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Empathizing with the End User: Effect of Empathy and Emotional Intelligence on Ideation

Mikko Salminen [a], Juho Hamari [a], and Niklas Ravaja [b]

[a]Tampere University; [b]University of Helsinki

ABSTRACT

Trait emotional intelligence and evoked empathy may help in a task where emotion-evoking source material is utilized to ideate solutions and services for the end-user. Participants of the current study read life stories of different persons, with perspective-taking instruction to evoke either high or low empathy. The reading was followed with ideation tasks, first identifying problems that the person of the story is facing, and then creating initial ideas for products or services to help with these problems. The perspective-taking empathy manipulation had an expected effect to the self-reported state empathy; however, it did not have an effect on the performance in the ideation tasks. Trait emotional intelligence was related to the detection of the problems and to the generating of more ideas. The results imply that emotional intelligence may be beneficial in ideation process where perspective of the customer or end user has to be considered.

Introduction

Creativity, emotions and empathy

Creativity is a mental ability related to creation of novel and appropriate ideas and solutions (Ivcevic, Brackett, & Mayer, 2007; Lubart, 1994). Creativity has been typically associated with different forms of arts, but it has relevance also in theoretical developments of science, and also in fields such as engineering and business. A product of creative work is often novel in some respect and it has either esthetic or more practical value (Averill, 2005). Liu (2016, p. 190) suggests that since creativity encompasses combining "seemingly remote concepts" (e.g. Mednick, 1962), it may be that parameters or factors that enhance this kind of combining of concepts could benefit creativity. Fredrickson's (2004) broaden-and-build theory posits that certain positive emotions widen momentary repertoire of thoughts and actions, thus they "promote discovery of novel and creative actions, ideas and social bonds" (p. 1367). On the other hand, according to the theory, negative emotions narrow the mind-set. These propositions of the broaden-and-build theory have been supported by studies that have examined the relations between emotions and creativity. Emotional states have been linked to creativity in several ways; emotions may enhance or inhibit creativity or they may be a result of creative activities (Averill, 2005). Various studies have highlighted the beneficial effects of positive emotional states to creative behavior (e.g., Ashby & Isen, 1999; Baas, De Dreu, & Nijstad, 2008; Rank & Frese, 2008). However, this is not to say that negative emotions wouldn't have a role in creative processes; there is increasing amount of evidence showing that for some task types also negative effect can enhance creativity. Previous studies have suggested that anxiety and anger may be related to creativity (Carlsson, 2002; Yang & Hung, 2015) and that simultaneous experience of positive and negative emotions, or emotional ambivalence, may enhance processing that is relevant for creativity (Fong, 2006). In experimental settings, it has been shown also that negative emotions (evoked by social exclusion) may lead to greater artistic creativity (Akinola & Mendes, 2008) and that moderate level of stress may promote creativity (Yeh, Lai, Lin, Lin, & Sun, 2015).

It must be noted, that the creative process may include generative phase and also phases where the initial ideas are evaluated, elaborated, and possibly eliminated. The generative ideation phases include forming of the initial ideas by combining concepts and thus, broad conceptual attention is needed to activate concepts that are remotely associated. Focused attention is needed during later stages when the initial

CONTACT Mikko Salminen mikko.salminen@iki.fi Gamification Group, Faculty of Information Technology and Communication Sciences, Tampere University, Tampere, Finland.

ideas are elaborated, executed and verified (Liu, 2016). Thus, both broad and narrow attention and emotional states supporting these may be needed in the different stages of a creative process (Finke, Ward, & Smith, 1992; Liu, 2016).

