

Why life should flash before one's eyes: episodic memory and a hypothesis arising from the recognition-primed decision model

Alexandre Linhares (linhares@clubofrome.org.br)
Getulio Vargas Foundation, EBAPE/FGV, Praia de Botafogo 190
Rio de Janeiro, RJ 22250-900 Brazil

Eric P. Nichols (epnichol@cs.indiana.edu)
Center for Research on Concepts & Cognition, Indiana University
Bloomington, IN 47401 USA

John Paxton (paxton@cs.montana.edu)
Computer Science Department, Montana State University
Bozeman, MT 59717 USA

Abstract

The English expression "I saw my entire life flash before my eyes" has counterparts in a large number of different cultures and languages. This expression refers to a phenomenon in which, when facing a dangerous, unexpected situation, would bring distinct, different, fragments of memory from different phases of one's life to one's mind. While at first it may seem to be an almost certain impossibility, as such a phenomenon does not seem to confer any evolutionary advantage to those who would go through such a seemingly random process, we propose that there is a sound basis in cognitive psychology to expect such phenomenon to be true. We present a hypothesis, based on the recognition-primed decision model, which may bring a plausible explanation to the reported phenomena of "life flashing before one's eyes". To our knowledge, this phenomenon has not been properly addressed in the literature, and it is our hope that readers may find our hypothesis cogent.

Introduction

"My whole life flashed before my eyes" (English)
"زندگیم در یک لحظه از جلوی چشمهایم گذشت" (Persian)
"A vida passou diante dos meus olhos" (Portuguese)
"Mi é passata tutta la vita davanti agli occhi" (Italian)
"Zendegiam dar yek lahzeh az joloyeh Cheshmhayam gozasht" (Latin Script)
"Вся жизнь промелькнула перед глазами" (Russian)
"Mein ganzes Leben passierte Revue" (German)
"Mie mi-a trecut toata viata prin fata ochilor." (Romanian)
"Livet passerte i revy foran øynene mine." (Norwegian)
"Toda mi vida me pasó delante de los ojos" (Spanish)
"Livet passerade revy framför mina ögon" (Swedish)
"Wa mana shereet hayaty endance raayt al mawt beayny" (Arabian)
"Het leven aan je voorbij zien gaan" (Dutch)
"J'ai vu toute ma vie défiler" (French)

Why should so many languages with so many distinct roots have such a similar phrase? This expression refers to a phenomenon in which, when facing a dangerous, unexpected situation, would bring distinct, different, fragments from different phases of one's life to one's mind. Perhaps, one might suppose, it is just a curiosity, and the explosion of telecommunications of the last century enabled such a phrase to rapidly spread through many different cultures and find analogues in their languages. This meme-spreading explanation is a plausible one, after all, since a number of clichés have indeed spread throughout the world's languages (i.e., "É a vida"; "C'est la vie"; "That's life", and so forth).

There is, however, the intriguing possibility that this is not the case when one mentions having seen their "entire life flash before their eyes". It is possible, in fact, that they are reporting a psychological phenomena which cries out for explanation. While at first it may seem to be an almost certain impossibility, as such a phenomenon does not seem to confer any evolutionary advantage to those who would go through such a seemingly random process, especially during time-pressured emergencies. What good could it do to go through random phases of one's life during a life-threatening emergency, a skeptic might ask? Under such light, the possibility of a universal human phenomenon seems virtually null.

But perhaps such a behavior might exist, even if it seems to be hopelessly unadaptive. Such an 'sub-optimal' behavior might arise just as our species' tendency to over-indulge in fats and sugar: a byproduct of an adaptation which conferred enormous advantage to humans during the course of our species evolution. It is possible that adaptive psychological mechanisms that provide enormous evolutionary advantages also provide flashes of random memories during specific circumstances.

