“Becoming the Colour:” Synaesthetic Gesture in a Case Study of Multiple Forms of Synaesthesia

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Phenomenological investigations of participants with grapheme-colour synaesthesia – a condition wherein an *inducer* consistently and automatically triggers an additional *concurrent* perceptual experience – have revealed an apparent paradox. Namely, they describe the automaticity of their synaesthetic experiences as being both willed and automatic. Here we apply in-depth interviews and signal-contingent experience sampling to investigate the lived experience of a single case (HR) of synaesthesia to address this paradox. Our results suggest that for HR an inducer elicits a non-visual, spatially-localized, immediate, and intuitive knowledge about the concurrent. Critically, HR reports that in order to experience the concurrent visually, she must perform a specific mental gesture. We suggest that reporting on the former yields descriptions of concurrent experience as being automatic, and reporting on the latter yields descriptions of concurrent experience as being willful. Our findings demonstrate the need for detailed phenomenological investigations of the experience of synaesthesia, in order to develop more accurate descriptions of this experience.

Key words: *synaesthesia, empirical phenomenology, signal-contingent experience sampling, constructivist grounded theory, gesture*

“Postajati barva:” Sinestetska gesta v študiji primera z več oblikami sinestezije

Fenomenološke raziskave udeleženk z grafemsko-barvno sinestezijo – stanjem, pri katerem *sprožilec* stalno in avtomatično sproži dodatno, sočasno zaznavno izkustvo – poročajo o navideznem paradoksu. Namreč, avtomatičnost svojih doživljanj sinestezije opisuje tako kot voljne kakor avtomatične. Tu uporabimo poglobljene intervjuje in od signala odvisno vzorčenje izkustva za raziskovanje živečega izkustva sinestezije pri enem primeru (HR), da bi naslovili ta paradoks. Naši izsledki kažejo, da pri HR sprožilci vzbujajo ne-vizualno, prostorsko umeščeno, takojšnje ter intuitivno vedenje o sinestetski asociaciji.

Bistveno je, da HR poroča, da za to, da izkusi sinestetsko asociacijo v vidni obliki, mora izvesti točno določeno miselno gesto. Predlagamo, da poročanja o prvi vodijo do opisov sinestetskih asociacij kot avtomatičnih, medtem ko poročanje o slednjih vodi do opisov sinestetskih asociacij kot voljnih. Naši izsledki kažejo pomembnost podrobnega fenomenološkega raziskovanja doživljanja sinestezije, da bi razvili podrobneje opise tega doživljanja.

Ključne besede: *sinestezija, empirična fenomenologija, od signala odvisno vzorčenje izkustva, konstruktivistična poskusna teorija, gesta*

1. Introduction

Synaesthesia is a condition wherein an *inducer* consistently and automatically triggers an additional perceptual experience, referred to as the *concurrent* (Cytowic 1993). For example, in grapheme-colour synaesthesia, the presentation of a monochromatic letter leads to the automatic experience of colour. Further, in sequence-space synaesthesia, time-related concepts (e.g., years, days of the week) are experienced as salient locations in egocentric space. One of the defining features of synaesthesia has been the automaticity of the concurrent. It is widely claimed that when synaesthetes experience an inducer, the concurrent involuntarily presents itself in their visual awareness (Meier & Rothen 2009; Rothen, Seth, Witzel & Ward 2013), provided that individuals attend to an inducer for a sufficient period of time (e.g., Mattingley, Payne, & Rich 2006).

Developmental theories have emphasised the associative nature of synaesthesia (Mroczko-Wąsowicz & Nikolić 2014), motivating investigations into whether synaesthesia can be acquired in adulthood. Specifically designed training regimens have been used to investigate if it is possible to train non-synaesthetic individuals to experience synaesthetic concurrents. In these associative training protocols, a series of letters are repeatedly paired with colours through adaptive memory and reading tasks for a period of five weeks (Bor et al. 2014; Rothen et al. 2018). These studies found that following the training regimen, participant's performance for trained letter-colour pairs on the gold-standard consistency test (Eagleman et al. 2007) passed the threshold indicative of synaesthetic experience (Bor et al. 2014; Rothen et al. 2018). In addition, participants also displayed synaesthesia-like behaviour for trained letters on a synaesthetic equivalent of the Stroop test (demonstrated by greater interference effects and slower response times in incongruent trials; see Meier & Rothen 2009; Ward et al. 2007). Critically, the majority of participants self-reported phenomenology that was suggestive of synaesthesia-like experiences (Bor et al. 2014; Rothen et al. 2018). However, these studies only provided superficial descriptions of training-induced changes in phenomenology.

In order to ascertain whether such training-protocols elicit experience that is comparable to naturally-occurring synaesthesia, Schwartzman and colleagues (2020) conducted phenomenological interviews both on participants who exhibit training-induced perceptual experiences and individuals with naturally-occurring synaesthesia. They report that participants' with naturally-occurring and training-induced synaesthetic experience display a

large degree of overlap, characterized by descriptive similarities in the strength, stability, shape and location of concurrent experience. They found that only the automaticity of colour experience differed significantly between the two groups. While most (9/14) individuals with training-induced synaesthesia required effort to experience concurrents, individuals with naturally-occurring synaesthesia described a diverse range of experiences associated with the automaticity of their concurrents. First, there was the distinction between *automatic* (concurrents happen to participants) and *willful* (concurrents are willingly brought forward into awareness). Three other types of automaticity were detected in naturally-occurring synaesthesia. *Contextually varied experience* refers to the experience wherein the automaticity of synaesthetic concurrents changed depending on the situation (e.g., being able to ignore them while reading prose). Second, *semi-automatic* experiences are those in which participants report being able to block the experience from occurring at all. Finally, *reflective association*, describes situations in which participants had to reflect on or consider the grapheme closely in order to become aware of the concurrent experience. Paradoxically, ten participants with naturally-occurring synaesthesia reported experiencing both willful and automatic synaesthetic concurrents in the *same* interview using the *same* inducers. These findings call into question the automaticity of concurrents as a defining feature of synaesthesia. To address the apparent paradox the current study provides an in-depth phenomenological case study of synaesthesia.

