we would like you to briefly describe your memories of 5 particular events that most likely have happened to you.**

The day you found out you were accepted into WLU

start

1. *High school graduation*

   Briefly describe what it was like for you:

2. *Canada Day Weekend*

   Briefly describe what it was like for you:

3. *Saying good-byes to your high school friends/family*

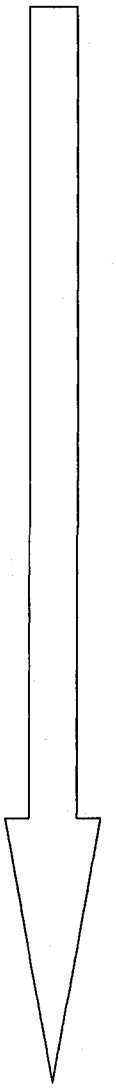
   Briefly describe what it was like for you:

4. *First day of class at WLU*

   Briefly describe what it was like for you:

5. *Receiving your very first mark or grade for an assignment or test in University*

   Briefly describe what it was like for you:



finish

Today

Remembering a life event from the past (Backward)

Most students remember the day when they find out that they have been accepted into University. Later on, we will ask you to answer several questions about the day when you found out that you were accepted into WLU. What we would like you to do now is to think about other life events that have happened to you since that day. **In the order we have specified below, we would like you to briefly describe your memories of 5 particular events that most likely have happened to you.**

Today

start

1. *Receiving your very first mark or grade for an assignment or test in University*

   Briefly describe what it was like for you:

2. *First day of class at WLU*

   Briefly describe what it was like for you:

3. *Saying good-byes to your high school friends/family*

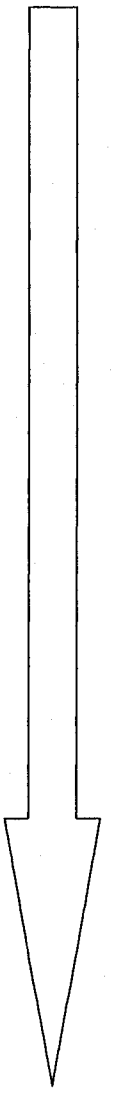
   Briefly describe what it was like for you:

4. *Canada Day Weekend*

   Briefly describe what it was like for you:

5. *High school graduation*

   Briefly describe what it was like for you:



finish

The day you found out you were accepted into WLU

Next, we would like you to answer the following questions **about the day you found out that you were accepted into WLU**.

1. Past experiences may feel quite close or quite far away, regardless of how long ago they actually occurred. Place a mark through the line below at the point that best indicates how close or far away the day you were accepted into WLU feels to you.

|----------|
Feels like yesterday Feels very far away

2. To what extent do you feel happy *now* about the day you found out that you were accepted into WLU?

1	2	3	4	5	6	7	8	9
Not at all happy				Somewhat happy				Extremely happy

3. To what extent do you feel proud *now* about the day you found out that you were accepted into WLU?

1	2	3	4	5	6	7	8	9
Not at all proud				Somewhat proud				Extremely proud

4. To what extent do you feel that you have changed as a person since the day you found out that you were accepted into WLU?

1	2	3	4	5	6	7	8	9
Not at all				To some extent				To a great extent

5. To what extent do you feel that "a lot has happened" since the day you found out that you were accepted into WLU?

1	2	3	4	5	6	7	8	9
Not at all				To some extent				To a great extent

Appendix B

Materials Used in Study 2

RESEARCH QUESTIONNAIRE: Life Events Study
Researchers: Dr. R. Buehler & Kent Lam

In our research, we are interested in examining how people remember past events.

This questionnaire will ask you to think about a positive event from the past (getting accepted into University) as well as other events in your life. In addition, we will ask you to list some of your thoughts and to answer some questionnaire items.

Questionnaire Instructions:

1. Please read and answer the questions in the order they are presented (answer all of the questions on a page before moving on to the next page).

