



Master's thesis

*Always Connected at Work?  
 The Role of Information Novelty and  
 Individual Needs*

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### Abstract

As a result of new ICT developments, many workers are almost constantly connected to job-relevant information and co-workers, regardless of when or where they are working.

Depending on workers' psychological needs, constantly being connected may be perceived as favorable (e.g., when it enhances task clarity or task performance) or unfavorable (e.g., when it creates ambiguity or external control). In the present research, perceiving connectedness as either favorable or unfavorable was expected to be a function of (a) information novelty, (b) need for structure, and (c) need for autonomy. Indeed, in three experiments that manipulated connectedness and measured participants' psychological needs, we found that the effects of connectedness are contingent on the fit or misfit between information novelty and individual needs. In order to reap the potential benefits from new ways of working without incurring the potential costs, these results suggest that organizations moving towards increased connectedness should take workers' psychological needs into consideration.

*Keywords:* connectedness, blended working practices, information novelty, need for structure, need for autonomy.

## Always Connected at Work?

### The Role of Information Novelty and Individual Needs

The world of work has changed. As a result of new information and communication technologies (ICTs), many knowledge workers are almost constantly connected to job-relevant information and co-workers, regardless of when or where they are working (Matusik & Mickel, 2011; Van Yperen, Rietzschel, & De Jonge, 2014). The use of online devices such as computers, laptops, tablets, and smartphones allows for cloud-based computing and enables constant and location-independent access to information via email, chat, video calling, and online file sharing (Derks & Bakker, 2013; Van Yperen et al., 2014). One of the ways in which organizations are responding to this intensified *connectedness* is by incorporating new work arrangements such as blended working practices (BWPs), enabling workers to blend on-site and off-site working via online technologies with the goal of improving favorable work outcomes and attitudes (Van Yperen, et al., 2014). However, not every individual may appreciate being constantly connected to one's work and co-workers through online media. The constant stream of incoming messages may be perceived as favorable by some (e.g., when the content clarifies the task or enhances task performance), but can also be perceived as unfavorable by others (e.g., when the content increases ambiguity or external control). Hence, in this paper we study the effects of connectedness by addressing the role of (a) information novelty, (b) need for structure, and (c) need for autonomy, and demonstrate that workers' perception of connectedness depends both on the content of the information received and the psychological needs of the worker.

### **Connectedness at Work**

The use of new ICTs and online devices facilitates workers' connectedness to information and co-workers from almost any location (Matusik & Mickel, 2011). As knowledge work mainly revolves around obtaining, analyzing and sharing knowledge

(Townsend, DeMarie, & Hendrickson, 1998), these core aspects of the job can now be performed online (Hill, Ferris & Mårtinson, 2003). Hence, knowledge work is no longer constrained to fixed working hours at the office (VanDyne, Kossek, & Lobel, 2007), and the use of connectivity technologies continues to rise as an increasing number of organizations are implementing new work arrangements such as BWPs (Kelliher & Anderson, 2010). Connectedness is bidirectional: it implies the ability to send information and questions to others, as well as the ability to receive information and questions from others (Kirsh, 2000). The current paper will focus on the latter aspect, because the aspect of continuous incoming information can result in either favorable or unfavorable work outcomes.

Connectedness can be perceived as favorable because it can increase task clarity and task performance. After all, connectedness increases (efficiency in) information access (Mazmanian, Orlikowski, & Yates, 2005; Govindaranju & Seward, 2005) and can provide workers with information and feedback that they would not have obtained otherwise (Fonner & Roloff, 2010). However, being constantly connected can also be perceived as unfavorable when incoming information results in ambiguity or feelings of external control. Ambiguity can arise because being continuously connected to co-workers makes it unclear whether, how and when information will be pushed to one's workplace (Kirsh, 2000). New incoming information can also generate a sense of overload that hinders workers' performance (O'Reilly, 1980). In addition, external control can be experienced when incoming information interrupts workers and prevents them from being totally involved in the task at hand (Jett & George, 2003; Leonardi, Treem, & Jackson, 2010). Whereas workers previously had the possibility to disconnect from incoming information (e.g., by closing their office doors), this becomes much harder when information is pushed via different online technologies (Kirsh, 2000).

### **Information Novelty and Workers' Psychological Needs**

Whether workers will appreciate the constant flow of incoming information resulting from connectedness is expected to be a function of information novelty and workers' psychological needs. *Non-novel* incoming information (i.e., non-original information that is predictable and in line with the task) can be perceived as favorable for executing the task because it has the potential to reaffirm the task goal and can increase task clarity when working remotely, but can also be perceived as unfavorable when it creates unnecessary interruptions that increase feelings of external control. By contrast, *novel* incoming information (i.e., original information that is unique and unusual) can be perceived as favorable for its potential to add a new perspective to the task, but can also be perceived as unfavorable when the added complexity is perceived as overwhelming and as creating ambiguity (Girard, 2008).

Both non-novel and novel incoming information can thus be experienced as either favorable or unfavorable, and previous research indicates that workers are more satisfied with their job when they receive incoming information that fits with their psychological needs (Trombetta & Rogers, 1988). In the current paper, we will focus on the need for structure and need for autonomy to explain the different outcomes of being connected to incoming non-novel and novel information (cf., Van Yperen et al., 2014). In line with typical use in organizational theories, people are considered to show individual differences in the strength and intensity of these needs (Gagné & Deci, 2005).

Specifically, it is expected that workers' perception of connectedness will depend on the fit of information novelty with their need for structure (Thompson, Naccarato, Parker & Moskowitz, 2001) and need for autonomy (Gagné & Deci, 2005). These expectations are based on previous research which indicated that both needs shape workers' reactions to contextual factors such as job demands and feedback (Slijkhuis, Rietzschel, & Van Yperen,

2013), and also shape their attitude towards different work arrangements (Van Yperen et al., 2014). That is, workers generally have a more favorable perception of BWPs that increase discretion (such as off-site working) when they are low in need for structure and high in need for autonomy (Van Yperen et al., 2014).

**Need for structure** refers to a strong preference for clarity and predictability, an aversion to extensive information processing, and a strong desire to diminish ambiguity and uncertainty (Neuberg & Newson, 1993; Thompson et al., 2001). Because of this, people high in need for structure have the tendency to form simple structures that are non-ambiguous (such as cognitive heuristics and schemas) with the aim of simplifying the environment into a manageable form (Neuberg & Newson, 1993). They prefer structure and predictability to flexibility, and they prefer to work in a simple, routinized, and organized work environment (Thompson et al., 2001).

**Need for autonomy** refers to the desire to experience personal freedom, independence, and individual discretion (Deci & Ryan, 2000). People high in need for autonomy prefer to act with a sense of volition, to be in control of their own actions, and to be able to decide on their own how and when to perform the job (Hackman & Oldham, 1976; Karasek, 1979). They prefer a work environment in which the work outcomes depend on their own decisions, initiatives and efforts (e.g., by setting their own work pace and work schedule and by determining their own procedures) and dislike external instructions or procedures (Deci & Ryan, 2000; Van den Broeck, Vansteenkiste, Witte, Lens, & Soenens, 2010). They prefer to work independently without being closely supervised, and show an aversion towards external control (Birch & Veroff, 1966).

### **Information Novelty and Need for Structure**

Because people high in need for structure dislike ambiguity, they tend to dislike work environments that are characterized by changes or reorganizations (Friesen, Kay, Eiback, &

Galinsky, 2014). They prefer work environments that are results-oriented and where clear performance criteria increase task clarity (Van Yperen et al., 2014). Given their desire to maintain certain knowledge, workers high in need for structure tend to avoid or ignore exposure to unexpected and ambiguous information (Schulz & Searleman, 1998). Instead, they prefer to organize information via simple and noncomplex structures and tend to apply these established simple structures to new, ambiguous situations (Ashford & Cummings, 1985). These strategies help to form generalizations and routines that enable them to draw inferences about the world without using a great deal of cognitive resources (Neuberg & Newson, 1993).

Accordingly, workers high in need for structure are expected to perceive connectedness as positive only when the information received is non-novel and unsurprising. For them, non-novel information fits their preference for clarity and for stereotypical information, which is expected to compensate for the negative effects of being provided with extra information. In addition, non-novel information may reaffirm the task goal, thus increasing task clarity and lowering ambiguity when working remotely. People high in need for structure tend to show low levels of flexibility, but high levels of persistence in their reasoning (Rietzschel, De Dreu, & Nijstad, 2007), and are expected to prefer non-novel incoming information that fits with this preference. By contrast, workers high in need for structure are expected to perceive novel information as unfavorable since novel information adds complexity to the task and requires more information processing. In addition, novel information will likely increase ambiguity, uncertainty and information load; aspects that make it difficult to understand and incorporate the incoming information in the task at hand. Previous research has indicated that workers high in need for structure tend to experience high levels of stress, discomfort and aversion when confronted with ill-structured situations that lack clarity (such as self-managed working and flexible work arrangements) (Neuberg &

Newson, 1993; Thompson et al., 2001; Van Yperen et al., 2014), and they are expected to experience novel incoming information in a similar way.

*Hypothesis 1:* When receiving non-novel information (as compared to no information or novel information), workers high in need for structure will perceive increased task clarity and feel less blocked during task performance.

*Hypothesis 2:* When receiving novel information (as compared to no information or non-novel information), workers high in need for structure will perceive decreased task clarity and feel more blocked during task performance.

### **Information Novelty and Need for Autonomy**

Workers high in need for autonomy have a strong preference for being in control of their actions, and are averse to external control. Hence, they prefer a work environment that allows for freedom and discretion, such as BWPs that offer the opportunity to combine on-site and off-site working (Van Yperen et al., 2014), and they report higher satisfaction and work performance when working remotely (O'Neill et al., 2009). As a result of their aversion to external control, workers high in need for autonomy are expected to perceive connectedness as negatively controlling and interrupting their workflow, unless the information received is highly novel. The reason for this is that receiving non-novel information has no added value for executing the task at hand, leaving only an unnecessary interruption. Because of this, non-novel information will likely lower their perceived level of discretion and self-managed working, and the interruptions created by connectedness are expected to increase feelings of external control. This reasoning is in line with previous research indicating that connectedness can lead to the social expectation to always be online and available for others, and can increase perceptions of external control (Mazmanian, et al., 2013), which are aspects that misfit with the need for autonomy. By contrast, receiving novel information is expected to compensate for the negative effects of being interrupted and experiencing external control

in a connected work environment. Novel information adds a new and original perspective to the task at hand which may enhance workers' flexibility and freedom in approaching the task (i.e., by having more available options for the task), which are aspects that fit with the need for autonomy and will likely be perceived as valuable for executing the task at hand.

*Hypothesis 3:* When receiving non-novel information (as compared to no information or novel information), workers high in need for autonomy will feel more externally controlled and feel more blocked during task performance.

