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Serendipity as chaos or discovery – exploring the role of personality and sense of coherence

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Introduction. Individual differences have long been said to influence serendipity. Empirically, however, robust evidence is lacking for this connection. This study addressed this research gap by linking serendipity to personality traits and sense of coherence.
Method. Data from 140 respondents was collected by an online survey. The survey measured the five-factor model personality traits, sense of coherence and serendipitously found useful and interesting information.
Analysis. The data was analysed by a general linear model regression analysis.
Results. Only 7% of variance of serendipity/usefulness and 10% of serendipity/interest could be explained by personality and sense of coherence. Usefulness was linked to sense of coherence (low comprehensibility), while interest was linked to personality (extraversion, agreeableness and low negative emotionality).
Conclusions. Individual differences in serendipity was found both related to a negative cognitive experience of information chaos and a positive affective-behavioural experience of discovery. Lack of control over the information flow could lead to a sense that acquisition of useful information is governed by chance rather than conscious efforts. Activity, social connectedness and positive emotionality, in turn, would increase the likelihood to discover interesting information.

Introduction

Today we receive more and more information passively instead of actively seeking it out. Some of this passively retrieved information could lead to serendipitous discoveries fostering innovation and creativity (Foster and Ellis, 2014; Erdelez et al., 2011). Serendipity does not happen, however, if we are not open to it, and able to seize and utilise it. To make the most of the potential of serendipity we need to understand the mechanisms behind it. Various factors that facilitate serendipity have been identified, from contextual to personal affordances (Björneborn, 2017). We, however, lack a deeper understanding of the exact

mechanisms which enable serendipity. This paper will address this research gap by exploring individual differences in serendipity in relation to personality traits (Costa and McCrae, 1992) and sense of coherence (Antonovsky, 1993).

Serendipity has been defined as an '*unexpected experience prompted by an individual's valuable interaction with ideas, information, objects, or phenomena*' (McCay-Peet and Toms, 2015b). It is

> an incident-based, unexpected discovery of information leading to an aha! moment when a naturally alert actor is in a passive, non-purposive state or in an active, purposive state, followed by a period of incubation leading to insight and value (Agarwal, 2015).

For some people being serendipity-prone is an integrated and valued part of their identity (Erdelez, 1997; Makri and Blandford, 2012b). Others, again, cannot recall serendipity ever occurring (Erdelez, 1997, 1999) or do not believe in it (Dantonio, 2010). Serendipity as an experience also contains a strong element of subjectivity (Makri and Blandford, 2012b). What someone may deem insightful and valuable, others may discard as meaningless. A person who often experiences serendipity may over time pay less attention to it as it becomes habitual (Makri and Blandford, 2012b). The subjective notion of serendipity is also dynamic, so that a person may regard an event as more or less valuable over time (Makri and Blandford, 2012b).

Anecdotally, serendipity has long been related to personality traits (Merton and Barber, 2004). Serendipitous scientists commonly share characteristics such as sagacity, awareness, curiosity, flexible thinking and persistence (Roberts, 1989). Despite qualitative support, however, quantitative studies remain inconclusive as to the role of personality in serendipity. The aim of this study was to address this research gap by exploring the impact of personality traits and sense of coherence on serendipity. Personality is a stable characteristic that influence behaviour across situations, while sense of coherence is dynamic and may alter due to life experiences. Personality according to the five-factor model has been found to influence information behaviour in several contexts including serendipity (Heinström, 2010). Sense of coherence, in turn, influences how people master information in their daily life and to which degree they have a sense of control over the information flow (Ek, 2005). The combination of these two measures will illuminate whether stable individual differences and more dynamic characteristics influences the degree of serendipity.

