

## **Meeting Deadlines in Work Groups: Implicit and Explicit Mechanisms**

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Nous nous sommes demandés, dans cette étude, si les groupes étaient mieux à même de respecter les délais quand leurs membres partageaient les mêmes cognitions temporelles, c'est-à-dire quand ils s'accordaient sur les dimensions temporelles de leur tâche. Dans une étude longitudinale portant sur 31 groupes, nous avons étudié l'effet des cognitions temporelles partagées sur le respect d'un délai et exploré deux antécédents des cognitions temporelles partagées: la cohérence des rythmes des membres du groupe et l'échange des rappels concernant le temps. Nos résultats montrent que ces deux facteurs ont un impact sur les cognitions temporelles partagées et cela à différentes étapes du travail collectif. De plus, il est apparu que les cognitions temporelles partagées pouvaient aussi bien faciliter que contrecarrer le respect des délais: cela dépend des rythmes des membres du groupe.

In this study, we examined whether groups were better able to meet deadlines when group members had shared temporal cognitions, that is, when they agreed on the temporal aspects of their task. In a longitudinal study involving 31 groups, we studied the effect of shared temporal cognitions on meeting a deadline and explored two antecedents of shared temporal cognitions: the similarity in group members' pacing styles and the exchange of temporal reminders. Our findings suggest that both antecedents are relevant to shared temporal cognitions, be it at different stages of group collaboration. Furthermore, we found that shared temporal cognitions may either facilitate or impede meeting a deadline, depending on the content of group members' pacing styles.

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This study was supported by a grant from the co-operation centre Tilburg and Eindhoven Universities, The Netherlands, researchproject: 99-Z. We thank Robert A. Roe for his helpful comments in preparing the research and the manuscript.

## INTRODUCTION

Although deadlines are important time markers in organisational life (McGrath & O'Connor, 1996), many teams appear to have difficulty meeting them. In a survey among 91 managers of project teams (Tukel & Rom, 1998), 56 per cent indicated that deadlines are often exceeded or missed. Meeting deadlines is an important aspect of group performance, but relatively little research has been conducted on this particular aspect, although some studies addressed it explicitly (Chang, Bordia, & Duck, 2003; Gersick, 1988, 1989; Waller, Giambatista, & Zellmer-Bruhn, 1999; Waller, Zellmer-Bruhn, & Giambatista, 2002).

Meeting deadlines in work groups involves intra-group synchronisation and external synchronisation (McGrath & O'Connor, 1996), which means that group members have to accommodate to each other's actions, as well as to the deadline to make sure that the intended output is delivered on time. In many projects, schedules and deadlines are used to facilitate synchronisation. Schedules and deadlines specify who is supposed to do what, when tasks should be completed, and how the combination of individual efforts should ultimately produce the desired end-product. Thus, they reduce ambiguity and increase the likelihood that group members coordinate their actions effectively. However, it can be argued that a smooth flow of work can only be established when all group members acknowledge, accept, and adhere to these schedules and deadlines. Hence, we believe that group members must internalise the meaning of schedules and deadlines to hold shared cognitions regarding the temporal aspects of task execution.

In this paper, we aim to investigate the role of shared temporal cognitions in regulating team processes toward meeting deadlines. Although several studies have demonstrated that shared cognitions facilitate group performance (Cohen, Mohrman, & Mohrman, 1999; Mathieu, Heffner, Goodwin, Salas, & Cannon-Bowers, 2000; Rentsch & Klimoski, 2001), questions remain about which cognitions need to be shared to improve particular aspects of group performance (Cannon-Bowers & Salas, 2001). We suggest that to improve meeting deadlines, it will be particularly helpful when group members share cognitions about the temporal aspects of task execution, such as deadlines, schedules, and task completion times.

In addition, we explore antecedents of shared temporal cognitions. We suggest that both implicit and explicit mechanisms may contribute to shared temporal cognitions. Blount and Janicik (2002) have produced valuable work studying individual preferences for the use of time in relation to intra-group synchronisation. We build on their research to suggest that shared temporal cognitions may arise when group members have similar pacing styles. Furthermore, we refer to prior research on attention to time in work groups (Gersick, 1988, 1989; Waller et al., 1999) to suggest that group members may

also develop shared temporal cognitions when they remind each other of important temporal aspects of a task. Finally, because we used a longitudinal research design, we were able to determine how these relationships changed over time in groups that continued to collaborate on a follow-up task.

## SHARED TEMPORAL COGNITIONS

We define shared temporal cognitions as the extent to which group members have congruent mental representations of the temporal aspects of a specific group task, such as the importance of meeting the deadline, (sub)task completion times, and the appropriate timing and pacing of task activities. Cognitions are shared when group members have common or overlapping views regarding these temporal aspects of task execution, which does not necessarily mean that group members have actively discussed them (Thompson & Fine, 1999). We suggest that shared temporal cognitions help group members to anticipate and understand each other's actions, and to adopt more compatible work patterns. This, in turn, will enhance the coordination of task activities and benefit team performance, meeting deadlines in particular.

