Increasing curiosity through autonomy of choice

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Abstract
This study examined the effect of satisfaction of the basic psychological need for autonomy on curiosity. One hundred and fifty-four participants first completed measures of autonomy-need satisfaction and curiosity. Participants were then randomly assigned to either a condition that supported autonomy of choice or a condition not supporting autonomy of choice. The autonomy-choice intervention provided participants with choice of topic for a video they could watch, while those in the non-autonomy of choice condition did not have choice. All participants then rated their curiosity regarding the topic of the video. Results showed that participants whose need for autonomy was more satisfied had higher levels of curiosity. Participants randomly assigned to the autonomy of choice condition, providing choice of topic showed greater curiosity regarding the topic than participants who did not have a choice of topic. Autonomy of choice was most beneficial in stimulating a high level of curiosity about the topic for participants who had low general autonomy need satisfaction. The results of the study support the importance of self-determination in fostering the emotion of curiosity.

Keywords  Autonomy - Autonomy of choice - Autonomy support - Curiosity - Self-Determination Theory

Curiosity is the desire to know (Noordewier and van Dijk 2017). Curiosity is a positive emotion related to interest (Fredrickson 1998) and can be experienced as a momentary state as well as a trait, with individuals high in trait curiosity more frequently and intensely experiencing curiosity (Kashdan and Steger 2007; Silvia 2008). Similar to other emotional states, curiosity is a motivating force (Kashdan and Steger 2007).

Curiosity may have several related dimensions (Kashdan et al. 2018). These include what Kashdan et al. described as joyous exploration, similar to interest (I-type) curiosity (Litman 2000; Litman et al. 2010); deprivation sensitivity, similar to curiosity stemming from lacking information (D-type curiosity; Litman 2008; Litman et al. 2010); social curiosity, similar to interpersonal curiosity (Litman and Pezzo 2007); thrill seeking; and intrapersonal curiosity, the desire for information about the self (Litman et al. 2017).

Curiosity can be understood by examining how it impacts motivation (Litman 2005). Curiosity related to wanting to know for the sake of knowing and fascination with new information and experiences may result in approach motivation, while curiosity that arises from being frustrated by not knowing may result in avoidance motivation related to escaping the frustration. The joyous exploration or interest dimension of curiosity may be most related to intrinsic motivation and to approach motivation (Litman et al. 2010). For example, Lauriola et al. (2015) found that individuals with greater interest type curiosity were more likely to have positive outcome expectancies and a higher level of behavioural activation; positive outcome expectancies and behavioural activation can facilitate approach motivation.

The motivation induced by curiosity may lead individuals to seek out and immerse themselves in new situations, which will tend to result in the acquisition of knowledge, building of skills, strengthening of relationships, and increased creative abilities (Kashdan et al. 2018). The joyous exploration or interest as well as the deprivation type of curiosity (Kashdan et al. 2018; Litman 2008; Litman et al. 2010; Mussel et al. 2012) may lead to positive emotions prompted by the acquisition of new information and solving of problems. Along with other positive emotions, curiosity may result in a broadening and building of resources that lead to increased well-being and an upward spiral of well-being and positive lifestyle changes as described by Fredrickson and Joiner (2018). Congruent with this postulation, Gallagher and Lopez (2007) and Kashdan et al. (2004) found
greater curiosity to be associated with indices of subjective well-being, such as high positive affect and happiness and low negative affect and with indices of psychological well-being, such as personal growth and sense of purpose in life. Curiosity aids academic achievement (Von Stumm et al. 2011) and facilitates creativity in work settings (Harrison and Dossinger 2017). A higher level of work-related curiosity is associated with better job performance (Mussel et al. 2012). Both higher interest-based curiosity and higher deprivation curiosity are related to greater intrinsic work motivation (Littman et al. 2010).

Autonomy, the need to experience behaviour as volitional rather than being coerced by external factors, is a central concept in Self-Determination Theory (Deci and Ryan 2000; Ryan and Deci 2000, 2017) as part of two related motivational processes. Autonomy is one of the three basic psychological needs described by Self-Determination Theory. Satisfaction of basic psychological needs is intrinsically motivating and important for growth and well-being (Deci and Ryan 2000; Ryan and Deci 2000, 2017). Satisfaction of autonomy needs is associated with a variety of life quality indicators. For example, Chen et al. (2015) found that across four cultures greater satisfaction of autonomy needs was associated with greater self-esteem, fewer symptoms of depression, and greater satisfaction with health and financial situations. Further, according to Self-Determination Theory (Deci and Ryan 2000; Ryan and Deci 2000, 2017), autonomy is an important aspect of regulation of motivation. Motivation falls on a continuum ranging from motivation regulated by external forces that reward or punish, to internalised motivation, to intrinsic motivation, which is motivation through the nature of an activity or experience itself. Internalised motivation falls into different categories that represent degrees of internalisation of what were previously external motivational forces, and these categories vary in degree to which they represent integration with the self. For example introjected regulation describes internalised rewards and punishment and is less integrated with the self, while identified regulation involves a greater synthesis with the self. The more integrated motivation is with the self, the greater the individual’s sense of autonomy. The most autonomous regulation stems from intrinsic motivation, such as that stemming from satisfaction of basic psychological needs. More autonomous and self-determined motivation in general leads to better life outcomes (Deci and Ryan 2000; Ryan and Deci 2000, 2017).