Literature review

The literature review includes studies that have explored similar concepts to serendipity, such as information encountering (Erdelez, 2005; Erdelez and Makri, 2020), incidental information acquisition (Heinström, 2006; Williamson, 1998) and opportunistic discovery of information (Erdelez and Makri, 2011). McKay-Peet and Toms (2015b) point out that these concepts are indeed serendipity-related but do not account for the whole process of serendipity, including both the use of the serendipitously encountered and finding something that is sought for in an unexpected manner. For the purpose of this paper, however, these studies will be included in order to largely cover empirical findings related to individual differences in serendipity-related phenomena.

McCay-Peet and Toms (2015b) describe the process of a serendipitous experience as consisting of a trigger which leads to a connection and follow-up, resulting in a valuable outcome. Central in this process is the finding: the essence of the encounter (Rubin, et al., 2011) and the trigger of the serendipity process (McCay-Peet and Toms, 2010). Jiang, et al. (2015) model of online information encountering includes pre-activities (browsing, searching, social interaction), mid-activities (the process of noticing, examining and acquiring) and post-activities (exploring, saving, using and sharing). The model recognises that both dynamic and constant elements related to users, information and the environment play out in this process. Constant user factors are intentionality, curiosity and activity diversity while dynamic factors include sensitivity, emotions, expertise and attitudes (Jiang, et al., 2015).

For a trigger to occur certain conditions must be in place (McCay-Peet and Toms, 2010). People may

either actively engage in activities that prompt serendipity (such as reading or socialising) or passively invite it (Sun, et al., 2011). Some people are more likely than others to find themselves in situations and contexts where serendipity is likely to occur. Personality traits such as perseverance (Foster and Ford, 2003; Liestman, 1992 cited from Makri and Blandford, 2012b) and extraversion (Heinström, 2002; 2005) lead to active information interaction which in turn increases the likelihood that the person accidentally comes across useful information.

Timing is a decisive element in the serendipity process (McCay-Peet and Toms, 2010). Every day we run into a multitude of information in various forms. Our perception by default needs to be selective among all these stimuli. Potentially useful pieces of information may therefore pass unnoticed unless the person is alert enough to pay attention to them. The Swiss cheese model (Makri and Blandford, 2011) illustrates that serendipity is most likely to occur in a conductive physical environment without time pressure where the person is (consciously or unconsciously) aware of a need and has an open mind (Makri and Blandford, 2012a). The likelihood to notice is increased by unfocused attention, a relaxed mindset, a prepared mind, being alert, in a good mood and willing to deviate from the current task (van Andel, 1994; Heinström, 2006; Makri and Blandford, 2012a; Pontis et al., 2016; Rubin, et al., 2011). The ability to recognise the value of serendipitously encountered information relies on a previous understanding or interest in the topic (e.g., Dantonio, 2010; Foster and Ford, 2003; Pálsdóttir, 2010; McBirnie, 2008; Rubin, et al., 2011). Topical expertise may, however, also have the opposite effect of blocking out serendipity if a person already has his/her mind set on a particular framework (Dane, 2010).

Serendipity prone people tend to have a more invitational and elastic attention span which in turn invites serendipitous encounters (Rubin, et al., 2011). Various demands, such as time pressure, stress and responsibility, tend to obstruct perceptual attentiveness, so that we more easily overlook cues to potentially valuable information (Jiang, et al., 2015; McBirnie, 2008). This filter is often unconscious. It is, however, also possible to deliberately shut out serendipity, for instance when it is necessary to pay close attention to the task at hand (Dantonio, 2010). Unfocused attention is therefore one key that increases the likelihood for serendipity (Rubin, et al., 2011). Miyata and Norman (1986) describe two basic styles of information processing: a task-driven and an interrupt-driven one. In a task-driven process people become so involved that they simply do not recognise input outside of their attentional focus. In an interrupt-driven state, people are more alert to outer events and distracted by non-focused thoughts and signals. The trigger of the serendipity process often occurs in moments of unfocused attention and explorative states, such as taking a mental break (McCay-Peet and Toms, 2015b).