We base this reasoning on a large body of work concerning the role of shared cognitions in regulating teamwork. Theory on shared cognitions and related constructs, such as shared mental models (Cannon-Bowers, Salas, & Converse, 1993; Klimoski & Mohammed, 1994), team schema similarity (Rentsch & Hall, 1994), transactive memory (Wegner, 1995), and shared understanding (Cohen et al., 1999), states that cognitive congruence in work groups enhances team performance through a positive effect on team processes. Shared cognitions are assumed to enhance team members' accurate expectations of task execution, and behavioral adaptations to the needs of the task and other team members (Cannon-Bowers et al., 1993).

Empirical research has indeed shown that shared cognitions among team members improve team processes and, consequently, team performance (Cohen et al., 1999; Mathieu et al., 2000; Rentsch & Klimoski, 2001). However, the timeliness of performance has not been studied in this respect. Here, we set out to determine the value of shared temporal cognitions for meeting deadlines. Before we elaborate on the role of shared temporal cognitions in regulating team processes towards meeting a deadline, we discuss antecedents of shared temporal cognitions.

### Antecedents of Shared Temporal Cognitions

We assume that both implicit and explicit mechanisms have the potential to contribute to shared temporal cognitions in work groups, in the sense that shared temporal cognitions may be due to common individual cognitions prior to group interaction, or that these may be generated through group

communication. We suggest that shared temporal cognitions emerge without team members consciously making an effort to align cognitions when group members have similar pacing styles. The second mechanism we propose is more intentional, in that group members can develop shared temporal cognitions by reminding each other of important temporal aspects of a task.

*Similarity in Pacing Styles.* People tend to anticipate a particular rate in the progression of events and activities over time. In work settings, for instance, people have preferences for the speed of their work processes and for the way in which these processes are spaced out over time (Blount and Janicik, 2002). These so-called pacing preferences represent a person's preference for the allocation of time in task execution under deadline conditions. While some people prefer a steady work pace and tend to spread out task activities evenly over time, others have a preference for working under the pressure of the deadline and wait until it comes very near before they start working on the task. The latter may be due to the discounting effect, expressed as a preference for short-term outcomes over long-term outcomes (see Koch & Kleinmann, 2002, for a discussion of discounting in relation to time management; Loewenstein & Thaler, 1997; Loewenstein & Prelec, 1993). Still others may want to finish a task as soon as possible and choose to take action as soon as possible, and are less active just before the actual deadline.

Some people claim that they prefer to start working on a task early, but acknowledge that, for whatever reason, they never do. Hence, we prefer to use the term pacing style to refer to the way an individual generally uses his or her time under deadline conditions. Thus, a person with an early action pacing style generally starts task activities early to finish long before the deadline, while a person with a deadline action pacing style does most of the work in a relatively short period of time just before the deadline.

We conceptualise pacing style as a relatively stable and general personal characteristic related to the allocation of time in task performance. Although there is a fair amount of research on time-related individual characteristics (for an overview, see Francis-Smythe & Robertson, 1999), little is known about how these characteristics affect group performance. Waller and colleagues (Waller et al., 1999) demonstrated that the presence of one time-urgent individual increases the group's focus on its primary task activity. Blount and Janicik (2002) found that negotiating partners were more effective in, and more content with, their interactions when they had similar preferences for the pace of their negotiation. These findings suggest that time-related individual differences may influence group processes and group performance.

The interactionist approach to personality-performance relationships suggests that personality traits are expressed in work behavior as responses to trait-relevant situational cues (Tett & Burnett, 2003). When confronted with a trait-relevant situational cue, individuals respond in a manner that

reflects their standing on this particular trait. Situational cues may be located at the organisational level, at the group level, or at the task level. We assume that a deadline constitutes a task-level situational cue that is relevant to the expression of pacing styles. When a group is introduced to a group task with a particular deadline, members will have their individual perceptions of the temporal aspects of that task, e.g. whether meeting the deadline is important, how much time is needed to perform the task, and how time should be used in task execution. These personal temporal cognitions are likely to reflect individual pacing styles, because the deadline activates the expression of pacing styles.

Of course, task conditions may impose constraints on the expression of individual pacing styles in group members' temporal cognitions (Tett & Burnett, 2003). Strong situations, for example, tend to negate individual differences in response tendencies by their clarity (i.e. because everyone construes them in the same way, everyone tends to behave the same way in them). The time available for task completion may be relevant in this respect. Presumably, group members are more likely to agree on the use of time when task completion times are short, simply because short deadlines limit the possibilities for time allocation. Except for these conditions of extreme time pressure, we expect that temporal cognitions will reflect personal pacing styles and that group members are, therefore, more likely to share temporal cognitions about a task when their pacing styles are similar.

*Hypothesis 1.* Similarity in individual pacing styles among group members is positively related to shared temporal cognitions about the group task.