*Hypothesis 4:* When receiving novel information (as compared to no information or non-novel information), workers high in need for autonomy will feel less externally controlled and feel less blocked during task performance.

The theoretical model is presented in Figure 1. In addition to these propositions, performance was measured as an exploratory variable. To test these propositions, three experiments were conducted that manipulated the information novelty of connectedness and allowed for the assessment of participants' individual needs. In Study 1, participants were provided with non-novel information (versus no information) during an idea generation task. In Study 2, participants received novel information (versus no information). In Study 3, participants received either novel or non-novel information.

### **Method Study 1 – Connectedness via Non-novel Information Sample and Design**

A laboratory study was conducted to examine the causal relation between connectedness and work outcomes as moderated by the need for structure and autonomy. Eighty-one students (33% male) of the University of Groningen voluntarily participated in this study either for token payment (€5, approximately \$6.85 U.S. dollars) or for partial course credits. Their ages ranged between 18 and 29 years ( $M = 21.94$ ,  $SD = 2.42$ ). Of the participants, most studied Psychology (61%), followed by Economics and Business (16%),

Natural sciences (7%), Law (7%), Arts (6%), and Medical sciences (3%). During this study, participants participated individually during a 45-minute session on computers located in separate cubicles. However, all participants were led to believe they were working together with another participant via interactive online software.

Participants were randomly assigned to brainstorm in one of two conditions (connectedness to non-novel information ( $n = 41$ ) versus no information ( $n = 40$ )). Connectedness was manipulated as the extent to which participants were able to continuously send and receive brainstorming ideas to, they were told, another participant (but in fact preprogrammed software). The ideas they received were all rated as non-novel in a previous unrelated study (Rietzschel, Nijstad, & Stroebe, 2007). Participants' individual needs were used as continuous moderators. Participants completed all measurements in an online survey created in Qualtrics and completed the brainstorming task with software especially created for the purpose of this study, which was integrated in our survey (as described in more detail in the next section).

### **Procedure**

On arrival, participants were welcomed and seated at a computer in individual cubicles. Participants received the consent form in which the cover story explained that during this study, they would “brainstorm together with another student via the internet, to come up with ideas to create a healthy Groningen.” In fact, however, all participants brainstormed individually (see, for a similar procedure, Homan, Greer, Jehn, & Koning, 2010). All participants signed the consent form.

Before starting the brainstorm task, participants filled out a questionnaire about their psychological needs and read the task instruction on the computer screen. They were again reminded of the goal of the study as described in the cover story, and were informed that the student with whom they would brainstorm online was participating at another faculty. They

were instructed to keep the four brainstorming rules in mind while brainstorming (see Osborn, 1957). To consolidate the cover story, participants were furthermore told that the brainstorming task would begin as soon as the other participant was also ready to start. After waiting for 5 seconds, the brainstorming task started automatically.

Brainstorming software was created for the purpose of this study and used online to enhance the idea of working together with another participant via the Internet. Participants were given 10 minutes for this task, after which they were informed on the screen that this was the end of the brainstorming part, and that they would now continue with the rest of the study. After the task, participants answered questions regarding the manipulation and the work process. Lastly, participants answered questions about their demographics. In order to partially overcome the problem of item non-response, all items had a forced response indication within the survey flow. At the end of the study, participants were thanked for their participation. After completing data collection, participants were debriefed via the email about the cover story and the actual goal of the study.

### **Connectedness Manipulation via Non-novel Information**

Participants in the *non-novel information* condition were informed in the task instruction that they were able to exchange ideas with the other participant. In this condition, a 'share' button was displayed next to every idea submitted by the participant during the task. Participants were told that they could share their ideas with the other participant by pressing this button. In fact, this button only recorded for which ideas participants pressed this button. In addition, nine preprogrammed pop-ups appeared after every 30, 60 or 90 seconds working on the brainstorming task. These pop-ups were said to display ideas shared by the other participant, but in fact showed preprogrammed ideas that were rated as non-novel in earlier unrelated research (see, Rietzschel et al., 2007). The time intervals of these pop-ups were fixed but not constant, to avoid raising any suspicion about the preprogrammed nature of the

pop-ups. Also, these time intervals were small to enhance a feeling of constant connectedness. In the *no information* condition, a simplified version of the brainstorming software was used. In this version, no pop-ups or share buttons appeared (i.e., there was no ability to receive or share ideas).

### Measures

All items, unless specified otherwise, were measured on a 5-point Likert scale ranging from 1 ('strongly disagree') to 5 ('strongly agree').

### Moderators

**Need for structure.** The need for structure was measured with 4 items of the Psychological Need Strength scale by Van Yperen et al. (2014) and adapted to fit the context of the current task. A sample item includes "In a brainstorming situation, I have the need for order and regularity." All items were measured on a 7-point Likert scale ranging from 1 ('not at all') to 7 ('to an extremely large extent'). The higher one's score, the higher one's need strength. Cronbach's alpha was high at .88.

**Need for autonomy.** The need for autonomy was also measured with 4 items of the Psychological Need Strength scale by Van Yperen et al. (2014) and adapted to fit the context of the current task. A sample item includes "In a brainstorming situation, I have the need to have a say in determining my activities and tasks." All items were measured on a 7-point Likert scale ranging from 1 ('not at all') to 7 ('to an extremely large extent'). Cronbach's alpha was high at .87.

### Manipulation Checks

**Perceived connectedness.** To assess whether participants in the high connectedness condition indeed perceived higher levels of connectedness during the brainstorm task, 4 items were used that were created for the purpose of this study (see Table 1). A sample item is: "I

felt connected to the other participant”. Higher scores indicated higher levels of perceived connectedness. Cronbach’s alpha was .75.

**Perceived novelty.** One item was created for the purpose of this study to measure the extent to which received ideas were perceived as novel: “The ideas I received from the other participant were creative.”

### **Dependent Variables**

**Clarity.** The extent to which participants perceived the brainstorm task as clear was assessed with one item created for the purpose of this study, namely: “During the task, I knew what was expected of me”.

**External control.** The extent to which participants experienced external control during the brainstorm task was assessed with 5 items created for the purpose of this study (see Table 1). A sample item is: “I felt pressured to be available”. Cronbach’s alpha was .81.

**Feeling blocked.** The extent to which participants felt blocked to come up with new ideas during the brainstorm task was assessed with one item created for the purpose of this study: “I felt blocked to come up with new ideas”.

**Performance.** The number of unique ideas submitted per participant was used as an indicator of their performance.

## **Results study 1 – Connectedness via Non-novel Information**

### **Preliminary Analyses and Data Treatment**

The sample means and standard deviations were compared with more robust measures and showed only minor differences, which indicated that possible outliers and extreme values do not create a bias in our sample mean and standard deviation (see Wilcox, 2003). In addition, the moderators and dependent variables showed normal distributions and homoscedasticity, with some exceptions<sup>1</sup>. As the violations were small, it was assumed that general techniques could be used safely.

The means, standard deviations, correlations and Cronbach's alphas of the variables of interest are given in Table 2. The highest correlations were obtained between sex and need for autonomy (indicating that women had a higher need for autonomy,  $r = .35, p = .00$ ) and between external control and feeling blocked ( $r = .38, p = .00$ ). The positive significant relation between the need for structure and need for autonomy ( $r = .33, p = .00$ ) was taken into account by creating regression models that included both moderators. Sex and age were more or less evenly distributed across conditions,  $\chi^2_{\text{sex}}(1, N = 81) = 1.21, p = .27$ , and  $F_{\text{age}}(1, 79) = .10, p = .75$  ( $M_{\text{non-novel info}} = 22.02$  vs.  $M_{\text{no info}} = 21.85$ ). Both were taken into account in the analysis, but generally indicated no significant effects on work outcomes,  $ps > .15$  for sex and  $ps > .10$  for age, with some exceptions (see Table 3).

### Manipulation Checks

**Perceived connectedness.** As expected, the level of perceived connectedness showed a positive significant effect for condition, indicating that participants in the high connectedness condition ( $M_{\text{non-novel info}} = 2.75, SD = .86$ ) experienced more connectedness compared to those who received no connectedness ( $M_{\text{no info}} = 1.94, SD = .82$ ) measured on a 5-point scale). Still, the level of perceived connectedness was relatively low for the high connectedness group, which might be due to the artificial task setup of being connected to a computer program. Unexpectedly, the effect of perceived connectedness was negatively moderated by the need for structure ( $b = -.19, t(75) = -2.16, p = .03$ , see Figure 2). The simple slopes tests (Aiken & West, 1991) indicated that the expected positive relation of perceived connectedness per condition occurred most strongly for those low in need for structure ( $b = .59, t = 4.33, p = .00$ ) and only marginally significantly for those high in need for structure ( $b = .24, t = 1.79, p = .08$ ), suggesting that participants high in need for structure perceived high connectedness in both conditions.

**Perceived novelty.** As participants only received non-novel information, it was expected that participants would also perceive the received messages as non-novel. Indeed, the low mean ( $M = 2.68$ ,  $SD = 1.23$ ) shows that participants generally did not perceive the incoming ideas as novel<sup>2</sup>.

### Hypothesis Testing

For all dependent variables, hypotheses were tested by running a regression analysis with connectedness, need for structure, need for autonomy, and the two interaction terms of connectedness with the needs. To represent the interaction between connectedness (dummy coded 1 = high, -1 = low) and psychological needs, the need variable under investigation was first standardized and then multiplied by condition (Aiken & West, 1991). Last, sex (with two levels, '-1' for men and '1' for women) and age were included as covariates in all analyses. All regressions are summarized in Table 3. I expected that participants high in need for structure would perceive connectedness via non-novel information as favorable (H1), whereas participants high in need for autonomy would perceive this as unfavorable (H3).

**Clarity.** I expected that the effects of connectedness on perceived clarity would be strengthened by need for structure. By contrast, however, the regression analysis only yielded positive main effects for connectedness ( $b = .20$ ,  $t(75) = 2.05$ ,  $p = .04$ ) and for need for autonomy ( $b = .22$ ,  $t(75) = 2.21$ ,  $p = .03$ ), indicating that those high in need for autonomy and those in the high connectedness condition experienced more clarity during the task relative to those low in need for autonomy or in the low connectedness condition.

**External control.** As expected with H3, the effects of connectedness on perceived external control were strengthened by need for autonomy. The regression analysis yielded a positive main effect of connectedness ( $b = .31$ ,  $t(75) = 4.25$ ,  $p < .001$ ) that was qualified by a positive interaction of connectedness and need for autonomy ( $b = .15$ ,  $t(75) = 2.12$ ,  $p = .04$ , see Figure 3). Simple slopes analysis showed that high connectedness to non-novel

information was associated with higher perceived external control when participants were high in need for autonomy ( $b = .46, t = 4.49, p < .001$ ), but not when participants were low in need for autonomy ( $b = .15, t = 1.50, p = .14$ ).

