Anger and creative process engagement: The moderating effects of social context

Abstract

Drawing on the componential model of creativity and the interactionist perspective, this paper hypothesized and tested the relationships between anger and three sub-processes of creative process (i.e. problem identification, information search and encoding and idea generation) and the moderating influence of social context (namely, co-worker support versus relationship conflict) on those relationships. The hypothesized model was tested with daily survey data obtained from a sample of 98 employees (422 days) from three consultancy companies in Portugal. Results of hierarchical linear modeling (HLM) analysis revealed that anger was positively related to problem identification but unrelated to informational searching and encoding and idea generation. However, anger was negatively related to information searching and encoding and idea generation when co-worker support was low or relational conflict was high but positively related to information searching and encoding when co-worker support was high rather than low.

Introduction

Employee creativity, the generation of new and useful ideas to improve products and services and to solve problems at work (George & Zhou, 2001) has long been linked to organizational survival and success in the turbulent business environment (Axtell, Holman, Unsworth, Wall, & Waterson, 2000). Increasingly researchers are keen to understand how affect, a critical human factor in the work environment (Brief & Weiss, 2002), influences creative performance (e.g. Amabile, Barsade, Mueller, & Staw, 2005; Binnewies & Wörnlein, 2011; George & Zhou, 2002, 2007; Madjar, 2008; Madjar, Oldham, & Pratt, 2002; To, Fisher, Ashkanasy, & Rowe, 2012; Zhou & George, 2001). So far, literature has shown that the impact of negative affect on creativity has been relatively inconclusive as opposed to that of positive affect (Baas, De Dreu, & Nijstad, 2008; Davis, 2009). While some researchers have reported a negative (Kaufmann & Vosburg, 1997) or non-significant (Isen, Daubman, & Nowicki, 1987; Madjar et al., 2002) relationship between negative affect and creativity, others have shown that negative affect may have a positive effect on creativity contingent on some contextual factors (e.g. the presence of supervisory support) (George & Zhou, 2002, 2007; Zhou & George, 2001). Against this background, the primary goal of this study was to investigate when negative affect such as anger may have a positive or negative effect on creativity.

Scholars have emphasized that specific discrete emotions (e.g. joy, calm, anger, sadness, fear) should not be conveniently subsumed by global constructs such as positive versus negative affect and called for studies on discrete emotions to gain a better understanding of the impact of affect in the workplace (Brief & Weiss, 2002). Perhaps due to its omnipresence in the work environment, anger has stood out being one of the most researched discrete emotions in the creativity literature (e.g. Akinola & Mendes, 2008; Amabile et al., 2005; Baas, De Dreu, & Nijstad, 2011; De Dreu, Baas, & Nijstad, 2008; Kaufmann, 2003).

Interestingly, the impact of anger on creativity has not been found to be clearer than when it was examined as a sub-component of negative affect. Some have suggested that anger may be beneficial to creative performance (Akinola & Mendes, 2008; Baas et al., 2011) whereas others have reported a detrimental effect of anger on creativity (Amabile et al., 2005).

   Nevertheless, the anger-creativity research has provided a greater understanding of anger that has not been offered by the negative affect-creativity research. Most notably, Baas et al (2011) observed in an experimental setting that anger promoted creativity at the early stage of creative activities but creative performance deteriorated at the later stages. They (Baas et al) explained this phenomenon by suggesting that anger lead to unstructured information processing which might be beneficial for creativity but at the same time might soon deplete cognitive resources. Consequently, angry led individuals to peak in creativity early on but decrease over time. These findings showed that the potential positive impact of anger on creativity but at the same time revealed the dynamic processes linking anger to creativity. It is therefore necessary to further investigate how anger may influence the process by which individuals come to creative ideas.

   The literature on creative process has suggested that the creative process is a complex and non-linear process and consists of multiple sub-processes and factors that are critical for one sub-process may not necessarily be influential for other sub-processes (Amabile, 1983; Binnewies, Ohly, & Sonnentag, 2007; Caniëls, De Stobbeleir, & De Clippeleer, 2014; Lubart, 2001). It is plausible that the impact of anger may differ at different sub-processes of the creative process. Consequently, this study aims to examine the relationship between anger and the three sub-processes of the creative process: problem identification, information search and encoding, and idea generation.

On the other hand, although much research has shown that emotions does not act alone to influence employee creativity (e.g. Madjar et al., 2002; Zhou & George, 2001) and the importance of taking account of social-contextual factors to fully understand the influence (Woodman & Schoenfeldt, 1990), research has yet to identify social-context conditions that may attenuate the link between anger and creativity. Drawing on Carnevale and Probst's (1998) work on the relationship between social context and creativity, this study investigates whether the impact of anger on the creative process may vary in a cooperation social context featured by co-worker support and a conflict social context characterized by relationship conflict. Figure 1 presents the hypothesized model.

*** INSERT FIGURE 1 ABOUT HERE ***

This study aims to make several important contributions to extant literature. First, literature has been inconclusive regarding the relationship between anger and creativity. By examining the impact of anger on multiple sub-processes of the creative process, this study contributes to shed light on when anger matters most during the creative process. Furthermore, by examining the boundary conditions of the link between anger and creativity, this study augments the efforts to identify the social-contextual factors that may attenuate the impact of emotions on creativity (e.g. George & Zhou, 2007; Madjar et al., 2002) and gain a better understanding on how anger influences creativity in the work environment. Finally, so far, with the exception of Amabile et al (2005), the relationship between anger and creativity has been examined mostly in the experimental settings. By examining the impact of anger on creativity in organizations, the study answers the call for more empirical research to understand how discrete emotions such as anger play out in the workplace to influence employee outcomes

(Brief & Weiss, 2002; Fitness, 2000; Geddes & Callister, 2007). The findings of this study will help managers and organization be better informed about how to channel anger this seemingly negative emotion to creative energy in the workplace.