*Temporal Reminders.* Monitoring group performance is an essential part of group regulation (Carver & Schreier, 1990). West (1996) argues that work groups build a more comprehensive and shared cognitive representation of their work, also with respect to time-use, when team members monitor their task accomplishments and discuss the need for adaptive actions. Several studies have demonstrated that monitoring progress and discussing time-related issues are important mechanisms in regulating group pacing (Chang et al., 2003; Gersick, 1988, 1989; Waller et al., 1999; Waller et al., 2002). Specifically, these studies have identified attention to time as a catalyst of group task activity because groups tend to use the elapse of allotted time as a metric to evaluate task progress and to initiate adaptations in work group processes. One way group members may draw attention to time is by using temporal reminders. For example, group members may remind each other of deadlines and urge one another to stick to task schedules to make sure that subtasks are completed on time.

One could argue that temporal reminders will not benefit shared temporal cognitions because they may increase awareness of the differences in how

group members think about time and lead to group conflict. That is, focusing attention on the differences in group members' time perspectives may actually draw group members apart and lead them to form coalitions (Blount & Janicik, 2002), instead of bringing them closer to a shared vision. However, talking about time in task groups has been shown to facilitate the establishment of temporal norms (Janicik & Bartel, 2002) and to focus group task activity (Waller et al., 1999). This suggests that temporal reminders may actually stimulate members who tend to underestimate the importance of particular temporal milestones, or who disregard intended work schedules, to align their view on the allocation of time in task performance with that of other group members. Hence, we expect that temporal reminders are more likely to have a positive effect than a negative effect on shared temporal cognitions.

*Hypothesis 2.* The exchange of temporal reminders among group members is positively related to shared temporal cognitions.

## Longitudinal Effects of Similarity in Pacing Styles and Temporal Reminders

The impact of similarity in pacing styles and temporal reminders on group members' temporal cognitions may change when groups continue to collaborate on a subsequent task. In a second collaboration on a similar task, group members will have more knowledge of the task demands and of team members' abilities to deal with these demands than the first time they worked together. In addition, groups will have experienced success or failure using a particular temporal approach. With this knowledge, the situational context of the second collaboration may be experienced as much clearer and stronger than in the first collaboration. Given that strong situations tend to reduce the influence of personality traits on behavior, it is more likely that groups will base their choices whether to continue in the same manner or to change their temporal approach on the follow-up task on previous experiences rather than on general pacing styles. Thus,

*Hypothesis 3.* When group members work together on a second task, the relationship between similarity in individual pacing styles and shared temporal cognitions will be lower than when they worked together for the first time.

The role of temporal reminders may also change over time. When group members perform a task for the first time, temporal reminders will draw attention to the temporal aspects of the task and these may help team members to reach shared temporal cognitions. On a follow-up task, this effect may wear off. Because the task is more familiar and everyone knows what to do, group members may become resistant to each other's comments regarding

the use of time in task execution. Then again, the effect of temporal reminders may also become stronger in a second collaboration. After all, when groups perform a particular task for the first time, members do not know that temporal aspects may be problematic in their group. Temporal reminders in this stage could be regarded as excessive and unnecessary. On a follow-up task, when groups have experienced temporal problems, temporal reminders are more likely to be considered justified and members may become more open to each other's comments. Since there is no literature on the effect of temporal reminders over time, it is hard to say which scenario is more plausible. Therefore, we formulate an open research question to investigate changes in the relationship between temporal reminders and shared temporal cognitions over time.

*Research question.* Does the relationship between temporal reminders and shared temporal cognitions change from the first to the second time group members work together?

## The Effect of Shared Temporal Cognitions on Meeting Deadlines

We propose that there is no direct relationship between shared temporal cognitions and meeting a deadline. Shared cognitions will only influence group processes in a positive way if the content of the similar cognitions is functional (cf. Rentsch and Hall, 1994). That is, shared temporal cognitions will only facilitate meeting the deadline when these cognitions are in line with the temporal demands of the task. When all group members underestimate the duration of the project or consider the deadline to be unimportant, sharing these cognitions is more likely to impede their ability to complete the task on time. These groups would probably be better off with one or two members with diverging perceptions on time who might promote a more appropriate allocation of time in task execution (cf. Waller et al., 1999).

Therefore, we expect that the influence of shared temporal cognitions on meeting a deadline is dependent upon the pacing styles of the members. That is, not only should temporal cognitions be shared to a high degree, but also should the pacing styles of the members be conducive to meeting the deadline. We assume that a group is more likely to miss the deadline when the members generally start task activities late, i.e. have a deadline action pacing style, and agree on how to use time, i.e. have shared temporal cognitions. These shared cognitions will lead to missing deadlines more often, because groups that start late will not have much time left to compensate for overly optimistic estimates of task completion times (Buehler, Griffin, & Ross, 1994), or to correct errors or mismatches between individual parts of the group work. If, however, the group members, on average, start working

on the task early, i.e. have an early action pacing style, sharing temporal cognitions will enhance meeting the deadline.