**Feeling blocked.** H3 was also supported for feeling blocked. The regression analysis yielded a positive interaction of condition and need for autonomy ( $b = .27, t(75) = 2.10, p = .04$ , see Figure 4), but no main effects were obtained. Simple slopes analysis showed that high connectedness was associated with feeling blocked when participants were high in need for autonomy ( $b = .37, t = 2.06, p = .04$ ), but not when participants were low in need for autonomy ( $b = -.13, t = -1.01, p = .32$ ), which was similar to the results obtained for external control. No support was obtained for H1.

**Performance.** No main or interaction effects were obtained for actual performance.

### Discussion Study 1

The results of Study 1 were partially in line with the expectations, suggesting that the effects of connectedness to non-novel information indeed are moderated by workers' psychological needs. Specifically, participants under conditions of high connectedness perceived more external control, and felt more blocked by the ideas of the (fictitious) other participants, but only when their need for autonomy was high. These results are in line with the notion that participants high in need for autonomy do not appreciate being sent information that does not have added information value over and above the obvious (H3). No support was obtained for the expected fit between non-novel information and need for structure (H1). An unexpected, yet interesting, finding was that need for structure strengthened the effects of participant's perception of connectedness. The implications of these findings are discussed in the general discussion.

Nevertheless, results were mixed. Also, the current study operationalized connectedness only by providing participants with non-novel information. As the expected

moderation effects were only obtained for those high in need for autonomy, it seems that especially a misfit (rather than a fit) between people's needs and the work context affects work outcomes. In Study 2, therefore, we aimed to replicate and extend these findings by manipulating connectedness to novel information (versus no information).

### **Method Study 2 – Connectedness via Novel Information**

#### **Sample and Design**

A second study was conducted to assess whether connectedness via novel incoming information is related to a misfit with the need for structure and a fit with the need for autonomy. To test this, the measures and procedure for Study 2 were identical to Study 1, except that this time, participants in the connectedness condition received ideas that were previously rated as novel (Rietzschel et al., 2007). Eighty-six undergraduate Psychology students (41.9% male) of the University of Groningen voluntarily participated in this study for partial course credits. Their ages ranged between 19 and 29 years ( $M = 20.12$ ,  $SD = 1.80$ ). Participants were randomly assigned to brainstorm in one of two conditions (connectedness to novel information ( $n = 43$ ) versus no information ( $n = 43$ )).

### **Results Study 2**

#### **Preliminary Analyses and Data Treatment**

The assumptions of normality and homoscedasticity were graphically inspected for the moderators and dependent variables. In addition, the means and standard deviations were compared with more robust measures. All variables under investigation met these assumptions, with some exceptions<sup>1</sup>. As the violations were small, it was assumed that general techniques could be used safely.

The means, standard deviations, correlations and Cronbach's alphas of the variables of interest are given in Table 4. The highest correlations were obtained for external control and feeling blocked ( $r = .40$ ,  $p = .00$ ). Similarly to Study 1, a positive significant relation was

obtained between the need for structure and need for autonomy ( $r = .26, p = .02$ ). Sex and age were more or less evenly distributed across conditions,  $\chi^2_{\text{sex}}(1, N = 86) = .76, p = .38$ , and  $F_{\text{age}}(1, 84) = .71, p = .40$  ( $M_{\text{novel info}} = 20.28$  vs  $M_{\text{no info}} = 19.95$ ). Both were taken into account in the analysis, but indicated no significant effects on work outcomes,  $ps > .15$  for sex and  $ps > .10$  for age, with some exceptions (see Table 5).

### Manipulation Checks

**Perceived connectedness.** As expected, the manipulation check indicated that participants who received high connectedness ( $M_{\text{novel info}} = 2.03, SD = .75$ ) also experienced more connectedness than those who received no information ( $M_{\text{no info}} = 1.60, SD = .70$ ),  $b = .23, t(78) = 2.95, p = .004$ . Compared with Study 1 ( $M_{\text{no info}} = 1.94$  vs  $M_{\text{non-novel info}} = 2.75$ ), the perceived level of connectedness in Study 2 was lower. This may be due to the novel content of information received that did not necessarily accord participants' own reasoning. The need for structure and autonomy did not moderate the relation between connectedness and perceived connectedness,  $b = -.12, ns$  and  $b = -.04, ns$ .

**Perceived novelty.** In line with the expectation that people in the novel information condition would perceive the received messages as novel, the novelty of the ideas was scored as high with an average of  $M = 4.05$  ( $SD = .82$ ). Relative to the rating of non-novel ideas in Study 1 ( $M = 2.68, SD = 1.23$ ), the novel ideas in the current study were indeed rated as more novel,  $t(165) = 8.51, p < .001$ .

### Hypothesis Testing

For all dependent variables, hypotheses were tested by running regression analyses with connectedness, need for structure, need for autonomy, the two interaction terms of connectedness with the needs, and the control variables age and sex as predictors. All regressions are summarized in Table 5. We expected that participants high in need for

structure would perceive connectedness via novel information as unfavorable (H2), whereas participants high in need for autonomy would perceive this as favorable (H4).

**Clarity.** In contrast to what was expected in H2, the effect of connectedness on perceived task clarity was not weakened by need for structure. No interaction effects for need for structure ( $b = .01, ns$ ) and need for autonomy ( $b = -.03, ns$ ) were obtained.

**External control.** No support was obtained for H4, that the effects of connectedness on external control would be weakened by need for autonomy. Instead, the regression analysis only revealed positive main effects for connectedness ( $b = .33, t(78) = 5.46, p < .001$ ) and need for structure ( $b = .19, t(78) = 2.93, p = .004$ ), but no effects for autonomy or the interaction between connectedness and both needs.

**Feeling blocked.** In line with what was expected in H2, the regression analysis yielded a positive interaction effect of connectedness and need for structure ( $b = .26, t(78) = 1.94, p = .06$ , see Figure 5). Simple slopes analysis showed that high connectedness was related to increased levels of feeling blocked for participants high in need for structure ( $b = .48, t = 2.67, p = .01$ ), but was not associated for participants low in need for structure ( $b = .02, t = 1.00, p = .92$ ). The regression analysis also revealed a positive main effect for connectedness ( $b = .23, t(78) = 1.82, p = .07$ ), but no support was obtained for H4.

**Performance.** In contrast to what was expected in H2 and H4, the regression analysis yielded no interaction effects of connectedness with the need for structure ( $b = .14, ns$ ) and the need for autonomy ( $b = -.81, ns$ ) on actual performance.

## Discussion Study 2

The results of Study 2 were partly in line with the obtained pattern in Study 1, suggesting that the effects of connectedness via novel information indeed are moderated by individual needs, especially when a misfit rather than a fit occurs. Specifically, participants under conditions of high connectedness felt more blocked by the ideas of the (fictitious) other

participant, but only when their need for structure was high. These results are in line with the notion that participants high in need for structure do not appreciate being sent novel information that adds complexity and ambiguity (H2). However, no moderation effects on the other outcome variables were found, and no support was obtained for the fit hypotheses of novel incoming information with need for autonomy (H1). The current study manipulated connectedness to novel information (versus no information), and both Study 1 and 2 focused on the effects of connectedness versus non-connectedness (i.e., receiving no information). We aimed to replicate and extend these findings in Study 3, by zooming in on the effect of information novelty in a context of high connectedness, by manipulating connectedness to non-novel information (versus novel information).

### **Method Study 3 – Manipulation of Information Novelty**

The measures and procedure for Study 3 were identical to the previous studies, except that this time all participants performed the brainstorming task in the context of high connectedness while the content of information received was manipulated (non-novel versus novel information). Seventy-eight undergraduate Psychology students (36% male) of the University of Groningen voluntarily participated in this study for partial course credits. Their ages ranged between 18 and 24 years ( $M = 20.18$ ,  $SD = 1.55$ ). Participants were randomly assigned to brainstorm in one of two conditions (connectedness: low ( $n = 39$ ) versus high ( $n = 39$ )).

### **Results Study 3**

#### **Preliminary Analysis and Data Treatment**

All variables under investigation met the assumptions of normality and homoscedasticity, with some exceptions<sup>1</sup>. As the violations were small, it was assumed that general techniques could be used safely. The means, standard deviations, correlations and Cronbach's alphas of the variables of interest are given in Table 6. The highest correlations

were obtained between external control and feeling blocked ( $r = .47, p = .00$ ). Again, a positive significant relation between need for structure and need for autonomy was found ( $r = .28, p = .01$ ). Sex was distributed exactly evenly per condition,  $\chi^2(1, N = 78) = .00, p = 1.00$ , and age was also more or less evenly distributed across conditions,  $F(1, 75) = .18, p = .67$  ( $M_{non-novel\ info} = 20.26$  vs  $M_{novel\ info} = 20.11$ ). Both were taken into account in the analysis, but indicated no significant effects on work outcomes,  $ps > .27$  for sex and  $ps > .23$  for age. Examining data patterns indicated that one participant in the novel information condition showed insufficient effort in responding (Huang et al., 2012), as manifested by the response of ‘strongly agree’ to all items, including original and reversed items. As inclusion of these data would likely lower the sample’s reliability, this participant was dropped from further analysis.

### Manipulation Checks

**Perceived connectedness.** The level of perceived connectedness showed a marginally significant negative effect for novelty,  $b = -.16, t(69) = -1.69, p = .096$ . People who received highly novel information perceived themselves to be less connected compared to people who received non-novel information ( $M_{novel\ info} = 1.98, SD = .69$  vs.  $M_{non-novel\ info} = 2.29, SD = .86$ ), which is in line with the results obtained in Study 1 and 2. As expected, this effect was not moderated by psychological needs (need for structure,  $b = .06, ns$ , and need for autonomy,  $b = .01, ns$ ).

**Perceived novelty.** As expected, a positive main effect of condition was present on the perceived level of novelty of received ideas,  $b = .70, t(69) = 6.64, p < .001$ , indicating that participants indeed perceived the novel ideas to be more novel ( $M_{novel\ info} = 4.08, SD = .85$  vs.  $M_{non-novel\ info} = 2.64, SD = 1.04$ ). Interestingly, a negative moderation of the need for structure ( $b = -.22, t(69) = -2.06, p = .04$ ) and a positive moderation of the need for autonomy were present ( $b = .27, t(69) = 2.17, p = .03$ ).

The simple slope analysis with the need for structure indicated that condition was positively related to perceived novelty when need for structure was high,  $b = .53$ ,  $t(69) = 3.34$ ,  $p = .001$ , but more strongly when need for structure was low,  $b = .90$ ,  $t(69) = 5.73$ ,  $p < .001$  (see Figure 6). The simple slope analysis with the need for autonomy indicated that condition was positively related to perceived novelty when need for autonomy was high,  $b = .89$ ,  $t(69) = 5.84$ ,  $p < .001$ , and less so when need for autonomy was low,  $b = .51$ ,  $t(69) = 3.32$ ,  $p = .001$  (see Figure 7). Thus, the positive increase in perceived creativity in the novel condition is highest for those low in need for structure and those high in need for autonomy.