While case studies that observe the lived experience of synaesthesia are common (e.g., Cytowic & Eagleman 2009), few studies (e.g., Gould et al. 2014) have taken into account the contemporary approaches to the acquisition of first-person data. The present study offers an in-depth empirical phenomenological study of one person's lived experience of synaesthesia, as well as aspects of her phenomenology that must be taken into account if we wish to understand how her synaesthetic experience fits into the broader description of how it is to be her (cf. Jaspers 1997).

Within this study, we observed a number of fundamental experiential gestures present in the visual experience of our participant that occur across different forms of synaesthesia. While the training regimens outlined above focus on grapheme-colour synaesthesia, data from our case-study suggest that differentiating between types of synaesthesia according to the modality of inducer is somewhat arbitrary. This observation is in line with recent critiques of building up theoretical constructs based on behavioral or functional criteria, which emphasize the need to start with the lived experience (Madeira et al. 2018). Therefore, here we do not

focus solely on grapheme-colour synaesthesia, but the entirety of synaesthetic experiences reported by our participant. This allowed us to investigate the automaticity of synaesthetic experience in more depth, observing its invariant properties as well as how it relates to other aspects of the case's mental life (e.g., empathy).

This paper contains two supplementary materials available on the *Open Science Framework* (**LINK HERE**):

- Supplementary materials A (SM-A): Transcripts of raw data;
- Supplementary materials B (SM-B): The codebook.

2. The case

We explore the lived experience of HR (herself a co-author of the paper). She is a 34-year-old, right-handed woman. She is ethnically white British, and a citizen of the United Kingdom of Great Britain and Northern Ireland. By the time she participated in this study, HR has had 20 years of formal education, and holds a bachelor's degree in textiles and costume design, a postgraduate diploma in theatre costumes, and a master's degree in Japanese studies. She is currently a doctoral candidate in creative and critical writing. She is a native speaker of English and speaks Japanese.

HR reports multiple forms of synaesthesia. She self-reports grapheme-colour, sound-colour synaesthesia (in relation to music), emotion-colour synaesthesia, person-colour synaesthesia, ordinal-linguistic personification (i.e., linking symbols with personalities), and sequence-space synaesthesia. During the study itself, she also observed taste-colour and smell-colour synaesthesia. Table 1 summarizes the colours and personalities she associates with individual letters of the English alphabet. She scores extremely high (eyes open = 79/80; eyes closed = 74/80) on the inverted Vividness of Visual Imagery Questionnaire (VVIQ; Campos & Pérez-Fabello 2009), suggesting hyperphantasia, a condition wherein individuals experience mental imagery that is so vivid as to be barely distinguishable from perception (Zeman et al., 2020).

Contemporary first-person research emphasizes the relationship between observing one's experience and contemplative practices (Kordeš et al., 2019). In light of this relationship, we note HR's experience with contemplative practices: she reports 10 years of active practice of mindfulness meditation.

Inducer	Colour concurrent [RGB code]	Colour name	Personality trait	Inducer	Colour concurrent [RGB code]	Colour name	Personality trait
<A>	192, 43, 11	Brick red	Proper, plastic	<N>	134, 225, 85	Lime green	Fun and playful
	12, 30, 39	Dark blue	Younger male	<O>	254, 254, 255	White	Huge, oppressive
<C>	229, 249, 20	Yellow	N/A	<P>	46, 9, 31	Purple	Uptight
<D>	22, 54, 12	Dark green	Kind old man	<Q>	11, 4, 7	Dark purple	Velvety texture
<E>	250, 47, 42	Pink-red	Cheeky	<R>	188, 59, 48	Dark pink	Older woman with glasses, also my collective family
<F>	9, 48, 1	Dark green	Old man librarian with moustache and glasses	<S>	199, 56, 44	Dark pink	Teacher
<G>	57, 23, 25	Dark purple	N/A	<T>	199, 163, 44	Yellow	Male
<H>	236, 25, 119 / 25, 36, 65	Magenta / blue	“Me!” (referring only to magenta)	<U>	219, 89, 9	Orange	Pleasing, background person
<I>	2, 5, 41	Dark blue	Demure, intelligent, calm	<V>	66, 7, 126	Blue-purple	Regal
<J>	216, 85, 4 / 137, 228, 102	Orange / Light green	My brothers	<W>	102, 43, 33	Brown	Strict and stern older woman with a soft side
<K>	71, 9, 143	Blue-purple	N/A	<X>	13, 1, 33	Dark blue	Mysterious male teacher
<L>	218, 223, 219	White-grey	Tall male, about 40ish	<Y>	236, 245, 9	Yellow	Omnipresent in a positive way
<M>	6, 6, 169	Dark red	“Think of my mum”	<Z>	N/A	N/A	N/A

Table 1: Overview of HR's grapheme-colour concurrents. The notation <> marks the letters as graphemes (i.e., elements of text) rather than phonemes (i.e., elements of speech).