Since emotions may affect creativity in various ways, it is possible that there are connections also between emotional intelligence (EI) and creativity. EI is usually defined to consist of abilities for monitoring one's own and other's emotions, ability to discriminate emotions and ability to use information about emotions to guide thinking and actions (Salovey & Mayer, 1990). The relationship between emotional intelligence and creativity was observed, for example, in a study where the participants had to come up with captions to cartoons (Geher, Betancourt, & Jewell, 2017). The rated creativity of the produced captions was related to the participant's EI that was measured with an ability test (reading the mind in the eyes; Baron-Cohen, Wheelwright, Hill, Raste, & Plumb, 2001). Certain components of the emotional intelligence may be especially beneficial in the creative processes. For example, it has been suggested that the ability or skill of emotional regulation could enable maintaining of higher positive affect, and that the ability or skill of facilitation of emotions would aid in using the positive affect in enhancing creativity (Parke, Seo, & Sherf, 2015).

A task where one has to process emotional material before ideation may lead to emotional contagion; previous studies have shown that emotional contagion may occur also from text material (e.g., Salminen, Ravaja, Kallinen, & Saari, 2013; Thompson & Nadler, 2002). In the current experiment the participants read affective, possibly empathy-evoking stories of lives of four different persons. It is possible that the stories evoke negative (or positive) emotions in the participants and these emotions would affect the following ideation tasks. It is suggested, that emotional intelligence could act as a mechanism that could help the participants in processing the affective material. A participant with high EI could possibly identify more accurately the emotional processes that the persons in the stories are experiencing and thus utilize the text material more effectively, in addition, he or she could possibly separate more effectively the emotions in the story and his or her own emotions and thus gain from the text stories beneficial insights for the ideation tasks.

Thus, the following hypotheses for trait EI are presented:

H1a: High trait emotional intelligence is related to better identification of the person's problems.

H1b: High trait emotional intelligence is related to more initial ideas generated as solutions to the person's problems.

H1c: High trait emotional intelligence is related to a more innovative generated idea.

Empathy is a concept related to EI; both EI and empathy cover aspects of emotional processing and they have been shown to correlate (e.g., Ciarrochi, Chan, & Caputi, 2000). In experimental research empathy has been defined as the subject's merging with the feelings of someone, whereas sympathy is defined as an awareness of the feelings of someone without being absorbed to them (e.g., Escalas & Stern, 2003). Ability for empathy, or for sharing and understanding the emotions of the other, is enabled by the ability to "map another's state to our own feeling substrates" (Hofelich & Preston, 2012, p. 119; Preston & De Waal, 2002).

Hofelich and Preston (2012) differentiate between theories of emotional contagion and neural theories in explaining the basis of empathy. Emotional contagion is suggested to build empathy by spontaneous mimicry of the empathized one and thus activating the neural representations of the empathizer, which in turn leads to emotional resonance (Hofelich & Preston, 2012; Oberman, Winkielman, & Ramachandran, 2007). On the other hand, a perception-action mechanism (PAM; Preston & De Waal, 2002) suggested by neural theories of empathy, proposes a more direct route from perceptions to neural mappings for producing actions (Hofelich & Preston, 2012). Similarly, some researchers have suggested a division between cognitive empathy and emotional empathy; a brain lesion study has confirmed the difference between an emotional contagion dependent system and a cognitive perspective taking related system (Shamay-Tsoory, Aharon-Peretz, & Perry, 2009).

Empathy may have a special role when ideating or innovating for those who have faced hardships and are in need. In previous studies, evoked empathy has led to various positive outcomes. Batson, Early, and Salvarani (1997), using a perspective taking manipulation in evoking empathy while the participants listened to an audio record of an interview, showed how evoked empathy toward a member of a stigmatized out-group led to more improved attitudes toward the whole group. Evoked empathy has been shown to lead also to increased willingness to help (e.g., Coke, Batson, & McDavis, 1978), putatively due to an altruistic (instead of egoistic) motivation (Batson, Duncan, Ackerman,

Buckley, & Birch, 1981). The role of empathy in creativity has not received much research attention but there are some studies that have established interesting correlations. Not only positive affect (Isen, Daubman, & Nowicki, 1987), but also trait empathy has been linked to creativity (Carlozzi, Bull, Eells, & Hurlburt, 1995) and imagination (Rabinowitz & Heinhorn, 1984). In addition, there are hints of a related concept, sympathy, to have a link with creativity; evoked sympathy has been shown to lead to creative originality when completing standardized tests for creativity (Yang & Yang, 2016).