Anger and creative process engagement

Creativity can be seen as an outcome or as a process (Runco, 2004). Although, the creativity literature has been dominated by the creativity-as-outcome approach, many scholars have increasingly recognized the importance of examining creativity as a process (Drazin, Glynn, & Kazanjian, 1999; Gilson & Shalley, 2004; Lubart, 2001; Shalley, Zhou, & Oldham, 2004; Zhang & Bartol, 2010). Creative process engagement is conceptually related to but distinct from creativity (as an outcome). It is a proximal precursor to creativity (Amabile, 1983) but emphasizes on 'the journey toward possibly producing creative outcomes' (Gilson & Shalley, 2004: 454). In line with prior research (Gilson & Shalley, 2004; Zhang & Bartol, 2010), we define creative process engagement as the extent to which employees engage in the problem-identification, information searching and ideas/solution generation activities.

In line with the social psychological of creativity literature (Amabile, 1996), research examining creative process engagement has largely focused on social contextual factors, such as leadership that may have impact on creative process engagement (Zhang & Bartol, 2010). Another line of research on creative process investigates the impact of cognitive training on one's creative process (Basadur, Graen, & Green, 1982; Scott, Leritz, & Mumford, 2004). Despite these efforts, few studies have examined the sub-processes of the creative process. This is surprising as researchers have noted that each sub-process of the creative process may involve different motivational and cognitive resources and need to be examined separately.

Consistent with the classic four-stage model of the creative process (Wallas, 1926),

Amabile's (1983) componential model of creativity depicted the creative process in four

stages: problem identification, information seeking and coding, idea generation and

verification. Amabile (1983) further proposed that task motivation, domain-relevant

knowledge and creativity-relevant skills have varied impact on the sub-processes of the

creative process. While task motivation is critical for problem-identification and idea

generation, creativity-relevant skills are important for idea generation and domain-

relevant knowledge forms the basis for information searching and encoding. Empirical

research examining the creative process as a multistage process has in general provided

supporting evidence (Binnewies et al., 2007; Caniëls et al., 2014; Yuan & Zhou, 2008).

Consequently, this study proposes that anger may have varied impacts on the three sub-

processes of the creative process: problem identification, information seeking/encoding,

and idea generation.

De Dreu et al (2008) reported that anger, different from positive moods such as happy and

elated, which influence creativity via cognitive flexibility (or divergent thinking), lead to

higher creativity via the mechanism of cognitive persistence and perseverance, i.e.

individuals' 'deliberate, persistent, and in-depth exploration' in their creative endeavours.

However, in another laboratory setting, Baas et al (2011) qualified the latter observation and

reported that anger, as opposed to sadness and neutral emotions lead to high level of

creativity only at the early stages of creative performance and the creative performance

declined over time due to depleted cognitive resources. Consequently we argue that anger is

especially beneficial at the beginning of the creative process, i.e. problem identification. Due

to its activation level, anger is likely to highlight the problems in the work environment and

motivate individuals to focus on the problem and engage in problem identification (De Dreu

& Nijstad, 2008). Furthermore, from the affect-as-information perspective, individuals

assess how they feel to form their judgement (Schwarz & Clore, 1983; Schwarz & Clore, 2003). Anger signals that the current situation is problematic. This, in turn, triggers problem identification, the initial stage of the creative process (Schwarz & Skurnik, 2003). The same beneficial effects however are unlikely to appear when individuals continue to search and encode information and to generate possible solutions.

Different from problem-identification process, information searching and encoding, and idea generation involves much deliberate and structured information processing. While information searching and encoding is concerned with building up a substantial repertoire of relevant information and response algorithms, idea generation involves exploring various response pathways for consideration (Amabile, 1983). Although anger may heighten arousal and enhance one's motivation to engage in learning relevant knowledge and to go through as many response pathways as possible, these potential positive effects may be cancelled out at these two sub-processes. First, anger has been noted for its interference of cognitive process especially where complex information processing is involved (Clore, Schwarz, & Conway, 1994; Lerner & Tiedens, 2006). More importantly, anger leads to unstructured and inconsistent information processing and such unstructured cognitive style cause fast depletion of energy and cognitive resources (Baas et al 2011). This, in turn will reduce one's perseverance in information searching and idea generation. This is line with the resource conservation perspective (Hobföll, 1989) which suggests that individuals tend to preserve their resources when they experience stressful situation. When experiencing anger, individuals are likely to reduce their involvement in the in-depth and systematic information processing such as information searching and encoding and idea generation. Taken together, although anger may motivate individuals to engage in activities that are related to information searching and encoding and idea generation, this motivational and cognitive efforts may be

hampered due to resource exhaustion or preservation resulting in non-significant effects. Thus,

H1. Anger is positively related to problem identification but unrelated to information searching and encoding and idea generation.

The moderating influence of social context

The social aspects (e.g. peer support, relationship with supervisors) in the work environment have long been underscored to have a significant impact on employee creativity (Amabile, 1983, 1996; Shalley et al., 2004). In addition to examining the main effects of the social context on employee creativity (Amabile, 1996; Amabile, Conti, Coon, Lazenby, & Herron, 1996), and in line with the interactionist perspective (Woodman, Sawyer, & Griffin, 1993; Woodman & Schoenfeldt, 1990), many researchers have investigated how individual factors, including moods (e.g. George & Zhou, 2007; Madjar et al., 2002) interact with the social context to influence creativity (see George, 2007; Shalley et al., 2004 for reviews).   For example, using a sample of 149 employees, Zhou and George (2001) reported that supportive work environment featured by co-worker support, help and feedback enhanced the relationship between negative mood (job dissatisfaction) and creative performance.   In a more recent study, George and Zhou (2007) further highlighted the importance of supportive context in managing the relationship between employees' emotions and creativity. So far research has yet to examine when anger may be a positive force for the creative process and when anger may work in the opposite direct, i.e. negatively affect the creative process. Consequently, we proposed to examine the moderating influence of two contrasting social contexts (co-worker support and relationship conflict) on the relationship between anger and the creative process. More specifically, we focus on two sub-processes: informational

seeking and encoding, and idea generation to investigate whether anger may have a positive or negative impact on the latter stages of the creative process given certain circumstances.

