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ONE-SHOT SYNESTHESIA

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Abstract

Synesthesia is commonly thought to be a phenomenon of fixed associations between an outside inducer and a vivid concurrent experience. Hence, it has been proposed that synesthesia occurs due to additional connections in the brain with which synesthetes are born. Here we show that synesthesia can be a much richer and more flexible phenomenon with a capability to creatively construct novel synesthetic experiences as events unfold in people's lives. We describe here cases of synesthetes who occasionally generate novel synesthetic experience, called one-shot synesthesias. These synesthetic experiences seem to share all the properties with the classical synesthetic associations except that they occur extremely rarely, people recalling only a few events over the lifetime. It appears that these one-shots are not created at random but are instead responses to specific life events. We contrast the properties of those rare synesthetic events with other, more commonly known forms of synesthesia that also create novel synesthetic experiences, but at a high rate—sometimes creating novel experiences every few seconds. We argue that one-shot synesthesias indicate that synesthetic associations are by their nature not prewired at birth but are dynamically constructed through mental operations and according to the needs of a synesthetic mind. Our conclusions have implications for understanding the biological underpinnings of synesthesia and the role the phenomenon plays in the lives of people endowed with synesthetic capacities.

Keywords

• Synesthesia • Ideasthesia • Semantics • Experience

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1. Introduction

Synesthesia is commonly thought to be a phenomenon of fixed associations. For example, a most common form is a letter to color synesthesia. For example, letter "A" would be associated with red color. These associations are consistent over lifetime and repeatedly occur each time when a letter is perceived. For those reasons, it has been proposed that synesthetic associations are determined already at birth, and thus, that it is something that cannot be changed any more over lifetime e.g., [1]. In this view, synesthesia has been seen as an aberrant form of brain functioning. The proposed physiological explanations include incomplete pruning of synaptic connections [1,2] and disinhibited feedback [3].

There are however, reasons to believe that this view of synesthesia is not correct, or at least partly incorrect. This is because meanwhile, much evidence has been accumulated that synesthesia has to do with the process of extracting meaning of the stimulus [4-9] and that synesthetic associations are created through the process of learning, mostly when dealing with abstract concepts [10]. These hypotheses explain for example, why the most common forms of reported inducers in synesthesia are *graphemes* (e.g., letters, numbers) and *time units* (e.g., weekdays, months in a year); graphemes and time-units are about the first abstract concepts that children are faced with through the educational systems [11]. Also, empirical evidence has been provided that synesthetic associations can be created for novel stimuli in a directed way in laboratory conditions simply by imposing a given meaning to the stimulus [7].

As a consequence of those results, it has been proposed that the very name of the phenomenon—*synesthesia*—is fundamentally misleading, as this term is a compound from Ancient Greek words *syn* for union and *aesthesis* for sensations, meaning a *union of senses*. Instead, a more correct name for the phenomenon would be *ideasthesia*, from the Ancient Greek word *idea* standing for concept. Ideasthesia then means *sensing concepts* [12]. Thus, synesthesia may be a phenomenon of producing vivid concurrent experiences during activation and manipulation of concepts.

These considerations have lead us to address in the present study a unique set of phenomena reported by synesthetes that do not seem to have received much attention by synesthesia researchers so far. Synesthetes often report that they have synesthetic experiences that do not repeat reliably and frequently throughout life. Rather, some synesthetic experiences seem to occur extremely rarely, or only once in their lives—for as far as they can remember. We refer to those as *one-shot synesthetic experiences*.

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If existence of those synesthetic experiences can be established as a psychological phenomenon, it would be difficult to explain those experiences as resulting from predefined fixed associations between a given stimulus and given concurrent with which the synesthetes would be born. Instead, these mental contents are more likely to result from ongoing mental processes, which may be taking place 'on the spot' – i.e., just preceding the moment of experiencing those synesthesias.

We describe here cases of four synesthetes reporting one-shot synesthesias. Each person has a different story and describes different circumstances under which she or he observed these unique synesthetic experiences. Nevertheless, all the subjects seem to have one thing in common: they report having full-fledged synesthetic experiences each of them having occurred just once. Besides being unique, these experiences have been often intensive and surprising. For those reasons synesthetes formed long-lasting memories of those events so that they could tell us about them. According to their reports, these synesthesias could be often attributed to intensive mental processes that preceded the synesthetic events. Sometimes these experiences left the subject wondering why these synesthesias occurred and what they really meant.

We contrast those one-shot synesthesias with one other class of synesthetic experiences that also produces a novel type of concurrents but takes place continually repeating multiple times each day and hence, can be considered *high-production synesthesia*. We explain why high-production synesthesia and one-shot synesthesia are likely to be two considerably different phenomena.