2. Your responses will be kept completely confidential.

Background Information:

1. Age: _____

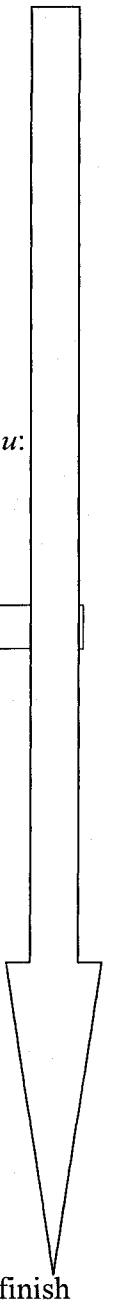
2. Sex (circle one): M F

Remembering life events from the past (Forward)

Most students remember the day when they find out that they have been accepted into University. Later on, we will ask you to answer several questions about the day when you found out that you were accepted into WLU. What we would like you to do now is to think about other life events that have happened to you. **In the order we have specified below, we would like you to briefly describe your memories of 6 other events that most likely have happened to you.**

1. First day of high school. *Briefly describe what it was like for you*:

start



2. Your 16th birthday. *Briefly describe what it was like for you*:

3. Submitting your University Applications. *Briefly describe what it was like for you*:

The day you found out you were accepted into WLU

4. High school graduation. *Briefly describe what it was like for you*:

5. Saying good-byes to your high school friends/family. *Briefly describe what it was like for you*:

6. First day of class at WLU. *Briefly describe what it was like for you*:

finish

Remembering life events from the past (Backward)

Most students remember the day when they find out that they have been accepted into University. Later on, we will ask you to answer several questions about the day when you found out that you were accepted into WLU. What we would like you to do now is to think about other life events that have happened to you. **In the order we have specified below, we would like you to briefly describe your memories of 6 other events that most likely have happened to you.**

start

1. First day of class at WLU. *Briefly describe what it was like for you*:

2. Saying good-byes to your high school friends/family. *Briefly describe what it was like for you*:

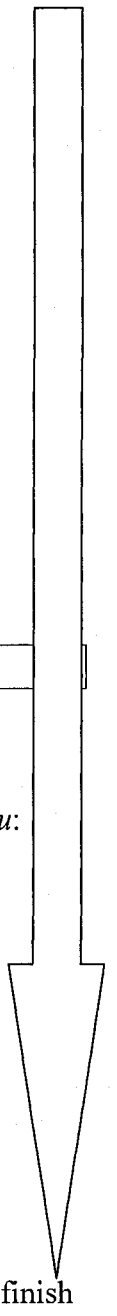
3. High school graduation. *Briefly describe what it was like for you*:

The day you found out you were accepted into WLU

4. Submitting your University Applications. *Briefly describe what it was like for you*:

5. Your 16th birthday. *Briefly describe what it was like for you*:

6. First day of high school. *Briefly describe what it was like for you*:



finish

Next, we would like you to answer the following question **about the day you found out that you were accepted into WLU**.

Past experiences may feel quite close or quite far away, regardless of how long ago they actually occurred. Place a mark through the line below at the point that best indicates how close or far away the day you were accepted into WLU feels to you.

|----------|

Feels like yesterday Feels very far away

Appendix C

Materials Used in Study 3

RESEARCH QUESTIONNAIRE: Life Events Study
Researchers: Dr. R. Buehler & Kent Lam

In our research, we are interested in examining how people remember past events.

This questionnaire will ask you to think about a positive event from the past: Getting accepted into University. We will also ask you to list some of your thoughts and to answer some questionnaire items.

Questionnaire Instructions:

1. Please read and answer the questions in the order they are presented (answer all of the questions on a page before moving on to the next page).

2. Your responses will be kept completely confidential.

Background Information:

1. Age: _____

2. Sex (circle one): M F

3. Year: 1 2 3 4 4+

Remembering a life event from the past (backward / 0 events)

Most students remember the day when they found out that they have been accepted into University. Later on, we will ask you to answer several questions about the day when you found out that you were accepted into WLU.

First, briefly describe yourself or what you did today

Briefly describe what you remember about the day you were accepted into Laurier:

Remembering a life event from the past (backward/ 3 events)

Most students remember the day when they found out that they have been accepted into University. Later on, we will ask you to answer several questions about the day when you found out that you were accepted into WLU. What we would like you to do now is to think about other life events that have happened to you since that day. Please read the instructions below carefully.