As noted above, although anger may heighten cognitive process and motivate one to engage the creative process, being angry may wear out one's cognitive resources over time (Baas et al 2011). This, in turn, will be detrimental to the information seeking and decoding and idea generation stages of creative process. We argue that a cooperation social context however may reduce the above-mentioned negative effect and help sustain the cognitive and motivational benefits of anger. On the one hand, a cooperation social context facilitates a flexible cognitive process and a broad range of attention (Carnevale & Probst, 1998), enhancing one's ability to retrieve information from memory and to perceive relationships between different subjects. On the other hand, a cooperation social context may also act as a 'buffering mechanism' (Cohen & Wills, 1985) reducing one's negative reaction to anger. Specifically, co-worker support may intervene in several ways. First, supportive co-workers may provide helpful feedback and information which can be used in solving the problems, helping structuring the information processing triggered by anger. Second, supportive co-workers may reduce, if not eliminate one's anger and related emotional strain. Thus, their creative efforts may be sustained throughout the creative process. Finally, employees may be more engaged in their creative efforts in order to reciprocate those supportive behavior demonstrated by their supported colleagues (Butt, Choi, & Jaeger, 2005). Thus,

H2. The relationship between anger and creative process will be moderated by co-worker support in such that the relationship between anger and (a) informational seeking and coding; (b) idea generation will be positively related when co-worker support is high rather than low.

Prior research has suggested that a conflict social context may hinder individual creativity as it triggers a conflict mental set leading to cognitive rigidity and narrow-minded thinking (Carnevale & Probst, 1998; Golec & Federico, 2004). De Dreu and Nijstad (2008) however refined the argument and suggested that cognitive rigidity and motivation to engage in information processing will only be affected when the conflicts are unrelated to the task at hand. When there is a high level of relational conflict in the work environment, not only will the potential positive impact of anger on the creative process be cancelled out, anger will lead to decreased motivation and cognitive effort to engage in the creative process. This is because a negative social environment gives rise to high levels of stress (Bliese & Halverson, 1998; Cole & Bedeian, 2007). As a result, individual will not be able to maintain their ability to engage in cognitive information processes (LePine, Lapine, & Jackson, 2004; LePine, Podsakoff, & Lapine, 2005) that are important to the creative process.

H3. The relationship between anger and the creative process will be moderated by relational conflict in such that the relationship between anger and (a) informational seeking and coding; (b) idea generation will be negatively related when relational conflict is high rather than low.

Method

Participants and Procedure

The participants of this study were recruited from three multinational management consultancy companies in Portugal, whose services are offered in the field of IT, financial management and human resource management respectively. Creativity is required on their daily work. We used a web-based survey tool (Qualtrics) to send out questionnaires. Prior to data collection, participants were informed of the purpose of the study, its confidentiality and study methodology. First, participants filled out a general online questionnaire at the

beginning of the study - answering questions on co-worker support, relationship conflict, high effort task, trait anger-temperament, and demographics variables. Two days later, at the end of every working day (for a working week) participants were invited to fill out an online questionnaire which included state anger and creative process engagement.

A total of 188 workers agreed to participate in the study by completing the general questionnaire representing a response rate of 48.2%, which was above the average response rate for online surveys (Nulty, 2008).   The final sample consisted of 98 participants due to the established criteria of participant's inclusion – participants should complete at least the daily questionnaire for three out of the five days. There were a total of 422 responses for the final sample (98 participants) by a mean of 4.3 days per person. The majority of the participants (71.4%) were male with an average age of 31.3 years (SD = 5.9) and an average tenure of 4.2 years (SD = 2.7). Almost all of the participants have a high school degree (92.9%).   The questionnaires was originally developed in English but then translated into Portuguese. We followed the translation and back translation procedure suggested by (Brislin, 1980) to insure the accuracy of the translated questionnaires

Measures

Creativity Process Engagement. An 11- item scale developed by Zhang and Bartol (2010) was used to measure three dimensions of creative process engagement: problem identification (3 items), informational searching and encoding (3 items) and idea generation (5 items). The lead question for this scale was: 'Today, in your job, to what extent did you engage in the follow actions when seeking to accomplish an assignment or solve a problem?' (1 = 'never', 2 = 'rarely', 3 = 'occasionally', 4 = 'frequently', 5 = 'very frequently'). Sample items are *'I have spent considerable time trying to understand the nature of the problem'* for problem identification, 'I consult a wide variety of information' for information searching and

encoding; and 'I consider diverse source of information of idea generation' for idea generation. The scale's alpha reliability for each of these three dimensions was .85, .86 and .86 respectively.

State Anger. A 10-item state anger subscale from the State-Trait Anger Expression Inventory – STAXI developed by Forgays, Forgays and Spielberger (1997) was used to measure state anger. The lead question for this subscale was: Please indicate your feelings today*:* (1 = 'not at all', 2 = 'somewhat', 3 = 'moderately so', 4 = 'very much so'). Sample items are, *'I was furious', 'I felt irritated'.* The scale's alpha reliability for this scale was .95.

Co-worker support. A 3-item scale adapted from Madjar et al. (2002) was used to measure co-worker support. Sample items are *'My co-workers other than my supervisor are almost always supportive when I come up with a new idea about my job', 'My co-worker other than my supervisor gives me useful feedback about my ideas concerning the workplace'.* Response options ranged from 1= 'strongly disagree' to 7 = 'strongly agree'. The scale's alpha reliability was .95.

Relationship Conflict. A 4-item scale adapted by Simons and Peterson (2000) from Jehn's scale (1995) was used to measure relationship conflict. Response options were 1 = 'none', 2 = 'a bit', 3 = 'moderately', 4 = 'much', and 5 = 'a very great deal'. Sample items are '*How much personal friction is there among your team?', 'To what extent are grudges evident among members of your group?'* The scale's alpha reliability was .90.

