Psychology of Consciousness: Theory, Research, and Practice

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Online First Publication, August 13, 2018. http://dx.doi.org/10.1037/cns0000156

American Psychological Association
Society of Psychological Hypnosis
Psychology of Consciousness: Theory, Research, and Practice

2326-5523/18/$12.00
http://dx.doi.org/10.1037/cns0000156

Phenomenology in Autobiographical Thinking: Underlying Features of Prospection and Retrospection

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Memories of personal events can generate complex subjective experiences with high-sensory details, a clear visuospatial context, and deep emotions. Future events, on the other hand, are thought to be experienced less strongly and less clearly than remembered past events. In this experiment, participants either remembered past events, imagined future events, or planned future events. Each mental representation of the event was followed by an extensive phenomenological questionnaire. As a second step, we added a new level of comparison by asking participants to generate alternative versions of these events and answer the same phenomenological questionnaire to examine phenomenology in counterfactual thinking, prefactual thinking, and prefactual planning. We ran an exploratory factor analysis to reveal common underlying features to this variety of autobiographical thinking. We extracted four principal factors that explained 53% of the total variance: an Autonoesis factor, a Scene-Construction factor, a Visual-Perspective factor, and an Optimism-Bias factor. When comparing remembered, imagined and planned events using our factor scores, we found that memory and prospection did not generate significantly different subjective experiences. However, participants experienced the representation of counterfactual events less vividly and less clearly than memories, whereas they experienced prefactual imagined and prefactual planned events similarly to their original versions. In conclusion, our findings indicate that humans construct diverse forms of autobiographical events with similar underlying features, but with some differences in the phenomenology of retrospection and prospection, as reality constrains the way we perceive the past, but not so much the future.

Keywords: prospection, future thinking, counterfactual thinking, autobiographical memory, phenomenology

Humans can mentally experience scenes or events that are not sensorially perceived. We can close our eyes and picture a blue sky even when it is raining outside, or hear the voice of a friend who has passed away. When remembering past events, the remembering process also can be accompanied by visual details or emotions, sometimes creating a sensation of almost

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This work was supported by a Macquarie University Research Excellence Scholarship to Aline Cordonnier, an Australian Research Council (ARC) Discovery Project and ARC Future Fellowship to Amanda Barnier, an ARC Discovery Project to John Sutton, the Memory Program of the ARC Centre of Excellence in Cognition and Its Disorders, and the Department of Cognitive Science, Macquarie University. Some data from this experiment were also presented at the international conference for the Society of Applied Research in Memory and Cognition (SARMAC XII), January 2017, Sydney, NSW, Australia, and formed part of a doctoral thesis submitted by the first author.

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"re-experiencing" the event. Similarly, when thinking about the future, one can visualize movements that are about to occur, feel the excitement of an upcoming reward, or mentally "pre-experience" events that may or may not happen later on.

The subjective experience associated with thinking about a personal event—also called the phenomenology of the event—has often been investigated in the context of empirical research on the similarities of retrospection (thinking about the past) and prospection (thinking about the future). Based on increasing neural, neuropsychological, and cognitive evidence, scientists have proposed that episodic memory and episodic future thinking rely on a similar constructive process (for reviews, see D'Argembeau, 2012; Klein, 2013; Szpunar, 2010). Schacter and Addis (2007a) and Irish and Piguet (2013), for instance, argue that this constructive process flexibly combines similar content from episodic and semantic memory to construct autobiographical past and future events, relying on a common neural network. Hassabis and Maguire (2007) focus instead on the spatial aspect of scene construction by arguing that the constructive process integrates semantic and episodic information into a coherent visuospatial context for the event.

However, there are many ways to think retrospectively or prospectively (Cordonnier, 2016). For example, the past can be remembered, or alternative versions generated, and the future can be imagined or planned. Previous research on the phenomenology of autobiographical events has focused mainly on the capacity to remember past events and imagine future events. Thus, in this experiment, we aimed to expand current research to examine the subjective experience of thinking about autobiographical events in a variety of ways.

Phenomenology of Autobiographical Events

Empirical interest in the subjective experience associated with thinking about personal events was strongly influenced by Johnson, Foley, Suengas, and Raye's (1988) landmark study of reality monitoring, the processes by which perceived and imagined events are discriminated or confused in memory. They created the Memory Characteristics Questionnaire to compare the qualities of memories versus the qualities of imagined, atemporal events. They found that memories were rated as having more perceptual and contextual information than imagined events, suggesting that such differences provide the basis for reality-monitoring decisions. As a consequence, vividly imagining events increased people's perceptions that the events had occurred in the past, as seen in the "imagination-inflation effect" (Garry, Manning, Loftus, & Sherman, 1996).

Researchers in the field of prospection have wondered if the phenomenology of remembered past events might differ in similar ways to imagined future events. D'Argembeau and Van der Linden (2004) asked participants to remember specific past events that they had experienced (e.g., a date) and to imagine specific future events (e.g., their next birthday). The researchers reported that past events contained more sensory details and were more clearly represented than imagined future events, which mirrors the results of Johnson, Foley, Suengas, and Raye (1988).

Since then, other studies have investigated the phenomenology of memories and future thoughts. Most experiments found several phenomenological differences between remembered past events and imagined future events. Participants' remembered, past events generally contained more sensory detail and had clearer location and spatial orientations of people and objects (e.g., Addis, Pan, Vu, Laiser, & Schacter, 2009; De Brigard & Giovanello, 2012), whereas participants' expected/imagined future events were more positive than past events. This general tendency of healthy subjects to see the future in an overly optimistic way has been dubbed the optimism bias (Schacter & Addis, 2007b; Sharot, 2011; Weinstein, 1980).

Conversely, in some studies, certain characteristics were rated alike in remembered past and imagined future events, such as the feeling of (p)reliving or (p)re-experiencing the event (D'Argembeau, Ortoleva, Jumentier, & Van der Linden, 2010; D'Argembeau & Van der Linden, 2004, 2006), but not in every experiment (Arnold, McDermott, & Szpunar, 2011). The visual perspective (field or observer) in which the event was perceived also received similar ratings across memories and imagined future thoughts (Addis et al., 2009; D'Argembeau & Van der Linden, 2004; De Brigard & Giovanello, 2012), but again, not in every experi-

ment (D'Argembeau & Van der Linden, 2006). Some of these differences or similarities may have been a result of the particular questions asked. For instance, in these studies, visual perspective was principally measured as a dichotomy (Field- versus Observer-Perspective scales) and did not account for the fact that some people switch from one perspective to the other (Rice & Rubin, 2009). In an experiment investigating visual perspective in depth, researchers found that, not only were there more observer than field perspectives in both past and future thinking, but that future thoughts were also more likely to be imagined from an observer perspective than memories (McDermott, Wooldridge, Rice, Berg, & Szpunar, 2016).