2. Methods

There is clearly a methodological limitation in studying one-shot synesthesia from an objective third-person perspective. The common forms of synesthesia, such as grapheme-color, are already tricky enough to prove with objective methods. Synesthesias that occur just once in a lifetime or very rarely, and take a unique form for each person, are even more difficult to study with objective methods. For those reasons, here, we must rely heavily on subjective reports about such synesthesias. Nevertheless, it was possible to ensure a certain level of scientific control of those reports. First, we searched extensively through the known circles of synesthetes until we found several subjects reporting similar phenomenon, to increase our confidence that one-shot synesthesia is a general phenomenon within a population, occurring to multiple people. Unfortunately, we do not have a large enough sample to accurately assess the prevalence of one-shot synesthesia among synesthetes. However, based on our experience we estimate that, as the lower limit, at least one out of hundred synesthetes can report also one-shot experiences.

We base our conclusions only on the properties that are shared among our subjects. Second, we contrast the descriptions of one-shot synesthesia with descriptions of synesthesias that also create novel concurrents but are highly productive. This allows us to qualify the unique properties of one-shot synesthesia. Third, we made sure that all our subjects are well informed about the phenomenon of synesthesia also from a third-person perspective. All our subjects have read about scientific research on synesthesia, attended conferences on the topic, and often contributed themselves to the existing literature (e.g., [13, 14]). That way we ensured that their experiences, although reported subjectively, have been assessed and reported based on a certain level of academic expertise on that topic.

We collected descriptions from a total of four synesthetes reporting one-shot experiences and contrast them to reports of two synesthetes about high-production synesthesia. All of them gave consent to have their experiences documented. Interestingly, one of the high-production synesthetes had also a one-shot synesthetic event affecting her high-production synesthesia. In the following text we provide brief descriptions of all our subjects. In the appendix we provide more detailed descriptions kindly offered by some of our subjects.

In addition to free-form descriptions of their synesthesia, we asked the subjects to judge their experiences on a semantic differential having the following 10 dimensions: vivid-unclear, cheerful-sad, abstract-concrete, surprising-expected, intensive-mild, confusing-orienting, helpful-unhelpful, dynamic-static, worrisome-reassuring, and desirable-undesirable. The questionnaires were sent out through email. We asked each subject to complete the same questioner twice, which allowed us to assess the consistency of responses—i.e., test-retest consistency. The two questionnaires were sent at least one month apart and at the time of the first test the subjects were naïve to the fact that they will be tested for a second time. Also, during the retest, they were instructed not to look up the responses from the first test.

As a measure of consistency, we first computed *d* for each dimension of the semantic differential by squaring the difference between first and second test. We then computed *D*, which is a square root of the averaged across all *d*'s. This gave us a consistency score for each subject.

3. Cases of one-shot synesthesia

3.1. Synesthetes who reported rare synesthetic events:

M.H.

I was waiting at the doctor's waiting room. As the doctor is a friend I was relaxed and calm. Suddenly a large terracotta-colored field occurred at the right side of my visual field. It was bright and shiny (see Figure 1). Suddenly it disappeared again. I knew that it stood for "friendship". I felt very good and relaxed after this synesthetic experience. I was released and happy. It never happened again.

The other experience was in December 2013. I bought a calendar. Afterwards, I perceived something like a formula "A = 4 – f". It gradually moved towards me. Like a flash! My feeling was okay, and I knew: This was the formula for the year 2014. Now I know what to do and how to prepare for this year. I was a little bit worried whether I could manage all that was demanded from me for that year.

A.D.

When I was writing my book on synesthesia and ideas and thoughts jumped around in