<u>*Control variables*</u>. We controlled for age, gender, anger trait, and task characteristics high effort task for their potential impact on creativity. *Trait Anger-Temperament* was measured by two items *('I am quick tempered' and 'I have a fiery temper')*(Forgays et al., 1997) on a 4-point scale (1= 'almost never' to 4 = 'almost always'). The scale's alpha reliability was .78.

High Effort Tasks was measured by a 6-item scale adapted from Hackman and Oldham

(1980). Sample items are 'm*y job tasks are very difficult' and '*there is a lot of daily effort'.

Response options ranged from 0 = 'never' to 5 = 'always – everyday'. The scale's alpha

reliability was .87

Scale validities

As our data relied on self-report for both day- and person-level questionnaires, common

method variance might influence the relationships examined (Podsakoff, MacKenzie, Lee, &

Podsakoff, 2003), we conducted confirmatory factor analyses (CFA) to test the

distinctiveness of our study variables. The results showed that both the hypothesized two-

factor (sate anger and creative process engagement) model for the day-level data ($\chi^2_{(422)}$ =

326.15, $p < .001$, $df = 109$, CFI = .97, RMSEA = .07, SRMR = .03) and the hypothesized

four-factor model (high effort tasks, trait anger, co-worker support and relationship conflict)

for the personal level data ($\chi^2_{(98)}$ = 87.51, $p < .001$, $df = 71$, CFI = .97, RMSEA = .05, SRMR

= .06) showed a good fit to the data. We then compared to hypothesized models to a single

factor model where all variables were loaded on a single construct for the day- and personal-

level data respectively. The results showed that both the hypothesized 2-factor model at the

day-level and the hypothesized 4-factor model at the person-level fit the data better than the

one-factor model ($\Delta\chi^2$ = 2192.955, $\Delta df = 6$; $\Delta\chi^2$ = 384.521 $\Delta df = 6$ respectively), indicating

the distinctiveness of our study variables.

Furthermore, we tested the construct and discriminant validities calculating the composite

reliability and the average variance extracted (AVE). The composite reliability results

showed that all variables exceeded .70, the minimum cut-off values except for that for co-

worker support (.67). The AVE for all variables except for co-worker support (.49) exceeded

the .50 cut-off value, indicating a reasonable convergent validity (Fornell & Larcker, 1981).

Finally we compared AVE of each variable to its shared variance with all other variables

(AVS)(Farrell, 2010). The AVS of each variable was always less than its AVE suggesting

that the scales for our study have a satisfactory level of discriminant validity (Hair, Black, Babin, Anderson, & Tatham, 2006).

Analytic Strategy

Given the nested structure of our data, that is day level data were collected for each person), we used Hierarchical Linear Modelling (HLM) to test our hypotheses (Aguinis, Gottfredson, & Culpepper, 2013; Bryk & Raudenbush, 1992; Hofmann, 1997). Following Hofmann and Gavin (1998), we determined the centering strategy according to the nature of the hypothesis. We grand mean centered L1 predictor to test for the main effects of state anger on the three sub-processes of the creative process (H1). For the hypothesized cross-level interaction effects (H2 & H3), we group mean centered L1 predictor to eliminate between-individual variance in the predictor variable, ensuring that estimates represent strictly within-individual associations.

Results

Table 1 displays descriptive the statistics and correlations among all study variables. Day level and person level variables are presented separately.

*** INSERT TABLE 1 ABOUT HERE ***

The results for HLM analyses are summarized in Table 2. Using HLM 7.0 software, we estimated a null model for problem identification (CPE1), information searching and coding (CPE2) and idea generation (CPE3) respectively, in which no predictors were specified for either the Level 1 or the Level 2. The results confirmed that there was significant between-person variance ($p < .001$) for all these three outcome variables. Furthermore, ICC1 for CPE1, CPE2 and CPE3 was .36, .43 and .38 respectively, indicating that a significant amount of variance in individual creative process engagement resided between individuals and thus

warranting the use of HLM in our analyses. We controlled for age, gender, trait anger and HET in all our analyses.

*** INSERT TABLE 2 ABOUT HERE ***

Main effects (H1)

To test H1, we regressed on problem identification, CPE1 (Model 1), information searching and encoding, CPE2 (Model 2) and idea generation, CPE3 (Model 3) respectively state anger at the day-level and controls (i.e. age, gender, high effort tasks, trait anger) at the person level. The results showed that state anger was positively related to CPE1 ($\gamma = .16$, s.e. $=.08$ $p < .05$) (Model 1) but was not related to CPE2 ($\gamma = -.00$, s.e. $=.07$, p= *ns*) (Model 2), or CPE3 ($\gamma = -.02$, s.e. $= .07$, p = *ns*) (Model 3). Thus, Hypothesis 1 received support.

Cross-level interaction effects (H2 & H3)

Although we only hypothesized the cross-level interaction effects for CPE2 and CPE3, we chose to include CPE1 in our analyses to be parsimonious. Thus, to test the moderating effects of co-worker support and relationship conflict, we regressed on CPE1, CPE2, and CPE3 state anger at the day level, controls and co-worker support and the cross-level interaction term of co-worker support and state anger for H2 (Models 4, 5 & 6) and the interaction term of relationship conflict and state anger for H3 (Models 7, 8, & 9). The results showed that the interaction term of co-worker support and state anger was significant in Model 5 ($\gamma = .43$, s.e. $=.15$ $p < .01$) and Model 6 ($\gamma = 0.39$, s.e. $= .17$, $p < .05$) but non-significant in Model 4 ($\gamma = .23$, s.e. $= .22$, $p = $ ns). The interaction term of relationship conflict and state anger was significant in Model 8 ($\gamma = -.40$, s.e. $= .18p < .01$) but not in Model 7 ($\gamma = -.40$, s.e. $= .23$, $p = $ ns) or Model 9 ($\gamma = -.36$, sd $= .20$, $p = $ ns). Thus, Hypothesis 3b was rejected.