Other phenomenological characteristics of remembered past and imagined future events were rated sometimes similarly and sometimes differently across different experiments. For example, across a number of studies, the emotional intensity of the event was either stronger in the past than the future (Addis et al., 2009; D'Argembeau & Van der Linden, 2004), stronger in the future than the past (De Brigard & Giovanello, 2012, Study 1), or identical in both temporal orientations (Addis, Wong, & Schacter, 2007; D'Argembeau et al., 2010; D'Argembeau & Van der Linden, 2006; De Brigard & Giovanello, 2012, Study 2). Thus, there is as yet no consensus on whether retrospection and prospection are more alike or different when it comes to the associated subjective experiences.

Furthermore, we do not know whether these phenomenological differences would remain when participants were not given the chance to directly compare the conditions, because most previous experiments have used within-subjects designs. In these past experiments, researchers evaluated whether memories were relatively richer in details than future thoughts if the person had to rate them both. Studies have yet to consider the absolute values of the qualities of memories and future thoughts, but we can find suggestion of a response in Arnold et al.'s article (2011). They tried to replicate D'Argembeau and Van der Linden's finding (2006) that temporally close events were rated as more detailed and more experienced than temporally distant events, but decided to use a between-subjects design "so that phenomenological ratings could not be based on comparisons across temporal distances or naïve theories of how the vividness of future events and memories set at different temporal distances *should* vary" (Arnold et al., 2011, pp. 955–956). Only one characteristic, the clarity of location, showed a main effect of temporal distance. The authors hypothesized that their use of a between-subjects design might have accounted for the conflicting findings between their experiment and D'Argembeau and Van der Linden's study (2004). As we wanted to investigate the absolute values of the qualities of autobiographical thoughts, we decided to follow the same approach as Arnold et al. (2011).

Finally, temporal orientation (past or future) might not be the only way to understand differences between remembered past events and imagined future events. Instead, one might see these differences as originating from a contrast between experienced events and hypothetical events. Debus (2014, p. 337) proposed that one can only be experientially aware of perceived past events. This hypothesis might explain why previous research has shown that counterfactual thoughts—hypothetical alternative ways past events could have occurred—although theoretically set in the past, are sometimes more similar to future thoughts than to memories. For instance, De Brigard and Giovanello (2012) compared past, future, and counterfactual events in two separate studies. They found that the scene of past events was clearer than the scene of both counterfactual and future events. Yet, memories had more sensory details than the other conditions in only one of the two studies. Other phenomenological ratings differed between the two studies, indicating that more research needs to be done.

De Brigard et al. (2016) replicated their earlier result that memories were relatively more vivid and spatially clearer than counterfactual and future events. Counterfactual thinking thus seems to produce similar subjective experiences to future thinking. Yet, if both are types of hypothetical events, one set in the past, the other in the future, they are not exactly alike. The construction of counterfactual thoughts is constrained by the reality of the initial event, whereas thoughts about the future are not constrained by reality to the same extent, as "there is no 'true' representation against which to contrast an imagined event" (Schacter, Benoit, De Brigard, & Szpunar, 2015, p. 18). Thus, different hypothetical versions of future events would be experienced in a similar way, whereas a

hypothetical alternative version of a past event (i.e., a counterfactual event) would be experienced quite differently, relative to its original memory. To examine this, we decided to compare counterfactual events—alternative versions of memories—with "prefactual" events—alternative versions of previously imagined future events.

Overview and Objectives

In light of these considerations, we investigated the similarities and differences in the phenomenological characteristics of a broad range of autobiographical thinking processes. Inspired by D'Argembeau's procedure (D'Argembeau & Van der Linden, 2004) but using a mixed design, our experiment has two parts. In the first part, participants remembered past events, imagined future events, or planned future events. Each mental representation of the event was followed by a questionnaire that combined most items from the multiple sources reviewed above to obtain a wide range of phenomenological measures. Thus, in this study, we compare the absolute qualities of different autobiographical events between subjects.

In the second part—in an extension of D'Argembeau's procedure—participants generated alternative versions of Part 1's events, followed by the same phenomenological questionnaire. In this section, we use a between-subjects comparison to evaluate the absolute qualities of hypothetical autobiographical events, but also to compare the phenomenological changes within subjects between original and alternative versions of autobiographical events.

We developed two main objectives for this research. Our first objective was to investigate how phenomenological characteristics of autobiographical events fall into natural factors, which might indicate underlying features of autobiographical thinking. In previous studies, researchers have sometimes averaged together some phenomenological characteristics to form new indexes or factors: sensory details have been clustered together to form a Sensory factor, clarity of location and of spatial arrangement have been clustered together to form a Location factor, also called a Composition factor, and the feeling of time traveling as well as the feeling of experiencing the event have been clustered together to form a Subjective Experience factor (D'Argembeau & Van der Linden, 2004; De Brigard & Giovanello, 2012; Szpunar & McDermott, 2008).

Other researchers have run similar factor analyses to check if and how these items correlate with one another, but with varying results. For example D'Argembeau et al. (2010) analyzed five phenomenological characteristics that yielded two factors: Episodic Details and Feeling of Experiencing. Similarly, De Brigard et al. (2016) ran a factor analysis over 19 characteristics and produced a nine-factor solution. In the current study, we ran an exploratory factor analysis on 25 scale items to look for indications of common underlying factors in autobiographical thinking.

Our second objective was to expand current research on the phenomenology of retrospection and prospection by analyzing how different ways of thinking about an event in time influence the phenomenological characteristics of the event. In Step 1, we compared remembered past events, imagined future events, and planned future events. Planning is an important part of our everyday life and is valuable in future-thinking research (Cordonnier, Barnier, & Sutton, 2016). Having a personal goal when thinking about future events helps structure events and increases their perceived plausibility (D'Argembeau & Demblon, 2012; D'Argembeau & Van der Linden, 2012). Furthermore, imagining and planning future events are two different forms of future thinking, and may differ in phenomenology from remembering and from each other (Cordonnier, 2016).