Recently, it has come to light that implicit demand characteristics may drive experience, especially for subjects who score high on scales of hypnotic suggestibility (Lush, 2020). Lush (*ibid.*) suggest that in the case of mirror-sensory synaesthesias, individuals may habitually (but involuntarily) implement phenomenological control in everyday life, when it is in-line with their goals, creating tactile sensations. These findings raise the possibility that habitual phenomenological control may also underlie the reported concurrent experiences in both induced and natural synaesthesia. To control for this possibility, HR was tested on the *Sussex-Waterloo Scale of Hypnotisability* (SWASH, Lush et al. 2018). She scores 1.95 on a range between 1.0 and 5.0 on the SWASH test, meaning she ranks low on the scale of suggestibility (based on Lush et al. 2018, mean SWASH score among a sample of British undergraduates is 2.67; SD = 1.23). Being low-suggestible decreases the possibility that her first-person reports are influenced by suggestion effects.

3. Method

A mixed-method phenomenological study was conducted. An initial meeting with HR took place in person on 2nd March 2020. She was introduced to empirical phenomenology, and asked about her synaesthesia. She described how, in experience, her synaesthetic concurrents feel connected to feelings of empathy and sensitivity to external sensations. She expressed interest in examining sequence-space synaesthesia more closely. She agreed to participate in a long-term, multi-phase study. The study itself consisted of two phases. During Phase 1, phenomena of interest were explored in-detail using phenomenological interviews. In Phase 2, once salient experiential categories were defined, signal-contingent experience sampling was employed to see how these experiences occur in HR's daily life, away from the specific context of a scientific study.

3.1. Phase 1: In-depth phenomenological interviews

15 in-depth phenomenological interviews were conducted. The in-depth interviews took place between March and June 2020. As the Covid-19 pandemic was ongoing, all communication was done via video conferencing. In the interviews, a specific phenomenon was elicited within the research setup. Then, HR was prompted to report on her experience either at a random moment or, if this was demanded by the provocation of the phenomenon, afterwards.

The interview was based on the *method of empathy*, used in descriptive psychopathology, that is, the field examining the lived experience of anomalous mental states (Oyebode 2008; Jaspers 1997). HR was asked open- and closed-ended questions. Occasionally, she was asked to perform *ad hoc* mental exercises to provide clarifying data on specific aspects of her experience. The interview began by asking HR to broadly describe all the salient events that were present in her experience at the time of the interview. After salient aspects of HR's experience were defined, each event was explored in detail. The interviewer guided HR from descriptions of folk psychological theories, general descriptions of experience, her own beliefs about experience towards descriptions of sensory experience, bodily feelings, mental gestures, and attitudes. After HR provided an account of her experience, the researcher recapitulated his understanding of her experience in order to a) maintain her contact with the experience in question; and b) check whether his understanding of her experience was adequate. If there were any misunderstandings, the same aspect of

experience was explored further. After HR agreed that the researcher's understanding of her experience is accurate, the interview continued. Normalizing statements were used if HR expressed her apprehension or embarrassment about some aspect of her experience (Oyebode 2008). Both audio and video recordings of the interviews were gathered.

Table 2 summarizes the tasks used throughout the interviews to elicit specific aspects of synesthetic phenomenology.

Interview code	Experience	Rationale	Interview code	Experience	
HR-I-01	Reading a short story	Does secondary activity (reading) change the nature of synaesthetic experience	HR-I-09	Observing English phoneme /eɪ/ and Latin-script letter <H>	What is HR's experience of grapheme- and phoneme-colour synaesthesia in her first language?
HR-I-02	Reading a short story	Same as HR-I-01	HR-I-10	Observing Russian phoneme /d͡ʒ/, and corresponding Cyrillic-script <ИГ>	What is HR's experience of grapheme- and phoneme-colour synaesthesia in a language she does not speak
HR-I-03	Listening to music	Obtaining experiential dynamics of music-colour synaesthesia	HR-I-11	Observing Russian phoneme /z/, and corresponding Cyrillic-script <Ж>,	Same as HR-I-10
HR-I-04	Empathizing w/ imagined a) fictional character; b) bee; c) the interviewer	In the initial meeting, HR reported on intuitively felt similarities between synaesthesia and empathy. HR's experience of empathy was explored	HR-I-12	Letter M, presented as the sound /em/ and the letter T, presented as the grapheme <T>	Same as HR-I-09
HR-I-05	Reflecting on colour a) indigo; b) orange-yellow	What is the experience of synaesthetic colours when carefully considering inducer, rather than merely glancing at them?	HR-I-13	Reflect on number related to time: 1962 CE.	Same as HR-I-06
HR-I-06	Reflect on numbers related to time: a) 1984 CE; b) 1911 CE; c) 1999 CE; d) 3017 CE; e) 3017 BC	What is the experience of sequence-space synaesthesia?	HR-I-14	<E> presented in the colour that is congruent to HR's synaesthetic concurrent (RGB code: 250, 47, 42). <R> presented as a complementary colour of HR's synaesthetic concurrent (RGB code: 40, 1, 48)	How does HR experience situations where graphemes are presented in (in)congruent colours?
HR-I-07	Copying a 2D image	What is HR's experience of visual working memory?	HR-I-15	Memorizing a sentence while observing a triplet of graphemes in order to dissociate attention from	How does HR experience her synaesthesia while performing a task that

				synaesthetic gesture	demands her attention?
HR-I-08	Reflecting on: a) a close friend; b) family member; c) stranger; d) celebrity; e) the interviewer.	What is HR's experience of person-colour synaesthesia?	N/A	Reflection on the study	Establishing the validity of interviews.

Table 2. Overview of prompts for Phase 1 interviews.