Unfocused attention paves the way for serendipity, but serendipity does not occur without the ability to seize the find (Fine and Deegan, 1996). Opportunistic discovery of information is favoured by the person's ability to recognise affordances in a text (Toms, 2000b). An important aspect of pursuing a find is thus to recognise its value and having the sagacity to convert the serendipitous find into an insight (André et al., 2009; Björneborn, 2017; Jiang, et al., 2015; Rubin, et al., 2011). The decision to pursue a find may depend on the context, the individual and a combination of both (Andre et al., 2009). It has been found that people vary in their ability to seize the moment and recognise opportunities (Shane et al., 2010). When some people encounter useful information, they stop their current task and switch their attention towards the find, while others remain focused on the task (Erdelez, 1997). This willingness may be enhanced by positive emotionality while being in a bad mood, stressed, tired or pressured with time would rather hinder it (Dantonio, 2010; Jiang, et al., 2015; Makri and Blandford, 2012b; McBirnie, 2008; Zhou et al., 2018).

People who make useful discoveries by chance often learn how valuable these encounters are. This increases their alertness to serendipitous finds and strengthens their willingness to act on and follow up on serendipitous events in the future (Erdelez, 1997; Makri and Blandford, 2012a). One way to increase the likelihood for serendipity is to purposefully cultivate an open and receptive mind (Foster and Ford, 2003; Jiang, et al., 2015; Makri and Blandford, 2012a; McBirnie, 2008; Makri et al., 2014; Watson, 2008). Although serendipity in itself is a positive experience, chance encounters may also at times be negative and distracting (Dantonio, 2010). Even for super-encounterers who value their ability to notice, the flow of information may become stressful and over-whelming (Erdelez, 1999).

Personality

The study investigated personality according to the five-factor model, currently the most agreed-upon model of personality (Revelle, et al., 2011). This model describes personality along five central dimensions: openness to experience, conscientiousness, extraversion, agreeableness and negative emotionality (Costa and McCrae, 1992). These personality traits will be described in the following including their potential connection to serendipity.

Openness to experience

van Andel (1994) states that anecdotally '*most serendipitist are open-minded, perceptive, curious, intuitive, smart, flexible, artistic, humorous and diligent*'. This notion corresponds well with the definition of the personality trait openness to experience (Costa and McCrae, 1992). Several scholars refer to open-mindedness as facilitating serendipity *(*André et al, 2009, Foster and Ford, 2003; Heeter and Greenberg, 1985; Makri and Blandford, 2012a; Rosenmann, 2002).

Openness to experience has been linked to creativity and a greater capacity for divergent thinking (McCrae, 1987). The ability to adapt to new situations, instead of strictly adhering to predetermined rules invites serendipity (McBirnie, 2008). de Rond et al. (2011) state that '*serendipity is to see meaningful combinations where others do not*'. Rosenman (2002) underlines the importance of a questioning mind to enable serendipity. The person must have an ability to make the connection by thinking critically and creatively (McCay-Peet and Toms, 2015b). Sagacity, the ability to make the unexpected connection, is essential (Andre et al., 2009; Liestman 1992 cited from Makri and Blandford, 2012b; Zhou et al., 2018). Prior research supports the connection between serendipity and creativity (Dantonio, 2010; Ford, 2004; Makri and Warwick, 2010). Creativity includes a cognitive aspect in the ability to develop multiple and original ideas (Carroll, 1993 cited from Furnham and Bachtiar, 2008). Creativity is, however, a multidimensional trait which includes curiosity and an optimistic outlook (Furnham and Bachtiar, 2008). Creativity has been linked to the personality traits extraversion, openness to experience and emotional stability. Combined these traits form a character that is active, outgoing, curious, and explorative with a tendency to feel calm and happy in most situations (Furnham and Bachtiar, 2008). Perhaps a similar combination of traits provides a good ground for serendipity?