We hypothesized that remembered events are experienced with more sensory details and a clearer visuospatial context than imagined future events. We also hypothesized that, on average, planned future events would be rated as slightly more vivid and spatially clearer than imagined future events. However, because our participants did not have the opportunity to directly contrast the qualities of different memories, we suggested that the differences between conditions would not be as marked as in previous studies.

In Step 2, also using a between-subjects comparison, we compared counterfactual past events, prefactual imagined events, and prefactual planned events. Whereas the idea of prefactual thinking is rarely mentioned in the future thinking literature, counterfactual thinking has received

some attention in relation to future thinking in the past few years. But as discussed above, counterfactual events are more constrained by reality than future events. Consequently, including counterfactual and prefactual thinking allows us to examine the role of temporal orientation when contrasting memories with future events, but also when contrasting hypothetical past and future events. Considerations drawn from existing research led us to hypothesize that, counterfactual and prefactual events, because of their hypothetical nature, would receive similar phenomenological ratings (De Brigard & Giovanello, 2012; De Brigard et al., 2016).

However, there is another factor in play. Participants generated alternative versions of events proposed in Part 1. Thus, when rating their phenomenological experience in Part 2, they most likely compared it to the phenomenological experience of the original version from Part 1. Consequently, differences found between counterfactual, prefactual imagined, and prefactual planned events depend on both the differences found in Part 1 between remembered, imagined and planned events, and the within-subject effect when comparing Part 1 to Part 2.

As a consequence, in the third and final step, we examined these within-subjects changes in phenomenological ratings between original and alternative events. In other words, we investigated which types of change (counterfactual, prefactual imagined, or prefactual planned) modify the phenomenology of the event the most. As past and future hypothetical events are not constrained alike by reality (Schacter et al., 2015), we surmised that counterfactual changes would have a stronger impact on phenomenology than prefactual imagined and prefactual planned changes.

Method

Participants

We recruited 51 undergraduate participants (42 women and nine men, mean age = 20.14 years, *SD* = 4.00, range = 18–42 years) who spoke English as their first language and enrolled in an introductory psychology course at Macquarie University, (Sydney, NSW, Australia). They gave informed consent, which included agreement to be audio-recorded, and received course credit as compensation in accordance with the Macquarie University Ethics Committee. We tested participants individually in a single 1-hr session. Each participant was randomly allocated to one of three conditions: the remembering condition (R), the imagining condition (I), or the planning condition (P).

Materials and Procedure

This experiment was composed of two parts. In the first part, participants remembered past events, imagined future events, or planned for future events. In the second part, participants provided alternative versions of these events.

Part 1. Upon arrival, we informed participants that they would be asked to talk about three specific events that happened to them before they started their university degree (remembering condition) or after they finished their university undergraduate degree (imagining and planning conditions). We chose these time constraints so the generated events would most likely be set in a different lifetime period (Conway & Pleydell-Pearce, 2000) than the one they were currently in. As discussed in Brown's transition theory (Brown, Hansen, Lee, Vanderveen, & Conrad, 2012) each lifetime period has a high degree of stability in the fabric of daily life, with many repeated events. Therefore, we introduced the time constraints to reduce strong similarities between past and future events and to avoid participants generating future events by recalling past events and presenting them as future ones.

We told participants that these events did not need to be important or significant; however, they had to be unique, singular events occurring at a specific point in time and lasting for a few minutes or a few hours, but no longer than a day. We also asked them to avoid extended events or events that blended into other similar events. We provided examples of repeated and extended events to make sure they understood their meanings. In a practice trial, participants told us about a family dinner. If they did not generate a specific personal event, we provided feedback and more explanation.

After the practice trial, we showed participants three pairs of cues (using a permutation order) and asked them to select one cue from each pair. The pairs of cues were (a) a birthday celebration or a date/meeting with a friend, (b) a first day of work/volunteering or an exam/test, (c) a day trip or a major public event. We selected these cues as we expected everyone to be able to

generate both past and future specific events related to them.

Regardless of the condition (R, I, or P), each event elicitation triggered a series of four steps: general questions, process task, description task, and phenomenological questionnaire, similar to D'Argembeau and Van der Linden's (2006) design. Upon receiving the first cue, participants answered a series of general questions about where the event was set, when (month and year), at what time of the day the event started, and the name or a description of another person present (e.g., "Jack" or "the bus driver"). We restricted events to those in which at least one other person was present, because the counterfactual and prefactual manipulation involved modifying the person present in the event.

After answering these general questions, participants closed their eyes for one minute and mentally remembered, imagined, or planned the event. In the remembering condition, the experimenter provided the following instructions.

> I am going to give you one minute to close your eyes and mentally remember this event. Keeping in mind the answers to the general questions you just gave me, be sure to remember it as it happened. It is important that you try to make it as clear and as detailed as possible.

In the imagining condition, the experimenter provided the following instructions.

> I am going to give you one minute to close your eyes and mentally imagine this event. Keeping in mind the answers to the general questions you just gave me, be sure to keep it in the future when things might not be the same as they were in the past. It is important that you try to make it as clear and as detailed as possible.

Finally, in the planning condition, the experimenter provided the following instructions.

> I am going to give you one minute to close your eyes and mentally plan for this event. Keeping in mind the answers to the general questions you just gave me, be sure to keep it in the future when things might not be the same as they were in the past. Also, be sure to really think about the different steps you will need to undertake to successfully plan for this event. It is important that you try to make it as clear and as detailed as possible.

We called this the "process task," as we wanted to investigate how the different processes of thinking about an event in time (i.e., R, I, or P) would influence the way the event was experienced afterward.

The third step involved verbally describing the event to the experimenter for up to 3 min, and was called the "description task." In the planning condition, participants were requested to describe the event itself and not the planning. This way, every participant described the occurrence of a personal specific event. In the fourth and last step, participants answered a questionnaire using a 7-point Likert scale while keeping the event they had just described in mind.