We do propose that there is a sound basis in cognitive psychology to expect such a phenomenon to be true, and we would like to propose, based on recent developments in naturalistic decision-making, that life not only does indeed flash before one's eyes, but that it must necessarily occur if a recent theory of naturalistic decision-making, named 'recognition-primed decision', reflects psychological truth. We propose such a phenomenon follows strictly from the mechanisms proposed in recognition-primed decision. We may start the discussion by briefly reviewing

The recognition-primed decision model

Naturalistic decision-making

The recent field of naturalistic decision making stands as a new, alternative model of study of decision-making. It bears contrast to both the classical model of rational choice and to the program of heuristics and biases.

The classical model of rational choice and optimization which has been the basis of studies in economics (for instance, in game theory), management science and operations research (in for example mathematical programming models), and in artificial intelligence (the symbols and search paradigm), proposes a set of standard, quantitative, methods in order to 'rationally' select a choice. Under this theory, the decision-maker (i) identifies a set of options, (ii) identifies ways of evaluating these options, (iii) weighs each evaluation dimension, (iv) calculates a rating of each option, and, finally, (v) selects one with the maximum score. Note that this model implies that, in order to have a number of choices to choose from, one must first have (i) perceived a problem, and (ii) perceived a set of alternative choices. The rational model will deal only with the phase of (iii) selecting one choice from the set.

Despite its widespread use in a number of distinct areas, the rational choice model has not found to be psychologically plausible, for a number of reasons (Plous, 1993). One of the reasons is that the chosen alternative depends on how decision-makers initially frame a problem (Kahneman and Tversky, 1979). There has been strong criticism of the rational choice model from the heuristics and biases research program, in which problems are carefully devised to show that one's intuitions generally depart from the expected optima, and are generally inconsistent. A large number of biases which depart from the 'rational choice' have been found (see, for instance, Plous, 1993), placing great strain on the traditional rational actor doctrine.

Yet the heuristics and biases studies are concentrated on carefully devised questionnaires applied mostly to undergraduate students. Thus a new field of naturalistic decision-making emerged, in which the focus is centered around real life settings, decisions being made under rapidly changing circumstances. A number of studies have been conducted, from firefighters to nurses to chess players to

military personnel. One of the most interesting theories to emerge from naturalistic decision-making, the recognition-primed decision model, was devised by Gary Klein and his colleagues (Klein, 1999).

Recognition-primed decision

Consider the following cases:

EXAMPLE #1. The Cuban World Chess Champion José Raúl Capablanca once remarked about his personal, subjective, experience: "I know at sight what a position contains. What could happen? What is going to happen? You figure it out, I know it!" In another occasion, talking about the numerous possibilities that less-skilled players usually consider on each board position, he bluntly remarked: "I see only one move: The best one." Perhaps the reader may think that Capablanca was quite simply being arrogant. But there is evidence to the contrary, that expert decision-makers actually are biased towards very high quality choices. We believe that, in fact, Capablanca was telling us an important fact about expert human psychology and decision-making, which would later be documented in recognition-primed decision studies.

EXAMPLE #2. A baby at an infirmary suddenly turns blue. Within seconds, a nurse has a diagnosis and a potential action. In this case, the nurse thinks the baby has a pneumopericardium, which means the sac surrounding the baby's heart is inflated with air, and the resulting pressure detracts from the heart's pumping of blood. There is a problem with this diagnosis, though. The electrocardiogram is showing a healthy 80 beats per minute. If nothing is done, the baby will die within a few minutes. The doctor walks into the room to find the nurse screaming for silence and listening to the baby's heart with an stethoscope. She is now sure of her diagnosis, and she gives the doctor a syringe: "stick the heart, it's a pneumopericardium, I know it". Given the electrocardiogram, other nurses are skeptical, until the x-ray operator screams out: "she's right!". Her intuitive diagnosis saves the baby's life.