*Hypothesis 4.* Shared temporal cognitions are negatively associated with meeting the deadline when group members, on average, tend toward a deadline action pacing style, but positively related to meeting the deadline when group members, on average, tend toward an early action pacing style.

## METHOD

### Procedure and Participants

We tested our hypotheses in a longitudinal study of 38 student groups of a business school in the Netherlands. Groups consisted of three to five members who were rather homogeneous with respect to age (between 21 and 25), gender (predominantly male), and educational background (second year in technology management). Students were allowed to sign up for group membership, which most of them did. Incomplete groups were assigned additional members by the course instructor.

The groups worked together over the course of eight weeks to complete two assignments that involved applying a particular modeling technique to two cases and writing a report on each case. They worked on one assignment at a time and had to finish each with a report after four weeks. The groups received a grade for each assignment and these were averaged to determine the final course grade. Group members were allowed to reallocate the total of their grades to reward individual contributions. Grades for the first assignment were known to the group before they started working on the second assignment.

Over the total working period of eight weeks, we administered four questionnaires. Halfway through the working period for each assignment (after week 2 for Assignment 1 and after week 6 for Assignment 2), we asked the respondents about their individual pacing styles, to what extent they had shared temporal cognitions, and to what extent group members used temporal reminders. One day after the deadline for the assignments (after 4 weeks for Assignment 1 and after 8 weeks for Assignment 2), we asked members when they had completed their work on the task. Thus, all variables were measured twice, once for Assignment 1 and once for Assignment 2. In the following, we will denominate all data collected during Assignment 1 as Time 1, and those collected during Assignment 2 as Time 2.

Questionnaires were administered via email. We received at least one completed questionnaire from 80 per cent of the respondents, 27 per cent of the respondents completed all four questionnaires. For the analyses, we selected groups of which at least 50 per cent of the group members provided data on their individual pacing style. As a result, our final sample consisted of 31 groups.

## Measures

With the exception of our measure for pacing styles, all questionnaire items were formulated at the group level (all measures are provided in the Appendix). We aggregated individual scores to group mean scores based on high levels of intra-group agreement (see Table 1,  $\bar{R}_{wg(j)}$ ; James, Demarée, & Wolf, 1984).

*Shared Temporal Cognitions.* Shared temporal cognitions were assessed with four items that asked participants to rate the extent to which group members had shared cognitions regarding the temporal aspects of task execution, such as agreement on how to use their time. Responses were provided on a 5-point response scale (1 = *disagree completely*, 5 = *agree completely*). Because the variable distribution diverged from the normal distribution at both measurement points (skewness:  $-1.13$  and  $-1.38$ , respectively; kurtosis:  $1.53$  and  $3.55$ , respectively), distributions were corrected using logarithmic transformation (Tabachnick & Fidell, 1996). As a result, scores ranged from 0 to 1, with higher scores indicating higher levels of shared temporal cognitions.

*Pacing Style.* We conceptualised the construct of pacing style as a relatively stable individual difference variable relating to the use of time when performing a particular task or project under deadline conditions. We constructed a scale of pacing styles with five graphs, representing different styles of time-use, and asked respondents to choose the graph that represented their personal style.

Each graph represented a particular rate of task activities to progress up to the deadline. We adapted these graphs from Lim and Murnighan (1994) and Blount and Janicik (2002): we selected some of their examples of pacing patterns showing steady or increasing activity over time and complemented them with pacing patterns that show a decrease in task activity over time. The first graph in the scale represented the *early action pacing style*, an individual's tendency to start and finish task activities as soon as possible. The third graph was the *constant action pacing style*, indicating a person's tendency to work steadily on a task, spreading it out evenly over time. The fifth graph represented the *deadline action pacing style*, showing the temporal approach of an individual who does most of the work in a relatively short period of time just before the deadline. The intermediate graphs, two and four, showed moderate tendencies toward the early action pacing style or the deadline action pacing style. Together these five graphs represented a range of possible styles regarding the pace, i.e. the acceleration or deceleration of one's task activities over time.

We administered the measure twice to establish test-retest reliability, which was adequate ( $r = .53$ ;  $p < .001$ ), averaged the two scores, and calculated

**TABLE 1**  
Descriptive Statistics and Intercorrelations

	M	SD	S	K	$\bar{R}_{wg(j)}$	1	2	3	4	5	6	7
1. Similarity in pacing styles	0.86	.40	-.34	-.24								
2. Group mean pacing style	3.33	.47	-.86	1.73		.28						
Time 1												
3. Temporal reminders	3.83	.39	.04	-.74	.86	-.03	-.11					
4. Shared temporal cognitions	0.66	.11	-.36	.43	.88	.29	-.29	-.11				
5. Meeting the deadline	2.16	.48	-.04	.17	.75	-.20	-.37*	.23	.02			
Time 2												
6. Temporal reminders	3.86	.54	.39	-.06	.87	-.18	-.36	.49**	.13	.14		
7. Shared temporal cognitions	0.66	.14	-.04	.95	.86	-.15	-.52**	.27	.50**	.23	.56***	
8. Meeting the deadline	2.39	.46	.86	-1.56	.82	-.21	-.30	-.05	-.14	.60***	.11	-.01

