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Motivated but not engaged: The implicit achievement motive requires difficult or unclear task difficulty conditions to exert an impact on effort

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ABSTRACT

Integrating the achievement motive literature and motivational intensity theory, we expected the implicit achievement motive (nAch) to directly determine effort mobilization when task difficulty is unclear. However, nAch should interact with task difficulty in determining effort mobilization when task difficulty is clear. Participants worked on an easy versus difficult memory task (Study 1) or a clear versus unclear arithmetic task (Study 2). We used the Picture-Story-Exercise to assess nAch and pre-ejection period (PEP) to operationalize effort. As predicted, PEP reactivity was strong in the difficult-high-nAch condition and in the unclear-high-nAch condition but low in the other three conditions. Supporting motivational intensity theory, our results showed that nAch requires difficult or unclear task conditions to exert a noticeable impact on effort.

1. Introduction

Motives have an important impact on humans and their behavior. According to McClelland (1961), three main motives direct and energize human behavior: the achievement motive (i.e., the need for significant accomplishment, mastering of skills, and excelling in relation to standards of excellence), the affiliation motive (i.e., the need to establish and maintain contact with others), and the power motive (i.e., the need to influence others, control the social environment, feel powerful, and maintain reputation and prestige). The traditional motive literature suggests that these motives exert a direct impact on behavioral parameters such as performance, effort, and persistence: the stronger the motive, the higher the performance, effort, and persistence (Biernat, 1989; McClelland, 1987). However, results of a recent study by Mazeres et al. (2019) challenged this notion of a direct motive impact on behavior. They showed that the implicit achievement motive interacted with task difficulty to determine effort mobilization—operationalized as effort-related cardiovascular response. Performing an easy arithmetic task resulted in low effort mobilization independent of motive strength. Performing a difficult arithmetic task led to high effort of participants with a high achievement motive but low effort of participants with a low achievement motive. The aims of the studies presented in this paper were twofold: First, we aimed to conceptually replicate the findings of Mazeres et al. (2019) with another cognitive task. Second, we aimed to extend the preceding findings to tasks with unclear task difficulty. To our knowledge, the impact of the implicit achievement motive on effort in tasks with unclear difficulty has not yet been investigated.

The achievement motive construct aims to explain interindividual differences in selecting and performing tasks that promise attainment of standards of excellence. Individuals with a strong achievement motive are postulated to be more interested in performing and succeeding in such tasks and should thus engage in them more frequently and be willing to work harder to succeed in them (Brunstein & Heckhausen, 2008). Originally, the achievement motive was assessed without differentiating between implicit (i.e., projective) and explicit (i.e., self-report) measures. However, a substantial amount of empirical research showed that implicit and explicit achievement motive measures do not always correlate and that the behavioral correlates of the two types of measures are different (deCharms et al., 1955; Schultheiss et al., 2009; Spangler, 1992). Consequently, researchers advanced the notion of two more or less independent motive systems: the explicit and the implicit achievement motive (McClelland et al., 1989). Even if the two motive systems are expected to affect different types of behavior—the implicit achievement motive should mainly affect operant, spontaneous behavior, whereas the explicit achievement motive should affect respondent, deliberate behavior—they should have similar effects

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on behavioral parameters. Many studies supported this view demonstrating that explicit and implicit achievement motives have similar and direct effects on behavior: Individuals with a high explicit achievement motive were found to be more likely to persist in a task (Atkinson, 1957; Brunstein & Maier, 2005), to aim at higher goals in sports (Wegner & Teubel, 2014), and to perform better than individuals with a low explicit achievement motive (Karabenick & Youssef, 1968; Rothstein et al., 1994). A high implicit achievement motive led to faster reaction times (Brunstein & Maier, 2005), more creative outcomes (Fodor & Carver, 2000; Schoen, 2015), better performances in a team tournament (Wegner & Teubel, 2014), and more participation in sports activities (Gröpel et al., 2016). Based on these results, one could expect that the achievement motive always exerts a direct impact on effort-related behavioral parameters: the stronger the achievement motive, the higher the effort mobilization. However, this view is challenged by motivational intensity theory (Brehm & Self, 1989). According to the theory, the impact of the achievement motive should be moderated by clarity of task difficulty.

Motivational intensity theory (Brehm & Self, 1989) offers two main predictions regarding effort mobilization. According to the first prediction, the effort mobilized at one point in time is a function of task difficulty as long as success is possible and justified, if task difficulty is fixed and clear—that is, if there is a fixed and stable performance standard that determines whether the task counts as success or not, and if this performance standard is known to the individual performing the task. Effort mobilization should be low for an easy task, moderate for a moderately difficult task, and high for a difficult but possible task. However, if the required effort for a certain difficulty level is not justified by success importance (e.g., a difficult task that does not promise significant returns), individuals should disengage and withhold effort. Success importance thus sets the upper limit of the effort that people are willing to invest to attain a personal goal, and is determined by variables like needs, performance incentives, or a task's instrumentality (Wright, 2008)[1]. Given that the achievement motive refers to the need to attain excellence, it should be one of the variables that determine success importance: the stronger the achievement motive, the higher the success importance. Consequently, achievement motive strength should have an indirect (i.e., moderating) impact on effort if task difficulty is fixed and clear. At lower task difficulty levels, it should not have an impact at all. Individuals should invest the required effort independent of their individual achievement motive strength. At higher task difficulty levels, individuals with a strong achievement motive should mobilize more effort than individuals with a weak achievement motive, given that a weak achievement motive should not be enough to justify the effort required for the difficult task. At extremely high task difficulty levels, achievement motive strength should again not make a difference given that even a very strong achievement motive should not justify the required effort and all individuals should thus disengage and invest no effort.

The second main prediction of motivational intensity theory refers to contexts in which task difficulty is unclear—that is, where no information about task difficulty is available—or unfixed—that is, where no fixed performance standard determines success. Under these conditions, effort should be a function of success importance (Richter, 2013). Consequently, achievement motive strength should directly determine effort under conditions of unclear and unfixed task difficulty: the stronger the motive, the higher the mobilized effort.