We combined questions used in several studies by D'Argembeau et al. (D'Argembeau & Mathy, 2011; D'Argembeau et al., 2010; D'Argembeau & Van der Linden, 2004, 2006, 2012), as well as other researchers (De Brigard & Giovanello, 2012; Szpunar & McDermott, 2008), most of which originated from the Memory Characteristic Questionnaire (Johnson et al., 1988). All the questions are listed in Table 1. With regard to the visual perspective measures, we deviated slightly from previous measures. In addition to the traditional dichotomy perspective scale, we included a separate field perspective scale as well as a separate observer perspective scale, as suggested by Rice and Rubin's (2009) research.

The question "How similar is this event to a previously encountered event?" was only asked in the imagining and the planning conditions to investigate how often participants produced thoughts of future events similar to a specific past event. The question "When you had to mentally plan for the event, did you think about the planning steps or more about the event itself?" was only asked in the planning condition to investigate how much the event itself was considered when thinking about how to plan for it. When participants completed the questionnaire, the same four steps were repeated with a new cue, until they had completed them three times in total.

Part 2. During Part 2, we investigated how generating an alternative version for each event would impact its phenomenological characteristics. Depending on the cue associated with the event, we asked participants to apply a specific counterfactual (for past events) or prefactual (for future events) change. "Work" and "exam" cues led to a change in emotional valence (the opposite valence, and if neutral, a change to positive valence); "birthday" and "date" cues led to a change in person; and "trip" and "public event" cues led to a change in location.

Table 1
Scale Items Forming the Questionnaire Used to Assess the Phenomenological Characteristics of the Remembered, Imagined, and Planned Events

Characteristics	Questions	Scale
Experiencing	Did you feel as though you were experiencing the event?	1 = *not at all*, 7 = *completely*
Mental time travel	Did you feel that you traveled backward/forward to the time when the event happened/might happen?	1 = *not at all*, 7 = *completely*
Field perspective	To what degree was the event experienced from your own eyes?	1 = *not at all*, 7 = *completely*
Observer perspective	To what degree was the event experienced from an observer's perspective?	1 = *not at all*, 7 = *completely*
Observer vs. field dichotomy	If you had to choose between both perspectives, would you say you saw the event through your own eyes or as an outside observer?	−3 = *observer*, 3 = *own eyes*
Vividness	Was the representation vivid in your mind?	1 = *not at all*, 7 = *completely*
Visual details	Did it involve visual details?	1 = *not at all*, 7 = *completely*
Sounds	Did it involve sounds?	1 = *not at all*, 7 = *completely*
Smells/tastes	Did it involve smells or tastes?	1 = *not at all*, 7 = *completely*
Location	Was the location where the event took/might take place clear?	1 = *not at all*, 7 = *completely*
Familiar setting	Was it set in a very familiar setting?	1 = *not at all*, 7 = *completely*
Object spatial arrangement	Was the relative spatial arrangement of objects clear?	1 = *not at all*, 7 = *completely*
People spatial arrangement	Was the relative spatial arrangement of people clear?	1 = *not at all*, 7 = *completely*
Time of day	Was the time of day when the event took place clear?	1 = *not at all*, 7 = *completely*
In words	Did it come to you in words?	1 = *not at all*, 7 = *completely*
Coherent story	Did it come to you as a coherent story and not as an isolated scene?	1 = *not at all*, 7 = *completely*
Complexity of the storyline	Was the storyline very complex?	1 = *not at all*, 7 = *completely*
Intensity of emotions during the event	How intense were/would your emotions (be) during the event?	1 = *not intense*, 7 = *very intense*
Valence of emotions during the event	Were those emotions negative or positive?	−3 = *very negative*, 3 = *very positive*
Similarity of emotion now and during the event	To what degree did you feel the same emotions as the ones you felt/would feel when/if the event occurred?	1 = *not at all*, 7 = *completely*
Intensity of emotions when thinking about the event	How intense were/would your emotions (be) when thinking about event?	1 = *not intense*, 7 = *very intense*
Valence of emotions when thinking about the event	Were those emotions negative or positive?	−3 = *very negative*, 3 = *very positive*
Personal importance	Is this event important to you (it involves an important theme or episode in your life)?	1 = *not at all*, 7 = *very important*
Past occurrences	How often have you encountered similar events in the past?	1 = *never*, 7 = *very often*
Future occurrences	How often do you expect to encounter similar events in the future?	1 = *never*, 7 = *very often*
Similarity to a past event[a]	How similar is this event to a previously encountered event?	1 = *not similar to any past event*, 7 = *very similar to a past event*
Planning during process task[b]	When you had to mentally plan for the event, did you think about the planning steps or more about the event itself?	1 = *only about the planning*, 7 = *only about the event*

[a] Characteristic only measured in the future tasks. [b] Characteristic only measured in the planning task.

When participants had an idea of how else the event would occur, they completed the process task again. They closed their eyes for 1 min and thought about how it could happen/have happened, considering the given change. Then they had up to 3 min to describe this new version of the event to the experimenter before completing the questionnaire once more. We repeated the same steps for the other two events.

In summary, participants generated three events (remembering the past, imagining the future, or planning the future, depending on their allocated condition) and provided one alternative version for each original event, one following a change of emotion, one following a change of person, and one following a change of location. For each original and alternative event, participants took 1 min to remember, imagine, or plan the event, and then described the event before answering the questionnaire. Consequently, we obtained 306 transcripts of events and their 306 corresponding questionnaires in total (six transcripts and questionnaires for each of our 51 participants). At the end of the experiment, participants completed a final questionnaire about their demographics and rated the perceived difficulty of each task on a scale from 1 (*very easy*) to 7 (*very hard*), after which they were fully debriefed and thanked for their time. For this paper, we focused on the phenomenological ratings for the 306 events described in response to the questionnaire.

Analysis of Phenomenological Ratings

When entering data, we recoded some scale items to keep a similar range across the questionnaire: Scales ranging from −3 to 3 (i.e., Field vs. Observer Perspective, Valence of Emotions During the Event, Valence of Emotions When Thinking About the Event, Planning During Process Task) were recoded on a scale from 1 to 7 (so −3 became 1, −2 became 2, etc.). In addition, for ease of comparison between the two perspective scales (Field and Observer) and the Dichotomy-Perspective scale, we reverse-coded the Observer Perspective scale, so that a rating of 1 now meant *completely from an observer's perspective* and a rating of 7 now meant *not at all from an observer's perspective*.

Results

Preliminary Analyses

We conducted preliminary analyses to examine the difficulty of our tasks, the content of the events generated, and potential mediators to our analyses.