*Note:* N ranges from 26 to 31. S = Skewness; K = Kurtosis;  $\bar{R}_{wg(j)}$  = mean interrater reliability. Descriptive statistics and correlations are based on pairwise missing; \*  $p < .05$ ; \*\*  $p < .01$ ; \*\*\*  $p < .001$ ; all  $p$ -values two-tailed.

the mean pacing style for each group. The lower the *group mean score*, the more group members, on average, tend to use an early action pacing style in task execution; the higher the group mean score, the more group members, on average, tend toward a deadline action pacing style. The standard deviation was used to determine the level of similarity in group members' pacing styles within the group. Finally, we converted these *similarity scores* so that higher scores represented more similarity in group members' pacing styles.

Additionally, we assessed the construct validity of our pacing style scale in a separate validation study. In this study, 121 students completed a questionnaire assessing their pacing style, individual orientation towards time and deadlines, and the Big Five factors of personality (using the Five Factor Personality Inventory; Hendriks, Hofstee, & De Raad, 1999). The study provided support for the concurrent validity of the mean scores of the pacing style scale, as it revealed significant correlations between individual pacing style and conscientiousness ( $r = -.44, p < .001$ ), individual temporal norms on punctuality and adherence to schedules and deadlines ( $r = -.25, p < .01$ ), and the experience of increased challenge and motivation under deadline pressures ( $r = .25, p < .01$ ). Individual pacing style showed non-significant relationships to the personality factors Extraversion ( $r = .13$ ), Emotional Stability ( $r = -.03$ ), and Agreeableness ( $r = .11$ ), which indicated discriminant validity. We interpreted these results, in combination with the face validity of the scale, as supportive of the construct validity of this pacing style measure.

*Temporal Reminders.* We used three items to measure the extent to which team members provided each other with temporal reminders, on a 5-point response scale (1 = *disagree completely*, 5 = *agree completely*).

*Meeting the Deadline.* Meeting the deadline was assessed with one item that asked participants to indicate when the assignment had been finished. Responses were given on a 3-point response scale (1 = *too late*, 2 = *just in time*, 3 = *in ample time*). The scale had high levels of intra-group agreement ( $\bar{R}_{wg(t)} = .75$  and  $.82$  at Time 1 and Time 2, respectively).

## Data Analysis

We analysed the data at the group level. Due to the limited sample size, our hypotheses could not be combined in an overall path analysis. Instead, we performed four separate analyses. First, we performed a multiple regression analysis to examine whether, and how, similarity in pacing styles and temporal reminders were related to shared temporal cognitions at Time 1. Because within-group standard deviations can be confounded with group average scores (Bedeian & Mossholder, 2000), we used the group mean

spacing style as a control variable in all analyses involving similarity in spacing styles.

Second, to test whether the relationships of similarity in spacing styles and temporal reminders with shared temporal cognitions changed over time, we performed a hierarchical regression analysis with two steps, thereby controlling for shared cognitions at Time 1.

Finally, the moderator-effect of shared temporal cognitions and group mean spacing style on meeting the deadline was tested at Time 1 and Time 2, using two separate hierarchical regression analyses. In testing the moderator-effect, we followed the guidelines of Baron and Kenny (1986).

## RESULTS

Table 1 presents the distributions and intercorrelations for all the variables in the study. Hypothesis 1 predicted that similarity in spacing styles would be positively associated with shared temporal cognitions at Time 1. The results of the analysis, reported in Table 2, confirm this hypothesis by showing a significant positive relationship between similarity in spacing styles and shared temporal cognitions at the onset of work group collaboration ( $\beta = .40$ ;  $p < .05$ ).

With respect to temporal reminders, we also predicted a positive relationship with shared temporal cognitions at Time 1 (Hypothesis 2). However, Table 2 reveals that we did not find a significant relationship between temporal reminders and shared temporal cognitions at the groups' first collaboration ( $\beta = -.15$ ; *ns*).

Then, we considered the effects of spacing styles and temporal reminders on shared temporal cognitions as the groups collaborated on a second assignment. Hypothesis 3 suggested that the strength of the relationship between similarity in spacing styles and shared temporal cognitions would be

TABLE 2  
Summary of Multiple Regression Analysis for Variables Predicting Shared Temporal Cognitions at Time 1 ( $N = 31$ )

Variable	Shared temporal cognitions (T1)		
	B	SE B	$\beta$
Intercept	1.05	.23	
Group mean spacing style	-.10	.04	-.42*
Similarity in spacing styles	.11	.05	.40*
Temporal reminders (T1)	-.04	.05	-.15

Note:  $R^2 = .25$  ( $p < .05$ ).