Motivational intensity theory offers a unique perspective to study the impact of the achievement motive on effort because of its integration with Obrist's (1981) active coping approach (Wright, 1996). In particular, empirical work on motivational intensity theory has used indicators of sympathetic (beta-adrenergic) impact on the heart to test the theory's effort-related predictions. Sympathetic activity influences the heart's contractility, which is reflected in pre-ejection period (PEP)—the time interval (in ms) between the onset of left ventricular depolarization and the opening of the left aortic valve (Berntson et al., 2004; Sherwood et al., 1990). Increased sympathetic activity—indicative of increased effort investment—leads to an increase of contractility and an associated shortening of PEP. Increased myocardial sympathetic activity also leads to increases in heart rate (HR), and the impact of sympathetic activity on both HR and myocardial contractility can result in increased systolic (SBP) and diastolic (DBP) blood pressure (Levick, 2003). Consequently, cardiovascular studies on motivational intensity theory used PEP, HR, SBP, and DBP to test its predictions (for an overview see Richter et al., 2016). Most of these studies tested the basic predictions of the theory as well as various applications to phenomena like mood, dysphoria, ability, or fatigue. However, there are only two studies that used the theory to examine the impact of the implicit achievement motive on effort.

Brunstein and Schmitt (2010) examined the joint impact of the implicit achievement motive and task difficulty on effort using SBP reactivity—the change from rest to task performance. In their study, individuals with a high implicit achievement motive mobilized high effort if task difficulty was moderate and low effort if the task was easy or extremely difficult. In contrast, effort mobilization of individuals with a low implicit achievement motive was generally low. This latter finding might have been the result of low achievement motivated participants disengaging from the task because of the required effort not being justified.

Mazeres et al. (2019) also examined the joint impact of the implicit achievement motive and task difficulty on effort, but they used with PEP a more sensitive indicator of myocardial sympathetic activity. Mazeres at al.'s study replicated the results of Brunstein and Schmitt (2010). The implicit achievement motive had an indirect impact on effort-related PEP reactivity by setting the upper limit of effort that individuals were inclined to mobilize for an arithmetic task with fixed and clear task difficulty: While performing the difficult task, individuals with a high implicit achievement motive had a greater PEP reactivity than individuals with a low implicit achievement motive. In the easy condition, all individuals had low PEP reactivity independent of the strength of their achievement motive.

The two studies by Brunstein and Schmitt and Mazeres et al. provided first evidence that the implicit achievement motive plays an indirect (e.g., moderating) role under fixed and clear task conditions. However, both studies did not assess perceived success importance. According to the motive literature, motives should also have an impact on subjective measures. Therefore, in our first study, we aimed at measuring self-reports to determine whether the strength of the achievement motive also influences perceived success importance. Furthermore, we aimed at conceptually replicating the results by Mazeres et al. using another cognitive task. Regarding the second prediction of motivational intensity theory (Brehm & Self, 1989), to our knowledge, no study has investigated the impact of the implicit achievement motive on effort in a task with unclear difficulty. If task difficulty is unclear, motivational intensity theory predicts a direct impact of the achievement motive on effort (for an overview see Richter et al., 2016). To fill this gap in the literature, our second study tested the impact of the implicit achievement motive as a function of task clarity.

1.1. The present studies

Using the framework of motivational intensity theory (Brehm & Self, 1989), our first study intended to test the impact of the implicit achievement motive on effort mobilization (i.e., myocardial sympathetic activity) in an easy or difficult memory task. In the second study, we aimed at investigating the impact of the implicit achievement motive on effort mobilization in an arithmetic task with either clear or unclear difficulty. In the first study, the implicit achievement motive should have no direct impact on effort mobilization but should determine the

[1] It is important to note that motivational intensity theory makes predictions about effort mobilization at one point in time but not about task persistence.

difficulty level at which individuals disengage (i.e., success importance). Thus, in the easy task, effort mobilization should be low and independent of the strength of the implicit achievement motive. Given that individuals with a high implicit achievement motive should have the desire to achieve a standard of excellence and to develop skill mastery, they should invest high effort in the memory task with a high difficulty standard, whereas individuals with a low implicit achievement motive should not engage in such situations where a large amount of effort is required to succeed.

In the second study, the impact of the implicit achievement motive on effort mobilization should depend on the clarity of task difficulty. In the easy task, effort mobilization should be low and independent of the strength of the implicit achievement motive. In the unclear task, implicit achievement motive (nAch) strength should directly determine success importance and effort mobilization: the stronger the motive, the higher both the success importance and the effort mobilization. Both studies enabled a comparison of the opposing predictions of the motive literature (i.e., direct nAch effect on effort; McClelland, 1987) and motivational intensity theory (i.e., nAch effect moderated by difficulty level and clarity of task difficulty; Brehm & Self, 1989). As in preceding work on motivational intensity theory, we used cardiovascular indicators of myocardial sympathetic activity to test our effort-related predictions (Richter et al., 2016). All study procedures obtained IRB approval based on the declaration of Helsinki and its later amendments. The experimental scripts are available at https://doi.org/10.26037/yareta:mi56pz7tszfwnf2p3kggmurbd4.

2. Study 1

2.1. Participants and design

We aimed at collecting valid data of 86 participants for the analysis of cardiovascular reactivity, especially PEP reactivity. This estimation was determined in an a priori power analysis using G*Power's (Faul et al., 2007) independent samples *t*-test procedure (one-tailed) for the planned a priori contrast of PEP reactivity, our primary dependent variable (see data processing and analysis section). Based on Mazeres et al.'s (2019) PEP reactivity results, we expected a medium to large effect size of $d = 0.72$ and specified an alpha error probability of 0.05 and a power of 0.95.

Data were collected in two sessions in a computer room and a laboratory, respectively, at the University of Geneva. In a screening session, we administered the Picture Story Exercise (PSE; Schultheiss & Pang, 2007) to 294 university students who participated for partial course credit of an introductory psychology class. Via an anonymous four-letter code that guaranteed participants' anonymity, we then selected and invited 80 individuals with nAch scores in the lower quartile of all participants' scores ($\leq$7.37) and 80 individuals with nAch scores in the upper quartile ($\geq$11.41) to participate in the second session (see also Richter et al., 2012).