Difficulty ratings. Generally, participants found our tasks neither too easy nor too hard (means ranged between 3.06 and 4.53). There was no difference across the remembering, imagining, and planning conditions nor across the counterfactual, prefactual imagined, and prefactual planned conditions regarding how difficult it was to think about the events or how difficult it was to answer the scales ($p > .05$ in both cases). Therefore, the difficulty of our tasks cannot explain the following results.

Content and temporal distance. During Part 1 of the experiment, we collected data from 153 events: 51 remembered past events, 51 imagined future events, and 51 planned future events. Thirty-four events were about a day trip (22.2%), 17 events were about a major public event (11.1%); 31 events were about a birthday celebration (20.3%), 20 events were about a date or a meeting with a friend (13.1%); 27 events were about an exam or a test (17.6%), and 24 events were about a first day at work or first day volunteering (15.7%). These events were collapsed together in our analyses, as they were not distributed equally across conditions.

To investigate the temporal distance of events, we first coded an approximate date for each event by using the information participants provided during the general questions phase. Participants only had to provide the month and year of the event (not the exact day), so we decided to use the 15th of the given month as the date. We then calculated the number of days separating the estimated date of the event from the day of the testing. The nonparametric Kruskal–Wallis test on the number of days as dependent variable revealed significant differences across conditions, $H(2) = 57.99$, $p < .001$. Considering that we had skewed distributions, we report the median values here. The median of remembered events was 476 days (or 1.30 years), the median of imagined events was 1,991 days (or 5.45 years), and the median of planned events was 1,788 days (or 4.90 years). Future events, imagined and planned, were

therefore set at a more distant time than past events. This difference makes sense considering our constraints on the time of the events (before or after their university degree), and with the knowledge that most of our participants were first-year university students.

Individual items. Two scale items ("similarity to past events" and "planning during process task") were not presented in all conditions, so we first analyzed them separately. On average, imagined and planned future events were both felt to be neither totally novel nor very similar to past events (imagined future events: $M = 3.10$, $SD = 1.37$; planned future events: $M = 3.71$, $SD = 1.16$, $F(1, 50) = 1.19$, $p = .172$). Moreover, participants in the planning condition reported that during the process task (when they closed their eyes and planned the events), they thought both about the planning and about the event itself ($M = 3.39$, $SD = 1.59$). We expected this result, because to plan for the event, participants also needed to think about what they wanted to achieve. Because participants did not complete these scale items in all conditions, we did not include them in the following analyses, which use the other 25 items.

Potential mediators. Before comparing our three main conditions, we investigated potential mediators that could affect the comparison between remembering, imagining, and planning to rule them out if necessary. First, as imagined and planned events were generally set at a more distant time than past events, we ran a multivariate analysis of variance (MANOVA) on the phenomenological characteristics, with condition (R, I, or P) as the independent variable and temporal distance (in days) as a covariate. We found no reliable evidence of an effect of temporal distance, so we dropped this variable from further analyses, $F(25, 123) = 1.10$, $p = .350$, Wilk's $\Lambda = 0.808$.

Second, each participant provided ratings for three separate events, so these data points could not be treated as independent. Therefore, a second MANOVA examined the effect of event order (first, second, or third event) in conjunction with the condition (R, I, or P) on the phenomenological characteristics. As there was no main effect of event order, $F(50, 236) = 0.92$, $p = .619$, Wilk's $\Lambda = 0.699$, and no interaction, $F(100, 484) = 0.88$, $p = .779$, Wilk's $\Lambda = 0.506$, we collapsed data for each participant to create a compiled score by averaging their ratings of the three events on each phenomenological characteristic.

Exploratory Factor Analysis

One of our main objectives was to investigate how correlations between some phenomenological characteristics might inform us of the underlying constructive processes of thinking about a personal event, regardless of its type or temporal orientation. Consequently, we ran an exploratory factor analysis on all events generated during the first part of the experiment. Factor analysis was appropriate and suited to our data as indicated by Kaiser–Meyer–Olkin (KMO) sampling adequacy test (0.757), and Bartlett's sphericity tests, $\chi^2(253) = 1{,}347.57$, $p < .001$. We used principal components extraction with varimax rotation to preserve orthogonality. The analysis of the scree plot and eigenvalues indicated a four- or five-factor solution. However, only one phenomenological characteristic loaded on the fifth factor, and this characteristic also loaded heavily on another factor. We therefore selected the four-factor solution. We removed two characteristics ("in words" and "smells/tastes"), as they did not load onto any factor. Our final four-factor solution accounted for 53.01% of the total variance (see Table 2).

We conceptualized our first factor as representative of Autonoesis (Cronbach's $\alpha = .84$). This factor consisted of phenomenological characteristics related to mental time travel (experiencing the event, mental time traveling), emotional intensity during the event and when thinking about the event, similarity of emotions between now and then, vividness, sounds, personal importance, complexity, and coherence of the story. The visual details characteristic placed in Factor 2 also loaded on Factor 1 almost equally (.47). We conceptualized our second factor as representative of Scene Construction (Cronbach's $\alpha = .76$). This factor consisted of phenomenological characteristics related to the location, spatial arrangement of people and object, time of day, how familiar the setting was, and how often similar events occurred in the past. We conceptualized our third factor as representative of Visual Perspective (Cronbach's $\alpha = .74$). This factor consisted of the three

Table 2
Factor Loadings for Explanatory Factor Analysis With Varimax Rotation of Phenomenological Characteristics

Characteristics	Factors 1	2	3	4
Intensity of emotions when thinking about the event	**.73**	.10	−.02	.31
Personal importance	**.71**	−.06	−.05	.14
Experiencing	**.66**	.08	.21	.14
Intensity of emotions during the event	**.66**	−.04	−.21	−.14
Mental time travel	**.64**	.10	.16	<.01
Vividness	**.64**	.20	.39	−.09
Coherent story	**.56**	.11	.28	.05
Similarity of emotion now and during the event	**.55**	.18	<−.01	.48
Sounds	**.53**	.27	<.01	.17
Complexity of the storyline	**.48**	.20	−.35	−.09
Familiar setting	.08	**.75**	−.09	.06
Location	.12	**.74**	.13	.10
People spatial arrangement	.22	**.66**	.18	−.22
Object spatial arrangement	.14	**.66**	.10	−.28
Past occurrences	−.02	**.56**	−.23	.17
Visual details	.47	**.49**	.29	−.02
Time of day	<−.01	**.47**	.34	.27
Field vs. observer dichotomy*	.12	.13	**.78**	<.01
Field perspective	.36	.14	**.73**	−.04
Observer perspective*	−.10	−.05	**.69**	.06
Valence of emotions during the event*	−.01	−.09	.11	**.82**
Valence of emotions when thinking about the event*	.20	−.09	.14	**.80**
Future occurrences	.10	.14	−.15	**.55**