In a theoretical examination of the role of choice in facilitating motivation, Katz and Assor (2007) suggested that having choice is motivating when choice supports autonomy. Although choice generally increases intrinsic motivation (Cordova and Lepper 1996), this is not always the case (Reeve et al. 2003). The role of choice in impacting intrinsic motivation can depend on cultural contexts, with choice having a stronger influence on intrinsic motivation in individualistic cultures (Tyengar and Lepper 1999).

Results of experimental research show that facilitation of autonomy, consisting of enhancing others’ perceived choice in actions, can lead to an increase in autonomy need satisfaction and associated beneficial outcomes (Deci and Ryan 2008), including greater interest in an area (Grolnick and Ryan 1987), better academic performance (Guay et al. 2008), increased employee workplace engagement (Hardé and Reeve 2009), and better mental and physical health (Ng et al. 2012). For example, in a meta-analysis of 184 studies on the effects of health practitioner support of patient autonomy of choice, Ng et al. found that autonomy support resulted in a reduction in symptoms of depression and anxiety, more weight loss among overweight patients, greater adherence to a healthy diet, and better dental hygiene.

The dual role of autonomy in regulation of motivation and as a basic psychological need (Deci and Ryan 2000; Ryan and Deci 2000, 2017) suggests that autonomy might be key in the development and manifestation of curiosity. Research findings indicate that intrinsic motivation related to autonomy underpins processes that result in optimal well-being (Ryan and Deci 2000, 2017). Deci and Ryan (2000) suggested that curiosity arises when individuals are intrinsically motivated. Curiosity may be an indicator of well-being prompted by intrinsic motivation. As a facet of well-being, curiosity is a positive emotion that can lead to broadening of perspectives and building of resources (Fredrickson and Joiner 2018).

Thus, Self-Determination Theory (Deci and Ryan 2000; Ryan and Deci 2000, 2017) may provide a foundation for better understanding how curiosity arises. Satisfaction of the basic need for autonomy and autonomy of choice may be especially relevant in generating curiosity. Research on the relationship between satisfaction of the need for autonomy and curiosity is lacking. Additionally, information regarding whether autonomy of choice can prompt curiosity is lacking. The purpose of the present study was to provide novel information regarding links between satisfaction of the basic psychological need for autonomy and curiosity.

The hypotheses were that:

1. Greater satisfaction of the need for autonomy is related to a higher level of dispositional curiosity consisting of desire for exploration.
2. Autonomy of choice in the form of allowing choice of information results in greater curiosity regarding the topic of the information as well as greater interest in the topic and intent to obtain more information regarding the topic.
3. Autonomy of choice is more beneficial in increasing curiosity for those who previously had a low level of autonomy need satisfaction.
Method

Participants

Participants were 154 mature-aged university students, of whom 125 were female and 29 were male, from Australia. Participants’ mean age was 34.80, SD = 11.71. Participants were recruited after approval of the study by the university ethics review board, and all participants provided informed consent.

Measures

Need for autonomy

The Autonomy Need Satisfaction Scale of the Basic Needs in General Scale (Johnston and Finney 2010) assessed level of satisfaction of autonomy needs. Sample items are “I feel like I am free to decide for myself how to live my life” and “I generally feel free to express my ideas and opinions.” Higher scores indicate more autonomy satisfaction. The scale has previous evidence of good reliability and validity (Johnston and Finney 2010). In the present study, internal consistency of the Autonomy Need Satisfaction Scale as assessed by Cronbach’s alpha was 0.72.

Curiosity

The Joyous Exploration Scale of the Five-Dimensional Curiosity Scale (Kashdan et al. 2018) assessed curiosity. Sample items are “I seek out situations where it is likely that I will have to think in depth about something” and “I find it fascinating to learn new information.” This aspect of curiosity explained the most variance in curiosity in Kashdan et al.’s (2018) research and may be most related to desire to explore and learn as shown by its strong relationship to epistemic curiosity and seeking information (Kashdan et al. 2018). Prior research indicates that the scale is reliable and shows evidence of validity (Kashdan et al. 2018). In the present study, internal consistency of the scale as assessed by Cronbach’s alpha was 0.91.