From this pool of 160 eligible participants, 98 students took part in the laboratory session one to two months later; The other 62 participants took part in other studies or had already achieved their necessary course credits. Data of 10 participants could not be used for analysis for the following reasons: Poor signal quality of the impedance cardiogram (eight participants) and medication influencing myocardial sympathetic activity (two participants). The final sample thus consisted of 88 participants (73 women, mean age = 20.68 years, $SD = 2.81$), of whom 46 participants (38 women, mean age = 20.11, $SD = 1.84$) with a PSE score ≤ 7.37 ($M = 4.85$, $SD = 1.92$, range = 1.15 to 7.35) constituted the low-nAch group and 42 participants (35 women, mean age = 21.31, $SD = 3.50$) with a PSE score ≥ 11.41 ($M = 14.03$, $SD = 1.89$, range = 11.41 to 18.71) constituted the high-nAch group. Participants either received partial course credit or approximately 20 USD. They were randomly assigned to one of two task difficulty conditions (easy vs. difficult). Final cell distributions were as follows: 21 participants (17 women) in the easy-high-nAch condition, 21 participants (17 women) in the easy-low-nAch condition, 25 participants (21 women) in the difficult-low-nAch condition, and 21 participants (18 women) in the difficult-high-nAch condition. Given the few men in our sample, we repeated all analyses excluding male participants. The patterns of results did not change for any of the analyses.

2.2. Measures and materials

2.2.1. Cardiovascular measures

We measured pre-ejection period (PEP), systolic blood pressure (SBP), diastolic blood pressure (DBP), and heart rate (HR) during two periods: habituation (rest period) and task performance. PEP constituted our primary dependent variable. HR refers to the number of heartbeats per minute. It depends on sympathetic as well as parasympathetic activity. SBP represents the maximum blood pressure after the ejection of blood from the left ventricle into the aorta following a heartbeat. It is influenced by sympathetic nervous system impact on the force of the heart's contraction but also by HR and total peripheral resistance, which are less systematically related to sympathetic impact on the heart. DBP represents the minimum blood pressure between two heartbeats and is influenced by the same parameters as SBP (Levick, 2003). SBP was assessed to enable comparisons with preceding research on motivational intensity theory, which strongly relied on SBP as effort-related measure (Richter et al., 2016). DBP and HR were assessed to verify that PEP responses reflected changes in myocardial sympathetic activity and not pre- or afterload effects (Obrist, 1981; Obrist et al., 1987; Sherwood et al., 1990).

PEP was assessed using an impedance cardiogram (ICG) and an electrocardiogram (ECG) collected with a CardioScreen1000 system (Medis, Ilmenau, Germany) at a sampling rate of 1000 Hz. Four dual gel-pad sensors (medis-ZTECT™) were placed on the right and left sides of the base of participants' neck and on the right and left middle axillary lines at the level of the xiphoid. The ICG and ECG signals were analyzed off-line with BlueBox software (Richter, 2014) to determine PEP (in milliseconds [ms]) and HR (in beats per minute [bpm]). SBP (in millimeters of mercury [mmHg]) and DBP (in millimeters of mercury [mmHg]) were measured using a Dinamap Procare monitor (GE Medical Systems, Information Technologies Inc., Milwaukee, WI), which uses the oscillometric method to determine arterial blood pressure. A blood pressure cuff was placed over the brachial artery above the elbow of participants' nondominant arm, and one blood pressure reading was obtained every minute.

2.2.2. Picture-story exercise

nAch strength was measured using a variant of the Thematic Apperception Test (TAT; McClelland et al., 1953; Murray, 1943): the Picture Story Exercise (PSE). Six pictures were presented on the computer screen in random order, four of which (pictures 1–4) are considered to have a high pull for nAch imagery, that is, they normally elicit "at least one scorable instance of imagery for a given motive in more than 50% of participants" (Schultheiss & Pang, 2007, p. 331). The pictures depicted (1) two female scientists working in a laboratory, (2) a boxer, (3) a man and a woman on a trapeze, (4) a cycling race (5) a ship's captain, and (6) a couple by the river. These pictures have been successfully used in previous research on implicit motives, and their properties including pull information are described in Schultheiss and Pang (2007). Each picture was presented for 15 s. Following the presentation of each picture, participants had five minutes to write an imaginative story related to the content of the picture (Pang, 2010). Afterwards, the next picture was presented so that participants spent about 30 min on the entire PSE. We made use of Winter's (1994) widely used and validated *running text scoring system* to code participants' achievement motive score. The advantage of the running text system over previous scoring systems is the considerable reduction of time necessary for coding (Schultheiss & Pang, 2007). This comes with the disadvantage of a less differentiated assessment, for instance, in terms of hope for success versus fear of failure (e.g., Heckhausen, 1963). As such a differentiation was not deemed necessary for the present research question (see Discussion section), we opted for the less time-consuming running text system. Stories were coded for achievement imagery using the following five categories: (1) adjectives that positively evaluate performances, (2) goals or performances that are described in ways that suggest positive evaluation, (3) mention of winning or competing with others, (4) failure, doing badly, or other lack of excellence, and (5) unique accomplishments. Two trained scorers who had previously attained over 85% agreement with training materials pre-scored by experts (Winter, 1994) coded all stories. The two coders double-coded 30% of all stories and reached a high agreement (ICC[2,1] = 0.87) on these stories.

In the low-nAch group, the mean nAch raw score was 3.32 (SD = 1.61), the average number of words written across the six stories was 712.22 (SD = 176.66), and the correlation between both variables was positive, r = 0.48. In the high-nAch group, the mean nAch raw score was 8.38 (SD = 2.44), the average number of words was 584.60 (SD = 160.04), and the correlation between nAch raw scores and written words was r = 0.92. Given the relationship between word count and nAch raw scores, we expressed nAch scores in terms of motive images per 1000 words throughout the manuscript, as recommended by Schultheiss and Pang (2007). The distribution of the word-corrected nAch scores is depicted in the Supplemental Material (Figure S1).[2]

2.3. Procedure and experimental task

The individual experimental sessions took about 30 min and used experimental software (Inquisit 4.0, Millisecond Software, Seattle, WA) to present information and collect participants' responses. At the beginning of the session, the experimenter, who was blind to hypotheses and to participants' nAch groups, explained the procedure to the participant. After having obtained informed consent, the experimenter attached the electrodes and blood pressure cuff, started the experimental software, and monitored the experiment from an outside control room. Participants first completed a demographic questionnaire that assessed their age and gender. They then watched a relaxing movie depicting underwater landscapes for eight minutes, during which cardiovascular baseline measures were taken.