Note. Factor loadings for each phenomenological characteristic in a given factor are in boldface.
* Recoded variable, see main text for detailed explanations.

perspective characteristics only.[1] Finally, we conceptualized our fourth factor as representative of Optimism Bias (Cronbach's $\alpha = .66$). This factor consisted of the two emotional valence characteristics (both during the event and when thinking about it) and the measure of how often similar events might occur in the future. The characteristic measuring the similarity between the emotions now and then, placed in Factor 1, also loaded on this factor (.48). In summary, generating autobiographical events rely on the capacity to project oneself in time and constructing a clear visuospatial scene for the event, but the perspective we take to perceive the event is not contingent on either. Furthermore, participants tended to see positive events as more likely to occur often in the future.

Comparing Factor Scores Across Conditions

Part 1: Remembering versus imagining versus planning. Consistent with previous studies (D'Argembeau & Van der Linden, 2004; De Brigard & Giovanello, 2012; Szpunar & McDermott, 2008), we estimated factor scores for each participant by averaging the different items loading on each factor (i.e., to create the Perspective factor score, we averaged participants' ratings from the Field-Perspective characteristic, the Observer-Perspective characteristic, and the Dichotomy-Perspective characteristic). The means, standard deviations and 95% confidence intervals for each factor and in each condition are described in Table 3. Univariate ANOVAs did not yield any effect of condition (R, I, or P) on factor scores associated with our Autonoesis factor, $F(2, 48) = 0.86$, $p = .431$; our Scene-Construction factor, $F(2, 48) = 1.62$, $p = .200$; our Visual-Perspective factor, $F(2, 48) = 0.63$, $p = .535$; or our Optimism-Bias factor, $F(2, 48) = 3.04$, $p = .057$. R, I, and P events were experienced phenomenologically in similar ways.

Part 2: Counterfactual thinking versus prefactual imagining versus prefactual planning. The events generated in this part were alternative versions of the ones generated in Part 1, thus placed at the same point in time and about the same content. Similar to Part 1, we again created four factor scores by averaging the scores from the items in each factor and compared them across conditions (see Table 4). Univariate ANOVAs indicated a main effect of condition for the Autonoesis factor, $F(2, 48) = 7.18$, $p = .002$, $\eta^2 = .01$. When thinking about alternative events, participants in the counterfactual condition had less of a feeling of mental time travel to the events and experienced them in less emotional, complex, and coherent ways than participants in the prefactual imagined and prefactual planned conditions. The Visual-Perspective factor also showed a main effect of condition, $F(2, 48) = 3.42$, $p = .041$, $\eta^2 = .01$.

[1] As explained in the method section, the Observer-Perspective scale was reverse-coded to allow for a positive correlation between the different Visual-Perspective scales.

Table 3
Averaged Factor Scores as a Function of Condition

	Past		Future			
	Remembering		Imagining		Planning	
Factors	*M* (*SD*)	95% CI	*M* (*SD*)	95% CI	*M* (*SD*)	95% CI
Autonoesis factor	4.21 (.81)	[3.83, 4.60]	4.18 (.88)	[3.80, 4.57]	4.50 (.68)	[4.12, 4.89]
Scene-Construction factor	5.19 (.96)	[4.84, 5.54]	4.81 (.44)	[4.46, 5.17]	4.96 (.66)	[4.61, 5.31]
Visual-Perspective factor	5.75 (.88)	[5.30, 6.20]	5.46 (.97)	[5.02, 5.91]	5.79 (.90)	[5.34, 6.24]
Optimism-Bias factor	4.54 (.70)	[4.21, 4.87]	5.02 (.68)	[4.67, 5.35]	5.06 (.66)	[4.73, 5.39]

Prefactual planned events were usually visualized more from a field perspective than counterfactual events, yet they did not differ from prefactual imagined events. In both cases, the effect size was very low. The Scene-Construction factor and the Optimism-Bias factor had similar factor scores across conditions. The clarity of the visuospatial scene was similar in all types of alternative events. Furthermore, participants in all conditions felt these events were relatively positive and likely to occur often in the future. In summary, participants felt like they experienced counterfactual events less than prefactual events, but participants could visualize the scene of the event similarly in all conditions. However, these differences between past and future alternative events might not truly be representative of the differential effect of temporal orientation of these alternative events. Instead, they might originate from the comparison between original events and their alternative versions, which we examine next.

Part 1 versus Part 2: Counterfactual changes versus prefactual imagined changes versus prefactual planned changes. To determine how counterfactual and prefactual changes to events influenced their phenomenology, we subtracted Part-2 ratings from Part-1 ratings for each event, such that positive numbers indicated higher ratings for Part 1 and negative numbers indicated higher ratings for Part 2. The first important point is that prefactual changes for imagined and planned future events had a relatively low impact on the phenomenological characteristics, as the maximum difference in both conditions and across all characteristics was less than 0.70 points. On the other hand, counterfactual changes modified ratings by up to 1.61 points on our scale. In other words, whereas alternative changes to future events, imagined or planned, did not really modify the way the events were perceived and rated, alternative versions of memories received lower phenomenological rating than their original events.