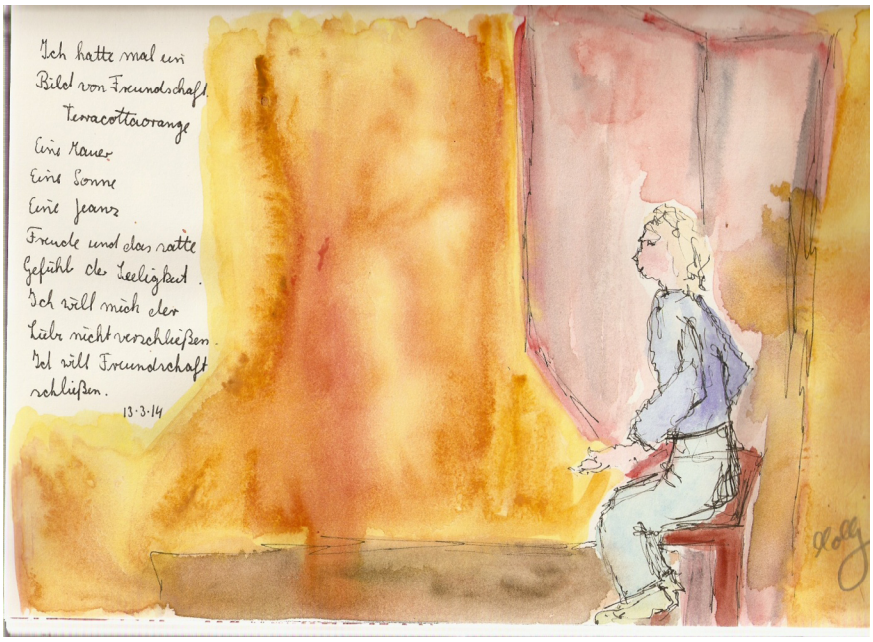

Figure 1. Graphical illustration of a one-shot synesthetic experience reported by M. H. The illustration shows the spatial position and extent of the synesthetic experience in relation to the position of the synesthete's body.

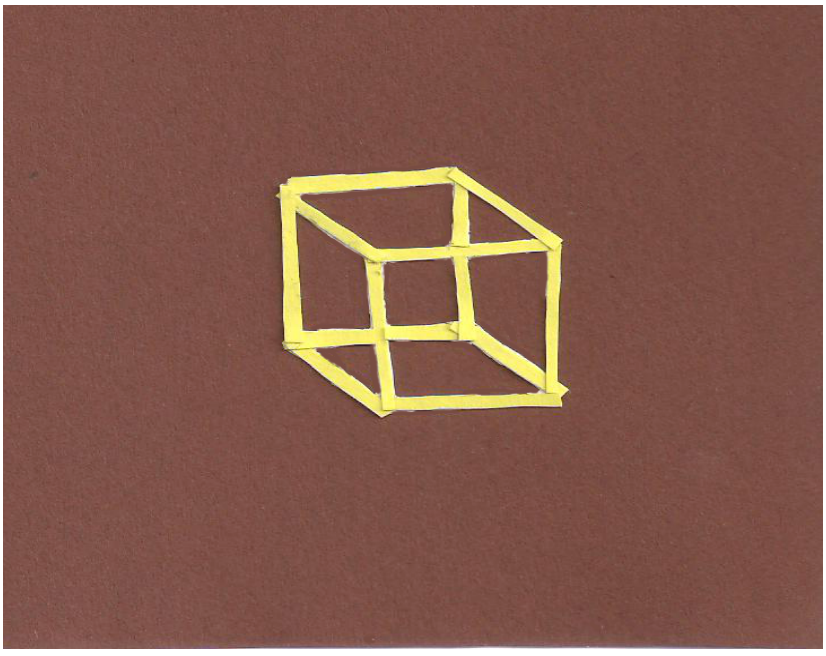

Figure 2. Graphical illustration of a one-shot synesthetic experience reported by A. K.—a yellow cube named *"Who is this person?"*

my head, very often I experienced geometrical forms. They occurred always hand-in-hand with unambiguous feelings like "Here is something missing.", "This is coherent.", "Over there, something does not fit together.", etc.

During the last 9 months of my life, often I had to make quick decisions that had far-reaching consequences (e.g., a decision on a medical treatment affecting the health of my father). In these moments those simple forms appeared again. They were synesthesias about various important feelings, such as: "This is correct.", "Still wait.", or "This is not coherent."

Every such synesthesia is unique. Nevertheless, I noticed certain regularities. For example, the colors of synesthesia related to feeling well are always in blue-green tones. And all synesthesias induced by my "gut instincts" always produce simple geometric forms. These forms were absolutely different from my other, more usual synesthesia.

A.K.

The first unusual synesthesia happened to me once when I was about to fall asleep:

A picture appeared at the left side of my visual field. It was a black and white abstract drawing. I knew it stood for a complex problem and gave me a hint on the answer to this problem. But I didn't know which problem this really was.

Another incident occurred during night. I woke up and I saw a yellow square located at the left side of my visual field. It was placed on a background painted in brown color (see Figure 2). Immediately, a question popped out in my mind. "Who is this person?" The entire strange event made me laugh loudly.

A third event occurred when I was thinking of my early childhood while driving a car. At that time the life circumstances were difficult for my mother and me. She had to ask other people to take care of me. While recalling memories of those events suddenly a blue image with a black structure appeared at the left side of my visual field. It was clear that this image represented me as a child. The blue color symbolized something frightening, but I did not know what. This surprised me because blue is my favorite color. The entire synesthetic event was unpleasant.

J.S.

I experienced a surprising form of synesthesia at one occasion when I had to make an important decision about my career and choose between different job offers. I refer to these events as my personal 'decision synesthesia'.