Research suggest an indirect link between openness and serendipity through active and explorative information acquisition (Heinström, 2002, 2012). Quantitative studies have, however, failed to find a direct connection between openness to experience and serendipity (Heinström, 2006; McCay-Peet, Toms and Kelloway, 2015a; Stokes and Urquhart, 2011). One explanation may be that openness is not enough if not supported by active information interaction (Heinström, 2002). Another possibility is that open people who often experience serendipity may not acknowledge the role of serendipity. For less open people chance events may be easier to recall as they are experienced as more salient (Hirschi, 2010). The link between openness and serendipity may, moreover, rather be found in a cultivated, purposeful attitude or momentary receptiveness (McCay-Peet and Toms, 2015b; McCay-Peet, et al., 2015a).

Typical for persons with high openness is intellectual curiosity (Silvia and Sanders, 2010) and high typical intellectual engagement (TIE) (Furnham, et al., 2009). Curiosity is a recognised key factor in serendipity (e.g., Björneborn, 2017; Dantonio, 2010; *Erdelez, 1997; Foster and Ford, 2003;* McCay-Peet and Toms, 2011; Toms, 2000a). Intrinsic motivation is, similarly, linked to serendipity (Heinström, 2006). Open persons tend to have wide interests and enjoy trying on new things (Costa and McCrae, 1992). Similar traits – curiosity, adventure seeking, and wide interests – have been found among super-encounterers (Erdelez, 1997). Openness to experience has been linked to receptivity to the unexpected (Pickering and Gray, 2001) and opportunity recognition in an entrepreneurial context (Shane et al., 2010). Interest, playfulness and inclusiveness as sub-factors in curiosity are key personal affordances for serendipity (Björneborn, 2017).

Conscientiousness

A conscientious person is reliable, dutiful, hard-working, efficient and thorough (Costa and McCrae, 1992). Conscientious persons are willing to invest effort in their work. Perseverance, a sub-trait of conscientiousness, has been recognised as an important factor behind serendipitous scientific discoveries (Foster and Ford, 2003; Liestman, 1992 cited from Makri and Blandford, 2012b). Researchers '*make their own luck*' by working hard and persistently (Foster and Ford, 2003). Serendipity is similarly more likely to occur through thorough information seeking (Liestman, 1992 cited from Makri and Blandford, 2012b) and investment of time in the search process (Dantonio, 2010), which is typical for conscientious persons (Heinström, 2002, 2005). Conscientiousness has indeed been positively linked to men's experience of serendipity (Kahn, 2012). A sense of laziness or indifference, on the other hand, dampens the willingness to pursue finds (Jiang, et al., 2015). In any given moment, however, conscientiousness may also hinder serendipity. Conscientious persons may, for instance, regard serendipitous finds as going off target and deliberately shut them out as distractions (Stokes and Urquhart, 2011). For some people, the lack of control over serendipity is regarded as something negative (Dantonio, 2010). Highly conscientious people e.g. prefer recommendation systems with low serendipity (Nguyen et al., 2018).

Extraversion

Extraversion has been found to increase receptivity for the unexpected (Pickering and Gray, 2001), including serendipity (Heinström, 2006; McCay-Peet, et al., 2015a). Extraverts are social, active, positive and impulsive (Costa and McCrae, 1992). All these traits play out in serendipity. Information is often serendipitously retrieved through social interaction (Dantonio, 2010; Dantonio, et al., 2012; McCay-Peet and Toms, 2010; McBirnie, 2008; McBirnie and Urquhart, 2011; Pálsdóttir, 2011). Active information seeking exposes a person to a larger variety of information sources, some of which may contain serendipitous finds (Foster and Ford, 2003; Pálsdóttir, 2010; Solomon and Bronstein, 2015). Impulsivity, finally, may hypothetically increase the likelihood to seize unexpected encounters.

Agreeableness

Agreeableness is a measure of friendliness and relatedness (Costa and McCrae, 1992). Social connections and conversations with friends and colleagues are often key to serendipity, both in terms of discovery and in recognising the value of a find (Dantonio, et al., 2012; McCay-Peet and Toms, 2015b). Agreeableness has been found to increase the influence of serendipity in career choice among men (Kahn, 2012).