Post curiosity regarding topic

Participants rated the topic of the video they watched on five items that as closely as possible matched the five items on the general joyous curiosity scale using a seven-point scale of agreement or disagreement. The five items were as follows: “Finding out more about the topic would be an opportunity to grow and learn.” “Finding out more about the topic would challenge how I think about myself and the world.” “I would enjoy learning about aspects of the topic that are unfamiliar to me.” “I plan to think in more depth about the topic of the video.” “I would find it fascinating to learn new information about the topic of the video.” Internal consistency of the post curiosity scale as assessed by Cronbach’s alpha was 0.93.

Post interest in topic

Participants rated their interest in the topic of the video they watched using a seven-point scale of agreement or disagreement with the statement: “I am very interested in the topic of the video.”

Post intent regarding topic

Participants rated their intent to seek out more information on the topic of the video they watched using a seven-point scale of agreement or disagreement with the statement: “I plan to seek out more information on the topic of the video.”

Videos

Participants either selected (in the autonomy of choice condition) or were randomly assigned to (in the control no-choice condition) one of three videos featuring TED presentations. The TED presentations were selected from a collection of classic TED talks (Must See TED Talks 2018). The talks represented different topics that might appeal to individuals with different interests and were of approximately equal length. Participants in the Autonomy of choice condition viewed a brief description of each before selecting the video they wished to view. Participants in the control condition viewed the same brief description of the video to which they were randomly assigned before viewing the video. The descriptions of the three videos were based on descriptions provided in Must See TED Talks (2018) and were as follows:

1. The new bionics that let us run, climb and dance

Hugh Herr is building the next generation of bionic limbs, robotic prosthetics inspired by nature’s own designs. Herr lost both legs in a climbing accident 30 years ago; now, as the head of the MIT Media Lab’s Bio mechatronics group, he shows his incredible technology in a talk that’s both technical and deeply personal.

2. The power of vulnerability

Brené Brown studies human connection — our ability to empathize, belong, love. In a poignant, funny talk, she shares a deep insight from her research, one that sent her
on a personal quest to know herself as well as to understand humanity.

3. The history of our world in 18 min

David Christian narrates a complete history of the universe, from the Big Bang to the Internet, in a riveting 18 min. This is “Big History”: An enlightening, wide-angle look at complexity, life and humanity, set against our slim share of the cosmic timeline.

**Procedure**

The study was conducted through an electronic platform that registered participant responses to measures, randomly assigned participants to conditions, and presented videos. Participants first completed pre measures of general curiosity and satisfaction of the need for autonomy. Participants were then randomly assigned to either (1) a condition in which they had choice of which one of three videos they to view or (2) a condition in which they were randomly assigned to view one of the three videos. All participants then completed a post measure of curiosity regarding the topic of the video they viewed and questions regarding their interest in the topic and intention to find more information regarding the topic.

**Results**

**Descriptive statistics**

There were no differences between women and men in curiosity, autonomy or post intervention curiosity regarding the topic of the video (see Table 1). Older participants were significantly more curious; there were no significant relationships between age and other variables (see Table 1).

**Table 1** Descriptive statistics and correlations

<table>
<thead>
<tr>
<th>Variable</th>
<th>1.</th>
<th>2.</th>
<th>3.</th>
<th>4.</th>
<th>5.</th>
<th>6.</th>
<th>7.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Gender*</td>
<td>−</td>
<td>−</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Age</td>
<td>−0.06</td>
<td>−</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Autonomy Satisfaction</td>
<td>0.04</td>
<td>0.13</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. General Curiosity</td>
<td>0.00</td>
<td>0.20*</td>
<td>0.25*</td>
<td>−</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Post Topic Curiosity</td>
<td>0.12</td>
<td>0.19*</td>
<td>0.20*</td>
<td>0.47**</td>
<td>−</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Post Topic Interest</td>
<td>0.11</td>
<td>0.15</td>
<td>0.22**</td>
<td>0.38**</td>
<td>0.82**</td>
<td>−</td>
<td></td>
</tr>
<tr>
<td>7. Post Topic Intent</td>
<td>0.07</td>
<td>0.12</td>
<td>0.13</td>
<td>0.42**</td>
<td>0.86**</td>
<td>0.76**</td>
<td>−</td>
</tr>
<tr>
<td>M</td>
<td>−</td>
<td>34.80</td>
<td>31.29</td>
<td>24.29</td>
<td>27.08</td>
<td>5.64</td>
<td>4.55</td>
</tr>
<tr>
<td>SD</td>
<td>−</td>
<td>11.71</td>
<td>5.31</td>
<td>6.24</td>
<td>6.25</td>
<td>1.45</td>
<td>1.75</td>
</tr>
</tbody>
</table>

n=154

*p<.05, **p<.01

*Dummy coded (male = 1; female = 2)