Klein (1999) conducted a series of studies with decision-makers under rapidly changing scenarios. During interviews, when questioned how a specific decision (or course of action) was adopted, decision-makers such as the nurse would proclaim, to Klein's frustration, that they "did not make decisions". One experienced firefighter proclaimed "I don't make decisions--I don't remember when I've ever made a decision" (Klein, 1999, p.10). Decision-makers did not seem to be comparing alternative courses of actions, as classical models would predict. "It is usually obvious what to do in any given situation" (p.11). Repeated statements of the sort by different decision-makers led Klein to propose a psychologically plausible model of decision-making which radically departed from the established view of "comparing alternatives and selecting the optimum".

Klein (1999) proposed a model of recognition-primed decision, in which experienced decision-makers would find themselves immersed in complex situations and rapidly take adequate courses of action. Decision-makers would rapidly perceive cues from any situation and retrieve from episodic memory similar situations (Tulving 1983), which would bring assessments and diagnoses and plausible courses of action. Because priming mechanisms are automatic and unconscious (Bargh and Chartrand 1999, Bargh et al 2001), these decision-makers reported doing "the obvious" action in different situations. This "obvious" course of action, Klein proposes, is brought from long-term episodic memory by priming mechanisms. Hence, decision-makers would not be selecting among distinct alternatives, but rather simply performing the automatically-provided action.

Even if the "obvious" action seemed plausible for a theory, another problem remained: if decision-makers did not compare alternatives, then how could they know that a course of action was good? In subsequent interviews, evidence emerged that decision-makers would be using the simulation heuristic, proposed by Kahneman and Tversky (1982). That is, facing a particular situation, experienced decision-makers would be primed towards a particular course of action, to the detriment of most alternative courses of action. This primed alternative would be 'simulated', or 'run through', one's mind, and, if found acceptable during the simulation processing, would be acted upon without further deliberation. If problems emerged during mental simulation, another different course of action would be primed. Thus was born a theory of intuitive decision-making, in which experienced people would not be selecting choices from a vast set of alternatives, but instead 'testing' their initially primed predispositions with a simulation heuristic.

This model, of course, applied only to expert decision-makers with years of experience. It involves access to a large episodic memory in order to rapidly retrieve a suitable course of action. This was initially found surprising by Klein: "Before we did this study, we believed the novices impulsively jumped at the first option they could think of, whereas experts carefully deliberated about the merits of different courses of action. Now it seemed that it was the experts who could generate a single course of action, while novices needed to compare different approaches." (1999, p.21)

Because priming mechanisms that brought plausible actions to mind are unconscious, people would report having "done the obvious thing to do". Decision-makers would be unable to visualize the cognitive processes underlying their decisions, and would in many cases even believe that they had skills of the "fantastic" variety: One firefighter demands that his whole crew abandon operations inside a house, just to see it collapse seconds afterward. A radar operator would 'chill' after spotting a new track, and would fire counter missiles against it, based on the 'feeling' that it was a hostile missile. It took over a year for this radar operator, after being interviewed by Klein, to understand the

incredibly subtle cues that he was responding to whenever he perceived the new radar track. Unable to reasonably explain their life-saving, rapid, decisions, both the firefighter and the radar operator thought that they had ESP or other fantastic abilities. Careful probing would show that they were able to unconsciously perceive subtle cues, which primed them towards adequate responses.

Why life should flash before one's eyes

We may now discuss our original question: Is there a theoretical reason as to why "life might flash before one's eyes"?

We propose so, under the following reasoning. Assume Klein's (1999) proposal is an accurate model of human intuition. A decision maker such as an experienced firefighter is confronted with a particular situation, and, within very brief moments, is primed with a course of action. This course of action is then 'run through' the firefighter's mind, and, if acceptable, is promptly acted upon. The firefighter is unable to report which cues from the situation primed such response; and their report is simply that "it just seemed like the obvious thing to do in that situation".

Consider now a person facing a complex, unexpected, emergency situation, such as suddenly finding themselves threatened with a gun. If Klein's model is correct, what should we expect from that person's perspective?