Analyzing one of the job offers I experienced a 3D shape that looked like a thin-walled shoebox with a narrow cylinder sticking out on its right side. The surface of the box and cylinder was white and non-transparent and it looked like

crumpled paper (see Figure 3). *I knew that the shape had a temporal dimension: The center of the picture was the present. The future was on the right side. This shape represented my gut feeling that this particular job offer would be great in the beginning, but in the long run I would feel confined, as if I was stuck in that narrow cylinder. The synesthesia told me that I should not accept this job offer; I declined.*

Another job offer that I considered in the same time looked like a hollow block of transparent glass in different shades of blue. The shape showed me that I would still be feeling sort of confined, as the shape did not take as much space in my visual field as it could have, and its walls were solid. But at least it looked nice. So for the moment, it was the best offer, and I accepted it – only to decline it four months later when the perfect offer emerged. I knew right away this offer was perfect. The accompanying synesthetic perception looked like a transparent layer with a star-like hole in the middle. Now, five years later, I have the confirmation through my career development that I made the right decision.

3.2. Synesthetes who report highly productive synesthetic experiences:

M.R.S.

Among other forms of synesthesia, I have a ticker tape stream of words that appear in my peripheral vision on the right side of my visual field. The ticker-tape of words literally spell out all my thoughts as they occur. This synesthesia is continuously present and accompanies all my conscious thoughts while I am awake.

I nevertheless had a highly unusual, memorable one-time synesthetic experience during a brief period in which my ticker tape synesthesia stopped working and changed in appearance. For the first time, my life-long, always present ticker tape of words got frozen, and the words themselves, while still visible, had become obscured by lavender squares that made the words impossible to read. This event only lasted several seconds, and was caused by a recent emotional trauma. Nevertheless, despite being so brief, this singular event was highly memorable – it was unforgettable. It was as if someone had temporarily stripped away my ability to see my thoughts and read them as they occur.

Although the running ticker tape returned to its normal state within several seconds, the effects of the trauma clearly altered the "functioning" of that synesthesia. The ticker tape of words had stopped working properly! The moving tape got stuck, and became unreadable, occluded by the lavender squares. It took six months until all of the functions of my ticker tape synesthesia were gradually restored.

T.F.

I experience synesthetic shapes that are 2-dimensional, colored and abstract. These shapes seem to be always present but most of the times very weak and thus, not noticeable. Only at certain moments the shapes are strong enough to fully prevent me from ignoring them.

Most of these visual experiences are unique and do not tend to repeat. I think this uniqueness has something to do with the uniqueness of the inducers, but also with my own unique mental states at the moments of synesthesia. Among other factors, the concurrent seems to be affected by my mood and how I experience a given moment of my life with all my senses.

In one situation I was listening to music, and in the meantime looking at a picture of an ensemble of black dots. Suddenly, I saw additional synesthetic shapes around these dots and synchronously to the music. These shapes appeared unpredictably. But I had the feeling that they made sense and fit well with the music, the picture I was looking at and my emotional impressions at this moment.

4. Semantic differentials

Subjects' reports in a form of semantic differentials, allowed us to compare quantitively the synesthetic experiences across the two groups, one-shot and productive. In addition, these measures allowed us to assess the consistency with which the subjects rated their experiences.

Subject turned out to be largely consistent in their responses. Overall, they exhibited a medium consistency with an average of D = 2.03. However, the distribution was highly skewed, as one outlier subject exhibited a very large D = 7.01 and only one subject exhibited a value close to the mean (D = 2.21). Everyone