### **Hypothesis Testing**

Moderated regression analyses were conducted to examine how the relation between incoming (non-novel versus novel) information and work outcomes is moderated by the need for structure and autonomy. Similarly to Study 1 and 2, the regression analyses included connectedness, need for structure, need for autonomy, the two interaction terms of connectedness with the needs, and the control variables of age and sex as predictors. All regressions are summarized in Table 7.

**Clarity.** In line with what was expected with H2, the effect of novel incoming information on perceived task clarity was weakened by need for structure. The regression analysis yielded a negative interaction of information novelty and need for structure ( $b = -.30$ ,  $t(69) = -3.17$ ,  $p = .002$ , see Figure 8). Simple slope analyses indicated that connectedness to novel information was associated to lower task clarity when participants were high in need for structure ( $b = -.43$ ,  $t(69) = -3.07$ ,  $p = .003$ ), but not when participants were low in need for structure ( $b = .15$ ,  $t(69) = 1.02$ ,  $p = .31$ ), supporting H2. Focusing on the effect per condition, it was found that participants in the novel condition experienced less clarity when high in need for structure but more clarity when low in need for structure ( $b = -.44$ ,  $t(69) = -3.44$ ,  $p = .001$ ). Last, the regression analysis showed a negative main effect for need for

structure ( $b = -.20, t(69) = -2.13, p = .04$ ), and a positive main effect for need for autonomy ( $b = .27, t(69) = 2.38, p = .02$ ).

**External control.** In line with what was expected with H4, novel incoming information weakened the perception of external control when participants were high in need for autonomy. The regression analysis yielded a negative interaction of novelty and need for autonomy ( $b = -.29, t(69) = -3.09, p = .003$ , see Figure 9). Simple slope analysis indicated that receiving novel information was associated with weakened feelings of external control when participants were high in need for autonomy ( $b = .30, t(69) = -2.71, p = .008$ ), and was marginally associated to heightened feelings of external control when participants were low in need for autonomy ( $b = .21, t(69) = 1.88, p = .06$ ). In addition, those in the non-novel condition with a high need for autonomy perceived more external control relative to those low in need for autonomy ( $b = .40, t(69) = -1.76, p = .08$ ). Thus, participants high in need for autonomy experienced most external control when receiving non-novel information, whereas those low in need for autonomy experienced most external control when receiving novel information, supporting H4.

**Feeling blocked.** We expected that the effect of novel incoming messages on feeling blocked would be strengthened by need for structure (H2) and weakened by need for autonomy (H4). The regression analysis only supported H4, and yielded a marginally negative interaction of connectedness and need for autonomy ( $b = -.31, t(69) = -1.97, p = .052$ , see Figure 10). Simple slope analysis showed that only the interaction between novelty and need for autonomy was significant, but that novelty was not significantly associated with performance when participants were high in need for autonomy ( $b = -.22, t(69) = -1.19, p = .24$ ) nor when participants were low in need for autonomy ( $b = .25, t(69) = 1.33, p = .19$ ). The interaction pattern indicated that people high in need for autonomy felt more blocked in

the non-novel condition and less in the novel condition, whereas the reverse pattern was obtained for people low in need for autonomy, supporting H4.

**Performance.** Performance was measured as an exploratory variable to investigate whether the effect of novel incoming messages on performance would be weakened by need for structure (H2) and strengthened by need for autonomy (H4). The regression analysis only supported H4, and yielded a positive interaction of connectedness and need for autonomy ( $b = .90, t(69) = 2.07, p = .04$ , see Figure 11). Simple slope analysis showed that only the interaction between novelty and need for autonomy was significant, but that novelty was not significantly associated with performance when participants were high in need for autonomy ( $b = .78, t(69) = 1.50, p = .14$ ), nor when participants were low in need for autonomy ( $b = -.60, t(69) = -1.14, p = .26$ ). The interaction pattern indicated that people high in need for autonomy performed better in the novel condition than in the non-novel condition, whereas the reverse pattern was obtained for people low in need for autonomy, supporting H4.

### Discussion Study 3

The results of Study 3 were partially in line with the expectations, suggesting that the effects of connectedness indeed are moderated by individual needs. Specifically, participants under conditions of connectedness via novel information experienced less external control, felt less blocked by the ideas of the (fictitious) other participant, and performed better, but only when their need for autonomy was high. By contrast, those high in need for structure experienced less task clarity under conditions of connectedness via novel information. An additional interesting finding was that the extent to which incoming information was rated as novel was weakened by the need for structure but strengthened by the need for autonomy. These results are in line with the notion that participants high in need for autonomy appreciate novel incoming information because it adds value with regard to executing the task at hand, and are more open to new and creative ideas for the same reason (H3). By

contrast, people high in need for structure do not appreciate being sent novel information because it adds complexity and ambiguity and they may thus experience novel ideas as weird and ambiguous instead of novel (H2). Additionally, people high in need for structure experience more task clarity when receiving non-novel incoming information as compared to novel information (H1). This study extended the findings of Study 1 and 2 that only obtained support for a misfit rather than a fit, because Study 3 obtained initial evidence for the expected positive fit between incoming novel information and need for autonomy as well as some indication of a fit between non-novel information and need for structure.

### **General Discussion**

New ICTs have made it possible for knowledge workers to be connected to co-workers and to job-relevant information from almost any location or time zone, and allow for new work arrangements such as BWPs in which workers combine on-site and off-site working in an optimal way with the aim to improve work outcomes (Van Yperen et al., 2014). However, connectedness may be a double-edged sword that is experienced as favorable by some workers (e.g., when incoming information increases clarity or adds value for completing the task), but unfavorable by others (e.g., when incoming information increases ambiguity or external control). Therefore, it is important to know for whom increased connectedness is likely to work. In the present paper, we examined the effects of connectedness by addressing the role of information novelty, need for structure, and need for autonomy.

### **Key Findings**

Three experiments were conducted to investigate the role of connectedness to incoming non-novel information (versus no information), to incoming novel information (versus no information), and to non-novel information (versus novel information) as contingent upon workers' psychological needs. Overall, the results were largely in line with expectations,

suggesting that the effects of connectedness are indeed dependent on the content of the information received and on psychological needs. Specifically, people high in need for structure experienced less task clarity and felt more blocked by the ideas of the (fictitious) other participant when being connected to novel incoming information. By contrast, people high in need for autonomy experienced less external control, felt less blocked, and performed better when receiving novel incoming information, whereas being connected to non-novel incoming information resulted in increased perceptions of external control and feeling blocked by the received ideas. These results are in line with the notion that people high in need for structure do not appreciate receiving novel information as this adds complexity and ambiguity without increasing clarity. By contrast, people high in need for autonomy do appreciate novel incoming information because it adds value with regard to executing the task, but they dislike being sent non-novel information that does not have added informational value over and above the obvious.

### **Unexpected Findings**

In addition to the key findings, some unexpected yet interesting findings were obtained. Firstly, the results obtained in the current studies especially support the misfit hypothesis between need for structure and novel information, but do not support the expected favorable outcomes when being connected to non-novel information. It may be that people high in need for structure experience a baseline level of clarity as long as the work setting fits their psychological needs, but experience the work setting more salient in case of a misfit, because a lack of clarity results in high levels of aversion, stress and resistance. Whether this effect holds should be investigated in further research.

Secondly, in Study 1, the need for structure strengthened the effects of participants' perception of connectedness. It may be that for participants high in need for structure, connectedness per se (i.e., being told that one is collaborating with another participant) is

more salient than for those low in need for structure (who would only perceive connectedness when they actually have the opportunity to exchange information). This would be in line with earlier results reported by Rietzschel, Slijkhuis and Van Yperen (2014), that workers with a higher need for structure perceive lower job autonomy. Future studies should investigate whether this main effect holds.

### **Limitations**

As with any study, there are certain limitations that suggest potentially worthwhile avenues for future research. Firstly, the artificial setup of connectedness in the current studies may threaten the external validity and generalizability of the results. More specifically, connectedness was conceptualized as the extent to which student participants receive preprogrammed ideas on the computer. Even though participants were informed that another participant shared these ideas, most did not seem to fully believe this cover story and expressed their doubt after completing the study. Still, the manipulation checks verified the intended differences per condition, and it can be expected that the obtained results per condition would have been even stronger if participants had experienced the manipulation as genuine. Future research should replicate our results in a more natural experimental setup that avoids the use of preprogrammed ideas, that allows for synchronous interactions between participants, and that examines the effects of connectedness in a different sample.

Secondly, as connectedness was not examined in a controlled setting before, we decided to create three separate studies instead of one larger study. This helped us to unfold the expected relationships step-by-step, and to investigate whether the expected difference indeed existed between connectedness and non-connectedness before zooming in on the expected effects of information novelty in connectedness. Due to differences in the sample between the studies (that resulted from sampling participants for token payment or for partial course credits), ad hoc merging of the three studies was not possible. Investigating each study

separately resulted in relatively small sample sizes, making the power for detecting small effects relatively low. Existing small effects are therefore unlikely to be detected in the current studies<sup>3</sup>. Future research should aim to obtain more power, for example by creating one larger study instead of different small studies. Another limitation concerns the measurement of outcome variables that were created for the purpose of the current study, and were not validated before. In order to have outcome measurements with acceptable Cronbach's alpha values, this resulted in some outcome variables containing few or only one item. Future research is needed to validate and improve these measurements.

### **Theoretical Contributions**

Despite these limitations, the current paper adds to the theoretical understanding of connectedness and psychological needs. Firstly, the present studies were the first to manipulate and operationalize connectedness in an experimental setting, using manipulation checks to verify that the manipulation of connectedness had the intended effect. While previous studies only investigated the role of connectedness in qualitative field studies (cf. Mazmarian et al., 2013), the present study examined the causal effects between connectedness and work outcomes in a controlled setting (Dipboye, 1990). This creates internal validity and extends previous results indicating that increased connectedness is associated with an increased pressure to respond experienced by workers (Mazmarian et al., 2013).

Secondly, the controlled setting of the experiments ensured that two distinct and constant conditions existed per study. Even though the level of novelty in ideas is usually difficult to rate and tends to be differently rated by experts and non-experts (Kaufman & Baer, 2012), participants rated the information novelty per condition as intended. The differences in novelty ratings between conditions were highly significant, which indicates that participants indeed perceived novel ideas as more novel. As our manipulations worked as

intended, this permitted us to investigate the important difference in work outcomes depending on the level of information novelty in incoming connectedness.