In user-centered design it is essential, by definition, to gain understanding of the users who the products and services are being designed for. In the fields of design and human-computer interaction (HCI), various approaches have been used to understand more deeply the user and the use experience of an application or a service. These methods include roleplay and simulations, bodystorming, acting and improvisation, use of personas, technology biographies, and narrative based methods (Blythe, Monk, & Park, 2002; Blythe & Wright, 2006; Buchenau & Suri, 2000; Oulasvirta, Kurvinen, & Kankainen, 2003; Strömberg, Pirttilä, & Ikonen, 2004; Wright & McCarthy, 2008). In the design work, various (written) scenario-based methods have also been employed. In a scenario the setting, the actors, and their goals are described (Carroll, 2000). There have also been attempts to include more empathy-evoking material to the scenario descriptions, such as motivations, values, and personality traits (Nielsen, 2002; Wright & McCarthy, 2008). It has been suggested that design empathy is needed when designing for personal experiences, rather than just for practical functions (Mattelmäki & Battarbee, 2002; Wright & McCarthy, 2008). The concept of design empathy stands for deeper understanding of the end users as persons with feelings and it is obtained by personal contact (Mattelmäki & Battarbee, 2002). In addition, in the field of HCI several methods have been developed that resemble ethnographic methods, but don't require personal contact with the studied population (e.g., Blythe et al., 2002; Wright & McCarthy, 2008). A similar concept with the design empathy, empathic design (Kouprie & Visser, 2009), describes a particular kind of imagination where the designers attempt to evoke empathy and deeper understanding of the possible end users of the product or service.

In the (social) psychological experiments empathy has been evoked by, for example, interviews listened from an audio record (Batson, Chang, Orr, & Rowland, 2002; Batson, Early et al., 1997), reading text story primes (Teachman, Gapinski, Brownell, Rawlins, & Jeyaram, 2003), viewing televised drama commercials (Escalas & Stern, 2003), or by producing text (Furman, 2005: Numata, 2013). In the current experiment, the empathy evoking method was inspired by the text descriptions of persons used in the fields of HCI and design. These persons are "hypothetical archetypes" of actual end users of the product or service that is being ideated or designed (Cooper, 1999, p. 28).

For trait empathy, the following hypotheses are presented:

H2a: High trait empathy is related to better identification of the person's problems.

H2b: High trait empathy is related to more initial ideas generated as solutions to the person's problems.

H2c: High trait empathy is related to a more innovative generated idea.

Regarding the evoked state empathy, the following hypotheses are presented:

H3a: High state empathy is related to better identification of the person's problems.

H3b: High state empathy is related to more initial ideas generated as solutions to the person's problems.

H3c: High state empathy is related to a more innovative generated idea.

In addition to more traditional self-reports, the psychophysiological method will be used to assess state empathy during the empathy induction, or reading of the empathy-evoking texts. Thus, the EEG activity during the conducting of the tasks was not studied; after all, it was affected by artifacts caused by typing the responses with a computer keyboard.

In empathy research one of the most commonly used psychophysiological signal has been the frontal asymmetry of the electroencephalogram (EEG), calculated as a relative difference in the activations of the anterior left and right brain regions. These regions are parts of two separate neural systems that underlie approach and withdrawal motivation, respectively (Davidson, 2004; but see Boksem, Kostermans, Tops, & De Cremer, 2012). Previous studies have shown that both the experienced empathy and the ability to empathize are linked to increased left frontal activation (e.g. Field & Diego, 2008; Harmon-Jones, 2003; Jones, Field, Davalos, & Hart, 2004). Although there are also studies that have linked empathic responding with the

right frontal cortical activation (e.g., Tullett, Harmon-Jones, & Inzlicht, 2012).

For the frontal EEG asymmetry, the following exploratory research questions are presented:

RQ1a: How is the frontal asymmetry of the EEG related to identification of the person's problems?