To further interpret the nature of the significant cross-level interaction effects we plotted the interaction effects using the procedures suggested by Aiken and West (1991). As shown

in Figure 2a & 2b, the relationship between state anger and CPE2 and that between state anger and CPE3 was positive when co-worker support was high but negative when co-worker support was low. Results of simple slope tests further showed that the simple slope for anger and CPE2 under conditions of high co-worker support was positive and significantly different from zero (b = .44, s.e. = .20, z = 2.21, p < .05). In contrast, the simple slope under conditions of low co-worker support was negative and significantly different from zero (b = -.43, s.e. = .11, z = -3.99, p < .001). The simple slope for anger and CPE3 under conditions of high co-worker support was positive but not significantly different from zero (b = .37, s.e. = .24, z = 1.51, p > .05). In contrast, the simple slope under conditions of low co-worker support was negative and significantly different from zero (b = -.41, s.e. = .18, z = -2.28, p < .05). Thus, Hypothesis 2a was supported but Hypothesis 2b was rejected. Similarly, Figure 3 showed that the relationship between state anger and CPE2 was positive when relationship conflict is low but negative when relationship conflict was high. Results of simple slope tests showed that the simple slope for anger and CPE2 under conditions of high relationship conflict was negative and significantly different from zero (b = -.39, s.e. = .19, z = -2.10, p < .05) while the simple slope under conditions of low relationship conflict was positive but non significant (b = .40, s.e. = .31, z = 1.3198, p > .05). Thus, Hypothesis 3a was supported.

Discussion

Although affect has been recognized as one of the most critical factors in the work environment influencing employee creativity (e.g. Amabile et al., 2005; Hennessey & Amabile, 2010; Shalley et al., 2004), the questions about whether and when negative emotions such as anger influence creativity have remained unclear. This paper addresses these gaps by investigating the relationship between anger and the creative process and the moderating effects of the social context, using daily survey data from 98 employees from three organizations over a period of five continuous working days. The results showed that

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anger has differentiated effects on the three sub-processes of the creative process: problem identification, information searching and encoding and idea generation. While anger was positively related to the initial stage of creative process engagement, problem identification, it was found to be unrelated to the latter stages of the creative process, information searching and encoding, and idea generation. However, the relationship between anger and these two stages was found to be moderated by co-worker support and relationship conflict. Specifically, anger was positively related to information searching and encoding when co-worker support was high rather than low. However, anger was negatively related to information searching and encoding and idea generation when co-worker support was low or relational conflict was high.

Theoretical implications

The results from our study have several important theoretical implications. First, researchers have called for more studies to understand the impact of anger on creativity given the inconclusive evidence in the literature (Baas et al 2011). Examining the relationship between anger and the creative process provides an opportunity to examine the differentiated impacts of anger on the sub-processes of the creative process. Our finding that anger is positively related to problem identification but not to the other two sub-processes suggest that the potential positive impact of anger on creativity may be limited to the early stage of the creative process, i.e. problem identification. This is in line with the affect-as-information perspective in problem-solving (Schwarz & Skurnik, 2003) and prior research (Zhou & George, 2001). Anger may serve as signal that something is problematic thus triggers the creative process. Furthermore, we provide empirical evidence for the notion that factors influential at one stage of the creative process may not have the same impact on other stages of the creative process (Amabile, 1983). Thus, our study augments the efforts to understand the sub-processes of the creative process (Binnewies et al., 2007; Caniëls et al., 2014; Yuan

& Zhou, 2008) and provides further insight on the role of anger at the different stages of the creative process.

On the other hand, the results that anger is not related to information searching and encoding and idea generation suggest that the motivation and the cognitive efforts to solve problems at work may not be sustained throughout the creative process. Baas et al's (2011) offered one possible explanation by attributing the change of positive impact of anger over time to cognitive resource depletion. Different from Baas and colleagues' focus on the internal change of cognitive resource (individual-based resources) in the creative process, and consistent with the interactionist view of creativity (Woodman et al., 1993; Woodman & Schoenfeldt, 1990), we highlighted the importance of the social context. The findings that social context such as co-worker support and relationship conflict moderated the relationship between anger and the creative process, especially at the stage of information seeking and encoding suggests that the social context plays a critical role in the processes linking anger and creativity. Although research has underscored the impact of social-context factors on employee creativity (Shalley et al 2004), research has yet to explain when and what kind of social-context factors matter most during the creative process. Our results show that the social context is particularly important for the information searching and encoding stage of the creative process when employees experience anger. When co-worker support is high, the potential benefits of anger on creativity will be sustained and employees will engage in searching and gathering relevant information to deal with work-related problems. Thus, although anger may deplete cognitive resource (Baas, et al 2011), the support from co-workers is likely to provide external resources for them to maintain their momentum for their creative efforts. The importance of social context can also be highlighted from another set of results from our study- the relationship between anger and information seeking and encoding was negative when co-worker support was low or relationship conflict was high. Overall,

these results offer a potential explanation for the documented inconclusive relationship between anger and creativity. Future research should extend the findings of this research and explore why social context may change the relationship between anger and creativity.

Practical Implications

The findings of this study provide actionable knowledge that organizations can use to manage anger experienced by employees and to channel it into creative performance. Managers should be informed of the nature of anger in the problem-solving process. Specifically, our finding suggests that anger is positively associated with problem identification at the initial stage of the creative process leading. Rather seeing anger as a negative emotion to be suppressed or avoided, managers should learn to see employee anger as an indicator of problems at work and pay attention to the problems that cause anger. The reported moderating influence of co-worker support and relationship conflict on the relationship between anger and the creative process suggest that management need to create a positive social environment if they are to channel the positive impact of anger to creativity. Management interventions that encourage team work and quality relationships will help sustain the motivation and cognitive efforts triggered by anger leading to creativity.