Once again, following what we did previously, we combined the difference scores from the items in each factor of Part 1 to create Difference-factor scores. Univariate ANOVAs showed a main effect of condition for the Autonoesis factor, $F(2, 48) = 14.56$, $p < .001$, $\eta^2 = .27$; the Scene-Construction factor, $F(2, 48) = 3.71$, $p = .032$, $\eta^2 = .10$; and the Visual-Perspective factor, $F(2, 48) = 5.09$, $p = .001$, $\eta^2 = .16$; but not for the Optimism Bias factor,

Table 4
Averaged Factor Scores of Alternative Events as a Function of the Condition

	Past		Future			
	Counterfactual thinking		Prefactual imagining		Prefactual planning	
Factors	*M* (*SD*)	95% CI	*M* (*SD*)	95% CI	*M* (*SD*)	95% CI
Autonoesis factor	3.22 (.76)	[2.79, 3.66]	4.12 (1.18)	[3.69, 4.56]	4.30 (.63)	[3.87, 4.74]
Scene-Construction factor	4.51 (.99)	[4.10, 4.92]	4.56 (.70)	[4.15, 4.97]	4.80 (.80)	[4.39, 5.21]
Visual-Perspective factor	4.63 (1.43)	[4.00, 5.27]	5.34 (1.43)	[4.70, 5.98]	5.80 (1.01)	[5.16, 6.44]
Optimism-Bias factor	4.18 (.74)	[3.85, 4.52]	4.65 (.67)	[4.32, 4.99]	4.73 (.65)	[4.40, 5.07]

$F(2, 48) = 0.01$, $p > .999$. The significant effects can all be considered relatively large (Cohen, 1988). Post hoc Tukey's tests indicated that in all three cases, counterfactual changes produced factor scores relatively lower than their original event, whereas both types of prefactual changes (imagined and planned) produced factor scores relatively similar to their original counterpart (see Table 5). Therefore, our results show that compared with the phenomenology of memories, thinking of alternative versions of past events led to a reduced feeling of traveling back in time and experiencing the events clearly, creating counterfactual events with less visuospatial details and less seen from a Field Perspective. However, original and alternative future events, whenever imagined or planned, had similar phenomenological characteristics.

Effect of type of change (location, person, emotion) on Difference-factor scores. Finally, we examined the impact of the type of counterfactual or prefactual change on our Difference-factor scores. As each participant provided three alternative events, which were therefore not independent, we analyzed our data by nesting the three events under participants. We ran multilevel linear models with condition and type of change as fixed events, and with event order (first, second, or third event) nested under participants. The only element of interest here was the significant interaction between type of change and condition, which was for the Autonoesis factor, $F(4, 140) = 2.88$, $p = .025$. Planned contrasts revealed a difference between the three types of change for the counterfactual condition only. Thinking about how else a past event could have happened if it was with someone else or if it was somewhere else led to reduced feelings of experiencing the events in an emotional, coherent, and complex way. Yet, thinking of how else it could have happened if the overall emotion was of the opposite valence did not reduce the feeling of experiencing the event in such a way (see Figure 1). Our other types of changes had no impact on other results.

Discussion

Our first objective was to run a factor analysis to seek correlations between different characteristics that could indicate underlying component processes of autobiographical thinking. We extracted four principal factors from our questionnaire: an Autonoesis factor, a Scene-Construction factor, a Visual-Perspective factor, and an Optimism-Bias factor. Together, they explained 53% of the total variance. These four factors are consistent with existing concepts in past- and future-thinking literature. The importance of autonoetic consciousness in retrospection and prospection has been widely discussed (for a discussion, see Klein, 2016), and it is not surprising that feelings of (p)re-experiencing events and mental time travel correlate with the vividness and intensity of emotion elicited by the event. Our Scene-Construction factor fits nicely with the scene-construction hypothesis (Hassabis & Maguire, 2007), but also with the constructive episodic simulation hypothesis (Schacter & Addis, 2007a). Participants rated their visuospatial details as clearer when similar events had often occurred in the past. Moreover, the scene-construction process seems to be a complementary to but separate process from autonoetic consciousness. Our third factor was composed of our Perspective scales only. Past research has shown that the use of Field or Observer Perspective depends on individual dif-

Table 5
Averaged Difference Factor Scores Between Original and Alternative Events as a Function of the Condition

	Past		Future			
	Remembering–counterfactual thinking		Imagined–prefactual imagined		Planning–prefactual planning	
Factors	*M* (*SD*)	95% CI	*M* (*SD*)	95% CI	*M* (*SD*)	95% CI
Autonoesis factor	.99 (.94)	[.72, 1.25]	.06 (.93)	[−.21, .32]	.20 (1.02)	[−.06, .47]
Scene-Construction factor	.68 (1.00)	[.39, .97]	.25 (.87)	[−.04, .54]	.16 (1.06)	[−.13, .45]
Visual-Perspective factor	1.12 (1.56)	[.57, 1.67]	.12 (1.82)	[−.42, .67]	−.01 (1.35)	[−.56, .54]
Optimism-Bias factor	.36 (1.54)	[−.07, .79]	.37 (1.47)	[−.06, .79]	.33 (1.68)	[−.10, .75]

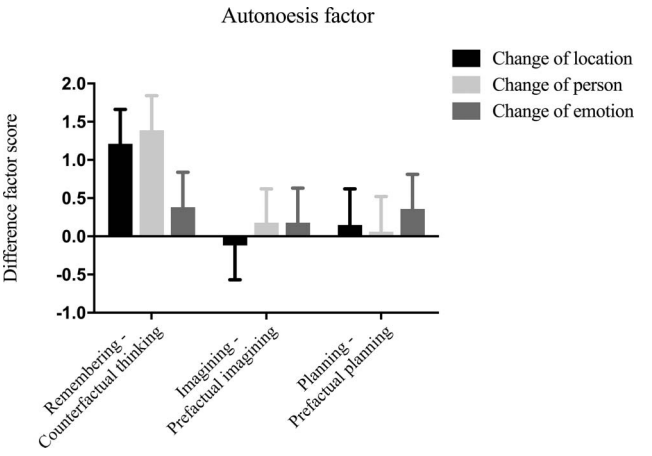

Figure 1. Difference factor scores for each factor as a function of condition.

ferences or on the type of events (McDermott et al., 2016; Rice & Rubin, 2009), or might be dependent on whether participants focused on the experience of the event or the coherence of the event with the self (Libby & Eibach, 2011). Hence our results might be indicative of these individual and event-specific differences that do not correlate with other phenomenological characteristics. Finally, our last factor was somewhat unexpected, but corresponds to the literature on Optimism Bias (Schacter & Addis, 2007b; Sharot, 2011; Weinstein, 1980). In accordance with this, participants rated events that they believed would occur often in the future as being more positive. Together, our four factors encompass important themes relevant to the literature on retrospection and prospection.