3.2. Phase 2: Signal-contingent experience sampling

Signal-contingent experience sampling was used to gather HR's lived experience in an everyday setting, unconstrained by a research setting. The sampling took place between May and August 2020. On a prearranged day, HR received seven prompts via phone for her to sample her experience. Sampling prompts were delivered to her at random moments between 9:00 and 22:00. A script was programmed in Python, creating seven random values in a given time interval. Upon receiving a prompt, HR was instructed to describe her experience according to seven elements:

1. *Date and time;*
2. *Context: objective facts about the situation;*
3. *General description about your experience;*
4. *Visual experience;*
5. *Subspace region: An aspect of HR's field of experience identified within the study itself – a space overlaying the world she experiences beyond her body that contains mental imagery and other aspects of her thinking (see below for more details);*
6. *Sensory awareness;*
7. *Aspects of empathy.*

After each sampling, HR provided feedback to the researcher on whether the sample was valid, meaning whether she was able to report on her experience *immediately* after the prompt. Whenever samples were invalid, the researcher did not inquire into the reason as to why. At the end of each sampling day, HR sent her reports to the researcher. The next day, a follow-up interview was conducted, clarifying discrepancies and providing additional detail to samples. Typically, two samples were explored in detail. The follow-up interview was structured in the same way as in Phase 1. In total, 13 sampling days took place.

3.3. Analysis

Recordings were transcribed verbatim. Whenever HR made a bodily gesture relevant to the description of experience, it was described in the metatext. HR commonly made idiosyncratic sounds when describing experience, which were transcribed as well. The first stage of the analysis of the gathered qualitative data was segmenting the descriptions into experiential episodes. Not all interviews and samples contained a single experiential episode. In some cases, two samples were constructed out of one. In Phase 1, 37 episodes were explored. In Phase 2, 97 samples were gathered, of which 16 samples were explored in follow-up interviews.

The analysis of the qualitative data was conducted simultaneously with the data acquisition, following the principles of constructivist grounded theory (Charmaz 2004). First, line-by-line coding was performed: a meaningful code was assigned to every line of interview data, thereby minimizing the analyst's bias.

Following this step, inductive coding was employed: Raw data were assigned more abstract, general descriptive tags (e.g., all HR's experience that included colour were grouped together as *colour*, rather than coding for specific shades). Categories were constructed from the data without deference to existing theoretical concepts. Finally, categories were grouped together according to their descriptive similarities (see Figure 1).

In the final stage of the analysis, a codebook was constructed (Nelson 2017; Hurlburt & Heavey 2006; Kordeš et al. 2019), containing a detailed description of induced categories. Experiential categories were specified according to: a) name; b) definition; c) relationships to other categories; d) relevant examples; and e) considerations (i.e., elaborations explaining and examples demonstrating the specific differences between similar categories and notes on dynamic interactions between them). The codebook serves three purposes: a) it represents a system of organization of categories; b) a logically consistent codebook provides evidence towards the validity of the coding process; and c) it provides an independent researcher who would be interested in replicating the findings an instrument to familiarize herself with the analysis procedure.

4. Findings

The categories, constructed within this study, are organized into three classes: *structure of visual consciousness*, *phenomenological dimensions of synaesthetic experience* and

synesthetic gesture. HR's synaesthesia seems to be more dependent on the mental acts she performs than the modality of the inducer (see Section 4.3 below). Thus, we provide a description of synaesthesia in general, rather than focusing on specific forms of synaesthesia (i.e., based on the modality of the inducer). The constructed experiential categories and subcomponents of HR's synaesthesia are described in Figure 1.

Figure 1. Experiential categories of HR's synaesthesia

Table 3 summarizes how often HR experienced synaesthesia during the second phase of the study (signal-contingent experience sampling). Out of the 97 valid samples, 51% contained some form of synaesthetic experience. By far the most common were linguistically-mediated synaesthetic experiences: grapheme-colour and concept-colour synaesthesia occurred 13% and 10% of the time respectively. By comparison smell-colour synaesthesia occurred only once.

Synaesthetic experience	Grapheme-Colour	Concept-colour	Taste-Colour	Taste-Colour	Emotion-Colour	Person-Colour	Sequence-space	Smell-Colour
51%	13%	10%	6%	6%	5%	3%	5%	1%

Table 3. Relative frequencies of HR's synaesthetic experience during the second phase of the study.

4.1. Structure of HR's visual consciousness

Structure of visual consciousness divides HR's experience into three poles: *mental space*, *visual field*, and the *subspace region*.

Mental space describes the part of HR's field of experience that corresponds to the location of her point of view; it is internal to her body and it is where she conducts her mentation, where her thoughts arise, and her inner speech takes place. On the other hand, *visual field* is HR's experience of the world as uncovered by her senses and present to her consciousness in the visual mode. *Visual field* corresponds to what Anil Seth (2014, 100) refers to as *subjective veridicality*, that is, perception as “experienced as part of—as continuous with—the real world.” This experience of the world is sometimes termed the *objective pole*. It is not objective in a metaphysical sense of having access to an observer-independent reality, but, as Charles Laughlin and Jason Throop (2006, 327) summarize, in the sense “where the ‘objective’ elements of experience are those that can be grasped by any given experiencer regardless of cultural, historical or social position.” For HR, accessing pure *visual field* takes wilful action:

[It is the], erm, exact feel of the soil and the roots, and what that felt like on my fingers, the colour of the soil, the colour of the roots, looking at the intricate root system that was all intertwined [...] Looking it, sort of as minutely as I can possibly look. Zooming in as far as I possibly could. [...] I suppose it is like slowly and, like, methodically and carefully running my eyes and registering each little part of something, and really, erm, gaining all the visual information. (HR-II-D04-S02)

The *subspace region* (a term HR uses and is itself a Star Trek reference) is the part of HR's field of experience that connects the *visual field* and the *mental space*. It refers to the part of HR's field of consciousness that belongs to her, to her attitudes, and imagery she projects into the world. HR describes it as follows:

[I]t's a sort of subspace region. [...] So, it's like a filtering. This is what I know or think to know to be reality here [waves her arm in front of her] and then there's a filter of things I know to be my mind's eye or my imagination. Filtered on top. So, I can be in both. Simultaneously. I can choose to be in one or I can choose to be in the other. [...] It doesn't seem to be limited at all by anything. So, vast, you know, multidimensional canvas. (HR-I-02-01)

It is a space of her experience that begins at the edge of her embodiment and extends outwards into space:

So, I'm aware it's not happening in the outside world. [...] That it isn't within the objects that I share with other people. It isn't in that space. [...] It feels very much like it is my own domain

and that [pause] it is not populated by other people. (HR-I-03-01)

Cassandra Gould and colleagues (2014) describe a similar aspect of synaesthetic experience. What they call the “mental room” is experienced as a field of experience that is superimposed on the real world. Attention can be willingly shifted between the mental room and the real world.

Let us now recapitulate this section with an illustration that depicts the structure of HR’s visual consciousness (Figure 2).

Figure 2. The structure of HR’s consciousness, constructed to describe her experience of the sound of a violin (see Table 4). A: HR’s embodiment; B: Mental space; C: Inducer; D.a and D.b: Subspace region; E: Peripheral vision; F: Visual field; G: Subjective veridicality. The subspace region overlays her body, her visual field, as well as the entirety of the space she is aware of. HR is aware of her synaesthetic experience – the red teardrop shapes – within her subspace region. Where the subspace region overlaps with the visual field, the visual experience of concurrents is the strongest. The image was shown to HR and she verified it accurately describes her lived experience.

4.2. How it feels to be a synaesthete: Phenomenological dimensions of HR’s synaesthesia

Now that we have oriented ourselves within HR's field of experience, we go on to discuss how she experiences individual phenomenological dimensions of synaesthesia. HR reports multiple forms of synaesthesia (see Section 2.). Based on HR's reports, we do not differentiate between them. Rather, we describe the more fundamental aspects of experience that remain common across the different forms of synaesthesia.

All of HR's experiences are described as being spatially localized. She experiences them, first, within her *subspace region*, and second, at a certain distance from her point of view. Consider the following experience of concept-colour synaesthesia that HR had while reading a story:

So, I, I'm at the '*his face cut by the backlash of the branch.*' And, erm, *cut* was instantly a red word. And I like felt the motion of *cut* and *backlash* similarly [...] Like something in front of me was torn open and it was red. Like a carmine red. Like the fabric of whatever it is here. The air. Was torn open and that was red. The gash was red. [...] [It was] in my perception, yeah. It was both. It was both in the outside world but also in my perception. So, spatially, I felt it beyond my body but I didn't see it as being located outside of me. (HR-I-02-01)

The previous example further demonstrates that HR's synaesthetic experiences are not perceptions, but are located in her perception; what we referred to as the *subspace region*.

HR's linguistically-mediated synaesthetic experiences (concept- and grapheme-colour synaesthesias) are the most common but also phenomenologically sparse. They only contain *colour* content and a presence in space. By contrast, emotions and sounds elicit richer experiences. The first reason for this is that these synaesthetic experiences contain a strong bodily component.

[My friend] is a very bright and optimistic person, and I think those colours make me feel bright and optimistic [...] I feel that her brightness in my sort of diaphragm. It's a ball of light in my diaphragm. And yellow is pretty much in my chest. (HR-I-08-01)

Consider also the following experience when HR hears a specific word:

Watching *Suffragette* [a TV show]. Speaker in parliament just said: 'eloquence is that which gets things done, Mrs Watts.' [...] Focused on *eloquence*, which was a very red and gold word [...] It is definitely a feely word. [...] I was not speaking it, but I could feel the word in my voice box. And the way that my body would response. And the way the word would feel in my mouth and throat. (HR-II-D07-S07)

Speech sounds exhibit synaesthesia as well. In the following example, HR heard a phoneme in Russian, a language she herself does not speak:

[Points at the height of her forehead] It was here, [whistles three times] in a silver, blue, and sort of shard-like shapes in the subspace. [...] This physical sensation that I feel is like at the top of my head, there [...] It's already there. And it's silver and light blue shards. Dancing shards. [...] Like a prickly sensation. Prick, prick, prick, prick, prick. (HR-I-10-02)

However, HR's strongest experiences of sound-colour synaesthesia are associated with listening to music, which is made more complex by a specific spatial experience. Namely, her synaesthetic colour experiences take on discernible shapes and forms. While listening to a piece of classical music, HR drew the shapes that individual instrument sounds have. Her illustrations are reproduced in Figure 3.

Figure 3. Shapes HR associates with the sound of a violin (left) and a harpsichord (right).

4.3. Synaesthetic gesture: From hints of colour to becoming the colour

The aim of this study is to attempt to better understand the automaticity of synaesthetic experience by examining, in detail, the lived experience of HR's multiple forms of synaesthesia. In the previous sections we first described the overall structure of visual consciousness as experienced by HR, and the static dimensions according to which we can specify her synaesthetic experiences. These sections served to orient ourselves within HR's broader field of experience. Now, we will examine how HR's synaesthetic experience evolves through time in relation to specific (wilful) mental acts, captured by five identified experiential categories: *hint*, *unravelling*, *impinging*, *blocking*, and *becoming the colour*.