Limitations and Future Research

This study has some limitations which must be highlighted. First, given the cross-sectional research design especially with the daily data, the direction of causality cannot be clearly determined. As Amabile et al (2005) found that creativity may lead to emotions as well as being a result of emotions, it is possible that employees get angry when they fail in their creative efforts. Although theories (Schwarz & Skurnik, 2003) as well as experimental studies (Baas et al., 2011) have supported the causal relationship between anger and the creative process, future research that should use a longitudinal research to ascertain the causal status of the relationships reported in this study. As with other studies that use daily

surveys (e.g. To et al., 2012), we relied on self-report data giving rise to concerns about the potential influence of CMV on the findings reported in our paper. However the CFA results revealed that these findings are not entirely attributable to CMV. Furthermore, CMV cannot account for the differentiated relationships between anger and the sub-processes of the creative process. Nevertheless we suggest that future research should obtain data on some of the individual-level variables such as co-worker support from peers.

Another limitation of this study is that the scale reliability for co-worker support (.78) was slightly lower than the suggested cut-off value of .80 (Lance, Butts, & Michels, 2006). It is important to note that low reliability has been suggested to attenuate the relationship between variable and reduce analysis power (McClelland & Judd, 1993). Thus, our results may underestimate the true strength of relationships reported in this study.

Two of our hypotheses regarding idea generation (H2b and H3b) did not receive support. A closer examination of the results showed that although all the relationships were in the hypothesized direction, the statistics failed to reach the significant level (i.e. $p < .05$). One possible reason is that the process of idea generation may need something beyond social support as idea generation involves exploring multiple pathways which requires not only motivation but also divergent thinking skills (Amabile, 1983). Future research should further explore other types of social support such as informational support (Madjar, 2008) or intellectual stimulation that may moderate the relationship between anger and idea generation.

Conclusion

Given the criticality of employee creativity to organizational success in a competitive business environment and the critical role of emotions such as anger plays in influencing such behavior, more research is needed to resolve the inconclusive relationship between anger and creativity. Our research highlights the need to examine the differentiated impact of anger on

the sub-processes of the creative process and the importance of taking the social context into consideration. Future research should extend the findings of this study by examining other social-contextual factors that may attenuate the relationship between anger and the creative process.

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Table 1 – Means, Standard Deviations and Correlations among variables considered at level 1 and level 2

	Mean	SD	1 (SA)	2 (CPE1)	3 (CPE2)	4 (CPE3)	5 (AGE)	6 (GEN.)	7 (HET)	8 (AT)	9 (CWS)	10 (RC)
Level 1 variables – Day-level (N = 422)												
1. SA	1.23	.53	*(.95)*									
2. CPE 1	3.10	.94	.08	*(.85)*								
3. CPE 2	3.02	.99	.03	.72**	*(.86)*							
4. CPE 3	2.90	.94	.06	.66**	.70**	*(.86)*						
Level 2 variables – Person-level (N = 98)												
5. AGE	31.32	5.89	-.04	-.10	-.08	-.10						
6. GENDER	.36	.48	.09	.05	.03	.10*	-.25					
7. HET	1.51	.94	.25*	.19	.11	.34**	-.19	.39**	*(.87)*			
8. TAT	1.73	.70	.23*	.28**	.25*	-.23*	-.13	-.03	.17	*(.78)*		
9. CWS	5.22	1.10	-.10	-.03	.02	.04	.16	-.22**	-.08	.05	*(.90)*	
10. RC	1.76	.69	.34**	-.05	-.06	.05	-.08		.14**	.11	.25*	-.04	*(.90)*

Notes: * p < .05   **p< .01; Th e Internal Consistency Reliability (Cronbach's Alphas) are in bold italic and on the diagonal parentheses. Gender: Male 0; Female 1
SA – state anger, CPE1 – problem identification, CPE2 – information searching and encoding, CPE3 – idea generation, HET – high effort tasks, TAT – trait anger temperament, CWS – Co-worker support, RC – Relationship conflict

Table 2 – Multilevel Modelling Analysis predicting CPE1, CPE2, CPE3

	Null Model	Model 1 CPE1	Null Model	Model 2 CPE2	Null Model	Model 3 CPE 3	Model 4 CPE1	Model 5 CPE 2	Model 6 CPE 3	Model 7 CPE 1	Model 8 CPE 2	Model 9 CPE 3
Level 1												
Intercept	3.10(.07)**	2.72(.52)**	3.02 (.08)**	2.63 (.57)**	2.90 (.07)**	2.27(.58)**	2.98(.54)**	2.58(.59)**	2.24(.59)**	2.60(.54)**	2.48(.60)**	2.22(.59)**
SA		.16(.08)*		-.00 (.07)		-.02(.07)	.32 (.19)	.01(0.12)	-.02(.13)	.39(.19)*	.01 (.14)	-.01 (.14)
Level 2												
Age		-.01(.01)		-.01(.01)		-.00 (.02)	-.01(.01)	-.00 (.02)	-.00(.02)	-.01(.01)	-.00 (.02)	-.00(.02)
Gender		.06 (.15)		.06(.16)		.04 (.14)	-.00(.16)	.05 (.18)	.05(0.153)	.05(.16)	.09 (.17)	.06(.16)
HET		.05 (.07)		-.01(.08)		.17 (.07)*	.06 (.07)	.00 (.08)	.17 (.07)*	.07(.07)	.01(.08)	.17 (.07)*
TAT		.24 (.08)**		.28(.09)**		.20(.08)	.28(.08)**	.27 (.09)**	.19(.08)*	.31(.08)**	.30(.09)**	.19 (.09)*
CWS							-.04 (.06)	-.02(.07)**	.01 (.05)			
RC										-.13(.08)	-.12 (.09)	-.01(.08)
Cross-level Interaction												
CWS X SA							.23 (.22)	.43 (.15)**	.39(.17)*			
RC X SA										-.40(.23)	-.40(.18)*	-.36 (.20)
Variance Components												
L1 (withim team variance)	.56	.54	.55	.55	.54	.54	.53	.54	.53	.53	.55	.54
L2 (Intercept variance)	.31	.26	.41	.38	.33	.27	.29	.40	.29	.28	.40	.29
Additional Information												
ICC	.36	__	.43	__	__	__	__	__	__	__	__	__
-2log likelihood (Deviance)	1.064.720	1.062.185	1.082.097	1.086.197	1.059.957	1058.811	1.069.095	1.086.248	1.059.593	1.064.375	1.087.715	1.061.171
Number of estimated parameters	2	4	2	4	2	4	4	4	4	4	4	4
Pseudo R2	0	.07	0	.04	0	.07	.13	.02	.06	.06	.03	.06