**Main analyses**

A Pearson r correlation tested the hypothesis that greater satisfaction of autonomy needs is related to a higher general level of curiosity. Greater satisfaction of autonomy needs was significantly related to higher general level of curiosity at r=.25 (see Table 1).

Tabachnick and Fidel (2007) recommended using analyses of covariance (ANCOVA) when a baseline variable is significantly correlated with the outcome measure in an experimental design. Tabachnick and Fidel (2007) recommended using a covariate in such circumstances because the covariate increases power to identify true differences between groups. Thus, ANCOVAs tested the hypotheses that autonomy of choice in the form of allowing choice of information results in greater curiosity regarding the topic of the information, greater interest in the topic and more intent to obtain information regarding the topic. In these analyses condition (choice of topic versus assigned topic) was the independent variable. Pre-intervention curiosity was the covariate (to allow assessment of the impact of the intervention with variance explained by the theoretically related variable of general curiosity, which was significantly associated with each of the post measures, to be held constant). Post-intervention curiosity, interest, and intent regarding the topic were the dependent variables. Seventy-five participants were in the choice of topic condition and 79 participants were in the assigned topic condition. Through random assignment of topics in the assigned topic condition, equal numbers of participants viewed each topic (27, 26, and 26 respectively for the three topics). However, all participants in the choice of topic condition independently elected to view the same video, “The Power of Vulnerability”. Following the original analysis plan, ANCOVAs first examined differences in outcomes between the choice of topic and assigned topic conditions. Because of the apparent strong preference of individuals in the sample for the one topic, additional...
ANCovAs compared differences in outcomes between the choice of topic and assigned topic conditions only for those who viewed the “The Power of Vulnerability” video. In this ancillary analysis the 75 participants in the choice condition who elected to view this video were compared to the 26 participants who were assigned to view this video.

Participants in the choice of topic condition had significantly more curiosity about the topic after viewing the video (M = 29.00, SD = 4.93) than participants in the assigned topic condition (M = 25.34, SD = 6.87), F(1, 152) = 20.61; p = .0001, partial eta squared = 0.25. Participants in the choice of topic condition had significantly more interest in the topic (M = 6.07, SD = 0.91) than participants in the assigned topic condition (M = 5.22, SD = 1.73), F(1, 151) = 18.23; p = .0001, partial eta squared = 0.12, and also had significantly greater intention to find out more about the topic (M = 4.99, SD = 1.47) than participants in the assigned topic condition (M = 4.12, SD = 1.89), F(1, 151) = 13.93; p = .0001, partial eta squared = 0.08.

Participants who chose to view the video “The Power of Vulnerability” had significantly more curiosity about the topic after viewing the video (M = 28.92, SD = 4.93) than participants assigned to view this same video (M = 27.00, SD = 6.61), F(1, 98) = 6.87; p = .01, partial eta squared = 0.07. Participants who chose to view “The Power of Vulnerability” had significantly more interest in the topic (M = 6.07, SD = 0.91) than participants assigned to view the same video (M = 5.61, SD = 1.55), F(1, 98) = 6.14; p = .01, partial eta squared = 0.06, and also had significantly greater intention to find out more about the topic (M = 4.99, SD = 1.47) than participants assigned to view the same video (M = 4.54, SD = 1.98), F(1, 98) = 4.59; p = .03, partial eta squared = 0.05.

A moderation analysis using PROCESS Model 1 tested the hypothesis that autonomy of choice is more beneficial in increasing curiosity for those who have a low level of autonomy need satisfaction. To account for differences in sample preference for video topics, in this analysis only participants who either chose to view the video “The Power of Vulnerability” or were assigned to this video were included. In the moderation analysis condition (choice of topic versus assigned topic) was the independent variable, pre-intervention curiosity was the covariate, post-curiosity was the dependent variable, and the pre-intervention measure of satisfaction of autonomy needs was the moderating variable. Satisfaction of autonomy needs significantly moderated the impact of condition (choice of topic versus assigned topic) on curiosity regarding the topic of the video. R² change due to the interaction between satisfaction of autonomy needs and condition was .07, F(1, 97) = 7.07, p = .009 (see Fig. 1). No autonomy of choice (represented by the assignment of topic condition) in combination with a low level of pre-intervention satisfaction of autonomy needs resulted in a low level of curiosity about the topic of the video. Participants in the autonomy of choice condition (who had choice of topic) had the same high level of curiosity regardless of their level of satisfaction of autonomy needs.