4.3.1. Hint.

Hint is the experience whereby HR becomes aware of an inducer and the concurrent simultaneously. This immediate awareness of the associated properties is *not* visual. HR

experiences *Hint* within the *subspace region*. It also has an egocentric location (most commonly on HR's right shoulder, or above and to the front of her head). For example, she reports: "It was a literal sensation on my shoulders. As if I was, as if I was carrying something over my shoulder and it was touching my head and shoulders. It had a weight but it wasn't heavy." (HR-I-09-01). Finally, *hint* takes the form of intuitive knowing:

[I]t feels like they will come over my shoulder. Loodidodido. In a rolling fashion. But I think, ordinarily, [pause] They are like a cloudy mass. Separate and together at the same time [...] It's like powdery and disparate around the edges. There's no fixed point to it. It's like a very definite presence. [...] I feel like the weight of the presence [...] It's just a knowing. (HR-I-01-01)

Hint also has a mass, and, by extension, density. It is by virtue of this density that HR feels attracted to it, as if she wants to direct her attention onto it. Consider the following report:

I wasn't taking the time to look at it. It was just the information was there. [...] It wasn't like at the front of experience. So, [pause] it's like a background. Erm, visual experience. Like a [pause] just a really, like, almost translucent filter. So, it's [pause] it's more like a sense of knowing that there is a visual element to it. (HR-I-11-01)

4.3.2. Unravelling

Unravelling is a specific mental gesture that is used for HR to become visually aware of her synaesthetic experience. *Unravelling* begins with an awareness of *hint*: "So, with [the word] *backlash*, the purple was over here [points to the back of her head on the right] on my right hand-side. Shoulder. Happening over here. And I zoomed into it." (HR-I-02-02)

While this gesture can be performed unconsciously, the automaticity has a character of being habitual for HR, rather than being a passive event. Conversely, the gesture of *unravelling* has a willed component:

I just decide to think about [the colours]. Yeah, it's definitely a decision. Not a verbalized decision. It's in my mind. Yeah. [...] An attentional decision, I guess. [...] It takes time, but it's quite quick. [...] it's just a growing awareness, I think. [...] They come out and I am looking at them. (HR-I-01-01)

HR's descriptions of *unravelling* all share two components. First, she focuses her attention on *hint*, making it more present in her consciousness. The second is a concrete glance. She directs her gaze at the *hint*. Consider the following excerpt in which both of these

dimensions are present:

It's like a knowing that the red is there on some level. And then looking and zooming in and seeing. [...] So, it's sort of that zooming in, zooming out. [...] It is quite literally me looking to the right. [...] I look with my eyes to the right and I turn my head to the side. [The cherry red] just sort of occupies this whole space over here. And I can very much feel it over my shoulder, and it is contained but it does feel infinite. In the subspace. (HR-I-09-01)

Finally, in the case of sequence-space synaesthesia, *unravelling* does not (necessarily) result in the awareness of a colour, but the experience of being immersed in a dense region of space, associated with a specific chronological element:

So, if I'm looking back in time [pause] erm, [pause] it's sort of a choice of zooming in, zooming out again. So, I see this block, with a wall, bookended by the decade. Erm, and then it's sort of a [pause] you know, I can just see the years. Just there. And if I zoom in, I can see the years, closer, as individual sections. [...] See in the subspace. (HR-I-06-01)

4.3.3. Becoming the colour

Once the visual awareness of colours or the felt spatial awareness of sequence-space synaesthesia is present to her, HR can extend the gesture of *unravelling* further. Continuing *unravelling* results in the experience of *becoming the colour*. This is a synaesthetic experience in which the entirety of HR's *subspace region* and *mental space* become filled with colour. Additionally, she experiences a prickly sensation in her body, giving her the sense that her body itself is transforming into that colour:

[The indigo]'s like a warm, unctuous river, out here [moves hands horizontally from her mouth outwards]. And it's very still. But also, quite solid. I can be in it. But I can also see what's above it. Erm [pause] So, it's like a very warm, very comfortable river. A bath. With no edges. So, it's sort of an ocean. [...] I just looked into my mind's eye. Into my subspace. [...] It was there. Instantly. [...] I can see it. It's vast. Like before, I said, like an ocean but very thick. I can sense its infinite size. [...] And I can feel it. Like the physical sensation of its warmth. (HR-I-05-01)

She further reports the sense of her embodiment disappearing into colour:

I can see parts of my body disintegrating and becoming the colour [orange and yellow]. [...] Sort of it happening to my arms and shoulders and the rest of my body. I just see it happening. [...] It's also very tactile. [...] It's very relaxing and very pleasurable to have your body disintegrate. (HR-I-05-02)

HR reports that the strongest of her synaesthetic experiences is the sequence-space synaesthesia. Its relative strength may be related to it sharing a number of phenomenological

similarities with *becoming the colour*. Namely, HR enters the synaesthetic awareness with her entire body, and the fabric of her *subspace region* itself organizes itself into the spatial representation of time:

I am inside of it, not looking at it. But that is how they arrange themselves. I am looking at it, I'm in it. [...] I am completely immersed in it. In it. So, it is not about separation. Not about where I am located within it, but there is a sort of [pause] additional focus to it. Which is similar to the ocean of indigo. (HR-I-06-05)

Further, the gesture of *unravelling* in general and *becoming the colour* in particular share similarities with how HR experiences empathy. HR experiences empathy as a gesture forward, towards the entity she is feeling with (as if glancing towards them), leading to her being aware of their emotions in her body. Loss of bodily boundaries bears some similarity with dissolution experience (Caporusso & Demšar 2020). Further, similar phenomenological descriptions of being overwhelmed by a sensory stimulus come from accounts of mystical experiences associated with the Kabbalah, in which it is reported that meditating on specific letters of the Hebrew script, the *aleph-beth*, can be associated with *becoming-the-colour*-like experience where “written letters [expand] ‘to the size of the mountains’” (Abram 2017, 245).