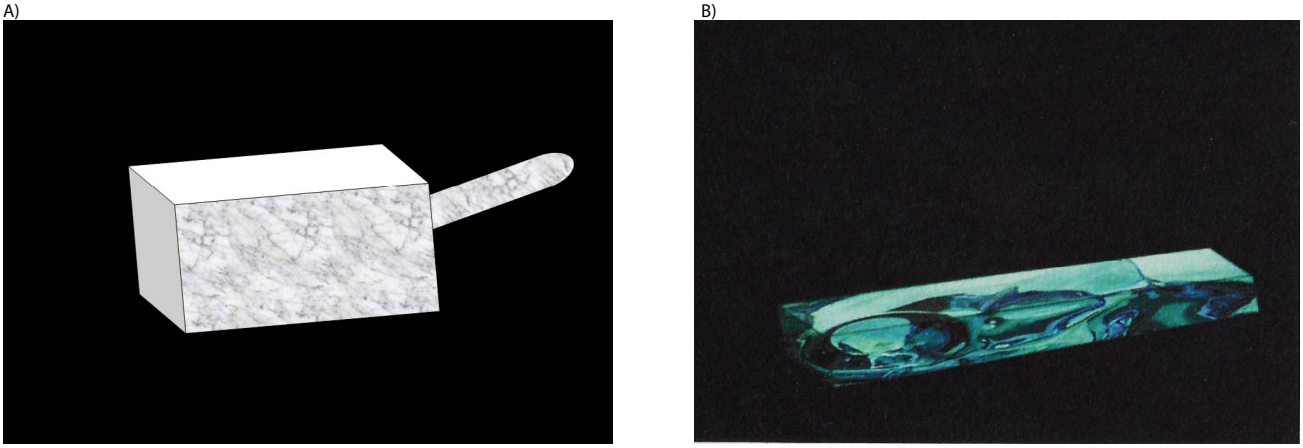

Figure 3. Graphical illustrations of one-shot synesthetic experiences reported by J. S. A) A shoebox with a narrow cylinder. B) A hollow piece of glass.

else had the value of D ≤ 1. Therefore, majority of subjects exhibited high consistency of reported experiences. Moreover, the outlier with a very large D was from the productive group, which meant that overall, the one-shot group was much more consistent than productive group (1.22 vs. 3.98, respectively). Although our sample size is too small to make generalizations to the populations, the results indicated that the responses of our synesthetes are for the largest part reliable i.e., consistent over time.

It is also interesting to compare the averages for the two groups, which are shown in Figure 4. While the profiles of the two groups were very similar, there were a few places that indicated differences. The following four dimensions indicated possible differences between the two groups: abstractness, intensity, dynamics and reassurance. The one-shot group seemed to find their synesthesias much more concrete than the productive group (1.25 vs. -2.5) and almost twice as surprising (-3.75 vs. -2). Moreover, the one-shot synesthesia are judged more than twice as static as the productive synesthesia (3.6 vs. 1.5), and much more reassuring (0.25 vs. 2.5). These results are generally consistent with what the subjects described in their free-form reports.

5. Discussion

Synesthesia has been studied usually from the perspective of lifelong fixed associations. This is understandable from the perspective of the needs to apply objective scientific methodology to investigations of the phenomenon. Phenomena not replicable in a lab are much more difficult, although not impossible, to study. In the present work, due to the very nature of one-shot synesthesia, the conclusions rely on the first-hand reports obtained from synesthete subjects. Thus, we rely on their judgment in distinguishing synesthetic associations from ordinary memory or from a simple mental imagination. There is a good reason to put the trust in their ability to detect reliably what is synesthesia and what is not. Namely, existing studies have shown high agreement between synesthetes' subjective judgments and objective measures of the presence of synesthesia [15, 16]. In addition, we made sure that our subjects were well informed about academic works on synesthesia.

The present findings suggest that consistent repeatable synesthetic experiences are only a part of the overall rich world of synesthesia. The present examples suggest that occasionally also one-shot synesthetic experiences occur. Apparently, synesthetic concurrents can be created for a single individual situation and that may be the only time when this person experiences that particular concurrent. These rare, one-shot events may occur multiple times in life, but each time a new concurrent is created—one that seems only suited for that particular situation.

When one-shot synesthetic concurrents occur, they seem to be short-lasting – often only a few seconds. Nevertheless, they seem to leave a strong impression on our subjects, probably due to the high novelty and surprise. Due to their high memorability, some of the subjects were able to illustrate graphically those concurrents after the one-shot synesthesia was gone.

Also, as we have seen from one example, just like synesthesia can be instantly created, an existing synesthesia can also be temporarily altered in a split second. In a single highly emotional event, a lifelong synesthetic routine can be altered for a brief period of time.

Contrasting one-shot synesthesia and high-production synesthesia

One-shot synesthesia, being a rare event, should be contrasted to high-production synesthesias. The two classes have in common a production