Participants then received instructions for the memory task and were told that memory span performance reflected intellectual abilities. They learned that they would have to memorize digits presented one after another on the screen and subsequently enter them in the correct order using the keyboard. Each trial started with a fixation cross displayed centrally for 500 ms followed by the digit series. Trial duration was the same in both difficulty conditions, but the conditions differed regarding the number of presented digits. In the easy condition, each series consisted of three digits displayed for 1000 ms each and followed by a blank screen presented for 6200 ms. In the difficult condition, eight digits were presented for 600 ms each with a blank screen presented for 2100 ms between the individual digits. At the end of each digit series, participants had eight seconds to enter the digit series. For each series that they entered, they received an immediate feedback ("correct" or "incorrect"). Participants could repeatedly rectify their response during the allotted time window if the preceding response was incorrect. Following the final feedback at the end of the eight-second response time window, another feedback screen displayed the correct response and the sentence "You have correctly memorized X series out of 10". Participants in the high-nAch group should find this self-referenced feedback structure of the task motive-arousing, since they could track their own performance and individual progress (Brunstein & Maier, 2005). Participants memorized 10 series of digits for a total task duration of 5 min and 15 s. After the task, participants rated their engagement during the task period ("To what extent did you stay engaged during the memory task?"), the difficulty of the task ("To what extent did the task appear difficult to you?"), and success importance ("To what extent was success on this task important for you?") on 7-point scales ranging from "not at all" (1) to "very much" (7). Finally, participants were carefully debriefed.

2.4. Data processing and analysis

The collected ICG signals were differentiated off-line and the resulting dZ/dt signal was used in combination with the ECG R-peaks to construct ensemble averages for each minute. R-onset and B-point were scored for each ensemble average by two independent raters following Sherwood et al.'s (1990) guidelines. PEP was computed as the time interval between R-onset and B-point, and the arithmetic means of both raters' PEP values (ICCs[2,1] > 0.95) were used in the statistical analyses. HR was determined by counting the detected R-peaks for each minute. For all cardiovascular parameters we computed the arithmetic means of the 1-minute scores of the last four minutes of the habituation period (Brinkmann & Franzen, 2017; Mazeres et al., 2019) and the first five minutes of the task period (Cronbach's αs > 0.99) to obtain cardiovascular baseline and task scores. Baseline scores were subtracted from task scores to obtain change scores (Llabre et al., 1991).

To test motivational intensity theory's hypothesis about the impact of nAch on the relationship between task difficult and effort, we calculated an a-priori planned contrast for our specific, directional hypothesis about PEP reactivity (Rosenthal & Rosnow, 1985). Contrast weights were −1 for the easy conditions, −1 for the difficult-low-nAch condition, and +3 for the difficult-high-nAch condition. To compare motivational intensity theory's hypothesis with the nAch-main-effect hypothesis suggested by the motive literature, we computed Bayes Factors (Masson, 2011; Richter, 2016; Wagenmakers, 2007) comparing both models. We conducted the same tests for our secondary dependent variables, that is, SBP, DBP, and HR reactivity. Finally, we conducted exploratory omnibus 2 × 2 ANOVAs on task performance and subjective measures.

2.5. Results and discussion

2.5.1. Cardiovascular measures

Means and standard errors of cardiovascular baseline scores are shown in Table 1. Means and standard errors of cardiovascular reactivity scores are displayed in Table 2. Supporting motivational intensity theory's prediction that nAch exerts an indirect impact on effort, the planned contrast was significant for PEP reactivity, $t(84) = -3.96$, $p < .001$, $\eta^2_p = .16$.[3] PEP reactivity was low and independent of nAch if task difficult was low. However, if the task was difficult, PEP reactivity of individuals with a high nAch was stronger than PEP reactivity of individuals with a low nAch. Fig. 1 displays this pattern. A comparison of motivational intensity theory's predictions with the motive main effect model resulted in a BF of 0.84, thereby providing no strong evidence in favor of one of the two models.

The significant planned contrast for SBP reactivity, $t(84) = 2.03$, $p = .02$, $\eta^2_p = .05$, is in line with preceding work on motivational intensity that found that SBP generally mirrored the PEP response pattern. SBP reactivity was high in the difficult conditions and low in the easy conditions. The model comparison provided no evidence in favor of either model, BF = 0.66. The planned contrast was also significant for DBP

[2] When comparing the distributions or means of the raw and word-corrected nAch scores with those from other studies, please note that PSE scores are subject to language and cultural differences, and that scores might not be readily comparable (see Hofer, 2010). Most of the published research on implicit motives stems from English- or German-speaking countries, whereas the present data were collected in the French-speaking part of Switzerland.

[3] We tested our a priori contrasts one-tailed given that they referred to a theory-driven, directional hypothesis.

Table 1
Means and standard errors of cardiovascular baseline scores in Study 1.

Condition	*M*	*SE*
	PEP baseline score	
Easy-low-nAch	96.77	1.37
Easy-high-nAch	97.33	2.25
Difficult-low-nAch	98.20	1.46
Difficult-high-nAch	97.91	1.80
	SBP baseline score	
Easy-low-nAch	103.10	2.33
Easy-high-nAch	103.48	1.61
Difficult-low-nAch	99.03	2.01
Difficult-high-nAch	97.13	1.68
	DBP baseline score	
Easy-low-nAch	56.99	1.16
Easy-high-nAch	58.36	1.36
Difficult-low-nAch	54.98	1.14
Difficult-high-nAch	54.88	1.13
	HR baseline score	
Easy-low-nAch	75.69	2.67
Easy-high-nAch	77.98	2.60
Difficult-low-nAch	76.48	2.39
Difficult-high-nAch	76.76	2.56

Note. PEP is in milliseconds, *SBP* and *DBP* are in millimeters of mercury, and *HR* is in beats per minute.

Table 2
Means and standard errors of cardiovascular reactivity scores in Study 1.