Thirdly, in addition to the experimental manipulation of connectedness, we addressed the question for whom connectedness is likely to be favorable. We argued that this would depend on differences in workers' psychological needs. Indeed, the findings of the present study suggest that the favorable effect of being connected to novel incoming information is weakened when high in need for structure, and strengthened when high in need for autonomy. These findings are in line with previous research indicating that a person-environment fit is obtained when the environment allows workers to satisfy their needs, which generally results in favorable work attitudes (Greguras & Diefendorff, 2009).

### **Practical Contributions**

While more research should be done to replicate and extend the current findings, the obtained knowledge can already be used in practice to optimize the fit between new work arrangements and individual needs of workers. This is because the current results are in line with the notion that new work arrangements are only successful if they fit workers' psychological needs (Van Yperen et al., 2014). Acknowledging individual differences is thus important for organizations willing to implement connectedness. More specifically, by assessing how well workers' psychological needs fit with connectedness, it becomes possible to predict (to some extent) workers' perceptions of connectedness. Combining the assessment of workers' psychological needs with the implementation of connectedness as a heterogeneous practice will likely allow organizations to tailor the exact characteristics of intensified connectedness. If the characteristics of connectedness are tailored to match the needs of workers more closely, this will increase the likelihood that connectedness results in positive work attitudes. For example, awareness could be raised among workers that sending information to others can sometimes misfit others' needs, and workers can be encouraged to

only send information that they deem relevant for the task in order to minimize perceived external control and to maximize task performance. In addition, the organization may set clear guidelines with workers high in need for structure about the moments at which they should work connected, and when it is acceptable and encouraged that they disconnect from ICTs (e.g., when trying to focus on a specific task), in order to minimize information overload and ambiguity.

### **Future Research**

While findings from this study can already be used when implementing a connected work environment, more research on this topic would be fruitful as well, and I will address some of the possible avenues for future research. Firstly, the current paper focused on information novelty and found that the extent to which favorable work outcomes resulted from incoming information was dependent on a fit with individual needs. For this reason it would be interesting to examine the process behind this (mis)fit, and to test why the novelty of incoming information matters. It may be that whether incoming information is appreciated also depends on the fit of this information with workers' current activated mental schemas or with the task at hand. While research indicates that brainstorming with others can be disruptive when people receive information that mismatches their current mental schemas (Stroebe, Nijstad, & Rietzschel, 2010), individual differences can additionally come into play here. More specifically, because people high in need for structure prefer clarity and dislike ambiguity and information load (Thompson et al., 2001), activating new categories with incoming information may be especially disruptive to them, as this information both requires information processing and misfits their current structure. In line with findings from the current studies, people high in need for structure may prefer information that fits their current train of thought over a misfit, as the first type creates less ambiguity. This is in line with the idea that people high in need for structure tend to show low levels of flexibility, but high

levels of persistence when brainstorming (Rietzschel et al., 2007). Still, people high in need for structure may prefer no input to input that fits their mental schema, because incoming information still requires extra information processing. By contrast, people high in need for autonomy may prefer heterogeneous input that activates new categories to homogeneous input that fits one's current train of thought. This is expected because the activation of a new mental category adds a new perspective and therefore adds value for completing the task, while ideas similar to one's own mental schema can be experienced as redundant and as creating an unnecessary disruption to their workflow.

Secondly, although connectedness implies both the ability to send and receive information to co-workers, the current study only focused on the effects of incoming information. Future research could take both aspects into account and investigate which workers perceive the increased ability to send information to others as favorable. Based on the current and previous research, it can be expected that those high in need for structure may dislike sending messages, *unless* their message contains a question or feedback seeking behavior. This is expected because the ability to constantly send messages increases ambiguity about when or whether this is expected from them, whereas the ability to show feedback seeking behavior allows workers to ask for more task clarity (Slijkhuis et al., 2013). On the other hand, those high in need for autonomy may like the increased ability to send messages to co-workers (Van Yperen et al., 2014), *unless* their message contains a question. This is expected because ability to constantly send messages enables workers to set their own schedules and to inform others whenever this suits them best, while feedback seeking behavior creates dependency upon others (Deci & Ryan, 2000).

Thirdly, the current research investigated the role of information novelty and therefore only looked at the effects of task relevant information (that is, receiving information that is in line with the task goal). Participants could only share and receive ideas, but did not have the

ability to communicate thoughts or questions and could not synchronously chat with each other. This decision was made in order to create a controlled experimental setting in which information novelty could be manipulated. Future research could extend the current investigation of connectedness by focusing on synchronous communication. Besides sharing ideas, this will likely also result in communicating emotional connotations, expectations, values, and attitudes. Additionally, it is not uncommon for workers to share and receive entirely irrelevant information, and that require one's attention in order to determine its relevance for one's job (Forster & Lavie, 2008). Hence, as connectedness implies the ability to send and receive all kinds of information, future research could extend the current findings by investigating workers' preference for other types of information exchanges when working in a connected environment.

Finally, in the current study, participants were led to believe they were working together with another student on the task at hand. As participants never met the other participant, had no shared past, and had no expectation of working together in the future, these (fictitious) ad hoc teams were solely formed for the duration of the study and may differ in important ways from teams formed in the work setting. Future studies could investigate connectedness in teams that are created for a much longer time, have a shared past, and an expected shared future. In teams with a shared past, aspects such as likeability, and the level of trust and familiarity with each other, will additionally affect work perceptions (Alge, Wiethoff, & Klein, 2003).

## **Conclusion**

The results of these first controlled experimental studies on connectedness and individual needs suggest that the favorable effects of an increasingly connected work environment depend on workers' psychological needs for structure and autonomy. Ideally, future studies would aim to replicate and extend the current findings by taking up a multiple-

study approach that combines experimental lab studies with correlational field studies to combine the strengths of both types of studies, and could examine additional contextual differences to investigate how these depend on individual needs. It seems clear that organizations moving towards increased connectedness should take into consideration that individual differences in psychological needs will determine whether workers experience new work arrangements as (un)favorable. This will help to reap the potential benefits from new ways of working, without incurring the potential costs.

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<sup>1</sup>Boxplots and Q-Q plots were created to graphically inspect the variables on outliers and normal distribution of the residuals, and scatterplots were created to assess homoscedasticity of the residuals. All variables showed a more or less homoscedastic pattern and most showed a uniform distribution, indicating that the variables can safely be used without transformations (Faraway, 2005). The following variables per study showed a mild non-normal distribution.

**Study 1.** Clarity was generally scored as above average, with few scores low or in-between. This led to a somewhat non-normal distribution without outliers. As the violations were small, it was assumed that general techniques could be safely used.

**Study 2.** Perceived connectedness was approximately normal distributed with one outlier at the upper side of the boxplot, but with a strong focus on the middle and few low and high scores. Clarity was skewed to the right with three outliers at the lower side of the boxplot, and the Q-Q plot indicated a Gumbel distribution. In addition, one person appeared as a Leverage point because of higher age.

**Study 3.** Perceived connectedness was skewed to the right without outliers. Clarity was skewed to the right with three outliers at the lower side of the boxplot, and the Q-Q plot indicated an Exponential distribution.

<sup>2</sup>Relative to the average rating of novel ideas in Study 2 ( $M = 4.05$ ,  $SD = .82$ ), the non-novel ideas in Study 1 ( $M = 2.68$ ,  $SD = 1.23$ ) were indeed rated as less novel,  $t(165) = 8.51$ ,  $p < .001$ .

<sup>3</sup> A post hoc power test was conducted and indicated an obtained power of .87 for detecting a medium effect ( $f^2 = .15$ ) in the moderated regression analysis when using an alpha level of .05 and having the aimed sample size of 80. This indicated that if medium or large effects existed, this would probably be detected in the analysis. The power for detecting a small effect ( $f^2 = .02$ ) was however much lower at .18, indicating that existing small effects are unlikely to be detected with this study.

Table 1. *Self-constructed scales for perceived connectedness and external control*

<p>The following questions are about your perceptions during the brainstorming task: There are no “right” or “wrong” answers. We are only interested in what you think.</p> <p>1= Strongly disagree 2 = Disagree 3 = Neither agree nor disagree 4 = Agree 5 = Strongly agree</p>
<b>Perceived Connectedness</b>
<ol style="list-style-type: none"> <li>1. I felt connected to the other participant.</li> <li>2. I felt isolated from the other participant (reversed item).</li> <li>3. This level of collaboration felt right to me.</li> </ol>
<b>External Control</b>
<ol style="list-style-type: none"> <li>1. I felt pressured to be available.</li> <li>2. I perceived external control.</li> <li>3. I felt obligated to directly use the ideas of the other participant.</li> <li>4. I felt as if I needed to be very responsive to the other.</li> <li>5. I felt as if I was constantly being interrupted.</li> </ol>

Table 2. Means, Standard Deviations, Correlations and Cronbach's Alphas Study 1

Variable	Mean	SD	1	2	3	4	5	6	7	8
1. Sex (scored -1 for men, +1 for women)	NA	NA	NA							
2. Age	21.94	2.42	-.32**	NA						
3. Need for Structure	3.38	1.15	.12	.07	(.87)					
4. Need for Autonomy	4.51	1.06	.35**	-.29**	.33**	(.88)				
5. External control	2.12	.77	.27*	-.30**	-.02	.21 <sup>†</sup>	(.77)			
6. Feeling blocked	2.53	1.16	.21 <sup>†</sup>	-.16	-.08	.24*	.38**	NA		
7. Clarity	3.83	.91	.16	.00	.28*	.12	.11	-.02	NA	
8. Performance	9.89	5.05	.08	-.06	-.04	-.04	.09	-.05	.10	NA

Note.  $n = 81$ . <sup>†</sup> $p < .10$ ; \* $p < .05$ ; \*\* $p < .01$ . When applicable, the corresponding Cronbach's alphas are displayed on the diagonal.