Note: * p < .05   **p< .01 L1 N = 422 , L2 N = 98

SA – state anger, CPE1 – problem identification, CPE2 – information searching and encoding, CPE3 – idea generation, HET – high effort tasks, TAT – trait anger temperament, CWS – Co-worker support, RC – Relationship conflict
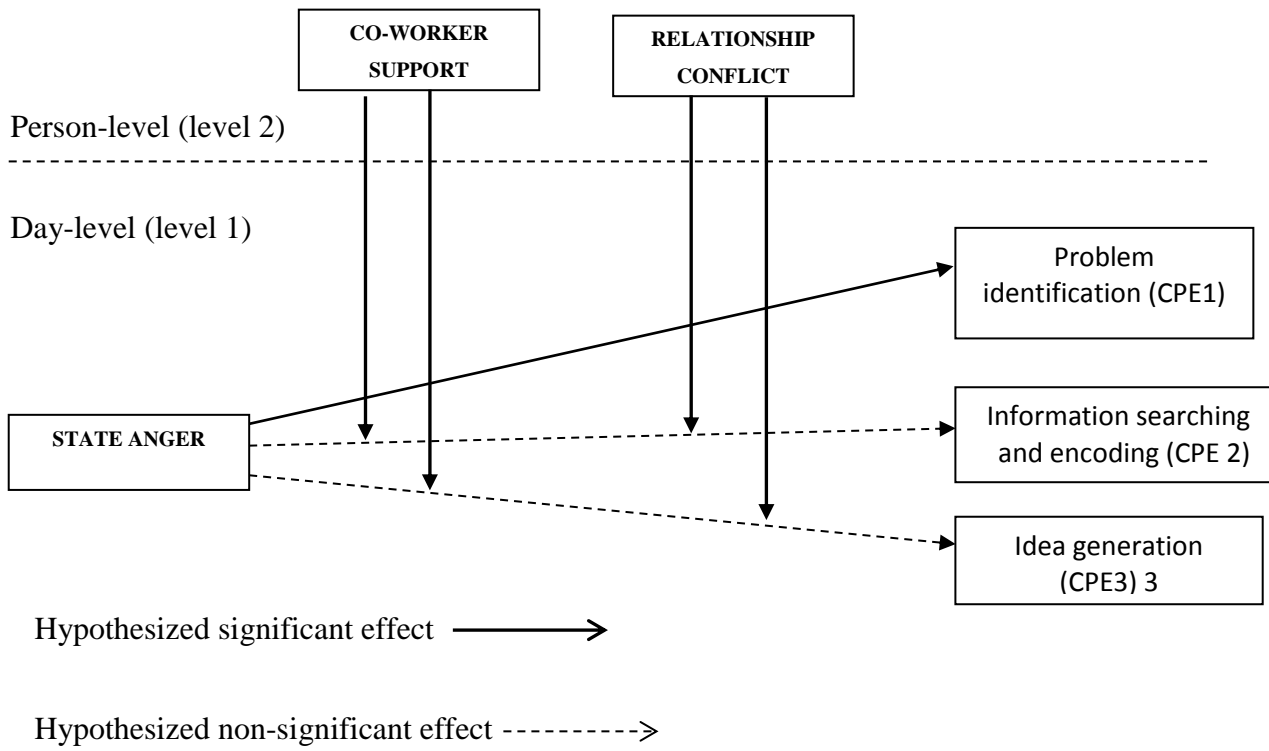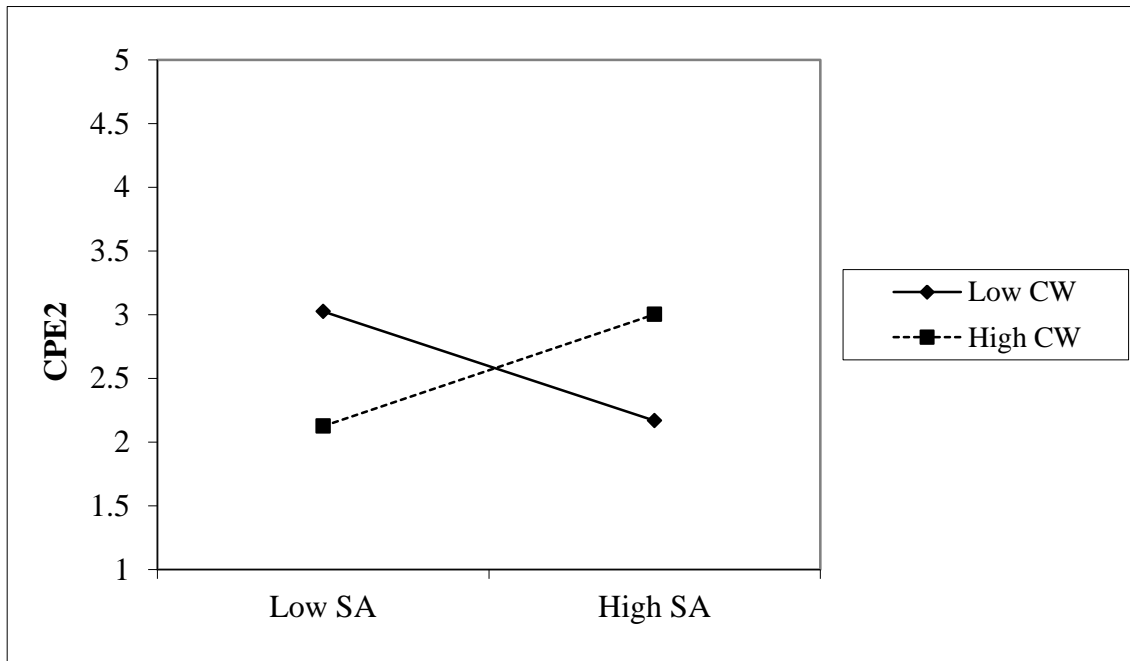
Figure 1: The Hypotheses Model