RQ1b: How is the frontal asymmetry of the EEG related to the amount of initial ideas generated for solutions to the person's problems?

RQ1c: How is the frontal asymmetry of the EEG related to the innovativeness of the generated idea?

Method

Participants

The participants were 43 (30 female) university students with varying majors. The mean age was 25.3 years (range: 19–38 years, *SD* = 4.9). All subjects gave written informed consent in accordance with the Declaration of Helsinki. The participant received 40 euros as a monetary compensation. In addition, three of the best scorers (amount of problems identified in Task 1 and amount of ideas generated in Task 2) received additional 40 euros; the participants were informed of this possibility for additional compensation.

Setting and procedure

The participant was seated in a comfortable chair by a desk and the whole experiment was carried out in an electrically shielded room on a computer using a web-form based solution containing all the instructions and the tasks. In a within-subjects design the participants were presented with four text stories, each preceded by a 0.5 min baseline period. During the baseline period, the participants were instructed to fixate to a cross, presented on a computer screen, and to relax. This was followed by reading of one of the four 2-3-page empathy-evoking stimulus stories (each approximately 1000 words) describing life events of a person, and each preceded with an instruction to read it either with low or in high empathy-evoking perspective. This procedure was inspired by the work of Batson et al. (2002). Each of the stories were followed by responding to self-report questions measuring evoked empathy and by conducting three tasks. The tasks were inspired by the nature of the creative process, which may consist of various sub-stages, such as idea generation, evaluation, and elaboration of the ideas (e.g., Finke et al., 1992; Liu, 2016). Thus, in the Task 1, the participant was asked to list in 5 minutes as many as possible problems that the person in the story may face in his/her life. In the immediately following Task 2, the participant had to list in 5 minutes as many as possible solutions (services, devices, or other) that could help the person in the story with his/her problems. In the immediately following Task 3, the participant had to choose one of the previously listed solutions for the person and describe it in more detail in 5 minutes.

The stories of the persons were picked from magazines and reports. There was one story of each of the four persons: 1) an elderly, 2) a student, 3) an unemployed, and 4) an immigrant. The stories were picked so that they focused to the hardships of each of the persons. Each story was read with either a low or high empathy perspective. This was instructed by asking the participant to pay attention to either 1) the events of the story and remain objective (low empathy), or 2) to the emotions and feelings of the person in the story (high empathy). This amount of empathy – manipulation reflected the one used by Batson, Sager et al. (1997). The order of the stories for each participant was randomized. For each story the depth of empathy -manipulations were presented in a counterbalanced order.

Instrumentation

The participants were asked to fill the Self-Reported Emotional Intelligence Test (SREIT) survey for trait emotional intelligence (Schutte et al., 1998). Validation studies of the SREIT have reported the measure's correlations with various theoretically related constructs, such as alexithymia ($r = -.65$, $p < .001$), attention to feelings ($r = .63$, $p < .001$), optimism ($r = .52$, $p < .006$), and impulse control ($r = -.39$, $p < .003$; Schutte et al., 1998). In addition, the SREIT has been shown to correlate with measures assessing empathic perspective taking, and social skills, for example (Malouff & Schutte, 1998; cited in Brackett & Mayer, 2003, p. 1150; Schutte et al., 2001). The reliability for the total score of trait emotional intelligence was in the current sample a = .80. Trait empathy was measured with the empathy quotient questionnaire (EQ; Baron-Cohen & Wheelwright, 2004), however, due to the low reliability of this measure in the current sample (a = .49) the analyses related to the effects of EQ (*H2a, H2b, H2c*) were discarded.