Table 3. Results for the Moderated Regression Analyses Study 1

Regression model	Dependent variables									
	Perc. Connectedness		Task Clarity		External Control		Feeling Blocked		Performance	
	<i>b</i> -value	95% CI	<i>b</i> -value	95% CI	<i>b</i> -value	95% CI	<i>b</i> -value	95% CI	<i>b</i> -value	95% CI
Intercept	1.57	[-.32;3.46]	3.58**	[1.58;5.53]	3.57***	[2.09;5.06]	2.89*	[.36;5.41]	11.93*	[-1.10;23.77]
Sex	-.13	[-.35;.10]	.09	[-.14;.33]	.11	[-.07;.28]	.16	[-.14;.46]	.58	[-.81;1.98]
Age	.04	[-.05;.12]	.01	[-.08;.10]	-.07*	[-.14;-.00]	-.02	[-.13;.09]	-.10	[-.63;.43]
Condition	.42***	[.23;.60]	.20*	[.01;.40]	.31***	[.16;.46]	.07	[-.18;.32]	-.02	[-1.19;1.15]
Need for Structure	.03	[-.16;.23]	.01	[-.19;.22]	.05	[-.10;.20]	.21	[-.05;.46]	-.34	[-1.56;.87]
Need for Autonomy	.08	[-.11;.27]	.22*	[.02;.42]	-.06	[-.21;.09]	-.18	[-.44;.08]	-.14	[-1.34;1.06]
Cond x Need Struc.	-.19*	[-.37;-.02]	-.02	[-.21;.17]	.02	[-.12;.16]	-.06	[-.30;.18]	.31	[-.82;1.44]
Cond x Need Aut.	.12	[-.07;.30]	-.07	[-.27;.13]	.13*	[-.02;.28]	.27*	[.01;.52]	-.32	[-1.51;.86]
$R^2$	.26		.15		.33		.16		.02	
Adj. $R^2$	.19		.07		.27		.08		-.07	

Note. <sup>a</sup>Unstandardized regression coefficients are shown.  $n = 81$ . <sup>†</sup>  $p < .10$ ; \*  $p < .05$ ; \*\*  $p < .01$ ; \*\*\*  $p < .001$ .

Table 4. Means, Standard Deviations, Correlations and Cronbach's Alphas Study 2

Variable	Mean	SD	1	2	3	4	5	6	7	8
1. Sex (scored -1 for men, +1 for women)	NA	NA	NA							
2. Age	20.12	1.79	-.13	NA						
3. Need for Structure	3.56	1.00	.12	-.01	(.89)					
4. Need for Autonomy	4.51	.90	.25**	.12	.26*	(.83)				
5. External control	1.99	.67	.18 <sup>†</sup>	-.11	-.02	.28**	(.70)			
6. Feeling blocked	2.92	1.20	.10	-.09	.15	.04	.40**	NA		
7. Clarity	3.62	1.01	.00	.01	.15	.09	-.21 <sup>†</sup>	-.15	NA	
8. Performance	9.64	4.25	-.12	-.19 <sup>†</sup>	-.03	-.03	-.21 <sup>†</sup>	-.18 <sup>†</sup>	-.13	NA

Note.  $n = 86$ . <sup>†</sup>  $p < .10$ ; \*  $p < .05$ ; \*\* $p < .01$ . When applicable, the corresponding Cronbach's alpha is displayed on the diagonal.

Table 5. Results for the Moderated Regression Analyses Study 2

Regression model	Dependent variables									
	Perc. Connectedness		Task Clarity		External Control		Feeling Blocked		Performance	
	<i>b</i> -value	95% CI	<i>b</i> -value	95% CI	<i>b</i> -value	95% CI	<i>b</i> -value	95% CI	<i>b</i> -value	95% CI
Intercept	.50	[-1.32;2.31]	3.79**	[-1.23;6.35]	2.84***	[1.45;4.22]	4.15**	[1.20;7.11]	20.01***	[9.45;30.75]
Sex	-.02	[-.19;.14]	-.01	[-.25;.22]	.04	[-.09;.16]	.05	[-.22;.32]	-.69	[-.166;.28]
Age	.07	[-.02;.16]	-.01	[-.14;.12]	-.04	[-.11;.03]	-.06	[-.21;.08]	-.51 <sup>†</sup>	[-1.04;.02]
Condition	.23**	[.08;.39]	-.22	[-.44;.01]	.33***	[.21;.45]	.23 <sup>†</sup>	[-.02;.49]	-.47	[-1.38;.45]
Need for Structure	.06	[-.10;.23]	.05	[-.18;.29]	.19**	[.06;.32]	-.02	[-.29;.26]	.03	[-.96;1.01]
Need for Autonomy	-.08	[-.27;.10]	.18	[-.08;.44]	-.10	[-.24;.05]	.23	[-.07;.53]	-.06	[-1.14;1.03]
Cond x Need Struc	-.12	[-.29;.04]	.01	[-.22;.24]	.10	[-.03;.22]	.26 <sup>†</sup>	[-.01;.53]	.14	[-.83;1.10]
Cond x Need Aut	-.04	[-.22;.15]	-.03	[-.29;.24]	-.03	[-.17;.11]	.04	[-.27;.34]	-.81	[-1.89;.28]
<i>R</i> <sup>2</sup>	.38		.07	.07	.38		.13		.10	
Adj. <i>R</i> <sup>2</sup>	.15		-.01	-.01	.32		.05		.01	

Note. <sup>a</sup>Unstandardized regression coefficients are shown. *n* = 86. <sup>†</sup>*p* < .10; \* *p* < .05; \*\* *p* < .01; \*\*\* *p* < .001.

Table 6. Means, Standard Deviations, Correlations and Cronbach's Alphas Study 3

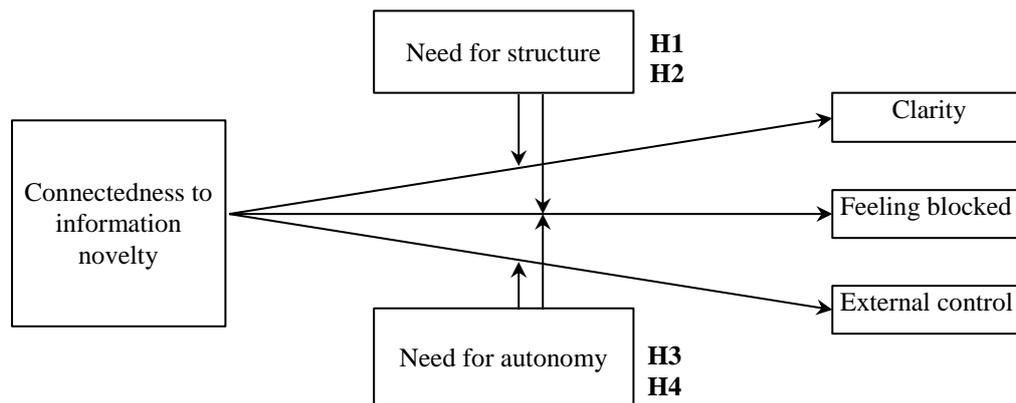
Variable	Mean	SD	1	2	4	5	6	7	8	9
1. Sex (scored -1 for men, +1 for women)	NA	NA	NA							
2. Age	20.18	1.55	-.19 <sup>†</sup>	NA						
3. Need for Structure	3.50	1.11	-.03	.01	(.89)					
4. Need for Autonomy	4.62	.88	.21 <sup>†</sup>	-.08	.28*	(.83)				
5. External control	2.40	.73	.06	-.15	.14	.03	(.70)			
6. Feeling blocked	2.81	1.13	.04	-.04	.00	.08	.47**	NA		
7. Clarity	3.78	.95	-.03	.02	.15	-.26*	-.06	-.04	NA	
8. Performance	10.26	3.18	-.05	.05	-.06	-.04	-.24*	-.15	.04	NA

Note.  $n = 87$ . <sup>†</sup>  $p < .10$ ; \* $p < .05$ ; \*\* $p < .01$ . When applicable, the corresponding Cronbach's alpha is displayed on the diagonal.

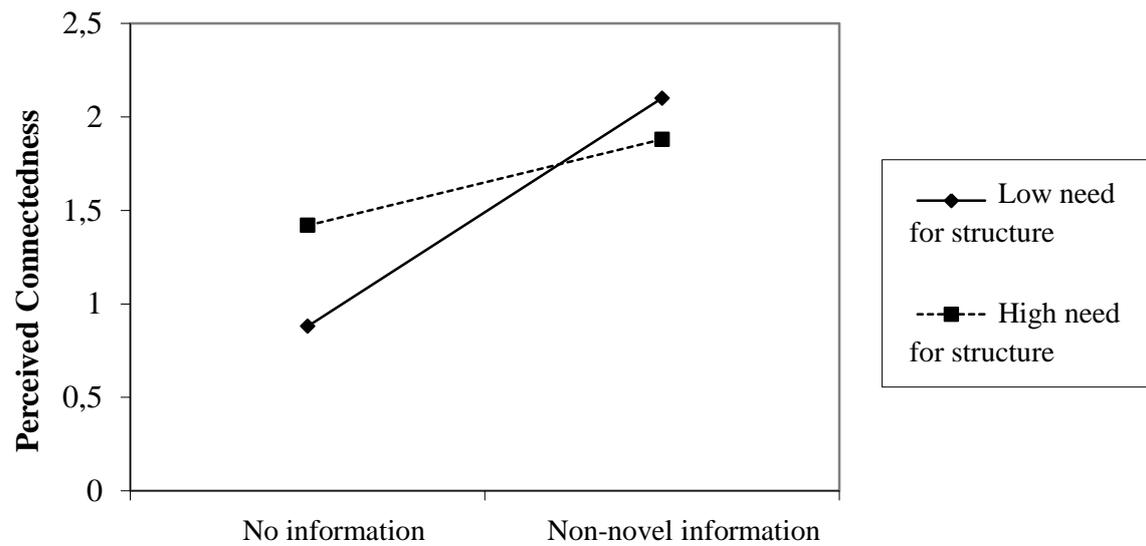
Table 7. Results for the Moderated Regression Analyses Study 3

Regression model	Dependent variables									
	Perc. Connectedness		Task Clarity		External Control		Feeling Blocked		Performance	
	<i>b</i> -value	95% CI	<i>b</i> -value	95% CI	<i>b</i> -value	95% CI	<i>b</i> -value	95% CI	<i>b</i> -value	95% CI
Intercept	1.31	[-1.12;3.74]	3.51**	[.89;6.11]	3.61**	[1.48;5.73]	3.18 <sup>†</sup>	[-.32;6.69]	8.29 <sup>†</sup>	[-1.51;18.10]
Sex	.03	[-.17;.24]	.12	[-.11;.32]	.08	[-.10;.26]	.04	[-.25;.33]	-.14	[-.95;.67]
Age	.04	[-.08;.16]	.01	[-.12;.14]	-.06	[-.17;.04]	-.02	[-.19;.15]	.10	[-.38;.58]
Condition	-.16 <sup>†</sup>	[-.34;.02]	-.12	[-.35;.04]	-.04	[-.22;.10]	-.01	[-.27;.25]	.04	[-.70;.77]
Need for Structure	.08	[-.10;.26]	-.20*	[-.42;.03]	.00	[-.16;.15]	.08	[-.18;.34]	.01	[-.72;.73]
Need for Autonomy	-.11	[-.32;.11]	.27*	[.03;.50]	.15	[-.04;.34]	-.00	[-.32;.31]	-.24	[-1.11;.64]
Cond x Need Struc	.05	[-.13;.23]	-.30**	[-.51;-.13]	.00	[-.16;.15]	.09	[-.16;.35]	-.51	[-1.23;.22]
Cond x Need Aut	.01	[-.20;.23]	.09	[-.15;.32]	-.29**	[-.48;-.10]	-.31 <sup>†</sup>	[-.62;.01]	.90*	[.03;1.78]
<i>R</i> <sup>2</sup>	.08		.27		.17		.06		.08	
Adj. <i>R</i> <sup>2</sup>	-.02		.19		.09		-.03		-.02	