\*  $p < .05$ , two-tailed.

TABLE 3  
 Summary of Hierarchical Regression Analysis for Variables Predicting Shared  
 Temporal Cognitions at Time 2 ( $N = 29$ )

Variable	Shared temporal cognitions (T2)		
	<i>B</i>	<i>SE B</i>	$\beta$
Step 1			
Intercept	.23	.15	
Shared temporal cognitions (T1)	.65	.22	.50**
Step 2			
Intercept	.11	.31	
Shared temporal cognitions (T1)	.52	.21	.40*
Group mean pacing style	-.06	.05	-.18
Similarity in pacing styles	.04	.06	-.11
Temporal reminders (T2)	.11	.04	.43**

Note:  $R^2 = .25$  for Step 1 ( $p < .01$ );  $\Delta R^2 = .30$  for Step 2 ( $p < .01$ ).

\*  $p < .05$ , two-tailed; \*\*  $p < .01$ , two-tailed.

weaker in a second collaboration. The results of the hierarchical regression analysis, as summarised in Table 3, provided support for this hypothesis. In contrast with Time 1, similarity in pacing styles did not show a significant relationship with shared temporal cognitions at Time 2 ( $\beta = -.11$ ; *ns*).

Table 3 also answers our research question whether the relationship between temporal reminders and shared temporal cognitions changes over time. The results show that, as opposed to Time 1, temporal reminders were positively related to shared temporal cognitions at Time 2 ( $\beta = .43$ ;  $p < .01$ ).

Finally, Hypotheses 4 predicted that the effect of shared temporal cognitions on meeting the deadlines would be moderated by the mean pacing style of the group. The results of this analysis at Time 1 are presented in Table 4. The model is marginally significant ( $F(3, 25) = 2, 83$ ;  $p = .06$ ). Seeing that both the proportion of variance explained and the beta weight of the interaction term are substantial, we attribute this to lack of power and consider an interpretation of the beta weights permissible. These indicate that the effect of shared temporal cognitions on meeting the deadline is indeed moderated by the mean pacing style of the group ( $\beta = -.36$ ;  $p < .05$ , one-tailed). This moderator effect is depicted in Figure 1, showing that sharing temporal cognitions was beneficial to meeting a deadline when group members, on average, had an early action pacing style, whereas it was detrimental to meeting the deadline when group members, on average, had a deadline action pacing style. This moderator effect was not significant at Time 2 ( $\beta = -.13$ ; *ns*).

Recall that group membership was self-assigned in most groups, but that some groups were put together by the course instructor (this was the case

TABLE 4  
 Summary of Hierarchical Regression Analysis for Variables Predicting Meeting the Deadline at Time 1 ( $N = 29$ )

Variable	Meeting the deadline at T1		
	<i>B</i>	<i>SE B</i>	$\beta$
Step 1			
Intercept	2.16	.09	
Group mean pacing style (G)	-.18	.09	-.39
Shared temporal cognitions (T1) (S)	-.04	.10	-.09
Step 2			
Intercept	2.11	.09	
Group mean pacing style (G)	-.13	.09	-.28
Shared temporal cognitions (T1) (S)	.01	.09	-.01
G $\times$ S	-.21	.11	-.36*

Note:  $R^2 = .14$  for Step 1 (*ns*);  $\Delta R^2 = .11$  for Step 2 ( $p = .06$ ).

\*  $p = .05$ , one-tailed.

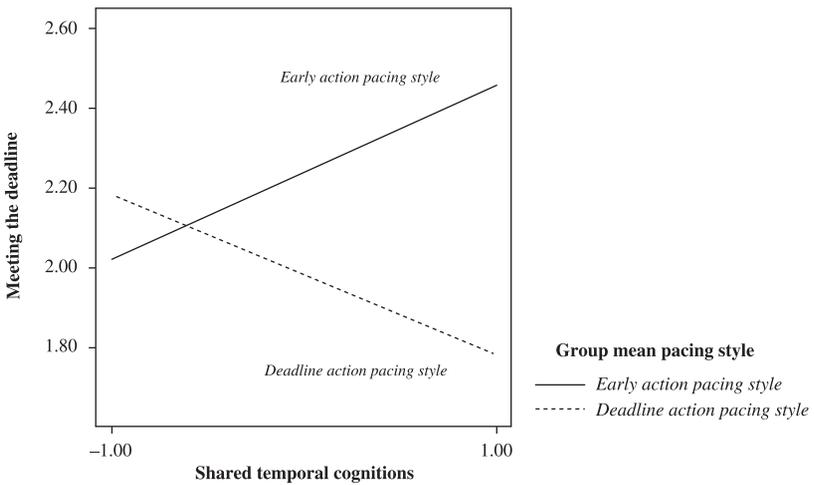


FIGURE 1. Interaction effect of shared temporal cognitions and group mean pacing style on meeting the deadline at Time 1.<sup>1</sup>

<sup>1</sup> Figure 1 depicts the regression lines between one standard deviation below and above the means of the independent variables (Aiken & West, 1991).

for five groups). Because the method of group assignment could affect the relationships under study, all analyses were also conducted while controlling for self-assignment. The results of these analyses revealed that, although self-assigned groups were more successful in meeting deadlines, this effect was not related to shared temporal cognitions, nor did it affect the relationships between shared temporal cognitions and meeting deadlines.