Negative emotionality

Several studies have underlined that serendipity is more likely to occur when a person is relaxed or in a good mood (Heinström, 2006; Dantonio, 2010; McBirnie, 2008; Makri and Blandford, 2012a; Zhou et al., 2018). Relaxed moods make people more receptive and able to allocate attentional resources to serendipitous discoveries (Sun, et al., 2011). Similarly, insight is more likely to occur when idle (Csikszentmihalyi and Sawyer, 1995 cited from Campos and Figueiredo, 2001). Positive moods are, moreover, linked to divergent thinking (Baas et al., 2008; Chermahini and Hommel, 2012; Davis, 2009). Divergent thinking, in turn, relates to flexible information seeking and increased receptivity for unexpected discoveries (Foster, 2004). Holistic (Ford et al., 2002) and lateral thinking styles (de Bono, 1990 cited from Campos and Figueiredo, 2001) also induces serendipity. Information is often e.g. encountered while surfing on the Internet (Erdelez and Rioux, 2000). This may be related to the relaxed mode of leisurely Web surfing, which inspires divergent and lateral thinking (Campos and Figueiredo, 2001). Serendipity is, further, more likely to occur during explorative searching rather than during goal-oriented, problem-focused searching (Heinström, 2002; Dantonio, 2010; Makri and Warwick, 2010; Toms, 2000b). Being relaxed and in a good mood is a temporary state, but some people also have a general tendency to be happy and calm across contexts. This personality trait, low negative emotionality, has been found to increase the likelihood to incidentally run across useful information (Heinström, 2006).

Stress and negative emotionality hinder explorative behaviour and serendipity (McBirnie, 2008; Sun, et al., 2011; Zhou et al., 2018). Being narrowly focused on a task or pressured by stress similarly shut out

serendipity (Dantonio, 2010; McBirnie, 2008; Sun, et al., 2011). Negative emotionality has, however, also been positively linked to serendipitous influence by others, as persons with high negative emotionality are more inclined to turn to others for help when faced with problematic situations (Kahn, 2012).

Sense of coherence

Sense of coherence describes a resilience to stress which explains why some people cope well with stressors in situations that others find overwhelming (Antonovsky, 1979, 1987). Sense of coherence consists of three dimensions: comprehensibility, manageability and meaningfulness. Comprehensibility suggests that a person perceive stimuli from the environment as structured, predictable and understandable. Manageability, in turn, refers to the belief that one has the needed resources to deal with life's challenges. Meaningfulness refers to a sense of purpose and belief that it is worth to invest effort in facing challenges. Those with a strong sense of coherence feel linked to their environment and understand messages they receive (Antonovsky, 1993). Drawing on the construct of sense of coherence, Ek (2005) developed the concept of information mastering which argues that our life is a problem-solving process where information is constantly needed. Ek (2005, 2008) describes weak information mastering as experiencing information as chaos, overload, or noise and not feeling heard and understood. A strong information mastering refers to the capacity to take in, sort out, and integrate information as well as to smooth communication with others.

No previous study has, to our knowledge, linked sense of coherence to serendipity. The link between sense of coherence could be a positive one, so that those with a high sense of coherence who feel linked to their environment and socially connected would be more receptive to serendipity. People who are easily overwhelmed by information rich environments have been found to dismiss or ignore triggers for serendipity (McBirnie, 2008; McCay-Peet and Toms, 2015b). It could, however, also be that those with a weak sense of coherence who experience their information world as chaotic (Ek, 2005) could believe that they retrieve more information by chance. Those with a low sense of coherence lack a sense of control over their lives (Pallant and Lae, 2002). An external locus of control may lead to a belief that life decisions are dependent on chance (Hirschi, 2010). Locus of control has, however, not been found to be influential on serendipity (McCay-Peet, et al., 2015a).