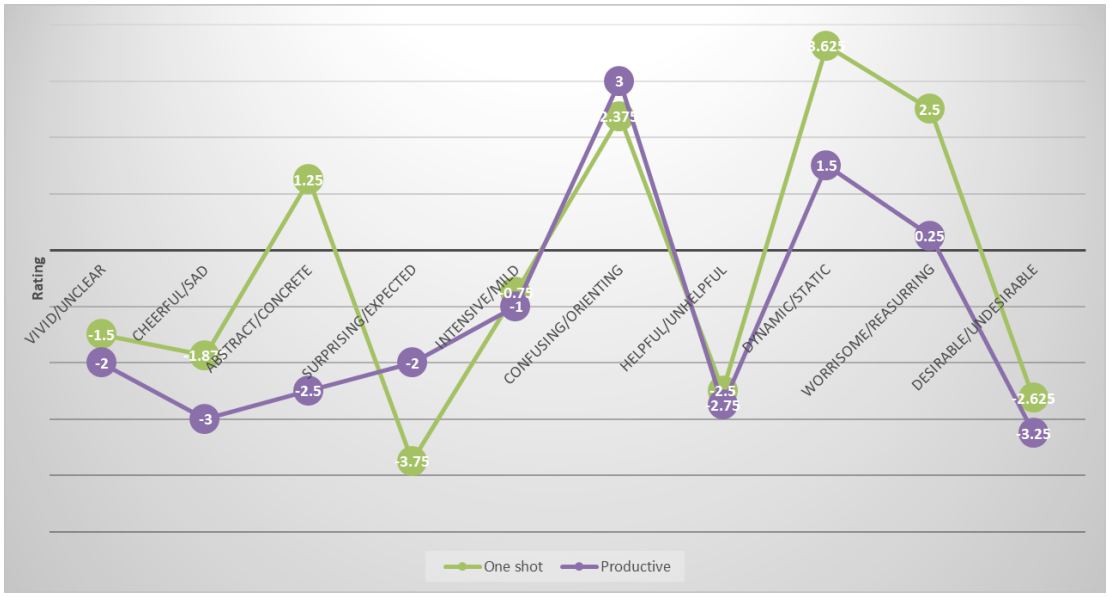

Figure 4. Average scores obtained on a semantical differential scale for two groups of synesthetes. For each pair of opposing poles (e.g., vivid/unclear) the left one is associated with negative values on the scale (e.g., vivid) and the right one with the positive values (e.g. unclear).

of novel concurrents. The descriptions of our subjects indicate that both forms create new visual concurrents in a form of colors, shapes and so on. There are however some differences. In one-shot synesthesia, it seems that at least in some of the synesthetes concurrents have not been selected from some existing pool of previously used types of concurrents. One-shot concurrents seem to take a new form. They are unlike any other synesthesias that these people experience regularly. In contrast, highly productive synesthesia seems to be strictly bounded within the limits of a single type of concurrents. That is, the concurrent remains consistently within the same 'modality'. High-production synesthesias do not produce surprises for their owners. In contrast, one-shot synesthesias are regularly followed by a surprise, interest, reflection, etc. Prior to the occurrence of one-shot synesthesias, our subjects did not expect those experiences to take place.

We propose that the difference between the two types synesthesia—one-shot and high-production—is related to the well-known distinction of cognitive phenomena into automatic processes on one hand (also referred to System 1) and controlled processes (referred to as System 2) [17-20]. Automatic processes are quick and effortless, and rely on skills that have been developed through extensive practice. Automatic processes can be executed without focusing much attentional resources. In contrast, controlled processes are slow and require effort, and require full engagement of attentional resources. Controlled processes engage usually in novel situations for which a person has not yet developed a set of skills. Controlled processes require a much higher engagement of thinking and problem-solving mechanisms than do automatic processes e.g., [19, 20].

When high-production subjects generate new synesthetic concurrents continuously – sometimes a new one every few seconds – the underlying mechanism seems to have the properties of automatic processes; the production of synesthesia does not seem to require much effort and, according to the reports, it appears that the subject can even focus their attention elsewhere and still synesthetic concurrents would be generated. Attention seems to be required only to bring these concurrents into the focus of mental experience, as these subjects seem to have a capability to decide consciously on the degree to which they will ignore or not ignore these synesthetic concurrents.

In contrast, one-shot synesthetic concurrents seem to be created as a result of an intensive mental work that has preceded those experiences. In most of the reported cases the subjects were able to identify the mental and psychological circumstances under which the experience took place. One-shot synesthesia occurred while our subjects were making decisions about a book structure, making a career decision, making plans for the future or reflecting on important life events in the past, and so on. All these circumstances have characteristics of controlled processes.

The difference between the two types of synesthesia, one-shot and high-production, can be also understood from a perspective of semantics vs. syntax. The novel concurrents of high-production synesthesia resemble, in their form, the highly productive generation of novel sentences using our language skills. By combining words according to well-established grammatical rules, we can quickly produce novel sentences, allowing us to express a seemingly infinite number of ideas [21] (Chomsky 1975). Similarly, high-production synesthesia seems to sample from a fixed set of elements of concurrents and combine them according to a fixed set of "rules" to produce novel combinations, reflecting a given sensory input or mental state. For example, if one knows what the current thought is, one can also guess what the content of the ticker tape synesthesia will be. Hence, high-production synesthesia seems to share some properties with natural language and seems to offer some sort of non-verbal language (mostly visual, in our cases). Unfortunately, this synesthetic "language" is not shared by anyone and cannot be used for direct communication with others. It only serves as a private inner speech of that person. The process of creating those synesthetic "sentences" can thus be described as relying to a high degree on syntax.