## DISCUSSION

The purpose of this study was to examine the effect of shared temporal cognitions on meeting deadlines in work groups, and to explore antecedents of shared temporal cognitions. We found that similarity in pacing styles was positively associated with shared temporal cognitions at the group's first collaboration, whereas temporal reminders were not related to shared temporal cognitions at that time. However, temporal reminders showed a positive relationship with shared temporal cognitions in the second collaboration, while, at that time, similarity in pacing preferences was no longer related to shared temporal cognitions.

These findings indicate that both pacing styles and temporal reminders may benefit the emergence of shared temporal cognitions, be it in different stages of group collaboration. Evidently, having similar pacing styles not only facilitates intra-group synchronisation directly (Blount & Janicki, 2002), but also indirectly, by supporting cognitive congruence among group members. However, because similarity in pacing styles was irrelevant when groups were more familiar with the task, our study also supports the interactionist's claim that task conditions may diminish the effect of personality traits.

Temporal reminders were only related to shared temporal cognitions in the second assignment. A possible explanation for this is that the groups moved from implicit to explicit mechanisms to establish shared temporal cognitions. Possibly, groups needed the first collaboration to realise that shared temporal cognition would not arise spontaneously, before they started using temporal reminders effectively in the second. The fact that the correlation between temporal reminders and shared temporal cognitions changed over time from negative ( $r = -.11$ ) to positive ( $r = .56$ ) hints at a reciprocal relationship between these variables, in the sense that a lack of shared temporal cognitions at Time 1 promoted the use of temporal reminders, which, in turn, enhanced cognitive congruence at Time 2. Our findings at least show that temporal reminders are not detrimental to shared temporal cognitions.

With respect to the effect of shared temporal cognitions on meeting the deadline, we found that shared temporal cognitions may either facilitate or impede meeting the deadline, depending on the mean pacing style within the group. When group members, on average, tend toward an early action pacing style, sharing temporal cognitions helps them to finish their task on time;

when groups tend toward a deadline action pacing style, sharing temporal cognitions impairs meeting the deadline. This effect was only observed in a first collaboration, not when group members worked together on a follow-up task. In fact, meeting the deadline at Time 1 was the only variable that correlated with meeting the deadline at Time 2 ( $r = .60$ ). This may imply that groups that did not meet the deadline at Time 1 experienced a delay in the second task. Because they still had to complete the first assignment, time scarcity may have overruled the effect of shared temporal cognitions, or in other words, simply not having enough time led to missing the deadline in the follow-up task (this backlog effect was also found in a previous study, but only for low potency groups; Gevers, van Eerde, & Rutte, 2001). This suggests that there may be a threshold after which shared temporal cognitions are no longer relevant; when there is too much work and too little time to do it, groups will fail to meet their deadlines irrespective of whether members have shared temporal cognitions or not.

All in all, we conclude that homogeneous work groups composed of individuals who tend to use an early action pacing style in task execution are most likely to meet deadlines, but that in the long run all groups can acquire shared temporal cognitions when they use temporal reminders. For practice, this implies that it may be beneficial to consider individual pacing styles when putting people together in work groups. Selecting participants with an early action pacing style will increase the likelihood that deadlines are met. However, we realise that composing the ideal work group is often impossible. Therefore, when deadlines are important, we recommend that members use temporal reminders to promote shared temporal cognitions in their group. When group members fail to use temporal reminders spontaneously, managers may consider providing them for the group. Yet, our study also shows that all groups should be aware that sharing inappropriate temporal cognitions is likely to impede their ability to meet deadlines. This emphasises the need for reflexivity with respect to temporal issues (Gevers et al., 2001). If necessary, managers may encourage team members to engage in reflection, for instance by stimulating discussions about task completion times and the importance of temporal milestones.

Our findings represent a first step in establishing the value of shared temporal cognitions for groups working under deadline conditions. We acknowledge that additional conceptual and empirical work is needed to refine and extend our knowledge of shared temporal cognitions in relation to meeting deadlines. Nevertheless, by showing that shared temporal cognitions affect the timeliness aspect of group performance, we have contributed to clarifying which particular cognitions should be shared to improve which particular aspects of group performance (Cannon-Bowers & Salas, 2001). Moreover, we have provided strong support for the notion that cognitive congruence is only part of the picture and that the appropriateness of their content is also important, as cognitions may be detrimental to task

performance (Rentsch & Hall, 1994). Finally, our findings suggest that both similarity in pacing styles and temporal reminders may contribute to shared temporal cognitions, at least when groups have the opportunity to learn from past performance on similar tasks.

