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The dynamics of surprise and curiosity

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Prologue

The dynamics of surprise and curiosity

Not everything makes sense. Things change and people are often confronted with unexpected or novel situations that are not completely understood right away. These “not knowing” situations trigger specific affective states or emotions, such that people experience surprise when confronted with an unexpected event (Meyer, Reisenzein, & Schützwohl, 1997) and feel curious when they realize they have a gap in their information (Loewenstein, 1994; Silvia, 2005). Surprise and curiosity are thus related to people’s knowledge or understanding of their environment and for that reason they are also referred to as knowledge or epistemology-based states (Keltner & Shiota, 2003; Silvia, 2008).

Surprise and curiosity are typically temporary. People are sensemakers and often resolve their lack of knowledge or understanding. As such, these knowledge states unfold from not knowing something to discovering what it is all about. Surprise and curiosity are thus dynamic states that change depending on where people are in their process of making sense. Based on this, I¹ will argue and show that to understand surprise and curiosity it is key to take these dynamics of sense-making into account. Only then, it is possible to meaningfully distinguish the not knowing component from the subsequent (almost) knowing component.

The starting point of the work described in this dissertation is that not knowing something feels very different from (almost) knowing something. Not knowing is likely to be experienced as unpleasant. An abundance of research in the domain of cognitive consistency (Aronson et al., 1968; Gawronski & Strack, 2012), fluency (Topolinski, 2013; Winkielman & Cacioppo, 2001), personal control (Kay, Whitson, Gaucher, & Galinsky, 2009), and information search (Loewenstein, 1994; Shani, Tykocinski, & Zeelenberg, 2008) all points to the notion that inconsistency, knowledge deprivation, lack of structure, or uncertainty is aversive because it threatens people's need for a predictable and coherent world (see also Miceli & Castelfranchi, 2015; Proulx, Inzlicht, & Harmon-Jones, 2012). The not knowing component

¹ Science is a collaborative effort and even though this dissertation is single-authored, the work is done in close collaboration with others. Therefore, I refer to “we” after this prologue.

of surprise and curiosity is therefore likely to be experienced as negative.

Contrary to this not knowing, (almost) knowing something can be very enjoyable. People are exploratory creatures who like to discover something new (Berlyne, 1971; Kashdan & Silvia, 2009; Silvia & Kashdan, 2009). Therefore, the anticipation of resolving one's lack of knowledge is likely to be experienced as pleasant (Loewenstein, 1994) and once understood, a previously unknown outcome may be nice (Valenzuela, Strebler, & Mellers, 2010). So, opposite from the not knowing component, the (almost) knowing component of surprise and curiosity has the potential to be positive.

In this dissertation, I aim to show that it is possible to integrate the not knowing versus (almost) knowing components of surprise and curiosity when taking the dynamics of sense-making into account. In Part 1, I focus on surprise and the temporal unfolding of responses to surprising outcomes. In Part 2, I focus on curiosity and the impact of feeling close to its resolution in terms of time and feeling able to deal with the unknown.

Part 1: Surprise

People anticipate and understand their environment using schematic representations and expectancies (Miceli & Castelfranchi, 2015). Yet, no matter how cognitively prepared people are, they are frequently confronted with unexpected outcomes. When surprised, ongoing thoughts and activities are interrupted, and attention is directed to the surprising stimulus to make sense of it (Horstmann, 2015; Meyer

et al., 1997; Reisenzein, 2000b). Once the surprising stimulus is cognitively mastered (Attardo, 1997; Forabosco, 1992; Suls, 1972; Topolinski, 2013) surprise dissipates and other affective states follow depending on the valence of the surprising event (Ekman, 2003; Tomkins, 1984). In other words, people first respond to the unexpectedness of an event and only after people had time to make sense, they respond to the valence of the event.