In contrast, the mental activity underlying one-shot synesthesia is more like an effort that results in a completely new thought or idea. This is a situation in which a solution to a mental problem is sought. One-shot synesthesia seems to be associated with the type of mental activity that is related to thinking, problem solving by insights and creativity. This synesthesia seems to be an integral part of that creative process and seems to assist it in some way. Thus, in comparison to high-production synesthesia, one-shot synesthesia can be considered as a result of a mental activity that deals much more with semantics than with syntax.

This similarity between different aspects of language and different forms of synesthesia is not to say that synesthesia is in some way a consequence of using language. Rather, what we propose, is that different types of synesthesia reflect engagement of two different types of cognitive mechanisms both of which are also known to be used in language.

Despite these differences between the two classes of synesthesias, the two may have some commonalities. For example, it is possible that high production synesthesia owes its syntax to intensive semantic processes during the development of that synesthesia. In general, existence of every skillful automatic activity, be it a use of a language or riding a bicycle, must be preceded by a period in life during which slow controlled processes are vigorously engaged and which were necessary to develop that skill [17, 20]. With all likelihood, the same applies to high-production synesthesia. The process of learning high-production synesthesia may occur during childhood in a way similar to that proposed for more typical forms of synesthesia [11]. At that time, synesthesia would be created through intensive controlled processes, which over time result in automaticity of generating synesthetic experiences.

Hence, whereas the automaticity of high-production synesthesias seems to be developed by controlled processes in childhood, one-shot synesthetic events seem to rely on controlled processes that take place in adulthood. One-shot synesthesias do not seem to rely on pre-existing syntactical rules for associating inducers to concurrents. Instead, the associations seem to be created 'on the spot', i.e., while the event is taking place. One-shot synesthesia is possibly the

closest we can come to observing the birth of a new synesthetic modality in an adult brain.

Significance of one-shot synesthesia

A fundamental question to understanding the nature of synesthesia is whether it is a phenomenon of (aberrantly) wired-up senses, or whether it is a result of creative cognitive processes that play a significant function within a mind. One-shot synesthesia seems to provide us with evidence for the latter. We have seen from the description of synesthetes that novel synesthetic modalities – i.e., novel types of synesthesia – can be created in adulthood in 'real time'. This creation is rare and involves an unusually extensive effort, but it seems to have otherwise all of the properties of the other forms of synesthesia that are lifelong present and that are better known.

These results support the previous proposals that, by its nature, synesthesia is not a phenomenon of mixed senses, but rather a phenomenon of semantics—being driven by the process of understanding the world and extracting meaning e.g., [4, 12]. From one-shot synesthesia we learn that the meaning-to-sensation synesthetic associations are not always necessarily automatic but that slow, controlled processes can be also occasionally involved to create, at least temporarily, a new type of synesthetic association. With the new ideas of how semantics comes about in biological systems [22], a new possibility opens to create a more satisfactory physiological theory of synesthesia [11].

We have previously shown that, by a manipulation of meaning in adult synesthetes, an existing concurrent can be transferred to a new inducer [7]. One-shot synesthesia tells us that new concurrents can also be added to the existing palette of person's synesthetic associations. Hence, the originally proposed significance of the concept of ideasthesia [12] can be expanded. Originally, the term ideasthesia has been introduced to point out the role that *activation* of concepts plays in synesthetic experiences. One-shot synesthesia, with its decision-making, planning and life-reflecting activities, suggests that also *creation* of concepts can be added to the definition of ideasthesia.

In any case, as evidence accumulates, our understanding of the mechanisms of synesthesia seems to increasingly diverge from the ideas of an inborn wiring or crossed-senses. Instead, activation and creation of concepts seems to occur in the background of synesthetic experiences. In particular, for creation of new synesthetic associations and new 'modalities' of synesthesia, a lack of appropriate concepts, or *semantic vacuum*, seems to be the driving main force the creation of new synesthetic associations. This seems to occur both during childhood [11] and possibly, as we have seen from one-shot synesthesia, during adulthood.

As these adulthood-created synesthesias do not tend to become automatic, perhaps also not all the childhood-created associations become automatic and make it to adulthood. We may hypothesize that only a fraction of childhood one-shot synesthesias sufficiently often repeat. Others may take a form of one-shot synesthesia and vanish from the person's memories over time. From the statistics of the prevalence of synesthesia in adulthood [23] it would appear that synesthesias most likely to perpetuate through lifetime are the ones with the simplest possible form of syntax – i.e., one inducer to one concurrent (as for example, grapheme-to-color synesthesia).

The much lesser prevalence of high-production synesthesias (e.g., ticker tape) may be due to the need to establish a more elaborate syntax. And only a few synesthetes may be going through such a "hard work". High-production synesthesias may be developed only if an unusually strong pressure i.e., a "deep" semantic vacuum, has been posed on a synesthetic kid.