Condition	*M*	*SE*
	PEP reactivity score	
Easy-low-nAch	−0.87	0.75
Easy-high-nAch	−2.92	0.98
Difficult-low-nAch	−1.74	1.00
Difficult-high-nAch	−6.60	1.27
	SBP reactivity score	
Easy-low-nAch	0.87	0.84
Easy-high-nAch	2.23	1.26
Difficult-low-nAch	6.40	1.13
Difficult-high-nAch	5.89	1.28
	DBP reactivity score	
Easy-low-nAch	1.40	0.60
Easy-high-nAch	1.55	0.74
Difficult-low-nAch	4.53	0.86
Difficult-high-nAch	4.72	0.73
	HR reactivity score	
Easy-low-nAch	1.58	0.72
Easy-high-nAch	2.63	0.68
Difficult-low-nAch	5.17	1.02
Difficult-high-nAch	4.89	1.41

Note. PEP is in milliseconds, *SBP* and *DBP* are in millimeters of mercury, and *HR* is in beats per minute.

reactivity, $t(84) = 2.52, p < .01, \eta^2_p = .07$. DBP reactivity was high in the difficult-high-nAch condition, lower in the difficult-low-nAch group, and low in the easy conditions. The planned contrast was not significant for HR reactivity, $t(84) = 1.49$, $p = .07$, $\eta^2_p = .03$. *BF*s comparing motivational intensity theory with the motive main effect model were 1.96 (DBP reactivity) and 0.28 (HR reactivity), thereby either not favoring one of the two models (DBP) or providing moderate evidence in favor of the motive main effect model (HR).

2.5.2. *Task performance and subjective measures*

Means and standard errors of task performance and subjective measures are shown in Table 3. A significant difficulty main effect in a 2 (task difficulty) × 2 (nAch group) ANOVA demonstrated that participants perceived the difficult task to be more difficult than the easy version, $F(1, 84) = 323.12$, $p < .001$, $\eta^2_p = .79$. Participants in the easy conditions rated the task to be easier than participants in the difficult conditions. The nAch group main effect, $F(1, 84) = 0.35$, $p = .56$, and the interaction effect, $F(1, 84) = 0.03$, $p = .86$, were not significant. A 2 (task difficulty) × 2 (nAch group) ANOVA of the engagement ratings revealed no significant effects: Difficulty main effect: $F(1, 84) = 2.58$, $p = .11$; nAch group main effect: $F(1, 84) = 3.75$, $p = .06$; interaction effect: $F(1, 84) = 0.15$, $p = .70$. Similarly, a 2 (task difficulty) × 2 (nAch group) ANOVA of the perceived success importance ratings revealed no significant effects: Difficulty main effect: $F(1, 84) = 0.15$, $p = .70$; nAch group main effect: $F(1, 84) = 1.95$, $p = .17$; interaction effect: $F(1, 84) = 0.15$, $p = .70$.

A 2 (task difficulty) × 2 (nAch group) ANOVA of task performance revealed a significant difficulty main effect, $F(1, 84) = 251.86$, $p < .001$, $\eta^2_p = .75$, but neither a nAch group main effect, $F(1, 84) = 0.13$, $p = .72$, nor an interaction effect, $F(1, 84) = 0.46$, $p = .50$. Participants in the easy conditions performed better than participants in the difficult conditions. We also computed correlations between task performance and PEP reactivity. Whereas performance was not associated with PEP

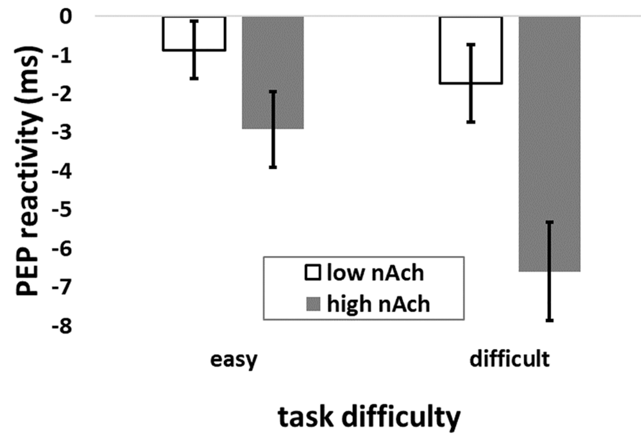

Fig. 1. Cell means and standard errors of pre-ejection period reactivity (in ms) during the memory span task in Study 1.

Table 3
Means and standard errors of task performance and subjective measures in Study 1.

Condition	*M*	*SE*
	Subjective task difficulty	
Easy-low-nAch	1.33	0.13
Easy-high-nAch	1.24	0.09
Difficult-low-nAch	5.56	0.22
Difficult-high-nAch	5.38	0.37
	Success importance	
Easy-low-nAch	4.67	0.38
Easy-high-nAch	4.33	0.36
Difficult-low-nAch	4.92	0.33
Difficult-high-nAch	4.33	0.23
	Engagement during the task period	
Easy-low-nAch	5.81	0.33
Easy-high-nAch	5.14	0.33
Difficult-low-nAch	6.16	0.21
Difficult-high-nAch	5.71	0.29
	Task Performance	
Easy-low-nAch	9.76	0.15
Easy-high-nAch	9.62	0.18
Difficult-low-nAch	2.24	0.52
Difficult-high-nAch	2.71	0.68

Note. Subjective task difficulty, success importance, and engagement during the task period were evaluated on 7-point Likert scales ranging from "*not at all*" (1) to "*very much*" (7). Task performance could vary from 0 to 10 correctly memorized digit series.

reactivity in the easy condition, $r(42) = -0.09$, there was a weak negative correlation in the difficult condition, $r(46) = -0.28$, indicating that participants who mobilized more effort (i.e., more negative PEP reactivity) performed better.

2.5.3. Discussion

The main finding of this first study was the significant planned contrast for PEP reactivity. This result showed that nAch had an indirect (e.g., moderating) impact on effort when task difficulty was fixed, clear, and possible: Independent of their nAch individuals mobilized little effort in the easy task. In the difficult task, individuals with a low nAch mobilized little effort, whereas individuals with a high nAch mobilized high effort. SBP and DBP reactivity were similar to the PEP reactivity pattern.

3. Study 2

The purpose of Study 2 was to provide first evidence that nAch has a direct impact on effort if task difficulty is unclear but not if it is clear and easy.