Following these temporal dynamics of sense-making, the first chapter of this dissertation is a review and integration of theories and empirical evidence on surprise. I distinguish surprise as initial interruption due to inconsistency or disfluency from subsequent states that follow after people cognitively master the surprising stimulus. I discuss methodological implications of this perspective and review cognitive and experiential consequences of surprise by arranging them onto the interruption-to-mastering timeline.

In the second chapter, I use this temporal framework to empirically explore the possibility that surprise feels negative. That is, because the lack of understanding of unexpected outcomes is in conflict with people's need for a predictable and coherent world, it is likely to feel negative (Miceli & Castelfranchi, 2015; Proulx et al., 2012). I investigate how linguistic features of surprise and its temporal dynamics may have contributed to previous confusion regarding its valence. Specifically, I use autobiographical recall of unexpected and surprising events and facial expressions of surprise to distinguish responses to the unexpectedness of an event from responses to the valence of the event.

In the third chapter, I more systematically investigate the unfolding of facial expressions after a surprising event. I reason that if surprise feels relatively negative, initial facial expressions to positive surprises should be more negative than later expressions. In addition, expressions to positive and negative surprises should be initially similar. Finally, I investigate the possibility that the surprised face involves frowning and test how different facial actions (e.g., frowns, brow raises, smiles) develop over time.

Taken together, Part 1 of this dissertation aims to show that to understand surprise, it is key to take the temporal dynamics of sense-making into account. The chapters provide a test of the logic that surprise is the initial interrupted state in which people do not (yet) understand what has happened, which is different from the subsequent state that people experience immediately after making sense of the stimulus. Next, I take the dynamics of sense-making to better understand curiosity.

From Surprise to Curiosity

Curiosity is triggered when people become aware of a gap in their knowledge, for instance when they have incomplete information or when they are confronted with something novel and complex that they do not understand completely right away (Kashdan & Silvia, 2009; Litman, 2005; Loewenstein, 1994; Silvia & Kashdan, 2009). Like surprise, curiosity can thus be the result of unexpectedness, but there are more causes. Just missing information can also make people curious, for instance, when people do not know what will happen or

when they do not have the answer to a question (Berlyne, 1960; Loewenstein, 1994; Miceli & Castelfranchi, 2015). Situations that induce curiosity are thus broader than situations that induce surprise.

Curiosity instigates exploratory behavior, aimed at resolving the lack of information (Loewenstein, 1994; Silvia, 2012; Van Dijk & Zeelenberg, 2007). As such, curiosity is a state in which people have an information-gap but at the same time anticipate that they will resolve it. Surprise and curiosity thus share that there is something unknown that people want to resolve. Yet, while the key component of surprise is the interruption as a result of an unanticipated outcome, curiosity is better described as a state of lacking information with the anticipation that the resolution will follow. In other words, surprise is the “undecided” state in which people do not yet know whether to approach or avoid the event (Scherer, Zener, & Stern, 2004), while curiosity refers to the motivation to explore the unknown (Silvia, 2005).

It should be noted, however, that people do not mindlessly explore the unknown. An important precondition for exploration is that people estimate that they have the skills, knowledge, and resources to deal with the event (i.e., coping potential, Silvia, 2005). This means that people will only engage in exploratory behavior to resolve their information-gap, when they feel able to cope with it (Silvia, 2005). Coping potential is particularly an issue when people are confronted with complex and/or novel events. Relative to more simple and familiar events, complex and/or novel events are more likely to interfere with people’s understanding of their environment. So, instead of exploring all that is unknown, people will be less inclined to do so when the information-

gap is appraised to be too difficult to deal with. Note that this logic also implies that it is possible to shift from surprise to curiosity, but only when people feel they can cope with the unexpected event (see also sequential appraisals in Scherer, 2001, and Chapter 2).

In Part 2 of this dissertation, I build on the notion that curiosity involves both not knowing something and the anticipation of resolving this, to investigate how it feels to be curious. Moreover, I relate feeling able to deal with the unknown to interest in complex novelty.