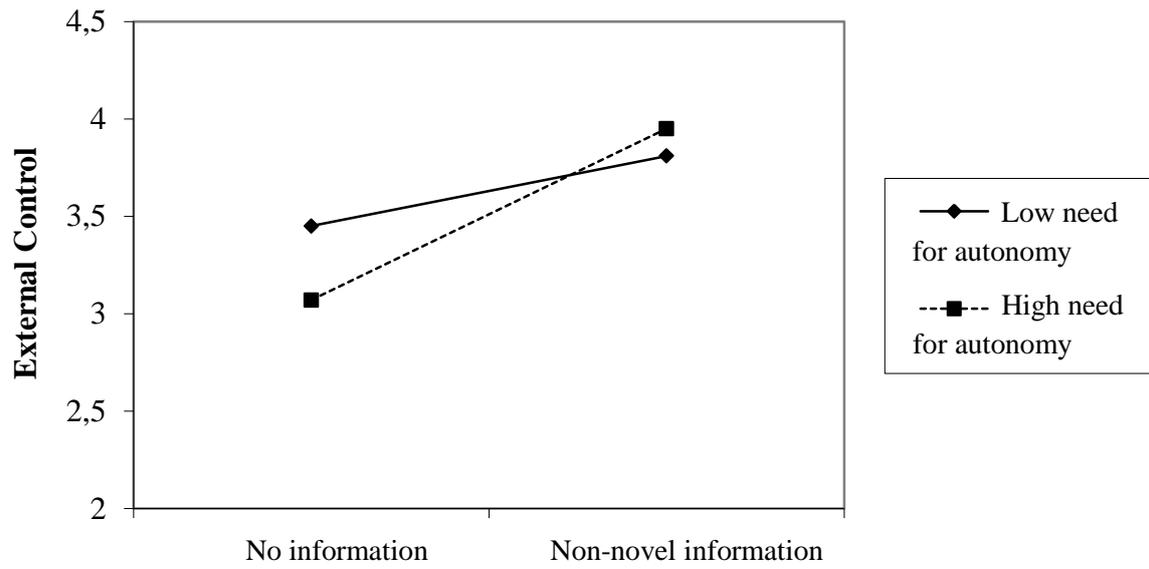
Note. Unstandardized regression coefficients are shown.  $n = 87$ . <sup>†</sup>  $p < .10$ ; \*  $p < .05$ ; \*\*  $p < .01$ ; \*\*\*  $p < .001$ .



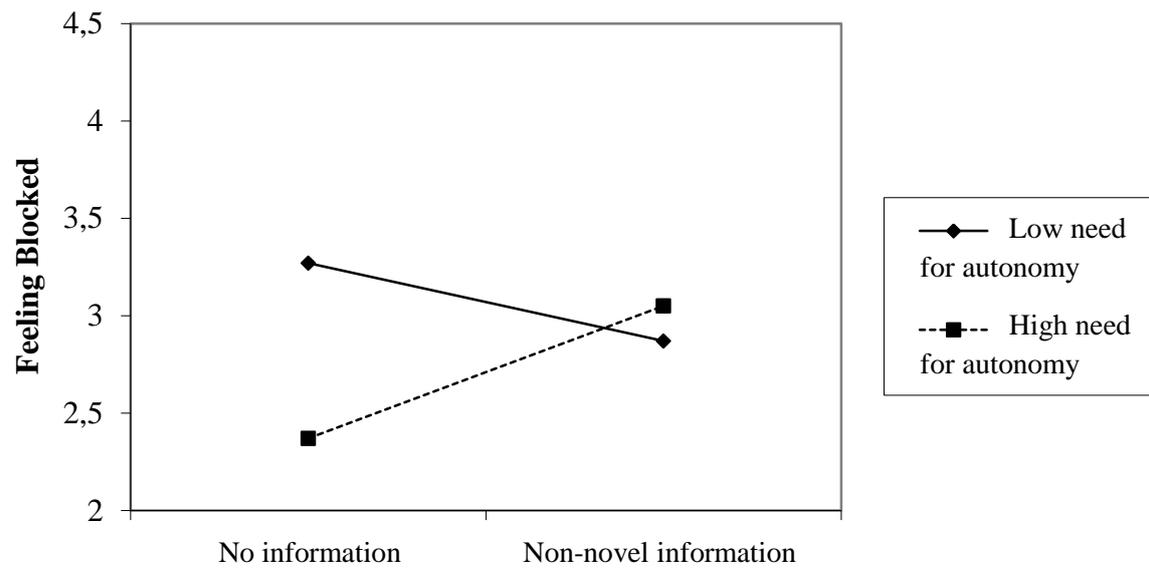
*Figure 1.* Theoretical model. Work outcomes as a function of information novelty, need for structure, and need for autonomy.



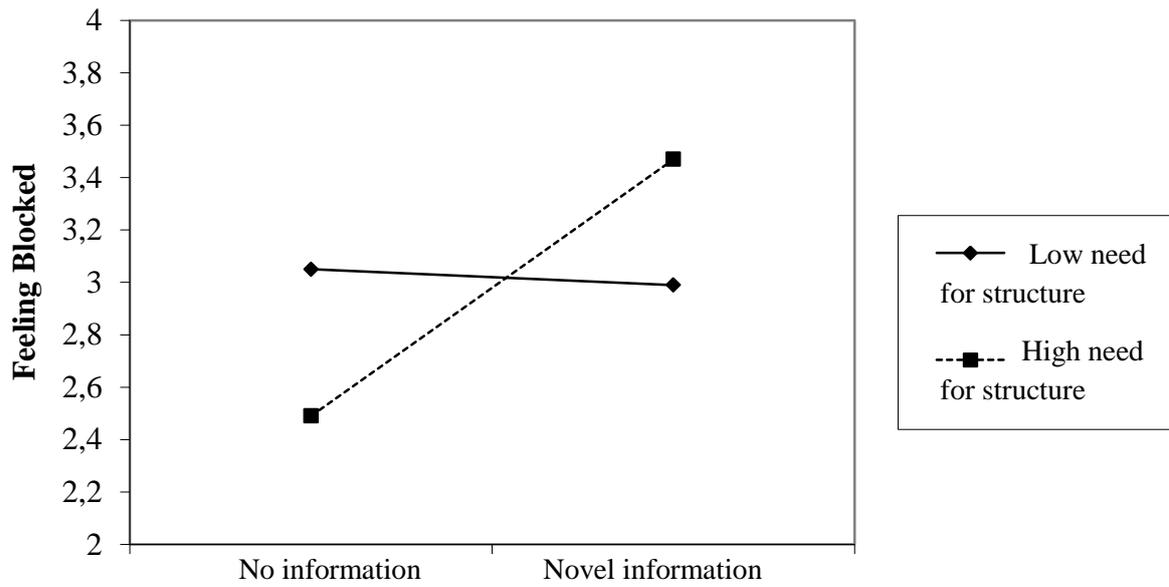
*Figure 2.* Perceived connectedness as a function of connectedness via non-novel information (vs. no information) and need for structure.



*Figure 3.* External control as a function of connectedness via non-novel information (vs. no information) and need for autonomy.



*Figure 4.* Feeling blocked as a function of connectedness via non-novel information (vs. no information) and need for autonomy.



*Figure 5.* Feeling blocked as a function of connectedness via novel information (vs. no information) and need for structure.