As the situation is dealt with, some cues should prime an option for action, brought from previous "similar" cases. Since the notion of similarity is complex and subtle, involving subcognitive mechanisms of analogy-making, it is possible that memory retrieval mechanisms would obtain, at times lacking a proper set of precedents, a number of irrelevant courses of action (Hofstadter and FARG 1995, Linhares 2005, Linhares and Brum 2006). Each option, rapidly retrieved from episodic memory, is 'tested' in a mental simulation phase, and found inadequate. Episodic memory should not contain "similar" experiences to the one at hand, thus there is no reason to expect the relevance of such retrieved memory to be high, and the ensuing mental simulation has, therefore, a high probability of encountering problems when confronted as a solution to the task at hand. In such case, a different course of action for the situation at hand should be primed.

Other primed actions are subsequently retrieved, and each one in turn, after being processed by a simulation heuristic, is discarded. If the emergency scenario retrieves irrelevant (or low relevance) potential actions, there is reason to expect that they will be subsequently discarded after processing by a simulation heuristic. Thus a sequence of episodes is retrieved, potential actions are simulated, and rejected for another episode and action. Consider that the episode in question is truly unusual, in the sense that a large number of primed potential actions are considered and

subsequently discarded by a simulation heuristic as irrelevant for the problem at hand.

As inadequate responses are retrieved, the retrieval process may also get increasingly more frantic. As more and more simulated solutions fail, a parameter of "relevance", or situation-similarity, may be turned up to allow more and more episodes to be considered. In other words, as the "normal" sort of solutions keep failing, an inner gauge notices the repeated failures, and starts allowing more and more new ideas in rapidly as the situation becomes ever more critical. Thus the entire life-flashing-before-eyes phenomenon may occur when this parameter passes a critical setting and the floodgates are opened to let basically everything -- a large number of episodes or episode fragments -- through at once. This is tantamount to a retrieval "temperature knob" used in active symbols architectures (Hofstadter and FARG, 1995; Linhares, 2005). Since there is, of course, a significant difference between a person's own life being at stake and a less attached decision situation, in the former case there may be pressure to "turn the knob all the way to one side in desperation", letting a large set of the memories through. (An analogy might be an inexperienced driver, losing traction and skidding on ice, who cranks the wheel all the way to one side in desperation instead of turning the wheels more gradually to regain traction. The internal episode-primer-retriever does not have much experience with the particular life-or-death situation at hand and lets too many episodes into memory, every though it is as useless as cranking the wheel all the way to one extreme.)

After undergoing such a process, what kind of report is to be expected from a person?

It would be not only reasonable, but actually expected, for people to report having seen random fragments of their lives in succession (as rapidly brought from episodic memory and discarded). Moreover, because the mechanisms postulated are automatic and unconscious, people would be unable to know the reasons for each particular image, situation, or action; people would not be able to report which cues of the situation triggered which memories, and hence reports should not be expected to exceed in detail the idea of 'random memories retrieved successively in one's mind'. Thus, what might initially appear as an esoteric, non-adaptive possibility might actually have a sound basis in human cognitive mechanisms.

Conclusion

From Persian to Dutch to Portuguese to Arabic and to Russian, the English expression "I have seen my entire life flash before my eyes" holds counterparts in a large number of different cultures and languages. This expression refers to a phenomenon in which, when facing a dangerous, unexpected situation, one would retrieve different fragments of memory from different phases of one's life to one's mind. While at first it may seem to be an almost certain

impossibility, as such a phenomenon does not seem to confer any evolutionary advantage to those who would go through such a randomly-seeming process, we propose that there is a sound basis in cognitive psychology to expect it to be true. We present a hypothesis, based on Klein's (1999) recognition-primed decision model, which may bring a plausible explanation to the reported phenomena of "life flashing before one's eyes". This is the first explanation of such phenomenon stemming from the decision-making literature, and it is our hope that readers may find this hypothesis cogent. Further research is aimed at developing experimental settings to test the hypothesis.

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