3.1. Participants and design

Based on the same considerations as in Study 1, we aimed at collecting valid data of 86 participants. Data were collected in two sessions in a computer room and a laboratory, respectively, at the University of Geneva. In a screening session, we administered the Picture Story Exercise (PSE; Schultheiss & Pang, 2007) to 589 university students who participated for partial course credit of an introductory psychology class. As the laboratory session took place about 6 months after the screening session and many students had already achieved their necessary course credits at that time of the academic year, we could not create extreme groups as in Study 1. Instead, all participants who wished to participate were allowed to take part in the laboratory session for partial course credit. We created two nAch groups by using a median split of participants' PSE scores that were matched to the data from the laboratory session via an anonymous four-letter code.

From the 91 participants in the laboratory session, data of three participants could not be used for analysis because of poor signal quality of the ICG. The final sample thus consisted of 88 participants (73 women, mean age = 20.92 years, $SD = 4.52$). Forty-four participants (40 women, mean age = 21.45, $SD = 5.71$) with a PSE score < 7.49 ($M = 4.90$, $SD = 1.56$, range = 1.44 to 7.35) constituted the low-nAch group. Forty-four participants (33 women, mean age = 20.39, $SD = 2.86$) with a PSE score ≥ 7.49 ($M = 11.00$, $SD = 2.26$, range = 7.63 to 15.63) constituted the high-nAch group. Participants were randomly assigned to one of two clarity of task difficulty conditions (easy vs. unclear). Final cell distributions were as follows: 20 participants (15 women) in the easy-high-nAch condition, 26 participants (25 women) in the easy-low-nAch condition, 18 participants (15 women) in the unclear-low-nAch condition, and 24 participants (18 women) in the unclear-high-nAch condition. Given the few men in our sample, we repeated all analyses by including women only. The patterns of results did not change for any of the analyses.

3.2. Measures and materials

We used the same cardiovascular measures and materials as in Study 1. Furthermore, we used the same measure and materials for assessing the strength of the implicit achievement motive as in Study 1. Three trained scorers who had previously attained over 85% agreement with training materials pre-scored by experts (Winter, 1994) coded all stories. The three coders double-coded 30% of all stories and reached a high agreement (ICC[2,1] = 0.87) on these stories. In the low-nAch group, the mean nAch raw score was 3.64 ($SD = 1.63$), the average number of words written across the six stories was 702.93 ($SD = 177.90$), and the correlation between both variables was positive, $r = 0.57$. In the high-nAch group, the mean nAch raw score was 7.35 ($SD = 2.71$), the average number of words was 654.62 ($SD = 204.27$), and the correlation between nAch raw scores and word count was $r = 0.72$. As in Study 1, we thus expressed nAch scores in terms of motive images per 1000 words. The distribution of the word-corrected nAch scores is depicted in the Supplemental Material (Figure S2).

3.3. Procedure and experimental task

The individual experimental sessions took about 35 min and used experimental software (Inquisit 4.0, Millisecond Software, Seattle, WA) to present information and collect participants' responses. At the beginning of the session, the experimenter, who was blind to hypotheses and to participants' nAch groups, explained the procedure to the participant. After having obtained informed consent, the experimenter attached the electrodes and blood pressure cuff, started the experimental software, and monitored the experiment from an outside control room. Participants first completed a demographic questionnaire that assessed their age and gender. They then watched a relaxing movie depicting underwater landscapes for eight minutes during which cardiovascular baseline measures were taken.

Participants then received instructions for the mental arithmetic task (LaGory et al., 2011). They learned that they would have to add up single-digit numbers presented one after another on the screen and enter the final total using the keyboard. Each trial started with a fixation cross displayed centrally for 500 ms followed by the digit series. Trial duration was the same in both difficulty conditions, but the conditions differed regarding the presented digits and the number of presented digits. In the easy condition, the digit series included only the digits 1 and 2 and each series consisted of six digits displayed for 600 ms and followed by a blank screen presented for 4400 ms (see Mazeres et al., 2019). In the unclear condition, 6 to 30 digits between 1 and 2 or 1 and 9 were presented for 600 ms with a blank screen presented for 400, 1400 or 4400 ms between the individual digits. The difficulty of the trials varied randomly, and participants could not predict the difficulty of the upcoming trials. At the end of each digit series, participants had 10 s to enter the total. For each total that they entered, they received an immediate feedback ("correct" or "incorrect"). Participants could repeatedly correct their response during the allotted time window if the preceding response was incorrect. As in Study 1, we presented a self-referenced feedback at the end of the response time window, indicating the participant's last entry, the correct response, and the sentence "Currently, you have correctly solved X out of 10 additions" so that participants could track their own performance and individual progress. Participants performed 10 additions for a total task duration of 6 min and 25 s. Afterwards, participants rated their engagement during the task period ("To what extent did you stay engaged during the mental arithmetic task?") and the difficulty of the task ("To what extent did the task appear difficult to you?") on 7-point scales ranging from "not at all" (1) to "very much" (7). Finally, participants were carefully debriefed.

3.4. Data processing and analysis

Data processing and analysis were similar to Study 1. The arithmetic means of both raters' PEP values were used for analyses (ICCs[2,1] = 0.91). For all cardiovascular parameters we computed the arithmetic means of the 1-minute scores of the last four minutes of the habituation period and the first six minutes of the task period (Cronbach's αs > 0.99) to obtain cardiovascular baseline and task averages. Baseline scores were subtracted from task scores to obtain change scores. To test motivational intensity theory's hypothesis, we calculated a priori contrasts modeling the contrast weights according to our predictions. We assigned contrast weights of −1 to both easy conditions, −1 to the unclear-low-nAch condition, and + 3 to the unclear-high-nAch condition. As in Study 1, we computed Bayes Factors to compare motivational intensity theory's hypothesis with the nAch-main-effect hypothesis.

3.5. Results and discussion

3.5.1. Cardiovascular measures

Means and standard errors of cardiovascular baseline scores are shown in Table 4. Means and standard errors of cardiovascular reactivity scores are displayed in Table 5. Analyses of PEP reactivity showed a significant a priori contrast $t(84) = -2.68$, $p < .01$, $\eta^2_p = .08$.[2] In the easy task, PEP reactivity was low and independent of the nAch group. In the unclear task, PEP reactivity of individuals with a high nAch was stronger than PEP reactivity of individuals with a low nAch. Fig. 2 displays this pattern. As predicted by motivational intensity theory, the achievement motive only had an impact on PEP reactivity in the unclear task. The model comparison provided no conclusive evidence in favor of one of the two models, $BF = 1.81$.