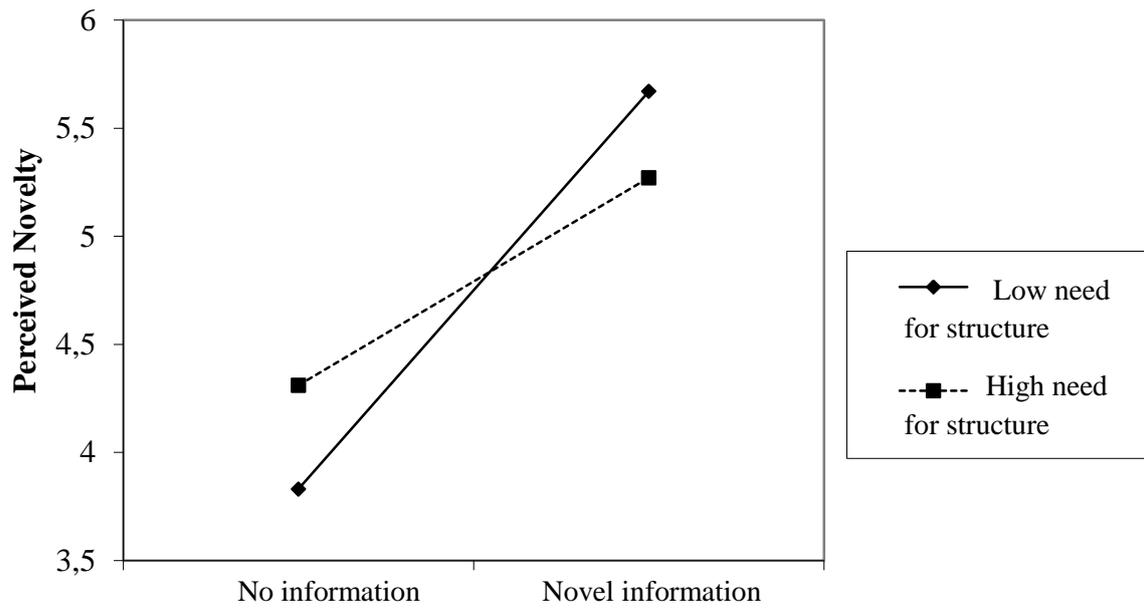
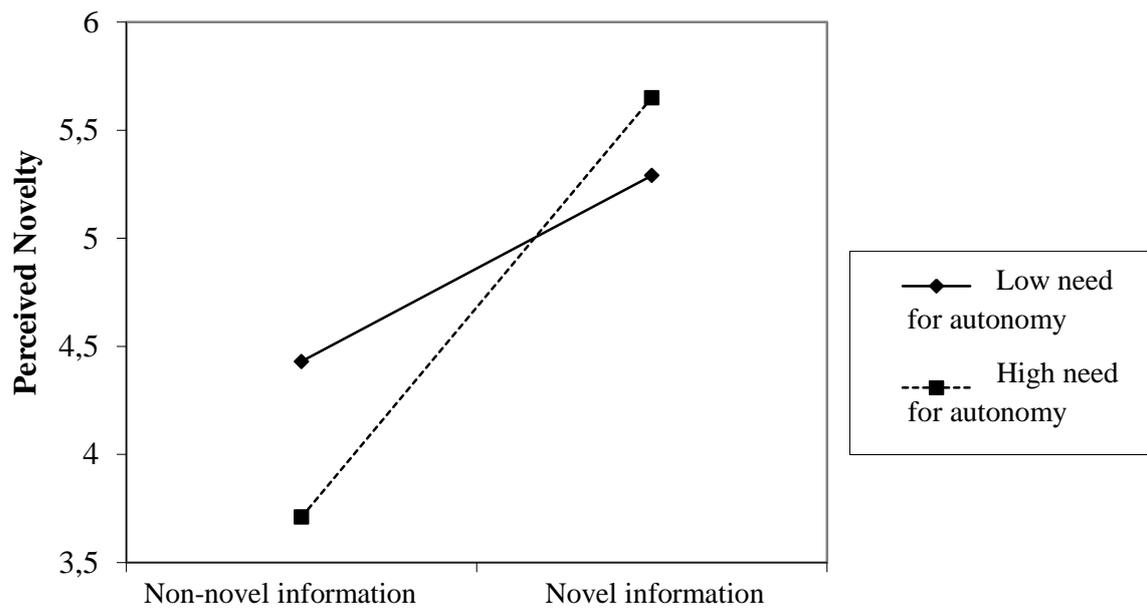
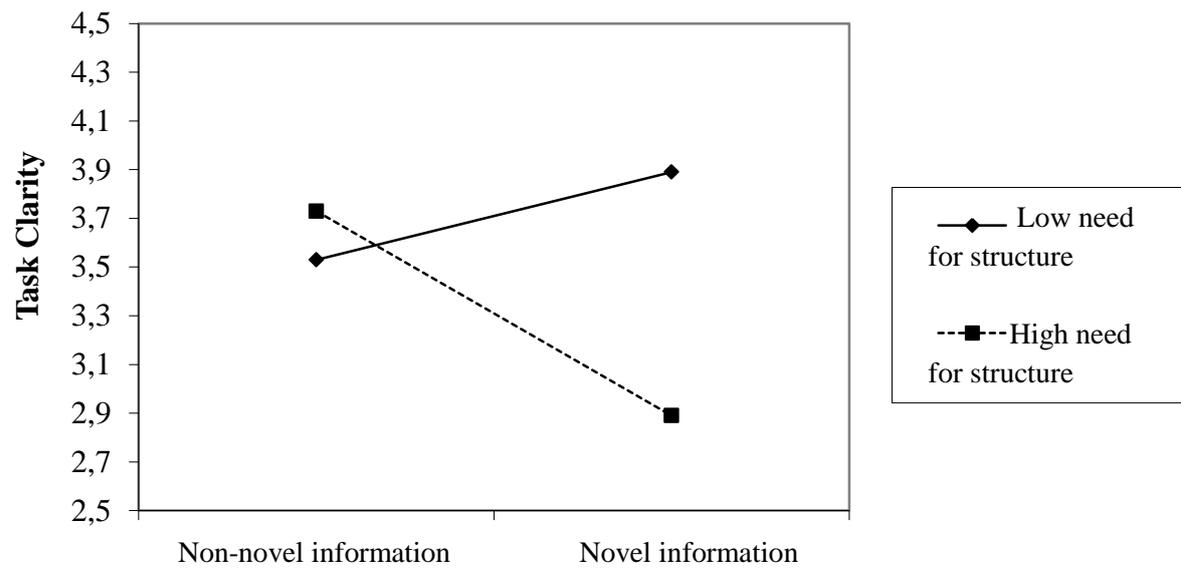


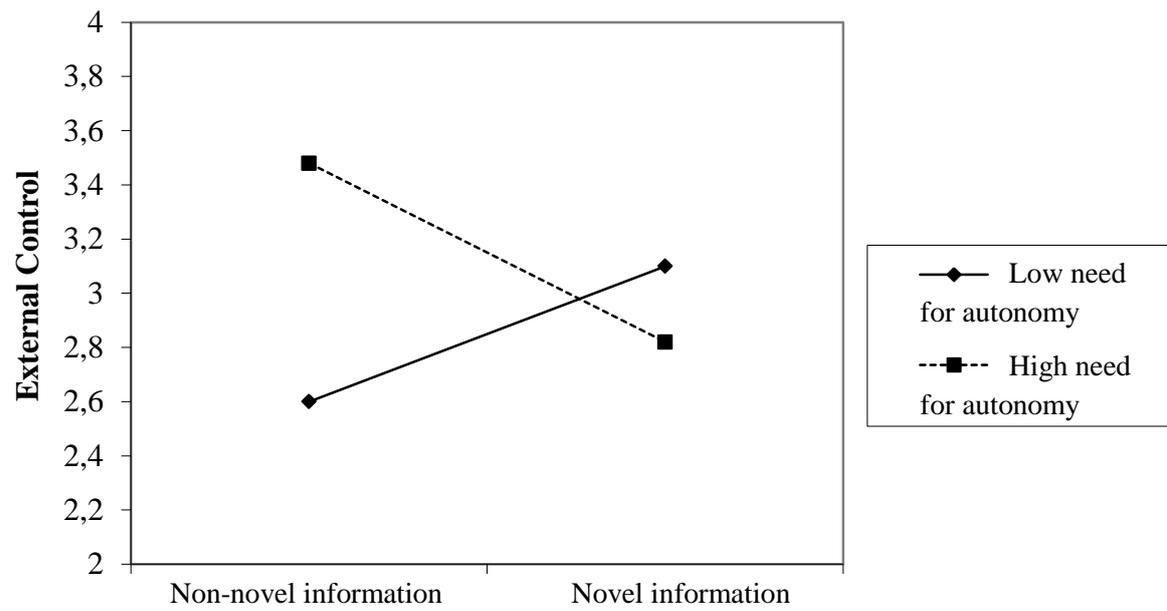
Figure 6. Perceived novelty of incoming information as a function of connectedness via non-novel information (vs. novel information) and need for structure.



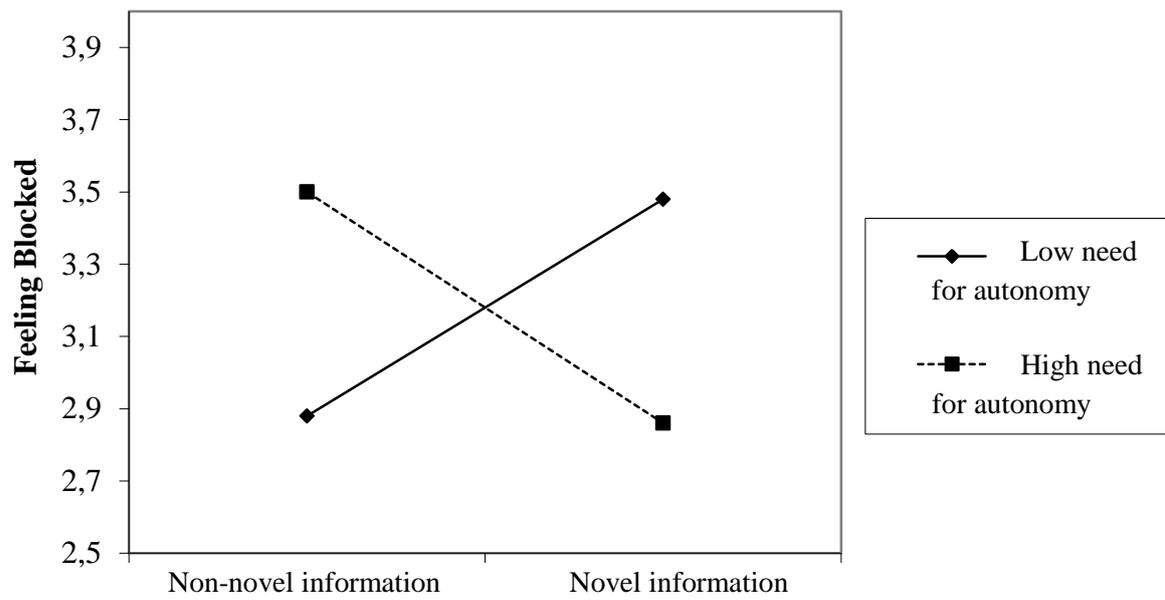
*Figure 7.* Perceived novelty of incoming information as a function of connectedness via non-novel information (vs. novel information) and need for autonomy.



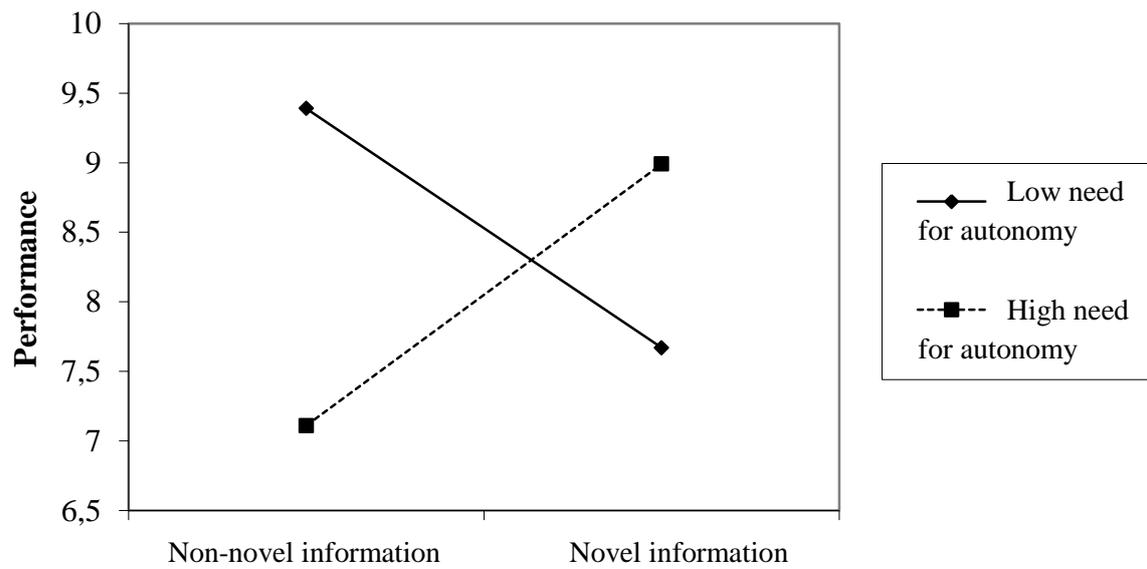
*Figure 8.* Task clarity as a function of connectedness via non-novel information (vs. novel information) and need for structure.



*Figure 9.* External control as a function of connectedness via non-novel information (vs. novel information) and need for autonomy.



*Figure 10.* Feeling blocked as a function of connectedness via non-novel information (vs. novel information) and need for autonomy.



*Figure 11.* Performance as a function of connectedness via non-novel information (vs. novel information) and need for autonomy.