Aim of the study

The aim of the exploratory study was to investigate the influence of the five-factor model personality traits and sense of coherence on serendipity.

The research questions are as follows:

1. Do the five-factor model personality traits influence serendipity, and if so, how?

2. Does sense of coherence influence serendipity, and if so, how?

Method

Serendipity, personality and sense of coherence were measured as part of a larger study on everyday information mastering (Heinström et al., 2019). As part of the scale development we conducted a pilot interview study with twenty upper secondary students to test interpretation of items and gain ideas for new items. Based on the pilot, two of the serendipity-related items were rephrased, one original item remained and one item was added.

The quantitative data ($n = 140$) were collected in two upper secondary schools which took part in a teaching intervention. The scale was administered by an online survey through Survey Monkey (https://fi.surveymonkey.com/). A five-point scale ranging from *totally disagree* to *totally agree* measured serendipity and personality while sense of coherence was measured on an equivalent seven-point scale.

Personality was measured by a 10-item scale of the five-factor model (Lönnqvist, et al., 2008). The scale measures each of the five dimensions by two items (each item being a pair of adjectives), giving a total of 10 items (20 adjectives). The short scale was chosen to shorten the overall survey. Sense of coherence was measured by a validated scale by Antonovsky ([1987](#)). The scale consists of 13 items, four measuring manageability, four measuring meaningfulness and five measuring comprehensibility.

Serendipity was measured by four items, two measuring serendipitously retrieved *useful* information and two measuring serendipitously retrieved *interesting* information. Scholars have argued that usefulness and interest may refer to different dimensions of serendipity and should be measured as such (Björneborn, [2017](#); Jiang, et al., 2015). The serendipity/usefulness scale consisted of two items: *Information that I find by chance is often even more useful than information that I have purposively sought out* and *I often run into useful information by chance.* The serendipity/interest scale consisted of two items: *I daily run into news that are interesting to me,* and *When I am surfing on the Web I almost always come across something interesting.*

Regression analysis was employed to explore how the independent variables predicted the dependent variables. A general linear model, which assumes normal distribution, was applied. The data did not pass the Kolmogorov-Smirnov test of normality. Normality was, however, evaluated graphically using Q-Q plots. All data was at least approximately normally distributed with a skewness of -0.34 (SE =.12) and kurtosis of -0.27 (SE = .24). Multicollinearity was not a concern (VIF = 1.6 to 2.13).

Results

Reliability for the personality scales was tested with Cronbach α giving following results: openness to experience (0.37), conscientiousness (0.45), extraversion (0.74), agreeableness (0.51) and negative emotionality (0.48). The reliability proved low for all scales except extraversion. Due to the low reliability, the option of using each personality item as a separate measure was investigated in explorative analyses. This solution, however, did not add value. Consequently, the two items measuring each respective personality trait were combined to summary variables. Reliability for sense of coherence as a whole scale and for each respective sub-scale was tested with Cronbach α. This gave the following results: sense of coherence (0.85), manageability (0.67), meaningfulness (0.75), and comprehensibility (0.69). Reliability for the serendipity scales were tested with Cronbach α giving the following results: serendipity/usefulness (0.53) and serendipity/interest (0.39). Due to low reliability the use of single items was tested. As this solution did not add value summary variables were created.

A general linear model was applied to test whether serendipity/usefulness and serendipity/interest could be predicted based on personality and sense of coherence. In the preliminary analyses it was found that using the three sub-scales of sense of coherence provided more fine-grained results than the overall measure of sense of coherence. The following hence reports results related to the comprehensibility, manageability and meaningfulness dimensions of sense of coherence.

The results of the regression analyses are shown in Table 1. Table 1 reports ß values, which show the strength of the relation between the independent and dependent variable, *F* values which show the degree of variability that the regression model can explain, and R^2 values, which show the amount of variance explained by the model. Only personality traits (extraversion, agreeableness and negative emotionality) and sense of coherence dimensions (comprehensibility) that were significantly related to serendipity are shown in the table.