After reading of each of the four text stories the participants were asked to rate how much they had

felt (1 = not at all, 7 = extremely) empathy, sympathetic, compassionate, softhearted, warm, tender, and moved. In the current sample the reliability of this 6-item selfreported empathy scale was a = .83. The mean of ratings for these adjectives have been used in previous studies to assess subjectively experienced empathy (e.g., Batson, Sager et al., 1997; for a review, see Batson, 1991). The scale has been shown to be reactive to perspective taking types of experimental empathy manipulations (see, for example, Batson, Sager et al., 1997). The validity of the scale has been confirmed in studies which have reported correlations with helping behavior (e.g., $r = .45$, $p < .001$; Batson et al., 2002). In addition, the self-reported state empathy using this scale has been shown to mediate the effect of experimental empathy manipulation on the attitudes toward stigmatized groups (Batson, Polycarpou et al., 1997).

EEG recording

The EEG signals were recorded using Brainproducts QuickAmp EEG amplifier with 1000 Hz sampling rate and the linked mastoids as a reference. 16 channels, placed following the international 10–20 system, were collected with Ag/AgCl electrodes attached to a stretch lycra cap. In addition, electro-oculogram (EOG) was measured for detecting vertical and horizontal eye-movements to facilitate the removing of eye-movement-related artifacts; the bipolar electrodes were placed above and below of the right eye and to the outer canthi of both eyes, respectively. The analyses were focused to the F3 and F4 channels that were used in calculating the frontal asymmetry index. This metric was selected as it is the most commonly used in the frontal asymmetry research (Tullett et al., 2012; see also Allen, Coan, & Nazarian, 2004). During the data collection, a 0.1 Hz high pass and a 100 Hz low pass filters were applied.

Data reduction and preprocessing

The EEG signal was analyzed with Analyzer 2 software (Brainproducts Inc.). On average there were 100.88 (SD = 42.07) segments per a story before artifact removal processes, the variance was due to differing reading times between the participants. The data were re-referenced off-line to global average reference montage. A 0.1 Hz high-pass, 100 Hz lowpass, and a 50-Hz notch filter were applied and eye-movement artifacts were removed by using an ocular correction ICA procedure of the Analyzer 2 software. The data was segmented into 5-s segments for the removing of the remaining artifacts; those 5-s segments that contained activity exceeding ±85 μV were removed.

Despite the preceding ocular correction ICA procedure, on average 35.6% (SD = 18.6) of each participant's segments were removed due to artifacts. For the four stimulus stories the average percentages and standard deviations, and maximum and minimum percentages were: elderly (M = 20.8%, SD = 19.5, max = 65.7%, min = 0%), student (M = 33.3%, SD = 18.0, max = 60.4%, min = 0%), un-employed (M = 44.4%, SD = 14.8, max = 69.7%, min = 18.5%), and immigrant (M = 43.8%, SD = 22.0, max = 85.6%, min = 2.6%). The majority of the artifacts were due to the horizontal eye-movements related to rapid reading of the stimulus texts, which the utilized algorithm couldn't sufficiently correct in the data (possibly due to small number of electrodes). Thus, the possible EEG results have to be considered cautiously. However, for the remaining EEG epochs, the power spectra were derived using the fast Fourier transform (FFT) with a Hanning window (applied to the distal 10% at the ends of the epoch). For each epoch power values (μV^2) from the alpha band (8–12 Hz) were extracted. A frontal asymmetry index was calculated using natural logarithmic transformation with an equation ln(F4) – ln(F3), thus higher scores indicate greater relative left frontal activity (e.g. Allen et al., 2004). Mean frontal asymmetry was calculated for the 0.5 min baseline period prior to each task and for the period during which the participant was reading each story. Δ values were formed by subtracting baseline values from the values obtained during the reading of the stories.

The performance of the participants on the experimental tasks was assessed by calculating the number of problems that the participant identified in Task 1 and the number of solutions that the participant was able to list in Task 2 for the persons in the stories. In addition, the responses for Task 3 were rated on their innovativeness (1 = not at all innovative, 5 = extremely innovative) by two independent research assistants, who were naïve to the experimental conditions (reliability between the raters: α = .7). Innovativeness was defined as the novelty of a solution or idea (e.g. Garcia & Calantone, 2002).