Figure 4 schematically depicts the phenomenological dynamics of *unravelling hint* first into the visual experience of synaesthesia, and then, if HR chooses to do so, into the state of *becoming the colour*.

Figure 4. HR’s phenomenological dynamics of *unravelling hint* into visual experience of synaesthesia, and *becoming the colour*. Full arrows represent gesture-dependent experiences.

4.3.4. Impinging and Blocking

Impinging describes synaesthetic concurrents passively happening to HR. There are two phenomenological dynamics associated with this dimension. The first is when HR is

attending to the world with a close, investigative, examining attention, an aspect of experience that she refers to as “meticulous observation:”

I think it was more attention-grabbing in his voice, and because of his, perhaps change in voice. Because he enunciated it, he said it with more importance, more gravitas maybe. The, I [pause] my attention was peaked. [...] It is [pause] focused listening. (HR-II-D06-04-02)

This meticulous listening is then followed by a visually apprehended synaesthetic experience of her interlocutor’s voice:

I could see it as a sort of a mass of purple. And you know, much like when I’ve seen letters and then the mass of colours is below here. This time it was the word *global* and the colour was a mass behind it. [...] Black typed letters. [...] It happened. [...] [It is] just there. (HR-II-D06-S04-02)

It seems that a particular style of observation, an engaged and mindful attention leads to the visual awareness of synaesthesia occurring automatically. Or, as HR poetically puts it: “Interest creates agency. Because I was interested in [it], it happened automatically.” (HR-I-04-02)

The second phenomenological dynamic associated with visual awareness of a synaesthetic concurrent *impinging* itself onto HR’s awareness is when the inducing experience co-occurs with difficult emotional content:

I am experiencing resistance on that particular year, because it is, has trauma attached to it. [...] My body is holding me back. And I am feeling a sense of reticence and unwillingness. I am not willing. [...] There is curiosity in 1911. [...] Whereas the 1999 feels forced, there's more force involved and I feel [pause] the emotional landscape is very complicated and [pause] I am not [pause] the curiosity isn't there. (HR-I-06-03)

When visual awareness of concurrents impinges onto her awareness, HR is able to perform a counter-gesture to prevent it. She does this by constructing a sense of solid space within her *subspace region*, a mass that prevents the visual synaesthetic awareness from coming into the forefront. Consider the following for an example of *blocking* with difficult emotional content:

There's like a [pause] [...] a block, a self-preservation block. [...] Almost like I am aware of something that I am refusing to look at it. [...] There is definitely like a huge [...] movement of resistance, I think. [pause] And I feel dense. [...] It's like a pushing away. A complete rejection. (HR-I-08-02)

Figure 5 schematically depicts the phenomenological dynamics of *impinging* and *blocking*.

Figure 5. Description of HR's phenomenological dynamics of impinging (above) and blocking (below). Full arrows represent gesture-dependent experience. Dotted arrows represent the experience where HR can change the course of the experiential dynamics.

5. Discussion

In this paper we present an empirical phenomenological case study of HR, who experiences multiple forms of synaesthesia in order to better understand the automaticity of synaesthetic phenomenology. We provide a general description of how HR experiences her visual consciousness, the phenomenological properties of her synaesthetic experience, and how her synaesthetic experiences evolve over time, depending on the specific mental gestures she performs. We observed an experiential category *hint*, an automatic, non-visual, spatially-localized and immediate awareness of the synaesthetic concurrent. It takes a specific mental gesture – *unravelling* – for HR to bring a visual awareness of the concurrent into the foreground of her experience. She is able to *unravel* this visual awareness further, experiencing *becoming the colour*. In this state, her entire field of experience disintegrates and becomes the awareness of a specific (concurrent) colour.

Multiple observations within empirical phenomenology suggest that we are always attending to our experience from a particular observational perspective. Urban Kordeš and Ema Demšar (2018; 2019) propose the notion of *horizons*, i.e., different observational perspectives from which we can – in the context of an empirical phenomenological study –

attend to experience, and which ultimately co-determine the precise nature of the resulting findings. For example, when comparing naturally-occurring and training-induced synaesthetic experience Schwartzman and colleagues (2020) noted that the same participants observing their synaesthetic concurrents during the same interview session provided different data regarding the automaticity of synaesthetic experience. When asked about the automaticity of the colour concurrents via a closed-form question, most natural synaesthetes report their experience was completely automatic. When moments later, however, they were asked to elaborate on their experience of the automaticity of their concurrent experience using open-ended interview questions, many of them reported that the experience consisted of a wilful act of bringing the colours to the forefront of their awareness. This dynamic was also reported by HR in detail when she was prompted to read a short story and then describe the concurrents associated with specific words (HR-I-01 and HR-I-02). When reading rapidly through the text, the concurrents took the form of amodal knowledge, localized in space:

Background feeling of the colours being there but because I was reading them quickly, and I wasn't crunching down on them, on each letter, it wasn't right up there. [...] I was not focusing on them. So, I couldn't say to you it was this, this and this. [...] They were just here [points to her right shoulder] [...] Yeah, right there [points to her right shoulder again]. (HR-I-01-01)

Only when HR was asked to attend carefully to specific words in isolation, this amodal knowledge of colour (*hint*) took the form of visual awareness. Schwartzman and colleagues (2020) identified an aspect of experience similar to *unravelling* as reported by HR: reflective association. This is the observation that, in experience, some individuals with naturally-occurring grapheme-colour synaesthesia have to carefully consider the letter in order to become aware of the concurrent. Our phenomenal data correspond to findings that link the awareness of synaesthetic concurrents to attention. Individuals must either allocate sufficient attentional resources to the inducers (Rich & Mattingley 2003; Ward, Jonas, Dienes, & Seth 2010) or the inducers themselves have to be adequately processed (Mattingley et al. 2006). As noted in Table 2, the session HR-I-15 was dedicated to a mock-experiment, where the researcher told her a sentence that she had to memorize. While repeating the sentence (*John and Mary painted the walls of their new apartment white and yellow*), she was shown a series of three letters (*XHA*). HR memorized the sentence by “slotting” it into her *subspace region*:

I knew that I lodged the words in the left-hand corner. . [...] I can see the sentence across the top of the subspace. But I didn't have those connecting visual experiences that time. I was just focusing on the lettering. [...] When I started saying *John*, it definitely had a quality of white to

it. *Mary* had a quality of blue to it. [...] I looked at X first, and I saw black, then I looked at H, and I saw pink, and then I looked at A, and I saw red. [...] I think I faulted in my speech, and then I was back to what I was supposed to speak. So, my attention did go from speaking to reading back to speech again. And I was able to look back at the subspace and continue saying what I was saying. [...] So, it was a [pause] I didn't have to look at them. [...] I didn't see [the sentence] [...] I felt its presence. [...] It was in my periphery. [...] Exactly like I know these plants are here. Wooop [tilts the laptop to show flowers to her left] (HR-I-15-01)

This example demonstrates how, in experience, HR's concurrents cannot be *unravelled* at the same time as paying attention to a secondary task. Further, the apparent paradox of the same participant reporting on incongruent experience of automaticity of synaesthetic experience reported by Schwartzman and colleagues (2020) corresponds to findings that the means by which we inquire into experience, co-determines the resulting information reported about a specific experience (Sikka et al. 2017). It has been proposed that the reason for this is that different prompts for subjective reports lead participants towards attending to different aspect of their experience (Heimann 2020). HR's first-person reports thus provide a plausible understanding of the divergent response regarding the automaticity of synaesthetic experiences.

We suggest that when using a closed-form question asking if a specific concurrent experience is automatic or wilful, participants report on the experience of *hint*. By definition, *hint* is an immediate and intuitive, non-visual awareness of the concurrent. In the literature, synaesthetes who report such non-visual experiences are referred to as *know-associators* (Edquist et al. 2006). Conversely, when asking participants to report on their concurrents in more detail using open-ended questions, they attend to their experience more closely, *unravelling* it into a visual awareness of the colour. Since *unravelling* has to be actively performed, the participants may be prompted to report on their experience as wilful, despite creating an inconsistency in their reporting.

For HR, *unravelling* mirrors the experience of empathy. In a similar way as she might experience intersubjective feelings with another person (HR-II-D06-S05), a fictional character (HR-I-04-01) or an inanimate object (HR-II-D04-S02), HR projects a personality onto inducers via an attentional mental gesture. Richard Cytowic and David Eagleman (2009) report on a number of cases for whom synaesthesia is associated with affect (most commonly familiarity). Based on these observation, Cytowic (1993) argues that the primary function of cognition is not a logical parsing of the world, but an emotional one. Our findings, similarly suggest that empathy and synaesthesia are similar in terms of mental gestures that engender

them. This has earlier been asserted by David Abram (2017) in his anthropology of animism. He claims that phenomenologically, synaesthesia, defined broadly as the multi-sensory experiences, is directly related to recognizing life in other beings. For Abram, this includes other animals, plants, as well as non-living parts of the world, such as rock formations, much how HR reports empathizing with a wide range of entities, such as bees (HR-I-04-02), soil and seedlings, (HR-II-04-02), and grain (HR-II-D01-S01).

Finally, *hint* and the experience of *unravelling* it into a modal awareness bear similarity to the notion of *gist*. (Lipič & Kordeš 2017; Kordeš & Demšar 2018; Kordeš et al. 2019). Gist is a phenomenological modality wherein individuals are aware of the potentiality of some experience. This experience is brought to the foreground of their awareness either by simply attending to it, waiting for its emergence, or by interrogating it with a specific intention (cf. Eilan 1998). Thus, *hint* and *gist* share two principal phenomenological properties: first, they are not present in the same modality as the object they refer to; second, it takes a process or a gesture of unfolding for these aspects of experience to translate itself into a modally present object.

6. Conclusion

Here we present an empirical phenomenological case study of HR, who experiences multiple forms of synaesthesia. The goal of the study was to provide a better understanding of synaesthetic phenomenology in order address a paradox reported by Schwartzman and colleagues (2020). Namely, that synaesthetic participants reported that their concurrent experience was both automatic and wilful. HR reports an experiential dynamic whereby her experience of inducer co-occurs with *hint*, a non-visual, spatially-localized, immediate, and intuitive experience of knowledge about the synaesthetic concurrent. HR can then perform the mental gesture of *unravelling*, bringing the *hint* spatially forward and glancing towards it, resulting in a visual experience of a synaesthetic concurrent. We suggest that when using closed-form questions, synaesthetes report on *hint*. However, when they are asked to provide a more detailed account of synaesthesia, they attend to their experience differently, performing a mental gesture, i.e., *unravelling*, causing them to describe their experience as being wilful. Using the methods of empirical phenomenology, we were able to provide a precise phenomenological description of a single case of multiple forms of synesthesia, which yielded a potential solution to a paradoxical insight regarding the automaticity of synaesthetic experience. Such work has the potential to transform consciousness science by bringing

objectivity to experiential phenomenology. Finally, we acknowledge that qualitative research does not reflect an objective, opinion-free point of view, but we suggest that its strength is in adding a unique level of understanding to a condition such as synaesthesia, which in turn can be used to drive future experimental work.

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