Our pacing style measure may be valuable to future research. We have constructed a measure of how people generally organise their time when working under deadline conditions. We acknowledge that this scale is not ideal, in that it is a single-item, ordinal measure, and the five graphs may not be exhaustive. For instance, there may be individuals who are inclined to show more effort in task execution at the start as well as the end, providing a U-shape model, or they may do the bulk of the work somewhere halfway through the allotted time, which would constitute an inverted U-shape. Still, despite its limitations, our pacing style scale has the advantage that it is short, and that it can be used to determine both the similarity in pacing styles and the mean pacing style within a group. Our study suggests that both measures are important for meeting deadlines.

The methodological approach we employed has some limitations. First, we should address the nature of our sample, which consisted mainly of familiar groups, maybe even friendship groups. Because team member familiarity can facilitate both the rate and quality of group performance (Harrison, Mohammed, McGrath, Florey, & Vanderstoep, 2003), it could serve as an alternative explanation for our findings. Self-assigned groups were indeed more likely to meet their deadlines. However, this was not attributable to the level of shared temporal cognitions in these groups, nor did it affect the relationship between shared temporal cognitions and meeting deadlines. Maybe the self-assigned groups were better able to meet deadlines because their members were more willing to help each other or to step in for each other. What causes familiar groups to be more successful than unfamiliar groups could be explored further in future research.

Then, our findings regarding the antecedents of shared temporal cognitions may suffer from common method variance, because they rely on self-reported cross-sectional data. Ideally, these data would have been obtained at multiple points in time, maybe even before group members started working on the first task. However, in order to answer questions on the level of shared temporal cognitions about the group task, the groups had to have some experience working on that particular task. Our questions could only be answered by the group members themselves, because the groups worked by themselves, without supervision. The high levels of agreement in the groups enhance our confidence in the reliability and internal validity of the data.

Another shortcoming of our study is that we focused entirely on meeting the deadline, whereas trade-offs may have taken place in relation to other dimensions of performance, such as quality. This topic definitely deserves attention in future research, also because in contrast to what is often

assumed, trade-offs do not necessarily occur (e.g. Atuahene-Gima, 2003) and positive relationships between timeliness and quality may also be found.

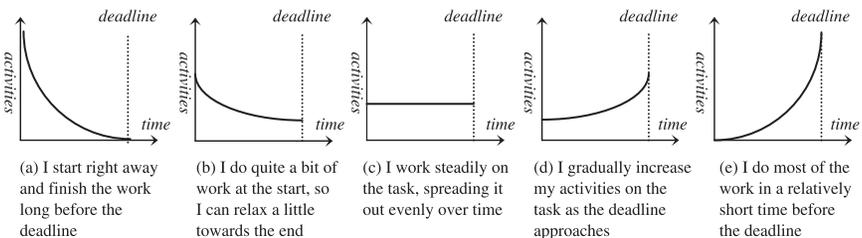
With respect to the external validity, we have to keep in mind that the number of groups in our study was limited and that these were leaderless groups with the same education level and area, working under highly structured task conditions. Although this sample allows a fair test of our hypotheses (Driskell & Salas, 1992), it would be helpful to study a broader and larger sampling of work groups to determine the applicability of our findings to the real world. In organisational settings, many projects involve participants from different organisational and functional backgrounds, which implies that team members cannot take over each other's tasks or responsibilities as the students may have done. Consequently, task interdependence could be higher in work settings, which may influence the extent to which group members need more cognitive congruence, making it a more important topic. In addition, organisational dynamics often induce changes in project plans, demanding a higher level of flexibility, or temporal responsiveness, of work groups (Blount & Janicik, 2001). Therefore, it would be interesting to study cognitive congruence in relation to work group flexibility and the ability of teams to collectively adapt their temporal cognitions to changing deadlines (Waller et al., 2002).

## APPENDIX

### Measures

#### *Pacing Style*

Which of the following models represents best the way you generally organise your time when performing a task or project?



#### *Shared Temporal Cognitions*

To what extent do you agree or disagree with the following statements? (1 = disagree completely; 2 = disagree somewhat; 3 = neither agree, nor disagree; 4 = agree somewhat; 5 = agree completely)

In my group, we have the same opinions about meeting deadlines.

In my group, we have similar thoughts about the best way to use our time.

In my group, we agree on how to allocate the time available.

In my group, we have similar ideas about the time it takes to perform certain tasks.

### *Temporal Reminders*

To what extent do you agree or disagree with the following statements? (1 = disagree completely; 2 = disagree somewhat; 3 = neither agree, nor disagree; 4 = agree somewhat; 5 = agree completely)

In my group, we have urged one another to finish subtasks on time.

In my group, we have reminded each other of important temporal milestones.

In my group, we have prompted each other to stick to agreements.

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