Table 1. The relationship between serendipity and the independent variables of the study. Negative connections are noted in italic.

Serendipity	Extraversion	Agreeableness	Negative emotion.	Comprehensibility	*F*	R^2
Useful				*ß=-0.18**	3.59***	0.07

| **Interest** | ß=0.13* | ß=0.14** | *ß=-0.14* | | 5.29*** 0.10 |

*p<0.05, **p<0.01, ***p<0.001

The general linear model was supported, albeit showing a modest influence of personality and sense of coherence on serendipity. Only 7% of variance of serendipity/usefulness and 10% of serendipity/interest could be explained by personality and sense of coherence. The usefulness dimension was negatively linked to sense of coherence (comprehensibility) but showed no connection with the five-factor personality traits. The interest dimension was positively linked to extraversion, agreeableness and negatively linked to negative emotionality. The interest dimension had no significant connection to sense of coherence despite a non-significant connection to meaningfulness (ß=.13, p=.06).

Discussion

Despite a long tradition of anecdotal evidence, empirical evidence has failed to present convincing evidence of individual differences in serendipity. This lack of connection was confirmed in the present study, as neither personality traits nor sense of coherence explained more than 10% of serendipity. The findings hence allude to McCay-Peet, et al.'s (2015a) finding that contextual factors play a significantly stronger role in serendipity than personality. One explanation may be that any single personality trait has little impact if not combined with other affordances. Serendipity may only occur when several situational and personal enablers are present (Björneborn, 2017; Makri and Blandford, 2011). A combination of a prepared mind, an energetic character and openness to new discoveries may increase the likelihood for serendipity, while any one of these characteristics in themselves do not necessarily have the same effect. A prepared mind without information access, an energetic searcher without curiosity, and curiosity without background knowledge and access, may all fall short of serendipity. Openness to experience in combination with extraversion and competitiveness leads to broad scanning, which is characterised by wide explorative information seeking and serendipity (Heinström, 2002), while mere openness may not have the same effect (Heinström, 2006). The experience of serendipity may, moreover, be interpreted in different ways dependent on the individual. More open people may, for instance, regard serendipity as a normal way to receive information. It has also been suggested that opportunistic discovery of information is a distinct trait in itself, which is not related to other personality traits (Wise, et al., 2012; Kim, et al., 2013).

A challenge with measuring serendipity, moreover, lie in operationalising the phenomenon. This limitation is also present in our study. We purposively tried to emphasise the value of serendipity in retrieving useful information by stating that serendipitously found information could be *more* useful than purposively sought information. This may, however, have resulted in bias as the respondents may have interpreted this as a less valid way to retrieve information. Interviews conducted in our pilot study showed that respondents hesitated to admit serendipity since they believed this to be a less valuable way to retrieve information than purposeful seeking (Heinström et al., 2019). Previous research has found that super-encounterers often feel ashamed of their information acquisition habits (Erdelez, 1997; McBirnie, 2008). Serendipity prone persons are often reluctant to talk about their experiences in a culture that favours systematic rationality (Liestman, 1992 cited from Erdelez, 2004). The serendipity/interest scale, in turn, might have suffered from the opposite problem as being phrased perhaps too generally. The scale potentially measured more of an openness for discovery than serendipity per se. Our measures, moreover, did not cover the whole process of serendipity, including the use of the unexpected information (McKay-Peet and Toms, 2015b). It may, therefore, be debated whether what we measured really was serendipity as we have no proof for how the retrieved information was used, if at all. A further limitation in our study was the low reliability of the used measures, particularly the ones measuring personality and serendipity. This was likely due to scales consisting of only two items, a factor known to lower alphas (Streiner, 2002), but nevertheless needs to be considered. The scales measuring sense of coherence consisted of several items and had a considerably higher reliability. The results should thereby be interpreted with caution. Our sample size was, moreover, small and our respondents were high school students. The results may hence not be generalised.