Statistical analyses

The data were analyzed using the linear mixed-models procedure in SPSS using maximum likelihood estimation and first-order autoregressive covariance structure for the residuals. In the model the participant ID was set as the subject variable and the number of the read story was set as the repeated variable. A fixed effects

model was defined with main effects for the person of the story; the self-reported state empathy, self-reported trait emotional intelligence and EEG frontal asymmetry were set as covariates. First-order autoregressive covariance structure was used for the residuals. In addition, the random effects for the subject and person of the story were defined, including random intercepts and slopes, as suggested by Barr, Levy, Scheepers, and Tily (2013).

Number of problems listed in Task 1, number of solutions listed in Task 2, and the innovativeness of the solution described in Task 3 was set, one at a time, as a dependent variable. The false discovery rate of Benjamini and Hochberg (1995) was used to adjust the *p*-values.

Results

A correlation matrix of the variables used in the analyses is presented in the Table 1.

As a manipulation check it was verified that the experimental empathy manipulation had an expected effect to the self-reported empathy level; $F(1, 112.815) = 7.230$, $p = .008$; high empathy conditions led to higher self-reported empathy ($M = 5.3$, $SD = 1.6$) than low empathy conditions ($M = 4.9$, $SD = 1.2$). There was also a statistically significant main effect for the person in the listed solutions (Task 2); $F(3, 84.328) = 4.391$, $p = .006$, most solutions were listed for person "Elderly" ($M = 8.7$, $SD = 4.0$), then for the person "Unemployed – poor" ($M = 7.5$, $SD = 3.9$), and least for the persons "Student" ($M = 6.9$, $SD = 3.2$) and "Immigrant" ($M = 6.9$, $SD = 3.3$).

There was a statistically significant effect of trait EI on the number of listed problems in Task 1; $F(1, 42.717) = 14.69$, $p = .005$, (*H1a*). High trait EI led to more listed problems ($M = 14.3$, $SD = 5.9$) than low trait EI ($M = 11.3$, $SD = 4.8$). High trait EI led also to more solutions listed in Task 2 ($M = 8.2$, $SD = 3.9$) than low trait EI ($M = 6.8$, $SD = 3.2$); $F(1, 51.49) = 9.89$, $p = .018$, (*H1b*). However, high trait EI didn't lead to more innovative descriptions of the one selected idea in Task 3; $p = .48$, (*H1c*). Thus, *Hypotheses 1a* and *1b* were confirmed but *Hypothesis 1c* wasn't confirmed.

Hypotheses 3a, 3b, and *3c* weren't supported by the findings. The self-reported state empathy didn't have a statistically significant effect to the identification of the person's problems ($p = .37$; *H3a*), amount of ideas generated ($p = .90$; *H3b*), or to the innovativeness of the one generated idea ($p = .16$; *H3c*).

Regarding the exploratory research questions, there was no statistically significant effect of the EEG frontal asymmetry during the reading of the stories to the identifications of the person's problems ($p = .47$; *RQ1a*), amount of ideas generated ($p = .79$; *RQ1b*), or to the innovativeness of the one generated idea ($p = .73$; *RQ1c*).

Table 1. Descriptive statistics and correlations for task-dependent variables.

Measure	1	2	3	4	5	6	*M* (*SD*)
1. Task	-	.74**	.14	.13	.44**	.08	12.85 (5.57)
2. Task 2	.74**	-	.10	.05	.32**	.17	7.52 (3.64)
3. Task 3	.14	.10	-	−.09	.18*	.02	2.93 (.94)
4. State empathy	.13	.05	−.09	-	.08	.04	5.09 (1.41)
5. Trait EI	.44**	.32**	.18*	.08	-	.09	3.75 (.34)
6. Frontal asymmetry	.08	.17	.02	.04	.09	-	.94 (.27)

Task 1 = number of identified problems of the person; Task 2 = number of invented ideas for the person's problems; Task 3 = innovativeness of the one selected and described idea; EI = emotional intelligence. *p < .05; **p < .01.