Instructions: Please direct your attention to the projector screen at the front of the room. The timeline you see spans from the day you found out you were accepted into university to today. In a moment, an arrow will appear right above the timeline and begin moving very slowly from **right to left**. As the arrow moves along the timeline, we would like you to think of exactly **3** other life events that have happened to you (**beginning from the most recent ones to the earliest ones**) since the day you were accepted into WLU. To equate the experience for all of our participants, it's important that your thoughts move at about the same pace as the arrow.

As best you can, jot down the thoughts in your mind in the space below. Try as best you can to briefly describe the events you are thinking about and when it happened.

Today: Briefly describe yourself or what you did today

1.

2.

3.

Briefly describe what you remember about the day you were accepted into Laurier:

Remembering a life event from the past (forward / 0 events)

Most students remember the day when they found out that they have been accepted into University. Later on, we will ask you to answer several questions about the day when you found out that you were accepted into WLU.

First, Briefly describe what you remember about the day you were accepted into Laurier:

Briefly describe yourself or what you did today.

Remembering a life event from the past (Forward/ 3 events)

Most students remember the day when they found out that they have been accepted into University. Later on, we will ask you to answer several questions about the day when you found out that you were accepted into WLU. What we would like you to do now is to think about other life events that have happened to you since that day. Please read the instructions below carefully.

Instructions: Please direct your attention to the projector screen at the front of the room. The timeline you see spans from the day you found out you were accepted into university to today. In a moment, an arrow will appear right above the timeline and begin moving very slowly from **left to right**. As the arrow moves along the timeline, we would like you to think of exactly **3** other life events that have happened to you (**beginning from the earliest ones to the recent ones**) since the day you were accepted into WLU. To equate the experience for all of our participants, it's important that your thoughts move at about the same pace as the arrow.

As best you can, jot down the thoughts in your mind in the space below. Try as best you can to briefly describe the events you are thinking about and when it happened.

Briefly describe what you remember about the day you were accepted into Laurier:

1.

2.

3.

Today: Briefly describe yourself or what you did today

Next, we would like you to answer the following questions **about the day you found out that you were accepted into WLU**.

1. Past experiences may feel quite close or quite far away, regardless of how long ago they actually occurred. **Place a mark through the line below at the point that best indicates how close or far away the day you were accepted into WLU feels to you.**

|----------|
Feels like yesterday Feels very far away

2. To what extent do you feel happy *now* about the day you found out that you were accepted into WLU?

1	2	3	4	5	6	7	8	9
Not at all happy				Somewhat happy				Extremely happy

3. To what extent do you feel proud *now* about the day you found out that you were accepted into WLU?

1	2	3	4	5	6	7	8	9
Not at all proud				Somewhat proud				Extremely proud

******Please stop here and wait for further instructions from the experimenter.

Appendix D

Materials Used in Study 4

RESEARCH QUESTIONNAIRE: Life Events Study
Researchers: Dr. R. Buehler & Kent Lam

In our research, we are interested in examining how people remember past events.

This questionnaire will ask you to think about a positive event from the past: getting accepted into University. It will also ask you to list some of your thoughts and to answer some questionnaire items.

Questionnaire Instructions:

1. Please read and answer the questions in the order they are presented (answer all of the questions on a page before moving on to the next page).

2. Your responses will be kept completely confidential.

Background Information:

1. Age: _____

2. Sex (circle one): M F

3. Year: 1 2 3 4 4+

Remembering a life event from the past (instructions for Backward recall in parentheses)

Most students remember the day when they find out that they have been accepted into University. Later on, we will ask you to answer several questions about the day when you found out that you were accepted into WLU. What we would like you to do now is to think about other life events that have happened to you since that day. Please read the instructions below carefully.

Instructions: Please direct your attention to the projector screen at the front of the room. The timeline you see spans from the day you found out you were accepted into university to today. In a moment, the cursor right above the timeline will begin moving very slowly from left to right (or right to left). As the cursor moves over each time period, we would like you to think about events that happened to you at that time. For example, when the cursor moves over the July part of the timeline, you might think about what happened to you on Canada Day or what it was like to start your summer job. As best you can, jot down the thoughts in your mind in the space below. Try as best you can to briefly describe the events you are thinking about and when it happened.