Despite the meagre results we did find some evidence for potentially influential individual differences. It is noteworthy that the mechanisms differed dependent on whether the serendipitously retrieved information was deemed useful or interesting. *Useful* information was only linked to low comprehensibility, a sense that life does not make cognitive sense. For people with low comprehensibility, information chaos often prevails (Ek, 2005). Previous studies have found that lack of expertise or insecurity in information seeking may lead to a belief that more information is received by chance (Behesti, 2012; Dantonio, 2010; Jiang, et al., 2015). Those with a weak sense of coherence may, therefore, believe that they receive more information serendipitously due to a sense of lack of control over the information flow. Drawing on signal detection theory (Green and Swets, 1966; Jiang et al., 2015) note that good sensitivity to information entails both the ability to recognise relevant stimuli and rejecting irrelevant noise. Those with a weak sense of coherence are less likely to have this ability as they perceive their information world as chaotic. It therefore seems that openness to information, including serendipity, may have both positive and negative connotations, at times simultaneously. Openness for serendipity increases the likelihood for valuable discoveries but at the same time openness may also be overwhelming. Even super-encounterers who value their openness for serendipity at times experience information overload and stress (Erdelez, 1999). It is important to notice this duality as encouraging openness to serendipity may include balancing an invitational attitude with controlling for information overload.

Serendipitously finding *interesting* information implied a positive notion of discovery, linked to extraversion, agreeableness and emotional stability. Several studies show that serendipitously retrieved information acquisition often occur through social interaction (e.g., Dantonio, et al., 2012). Extraverted and agreeable people have large networks through which they are likely to receive interesting information unexpectedly. Extraverted people are, moreover, active which further increases exposure to information (Heinström, 2006; McCay-Peet, et al., 2015a). It is also well-established that positive emotionality and lack of stress is conductive for serendipity (e.g., McBirnie, 2008). Social connectedness, activity and positive emotionality thereby constitute a conductive ground for receiving interesting information unexpectedly. Activity leads to exposure and positive emotionality increases the openness for new impulses.

The study introduced sense of coherence to the study of serendipity. The found link between sense of coherence and serendipity confirms the role of sense of coherence in information behaviour. Previous studies have found that sense of coherence influences information mastering (Ek, 2005, 2008), interest or avoidance of health information (Ek and Heinström, 2011) and information sharing (Heinström and Ahmad, 2017). The connection between sense of coherence and serendipity would be valuable to explore in future studies.

Conclusions

The study failed to show convincing evidence of the impact of personality and sense of coherence on serendipity. The findings, nevertheless, point to both cognitive, affective and behavioural differences that influence serendipity. These mechanisms, moreover, differed in serendipitously finding useful or interesting information. The combination of sense of coherence and personality traits contributed to a more complex picture of individual differences in the experience of serendipity. Sense of coherence pointed to cognitive dimensions while personality traits underlined affect and behaviour. Combined the study showed that serendipity could both be related to a negative cognitive experience of information chaos and be a result of positive emotions and activity. Cognitive differences were related to finding useful information and affective-behavioural differences to finding interesting information. The affective-behavioural differences related to discovery of interesting information largely confirmed previous findings (e.g. McCay-Peet, et al., 2015a). The cognitive difference, however, showed a novel link between serendipity and sense of coherence. Serendipity is inherently positive and linked to unexpected valuable discoveries. This experience may, however, occur on a backdrop of a generally chaotic information world.

Jiang, et al.'s (2015) model of online information encountering includes pre-activities (browsing,

searching, social interaction), mid-activities (the process of noticing, examining and acquiring) and post-activities (exploring, saving, using and sharing). Our study found that personality particularly influences pre-activities, actively being engaged in active information interaction or in a good mood. Personality traits may, therefore, be seen as contributing to serendipity indirectly by increasing elements such as active exposure, positivity and opportunity.

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