Our second objective was to examine the phenomenology of a range of autobiographical events. In Part 1, participants rated their subjective experience similarly, regardless of whether they remembered past events, imagined future events, or planned future events. The lack of reliable differences across conditions was partially unexpected. Previous research on phenomenological characteristics generally has revealed differences between past and future thinking, especially for sensory details (e.g., Addis et al., 2009; D'Argembeau et al., 2010; D'Argembeau & Van der Linden, 2004, 2006; De Brigard & Giovanello, 2012; McDermott et al., 2016). However, these findings were not systematically found across all studies. Differences between retrospection and prospection often depended on the design of the experiment and usually had a small effect size. Furthermore, most studies used a within-subjects design, which allowed participants to directly contrast their phenomenological ratings of past events with future events, and vice versa. As our experiment used a between-subjects design like Arnold et al. (2011), participants completed one condition only and, consequently, may have lacked a comparison baseline. Most generated events also were relatively mild and common and thus received ratings in the middle range of our scale. Differences may be thus more likely to arise when people make explicit comparisons between conditions.

In Part 2, phenomenological characteristics of counterfactual events received lower ratings than phenomenological characteristics of prefactual events, imagined and planned, and mainly for items loading onto our autonoesis factor, with a relatively small effect size. This finding goes against our initial hypothesis, however analyses of the changes between Part 1 and Part 2 provide some explanations. We believe these results were driven by initial differences between memories and counterfactual events when compared within-subjects. Similar to past studies (De Brigard & Giovanello, 2012; De Brigard et al., 2016), counterfactual events received lower ratings on factor scores representing autonoesis (especially after changes of person or location), scene construction, and the use of field perspective. On the other hand, and as hypothesized, modifying the way a future event

could happen did not impact the way the event was perceived and constructed. This divergence between counterfactual and prefactual thinking suggests that the future is not set in stone and that we can generate multiple versions of a single event, which could have an adaptive function (Schacter, Guerin, & St. Jacques, 2011). This hypothesis also aligns with recent theories on predictive coding (Clark, 2013; Donnarumma, Costantini, Ambrosini, Friston, & Pezzulo, 2017) by providing us with the tools to test or anticipate the future to make informed decisions. But the past is not as flexible as it is constrained by reality (Schacter et al., 2015), and even if we can create alternative versions of what could have happened, there is a different phenomenological feel to remembered events as they have been experienced (Debus, 2014). Incidentally, the belief that positive events will occur more often in the future is not affected by counterfactual or prefactual changes.

The similar ratings between retrospection and prospection in Part 1, combined with the phenomenological changes experienced between memories and counterfactual thoughts, indicate that participants used their first event as a baseline to evaluate their subjective experience. In other words, our findings point to the fact that phenomenological judgments of retrospection and prospection are not absolute but relative to previous judgments and experiences. We can find a similar consideration in what has been called the "reference-group effect" in cross-cultural comparisons, where researchers have noted that "Likert scales capture one's feelings relative to a comparison group or shared norm, but they do not provide a context-free assessment of one's absolute standing" (Heine, Lehman, Peng, & Greenholtz, 2002, p. 905). Yet, our results show that even within the same culture, reports of subjective experiences might be relative to what they are compared with.

The phenomenological differences usually found between memories and future thoughts tend to be of a small magnitude. Thus, we cannot say if they are simply not detectable in a less powerful, between-subjects paradigm or if they are due to what Arnold et al. (2011) called "naïve theories of how the vividness of future events and memories . . . *should* vary" (pp. 955–956). What is clear, however, is that, methodological designs created to compare the phenomenology of different types of autobiographical thinking have to be carefully devised. When comparing across subjects, scientists run the risk of creating a "lack of base rate bias," whereas when comparing within subjects, scientists run the risk of creating intricate order effects where the first event generated becomes the baseline against which the others are compared to.

Finally, we should acknowledge some limitations to our study. The first limitation lies in our limited sample size, especially with regards to the within-subjects comparisons, making our study exploratory to some degree. Sample sizes in previous similar studies have varied considerably, ranging from as few as 16 participants to more than 100, depending on the difficulty of the procedure. Taking into account the length or our testing session, which included multiple oral descriptions of events, we settled on 51 participants. We also requested three events per participant, which slightly increased our power. The medium to large effects sizes we found when comparing counterfactual changes with prefactual changes also indicate that our sample was powerful enough. However, future researchers should try to replicate our findings with a larger sample size.

The imposed constraints on the time of the events created another limitation. Because of the nature of our participant sample (composed mainly of first year psychology students), past events were usually set at a more recent time than future events. However, we might have expected this difference in temporal distance to increase the differences between past and future thinking instead of reducing them, as near events tend to be better remembered or imagined than distant events (Conway & Loveday, 2015; D'Argembeau & Van der Linden, 2004). Yet this is not what we found as the effect of temporal distance was ruled out in our statistical analyses.

The last shortcoming of this study relates to our suggested changes for alternative versions. As our results did not generally show an effect of the type of change on our analyses (aside from the impact on our Autonoesis factor), this diversity of changes might have weakened some of our findings. More specifically, changes of location and person could either result in extreme changes (a trip to India is not the same as a trip to Antarctica), or in insignificant ones (going to a birthday with my friend Annie or my friend

Jane). It seemed that the change of emotion brought the most consistent changes to past and future events. Future researchers could investigate the impact of different types of changes on the way people think retrospectively or prospectively.

In summary, we found that autobiographical events combine features of autonoesis and scene construction, allowing us to project ourselves and experience the event in subjective time while constructing a mental representation that is visually and spatially clear. Yet the perspective we take when thinking about these events is independent of these other variables. Finally, we tend to associate events that are likely to happen in the future with positive emotions.

Together, our findings indicate that we construct diverse forms of autobiographical events with similar underlying features, yet there are some differences in the phenomenology of retrospection and prospection. If prior studies have shown that memories tend to be experienced with more sensory details and a clearer visuospatial context than imagined future events, we found that this difference only appears when participants make direct comparisons between the different types of autobiographical thinking. Furthermore, past and future hypothetical events have a different relation to reality. Because of its connection to a "true event," counterfactual thinking is constrained to a certain degree by the reality of what happened (Epstude & Roese, 2008; Schacter et al., 2015), which leads us to subjectively experience the representation of counterfactual events less vividly and less clearly than memories. Yet, the future is infinite in its possibilities, making it easy for us to construct and experience multiple versions of possible future events.

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Received November 7, 2017
Revision received March 2, 2018
Accepted April 14, 2018 ■