Figure 2a: The Moderating effect of co-worker support (CW) on the relationship between state anger (SA) and information seeking and encoding (CPE2)
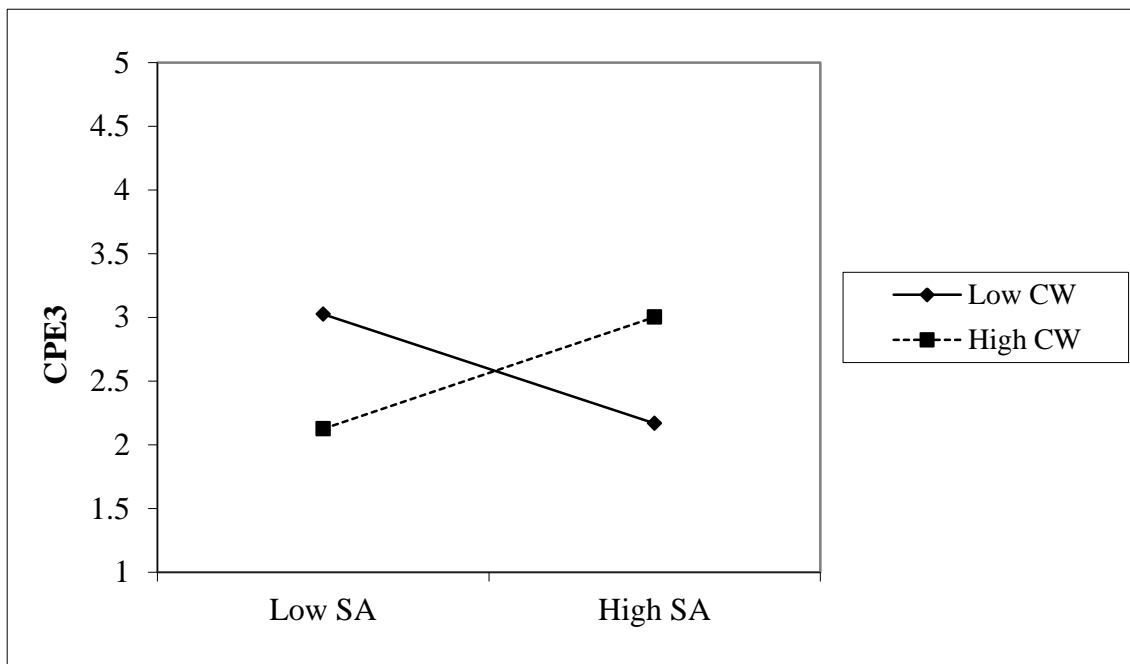

Figure 2b: The Moderating effect of co-worker support (CW) on the relationship between state anger (SA) and idea generation (CPE3)
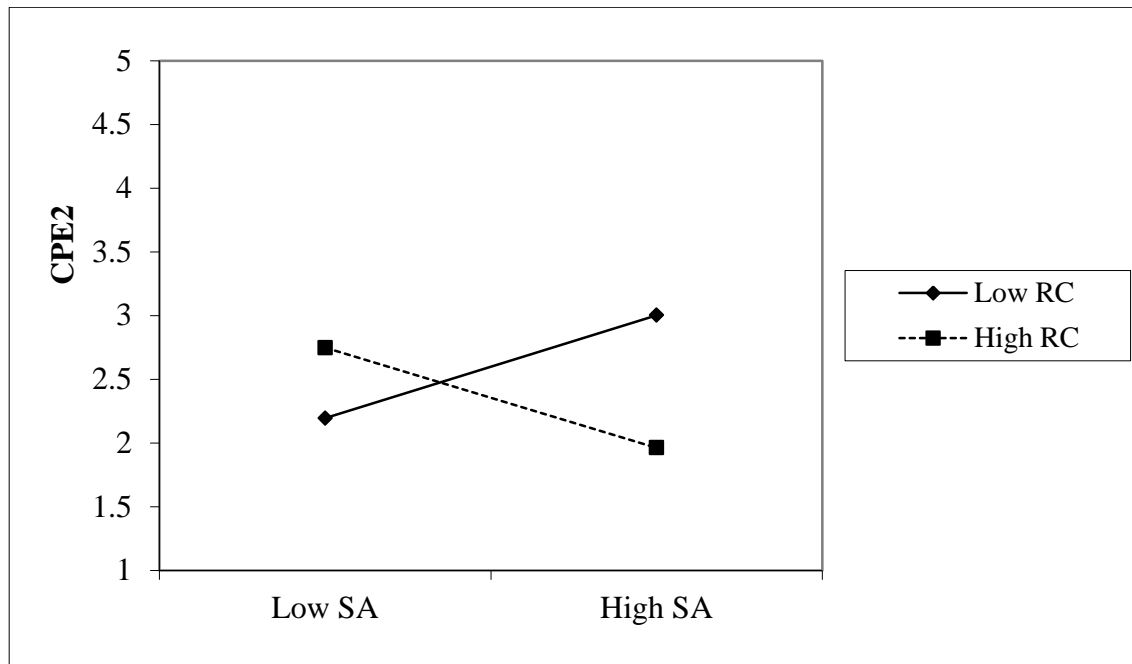
Figure 3: The moderating effect of relationship conflict (RC) on the relationship between state anger (SA) and information seeking and encoding (CPE2)