Our specified a priori contrast was significant for SBP and DBP reactivity, $t(84) = 2.43$, $p < .01$, $\eta^2_p = .07$, and $t(84) = 1.79$, $p < .04$, $\eta^2_p = .04$. In the easy task, SBP and DBP reactivity was low and independent of the nAch group. In the unclear task, individuals with a high nAch showed higher SBP and DBP reactivity than individuals with a low nAch. As predicted by motivational intensity theory, the achievement motive only had an impact on SBP and DBP in the unclear task. For SBP and DBP, the model comparison provided no conclusive evidence in favor of either model, $BF = 1.67$ and $BF = 0.33$.

Analyses of HR reactivity showed a significant a priori contrast, $t(84) = 2.66$, $p < .01$, $\eta^2_p = .08$. In the easy task, HR reactivity was low and independent of the nAch group. However, in the unclear task, HR reactivity of individuals with a high nAch was stronger than HR reactivity of individuals with a low nAch. As predicted by motivational intensity theory, the achievement motive only had an impact on HR in the unclear task. The model comparison provided moderate evidence in favor of motivational intensity theory's prediction, $BF = 3.90$.

3.5.2. Task performance and subjective measures

Means and standard errors of task performance and subjective measures are shown in Table 6. A significant difficulty main effect in a 2 (task difficulty) × 2 (nAch group) ANOVA demonstrated that participants perceived the unclear task version to be more difficult than the easy version, $F(1, 84) = 149.92$, $p < .001$, $\eta^2_p = .64$. There was neither a nAch group main effect, $F(1, 84)$, $= 0.15$, $p = .70$, nor an interaction

Table 4
Means and standard errors of cardiovascular baseline scores in Study 2.

Condition	*M*	*SE*
	PEP baseline score	
Easy-low-nAch	100.68	1.72
Easy-high-nAch	101.66	4.00
Unclear-low-nAch	101.58	2.53
Unclear-high-nAch	101.04	1.74
	SBP baseline score	
Easy-low-nAch	99.19	1.23
Easy-high-nAch	99.77	2.18
Unclear-low-nAch	102.58	2.30
Unclear-high-nAch	100.91	1.67
	DBP baseline score	
Easy-low-nAch	55.44	0.91
Easy-high-nAch	54.71	1.63
Unclear-low-nAch	58.86	1.66
Unclear-high-nAch	55.54	1.25
	HR baseline score	
Easy-low-nAch	75.11	2.18
Easy-high-nAch	78.18	2.73
Unclear-low-nAch	74.60	2.25
Unclear-high-nAch	77.35	2.29

Note. PEP is in milliseconds, *SBP* and *DBP* are in millimeters of mercury, and *HR* is in beats per minute.

Table 5
Means and standard errors of cardiovascular reactivity scores in Study 2.

Condition	*M*	*SE*
	PEP reactivity score	
Easy-low-nAch	−1.40	0.52
Easy-high-nAch	−2.08	0.54
Unclear-low-nAch	−2.62	0.82
Unclear-high-nAch	−3.91	0.63
	SBP reactivity score	
Easy-low-nAch	2.06	0.83
Easy-high-nAch	2.96	0.66
Unclear-low-nAch	4.91	0.96
Unclear-high-nAch	5.69	0.96
	DBP reactivity score	
Easy-low-nAch	0.90	0.58
Easy-high-nAch	1.82	0.54
Unclear-low-nAch	2.43	0.77
Unclear-high-nAch	3.02	0.69
	HR reactivity score	
Easy-low-nAch	0.56	0.53
Easy-high-nAch	0.72	0.69
Unclear-low-nAch	3.21	1.06
Unclear-high-nAch	3.70	0.74

Note. PEP is in milliseconds, *SBP* and *DBP* are in millimeters of mercury, and *HR* is in beats per minute.

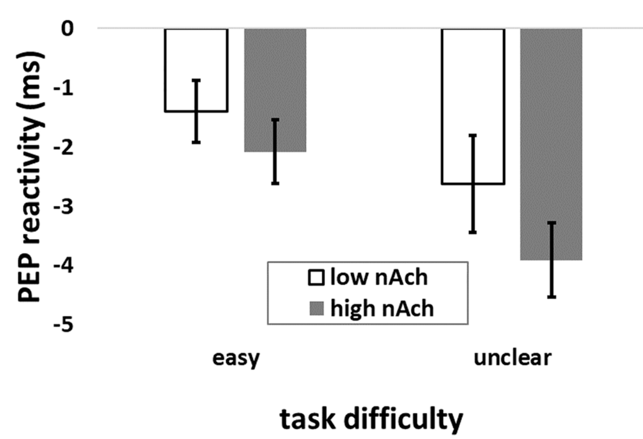

Fig. 2. Cell means and standard errors of pre-ejection period reactivity (in ms) during the arithmetic task in Study 2.

Table 6
Means and standard errors of task performance and subjective measures in Study 2.

Condition	*M*	*SE*
	Subjective task difficulty	
Easy-low-nAch	1.38	0.10
Easy-high-nAch	1.35	0.17
Unclear-low-nAch	4.22	0.35
Unclear-high-nAch	4.08	0.27
	Engagement during the task period	
Easy-low-nAch	4.77	0.35
Easy-high-nAch	5.40	0.45
Unclear-low-nAch	5.33	0.33
Unclear-high-nAch	5.75	0.15
	Task Performance	
Easy-low-nAch	9.15	0.31
Easy-high-nAch	9.10	0.32
Unclear-low-nAch	8.17	0.33
Unclear-high-nAch	7.63	0.33

Note. Subjective task difficulty and engagement during the task period were evaluated on 7-point Likert scales ranging from "*not at all*" (1) to "*very much*" (7). Task performance could vary from 0 to 10 correctly solved additions.

effect, $F(1, 84), = 0.05$, $p = .82$. A 2 (task difficulty) × 2 (nAch group) ANOVA of the engagement ratings revealed no significant main or interaction effects: Difficulty main effect: $F(1, 84), = 1.84$, $p = .18$; nAch group main effect: $F(1, 84), = 2.41$, $p = .12$; interaction effect: $F(1, 84), = 0.10$, $p = .75$. A 2 (task difficulty) × 2 (nAch group) ANOVA of task performance revealed a significant difficulty main effect, $F(1, 84) = 13.90$, $p < .001$, $\eta^2_p = .14$. Participants in the unclear task resolved less additions than participants in the easy task, independent of nAch group. There was neither a nAch group main effect, $F(1, 84), = 0.81$, $p = .37$, nor an interaction effect, $F(1, 84), = 0.55$, $p = .46$. Task performance was unrelated to PEP reactivity in both conditions: easy condition $r(46) = 0.11$, unclear condition $r(42) = 0.07$.