Finally, following this argument, we can hypothesize that one-shot synesthesia occurring in adulthood is so rare not only because it takes place in special situations but also because it happens only to special individuals—i.e., only to those who lay at the far end of the capability of creating synesthetic experiences. Given that synesthesia is also associated with particular cognitive styles [24, 25], it is possible that one-shot synesthetes are those who push to the extremes the adjustments of cognitive functions that come together with synesthesia. Due to its apparent creative lifelong foundations, one-shot synesthesia may be in a way the pinnacle of all synesthetic experiences.

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Appendix

For two of our subjects we provide here more detailed descriptions of the nature of their synesthesias described in the main text. The following texts shed more light on the life conditions that may have affected their synesthesias, presumably directly triggering them or leading to their gradual development.

J. S.

When I had to make a career decision, I was surprised by a synesthetic experience, which I spontaneously called "decision synesthesia". I had to concentrate on every image very hard because the images where very pale. I would like to describe three of these synesthetic experiences that occurred to me, each only once in my life. One was a thin-walled shoebox with an exhaust pipe, not transparent at all, not changeable. It had a temporal dimension: the present was situated in the middle of the picture; the future extends to the right side. I interpreted this experience as telling me that presumably everything would be all right at the beginning. However, on a long run, I would have felt as if I got stuck in that exhaust pipe. If I were to accept this job offer, I should already start to considering alternatives in the near to middle future.

Another synesthetic experience was a long transparent hollow glass block, whose color was in different shades of blue . The end of the block was not visible (therefore, I had to increase the size of my inner mental screen). This experience told me that my future wouldn't be boring or narrow, like it was at the moment. However, a full breath of experiences that I desired would not have been provided but that job either. So, this choice was not an ideal option for me. This conclusion came from the fact that my available "synesthetic space" was not filled by that object. Of course, I did not have any rational comprehensible arguments to support my interpretations of those synesthesias. Nevertheless, I decided in favor of the glass block over the shoebox. The appearance of the glass block and its transparency symbolized a certain potential for being interesting.

Yet another job option came up later. It was accompanied by yet another unique synesthetic experience It was like a transparent layer on my normal synesthetic mental screen (which is very dark), with a star-like shaped hole in its middle. This shape filled my "synesthetic space" very well and indicated to me the deep and unambiguous knowledge that everything would be alright. I took this job.

Over time I realized that the initial name "decision synesthesia" did not describe accurately what was happening to me. A term "evaluation synesthesia" would have been more appropriate because those images presented some form of synesthetic visualizations of the decision evaluation processes that were going on in my head. I feel that the inducers for those synesthetic perceptions were the emotions generated through my job evaluation processes.

M. R. S.

Shapes are huge in my life, they are essential in my thought process both dreaming and awake. First, I see everything that happens to me in a picture language which, I have had since first memory. I also see words on a ticker tape at the same time. The difference is their location on the inner screen where I watch what happens to me in pictures and words. The shapes are on my left, while the words come in from my right.

That briefly changed from a trauma. Whereas I normally see a shape on the left and a word on the right, a large shape appeared and the words were all gone. It made me feel aphasic to see them missing. It has not recurred. I'm not sure how long it lasted but no more than 1 or 2 seconds but I can remember it perfectly because I'd never seen anything like it before.

However, soon I could see that the words were not permanently gone; they just weren't working. In peripheral vision on the right, I could see a long ticker tape, behind a curtain waiting for a cue to come on stage but the cue never came. And I was powerless to retrieve the words which appear involuntarily.

After a few weeks, words came back in a very strange way. One word appeared that took up all the space and the shapes disappeared—or so I thought. Close up I couldn't read because oddly there were lavender squares hanging from the tops of letters covering up their front so I could not identify them or read the words. It felt bizarre.

Luckily all my functions returned in 6 months, but I ponder this question of the single time I thought the shapes disappeared and have a new view. The shapes did not disappear; they reappeared in a different role in a new location. Instead of taking their usual spot separate from and on the left side of the word, they jumped over to the word and wrapped themselves around it like a snake; together they made a hybrid word from my two languages that I could not read in either. It was the first time that has ever happened. It has not recurred.

But as I think of the image now, it was a powerful metaphor of someone who has lost her equanimity and voice.

In my dreams, I find that I will dream about the same shape on and off for a few years at a time until it is replaced by another—and while other shapes appear, I can see over a long period of time that there is a recurrence. But so far apart in years, I might not see a connection—and they absolutely mean something, but I have trouble explaining it when I wake up though I can still see it; I can't feel its meaning as I did while dreaming.