Discussion

In the current study the effects of trait emotional intelligence, trait empathy, and evoked state empathy on the effectiveness of ideation were studied. It was expected that experimentally evoked state empathy would enhance ideation effectiveness. In addition, it was hypothesized that both trait empathy and trait emotional intelligence would help in this ideation task, where the participant was instructed to consider the emotions felt by the persons in the stories and to empathize with them. The ideation effectiveness was assessed with three tasks after reading a story; the participant was asked first to identify and list as many as possible problems that the person in the story may face in his or her life, second it was asked to list as many as possible solutions that could help the person in the story with his or her problems, and thirdly the participant had to choose one of the previously listed solutions for the person and describe it in more detail. The empathy-evoking method employed perspective-taking, or evoking cognitive empathy, which in turn helps in understanding and even experiencing the emotions of the person of the story, and thus also emotional empathy is possibly evoked (e.g., Shamay-Tsoory et al., 2009). The empathy manipulation, inspired by the work of Batson, Sager et al. (1997), had an expected effect on the self-reported state empathy (manipulation check). This encourages to use perspective-taking techniques for empathy evoking also in future studies and practical applications that are targeted to enhance ideation.

There were differences between the stories in how efficiently the participants could conduct the ideation task; most solutions in Task 2 was listed for the "Elderly," then for "Unemployed", "Student," and the

"Immigrant". It is possible that the elderly person was the most fruitful for the task due to most persons having at least some contact with elderly in their life. On the other hand, the participants were students, and it would have been likely that most solutions would have been ideated for the student person. It is likely that there was an interaction between how effective the specific story was in evoking empathy and spawning creativity and how familiar in general the participants were with the specific person type of the story. This is an issue that must be considered when planning to use such text descriptions as a basis for ideation.

In the current experiment mimicry, one of the central mechanisms in face-to-face perspective taking, was not possible and the participants had to use their existing knowledge structures when trying to infer the described person's internal state. A variety of transformation rules control, for example, the target person's reactions to hypothetical stimuli and thus guide the forming of guesses about the person's thoughts (Davis et al., 2004; Karniol, 1995). Davis et al. (2004) showed that perspective taking may actually increase the likelihood of self-related thoughts; this may lead to producing explanations for the behavior of the target person that actually stem from self. This would be problematic in an ideation process where it would be important to be able to think from the end user's perspective. This issue needs to be considered when applying perspective-taking techniques to gain deeper understanding of the end-user's needs. It is suggested that the evoked empathy toward the person of the story would be of help in such situations, assisting in moving the focus from the self to the empathized other.

Trait emotional intelligence aided in identification of the person's problems and hardships (*H1a*), and in generating more ideas (*H1b*), but it didn't have an effect to the innovativeness of the one selected and described idea *(H1c)*, thus suggesting that EI may have beneficial effects during the generative phase of ideation, or in other words, that the EI would benefit especially the stages where broad attention is needed (Finke et al., 1992; Liu, 2016). When ideating the participants had to use evoked empathy and contagious emotions of the stories in guiding their thinking to create as much ideas as possible in the short time provided. In this task, especially the components of emotional intelligence that are related to the using of information about emotions to guide thinking and actions were putatively useful (e.g. Salovey & Mayer, 1990; Schutte et al., 1998). In addition, the skill of emotional processing and controlling that are encompassed in emotional intelligence may have worked also by another mechanism. Controlling of own emotions is an important facet of self-regulatory abilities that may be critical for success especially in a novel and complex task (e.g., Rank & Frese, 2008). It is suggested, that possibly efficient regulation of (emotional) impulses could be especially important in such tasks that were utilized in the current experiment, where there are strict time limits for each ideation task and the participants are aware that their performance is being measured. Finally, it is also possible that in such tasks EI helps the participants in maintaining higher positive affect despite the possibly negative emotions conveyed by the text material; this positive affective state would lead to increased creativeness (Parke et al., 2015), possibly by widening momentary repertoire of thoughts (Fredrickson, 2004). However, the exact mechanism by which EI affects in such ideation task would have to be verified in forthcoming studies.