Next, we would like you to answer the following questions **about the day you found out that you were accepted into WLU**.

1. Past experiences may feel quite close or quite far away, regardless of how long ago they actually occurred. **Place a mark through the line below at the point that best indicates how close or far away the day you were accepted into WLU feels to you.**

|----------|
Feels like yesterday Feels very far away

2. To what extent do you feel that "a lot has happened" since the day you found out that you were accepted into WLU?

1 2 3 4 5 6 7 8 9
Not at all To some extent To a great extent

3. To what extent do you feel that you have changed as a person since the day you found out that you were accepted into WLU?

1 2 3 4 5 6 7 8 9
Not at all To some extent To a great extent

Appendix E

Materials Used in Study 5

Life Events Questionnaire (Mass Testing Session)

A. Remembering Past Events

First, we would like you to think about a memorable event that you experienced during your high school days that made you feel proud or happy:

Briefly, tell us what happened?

As best you can, recall the date of the event: _____(month) _____(year)

Next, we would like you to think of several life events you have experienced since the above event. We know you could probably think of dozens of events that have happened since then but please select 5 events that stand out most in your mind and, in chronological order, tell us about them.

Event #1

Briefly, tell us what happened?

As best you can, recall the date of the event: _____(month) _____(year)

Event #2

Briefly, tell us what happened?

As best you can, recall the date of the event: _____(month) _____(year)

Event #3

Briefly, tell us what happened?

As best you can, recall the date of the event: _____(month) _____(year)

Event 4

Briefly, tell us what happened?

As best you can, recall the date of the event: _____(month) _____(year)

Event 5

Briefly, tell us what happened?

As best you can, recall the date of the event: _____(month) _____(year)

RESEARCH QUESTIONNAIRE: Life Events Study
Researchers: Dr. R. Buehler & Kent Lam

In our research, we are interested in examining how people remember past events. This questionnaire will ask you to think about several life events from the past and to respond to several questionnaire items.

Questionnaire Instructions:

1. Please read and answer the questions in the order they are presented (answer all of the questions on a page before moving on to the next page).

2. Your responses will be kept completely confidential.

Background information:

1. Age: _____

2. Sex (circle one): M F

3. Year: 1 2 3 4 4+

Section 1

Remembering life events from the past

In this section, we will ask you to remember several life events that have happened to you. **You may recall filling out a questionnaire in mass testing that required you to list several past events**. We have recorded each of the events you mentioned in mass testing on the next few pages of this questionnaire. You will be asked to tell us more about a memorable positive event you experienced during your high school days and, in random order, several other life events that have happened since. To help you along, there will be a brief heading on each page that identifies the event we would like you to remember. For each event, briefly (a couple of sentences or so; point form is fine) write down what you remember or what your thoughts are about it. Please do not provide identifying information in your written responses (i.e., your name).

According to our records, you reported in an earlier questionnaire that the following event occurred during your high school days and that it made you feel proud and/or happy.

The event: _____

Date of the event: _____ (month) _____(year)

Briefly, tell us what happened:

Event #1

According to our records, this event _____ occurred in
_____ (month) _____(year)

Briefly, tell us what happened:

Event #2

According to our records, this event _____ occurred in
_____ (month) _____(year)

Briefly, tell us what happened:

Event #3

According to our records, this event _____ occurred in
_____ (month) _____(year)

Briefly, tell us what happened:

Event #4

According to our records, this event _____ occurred in
_____ (month) _____(year)

Briefly, tell us what happened:

Event #5

According to our records, this event _____ occurred in
_____ (month) _____(year)

Briefly, tell us what happened:

Next, we would like you to answer the following questions **about the event in high school that made you feel proud and/or happy.**

1. To what extent do you feel that "a lot has happened" since that day?

1	2	3	4	5	6	7	8	9
Not at all				To some extent				To a great extent

2. To what extent do you feel that you have changed as a person since that day?

1	2	3	4	5	6	7	8	9
Not at all				To some extent				To a great extent

3. Past experiences may feel quite close or quite far away, regardless of how long ago they actually occurred. **Place a mark through the line below at the point that best indicates how close or far away that particular event feels to you.**

|----------|

Feels like yesterday Feels very far away