Part 2: Curiosity

Based on the notion that curiosity is a combination of not knowing and almost knowing, in the fourth chapter of this dissertation, I investigate how time affects the subjective experience of curiosity. Specifically, I reason that the temporal proximity of the resolution of curiosity affects the relative impact of the not knowing (information-gap) vs. almost knowing component (anticipation of resolution). When people do not expect to close their information-gap soon (long time to the resolution), the anticipation of the resolution is weaker and not knowing is predicted to affect the experiential content of curiosity more strongly than when they expect to close their information-gap quickly (short time to the resolution). Because not knowing feels more negative than almost knowing, curiosity is predicted to feel more unpleasant the further in time the resolution.

Next, in the fifth chapter, I build on the fact that people need coping potential in order to be motivated to explore the unknown. Specifically, I investigate the relation between coping potential and

interest in complex novelty. Complex novelty, like new products or technologies, can be exciting in terms of promising possibilities, but also challenging because people do not exactly grasp its meaning or purpose. To become curious and interested in complex novelty it is therefore key that people have a sense that they can cope with it. I investigate this for both actual coping potential (product-specific understanding) and perceived coping potential (a general coping state that makes people able to tolerate the difficulty component of complex novelty).

In the current framework, I focus on the similarities between curiosity and interest, based on their shared exploratory motivation (see also Kahsdan & Silvia, 2009). It should be noted, however, that some researchers differentiated between curiosity and interest by arguing, for instance, that curiosity is more unpleasant and short-lived than interest (e.g., Hidi & Berndorff, 1998; Loewenstein, 1994). Situational curiosity is often (but not exclusively) studied with relatively specific and clear information-gaps (e.g., a box containing something round; see Van Dijk & Zeelenberg, 2007; or answers to knowledge questions, Litman, Hutchins, & Russon, 2005; see also Chapter 4). Interest, on the other hand, is typically studied in more complex and diffuse domains (e.g., art appreciation or learning, see Hidi & Berndorff, 1998; Silvia, 2005; Chapter 5) and even defined as such (i.e., novelty-complexity as one of the underlying appraisals of interest; cf. Silvia, 2005). In studies on curiosity it is therefore often clearer what piece of information is missing than in studies on interest. As such, curiosity can be resolved with finding this specific missing information, whereas with interest,

discovering one thing may motivate finding out more. This not only makes interest last longer, it is also likely to be more pleasant as there are many more possibilities for gaining knowledge than with the more specific information-gap of curiosity (see also the discussion on lack of informational end-point in Chapter 4).

While there are thus reasons to differentiate between curiosity and interest, it also seems that the assumed differences are at least partly a byproduct of the domains in which curiosity and interest are studied. In addition, while perceptual curiosity (attention to novel visual, auditory, or tactile stimuli, see Berlyne, 1954; Collins, Litman, & Spielberger, 2004) may fit the perspective of clear information-gaps, with epistemic curiosity this becomes more difficult. Epistemic curiosity is the desire for knowledge aroused by conceptual puzzles or (complex) ideas (Berlyne 1954; Litman & Spielberger, 2003). This thus also includes more complicated and diffuse topics making it hard to distinguish it from interest (see also the concept of diversive curiosity in Berlyne, 1960). In general, there are thus many similarities between curiosity and interest and for the sake of parsimony, in this dissertation I focus on the features they share.

Finally, a note about the chapters that will follow: The chapters are written as (empirical) journal articles and they can be read independently and there is some overlap. Moreover, due to changing times in social sciences (cf. Kline, 2013), the different chapters contain somewhat different statistical methods to test the hypotheses. This is a reflection of different requirements of journals moving away from only performing null hypothesis significance testing procedures (Cumming,

2015; Trafimow & Marks, 2015) and a general trend toward promoting good research practices (Simmons, Nelson, & Simonsohn, 2011, 2013).