The effect of the trait empathy couldn't be studied (*H2a-b-c*) due to poor reliability of the selected measure in the current sample. In future studies other measures, or combination of multiple measures, could be considered.

Self-reported state empathy had no statistically significant effect to the ideation outcome (*H3a-b-c*) and neither did the utilized psychophysiological correlate of empathy, EEG frontal asymmetry that indexes approach motivation (*RQ1a-b-c*). However, it is suggested that both these methods, self-reports on subjective experiences and objective physiological measures should be utilized also in future studies on ideation. After all, there are differences between these methodological approaches that are relevant also in the context of ideation process. Self-reports are typically collected after the task or experience (e.g., reading of an empathyevoking text) whereas the EEG and other physiological signals can be measured continuously during the whole studied period. The self-reports are thus affected by e.g. memory processes and social desirability bias (Ravaja, 2004). In addition, these two methods measure different components of emotional or motivational processes. Self-reports measure the subjective experience and psychophysiological methods measure the physiological component of emotions (Lang, 1995); it is thus possible, that self-reports and psychophysiological methods produce seemingly discrepant results.

Empathy-evoking methods are suggested to be useful in the process of gaining understanding of the user of the service or product, by making it easier for the person ideating to reach outside his or her own viewpoint, and to gain new insights. Otherwise, there is a risk that the innovator may estimate the client's or end user's viewpoint to be similar with their own. The laborious changing of the viewpoint may be facilitated

by empathy evoking techniques and exercises. It must be noted that constantly emphasizing and evoking different emotional states, thus conducting a form of emotional labor (Morris & Feldman, 1996), may turn out to be tiresome. Empathizing exercises could be used as targeted elements of longer duration processes of product and service development. It is suggested that empathizing exercises would best fit to the initial stages of an ideation process where it is crucial to gain a deep understanding of the possible customer or end user. That is, not only to understand the customer's observable behavior but also the thinking that evokes and guides the behavior. Although, empathy training could also be conducted with the goal to increase the more general empathy skills of the persons conducting ideation. Such training has been shown to have positive effects in nurses, for example (Ançel, 2006).

In the current experiment the participants received monetary compensation for the participation and additional compensation was issued to the best performers to motivate focus to the task for good performance. It is possible that the extrinsic motivator, in the form of monetary compensation, influenced the participant's behavior and outcomes. Previously it has been shown, that a reward may decrease the creative output and also enjoyment of conducting the task (Amabile & Pillemer, 2012; Kruglanski, Friedman, & Zeevi, 1971). The intrinsic motivation hypothesis of creativity, presented by Amabile (1983), posits that a state of intrinsic motivation enhances creativity whereas a state of extrinsic motivation (e.g., monetary reward) may actually decrease creativity. Considering the context of the current experiment, these effects are relevant. After all, when ideating new products and services as a work task, one is putatively motivated by both intrinsic and extrinsic factors, for example by sheer interest to the topic and also by monthly pay, respectively.

The empathy-evoking stories in the current experiment were collected from publicly accessible reports and newspapers. The participant's familiarity with the material was not controlled. However, in the current experiment the target was not to study differences between the stories as such, but the effect of the empathy manipulation and the effect of the trait EI. In future experiments other types of stimulus material could also be used, for example, video or audio recordings of the persons describing their life by themselves.

In addition, in future studies, new metrices to assess the participants outputs could be considered. Given the different task types where responses were either lists of even single words (Tasks 1 and 2) or on the other hand paragraph long text pieces (Task 3), a uniform measure for the studied features, e.g. the innovativeness of a response, could be utilized. However, it is by no means an easy task to utilize a unitary scale in rating the participants responses in these different types of tasks, since the persons conducting the rating of the responses are probably more unanimous about the longer and more elaborated responses whereas for the single word responses there is more room for interpretation and there would more likely be greater variance in ratings.

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ORCID

Mikko Salminen http://orcid.org/0000-0002-6528-8389
Juho Hamari http://orcid.org/0000-0002-6573-588X
Niklas Ravaja http://orcid.org/0000-0003-1876-8731

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