![Fig. 1 Level of autonomy need satisfaction moderates the effect of autonomy of choice on curiosity](image)
Discussion

This study examined the relationship between satisfaction of the basic psychological need for autonomy and curiosity. Participants whose need for autonomy was more satisfied in general had higher levels of curiosity consisting of desire for exploration. With general curiosity as measured before the intervention held constant, participants whose autonomy was supported through providing them with a choice of information showed greater curiosity regarding the topic of the information than participants who did not have a choice of information. The provision of choice of information was most beneficial in stimulating a high level of curiosity about the topic for participants who had low general autonomy need satisfaction prior to the intervention.

The results of the present study add to the body of theory and research focusing on the importance of self-determination, acting on intrinsic motivation, and autonomy need satisfaction (Deci and Ryan 2000; Ryan and Deci 2000, 2017). Self-determination and satisfaction of autonomy needs create a foundation for well-being and optimal functioning (Ryan and Deci 2017). One of the indicators of well-being and a stimulant of optimal functioning may be curiosity. Curiosity can be conceptualised as a positive emotion that leads to broadening of perspectives, exploration, and building of resources (Fredrickson and Joiner 2018).

The results of the brief autonomy of choice facilitation intervention used in the present study to impact curiosity add to theory and research regarding the effects of autonomy of choice in stimulating beneficial emotional, cognitive and behavioural outcomes (Ryan and Deci 2017) for example in health-related outcomes (Ng et al. 2012). A novel finding in the present study was that autonomy of choice had the strongest impact on participants low in general autonomy need satisfaction. It may be that the provision of choice was most salient for these participants because they were in a deficit state of autonomy need satisfaction.

Teachers vary widely in how much they support student autonomy in learning (Dwee and Anthony 2017). The present findings suggest that teachers may be able to increase curiosity, at least in the short run, by allowing their students autonomy in topics to explore. Such autonomy in choice need not be open-ended. In the present study, participants had only three options before them.

The results of the present study should be viewed in light of several limitations. First, the relationship between higher general autonomy need satisfaction and greater general curiosity was based on cross-sectional data and does not allow causal inferences. Second, the present study focused on the aspect of curiosity Kashdan et al. (2018) described as joyous exploration. Other aspects of curiosity, such as deprivation sensitivity (Kashdan et al. 2018), might show different associations with autonomy need satisfaction and might be impacted differently by autonomy of choice interventions. Participants in the choice condition favoured one of the video topics, creating a confound in the main analysis testing the hypothesis that autonomy of choice in the form of allowing choice of information results in greater curiosity regarding the topic of the information as well as greater interest in the topic and intent to obtain more information regarding the topic. We added analyses to work around this problem. Finally, the random assignment to autonomy of choice supportive or not supportive conditions portion of the study utilised a brief intervention and self-report of curiosity regarding the chosen or assigned topic. More in-depth interventions and behavioural observation measures might lead to different results.

Future research might examine the relationship between general autonomy need satisfaction and curiosity using longitudinal designs to assess how in natural settings satisfaction of the need for autonomy predicts changes in curiosity. Future research might also examine the impact of autonomy of choice on additional dimensions of curiosity, such as deprivation prompted curiosity (Kashdan et al. 2018; Litman 2008; Litman et al. 2010; Mussel et al. 2012) and intrapersonal curiosity (Litman et al. 2017). It may be that providing choice in itself may create the perception that the viewed topic is interesting and future research might further examine this possible path between choice and curiosity. To better control for initial interest in choice of topics, future research might employ yoked designs, similar to those used by Lyengar, and Lepper (1999). Finally, future research might build on the findings of the present study through examining the effect of more comprehensive autonomy of choice interventions intended to produce long-term increases in curiosity and outcomes associated with curiosity. Such a comprehensive autonomy of choice intervention might be implemented through curriculum design providing frequent choice of modality and study topics, with outcomes of the intervention assessed by measures of curiosity, affective response to study material, and acquisition of knowledge and skills. Changes in objective measures, such as amount learned or actions taken to satisfy curiosity, could be included.

In conclusion, the results of the present study add to previous findings regarding the value of autonomy and suggest an approach to stimulating the emotion of curiosity.

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Compliance with ethical standards

Conflict of interest The authors declare no conflict of interest.

Ethical approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed consent Informed consent was obtained from all individual participants included in the study.

References


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