3.5.3. Discussion

The findings of Study 2 conceptually replicated and complemented those of Study 1. These results showed that the implicit achievement motive had a direct impact on effort when task difficulty was unclear: Individuals with a low implicit achievement motive mobilized less effort—that is, showed weaker PEP reactivity—than individuals with a high implicit achievement motive. When task difficulty was clear and easy, effort—PEP reactivity—was low and independent of the implicit achievement motive. Results of SBP, DBP, and HR reactivity mirrored the pattern of PEP reactivity. The clarity of task difficulty thus plays an important role in determining effort mobilization.

4. General discussion

Study 1 demonstrated the indirect (e.g., moderating) impact of the implicit achievement motive on effort-related cardiovascular response under conditions of clear and fixed task difficulty. In the easy task, PEP reactivity was low and independent of the implicit achievement motive. In the difficult task, PEP response was stronger in the high-implicit-achievement-motive group than in the low-implicit-achievement-motive group. These results are consistent with a recent study about the impact of the implicit achievement motive on effort by Mazeres et al. (2019) and conceptually replicate these previous findings using a different cognitive task—Mazeres and colleagues had used a mental arithmetic task—and a larger sample size. Study 2 demonstrated that the impact of the implicit achievement motive on effort-related cardiovascular response was dependent on task clarity. In the clear and easy task, PEP response was low and independent of the implicit achievement motive. In the unclear task, however, the implicit achievement motive had a direct impact on effort.

In both studies, SBP reactivity mirrored PEP reactivity. These results are in line with a wealth of studies using SBP to test motivational intensity theory's effort-related hypotheses (Gendolla et al., 2019). In addition, HR and DBP reactivity roughly reflected the PEP pattern. This is important because decreases in HR and DBP would have indicated that increases in preload (i.e., ventricular filling before the ejection of the blood into the aorta) or decreases in afterload (i.e., the load that opposes the ejection of blood into the aorta) were responsible for the observed PEP increases (Obrist, 1981; Obrist et al., 1987; Sherwood et al., 1990)—instead of changes in myocardial sympathetic activity. As this was not the case in our studies, it is most likely that PEP response reflected increased sympathetic activity and thus effort mobilized during task performance.

We also compared the prediction of the general literature on motives postulating a direct impact of the achievement motive on effort with the interaction hypothesis based on motivational intensity theory using Bayes Factors. In both studies, there was no evidence in favor of either model regarding PEP, SBP, or DBP reactivity. Bayes Factors for HR reactivity favored the main-effect model in Study 1 and the interaction-effect model in Study 2. Taken together, the significant a priori contrasts illustrate that motivational intensity theory's interaction hypothesis offers a good explanation of the data of both studies, but the Bayes Factors revealed that the data can be equally well explained by an achievement motive main-effect model. Notwithstanding, the present studies, together with the Mazeres et al. (2019) study, highlight the importance of taking task difficulty and task clarity into account and suggest that the role of those effort determinants must not be disregarded if implicit achievement motive effects on behavior are examined.

Concerning the exploratory analyses of our subjective measures, we found a significant task difficulty main effect on participants' task difficulty ratings in both studies. Independent of the implicit achievement motive group, individuals evaluated the difficult or unclear tasks as more difficult than the easy task, thereby demonstrating a successful manipulation of task difficulty. In both studies, participants' self-reported engagement during the task period did not vary as a function of task difficulty or achievement motive group. Furthermore, in Study 1, we did not find the expected achievement motive main effect on perceived success importance. It is important to note that previous studies using similar experimental paradigms have also revealed expected effects on cardiovascular reactivity without finding significant effects on self-report measures (e.g., Freydefont et al., 2012). Furthermore, self-reports are subject to socially desirable and self-protective answers (e.g., Pyszczynski & Greenberg, 1983; Rhodewalt & Fairfield, 1991) and their retrospective assessment makes them vulnerable to several types of biases (Robinson & Clore, 2002). Taken these facts together, the non-significant engagement and success importance ratings might be a problem inherent to its measurement rather than a threat to the theoretical assumptions underlying motivational intensity theory.

Regarding the exploratory analyses of performance outcomes, we found a significant task difficulty main effect on the number of correctly memorized digit series (Study 1) and on the number of correctly solved additions (Study 2). In contrast to the motive literature suggesting that high achievement motivated individuals should have better performance outcomes than low achievement motivated individuals, we observed no difference in performance outcomes between individuals with a low and a high implicit achievement motive. In both studies, participants performed better in the clear and easy tasks than in the clear and difficult task (Study 1) and in the unclear task (Study 2). This result can be explained by the fact that the easy tasks were very easy, leading to better performance in these conditions. To determine the role of the achievement motive, we performed additional correlation analyses between PEP reactivity and performance. Whereas there were no associations in Study 2 in both task conditions, we found a negative correlation in Study 1, indicating that participants who mobilized more effort in the difficult task (i.e., had more negative PEP reactivity values) performed better. This latter result suggests that performance differences between individuals with low and high achievement motives in past studies (e.g., Rothstein et al., 1994; Wegner & Teubel, 2014) have been found in rather difficult tasks, even if task features have not explicitly been reported. Finally, it is of note that past research in the framework of motivational intensity theory did not always find substantial associations between effort and performance and that effort is only one of several determinants of performance outcomes (e.g., Gendolla & Richter, 2005; Richter et al., 2008).

We have deliberately not taken into consideration a further differentiation of the achievement motive, that is, the two components fear of failure and hope for success (Heckhausen, 1963). Capa et al. (2008) have differentiated between individuals with a predominant, explicit motive to achieve success and participants with a predominant, explicit motive to avoid failure. They have observed stronger effort mobilization—assessed as reduced midfrequency heart rate variability—by approach-driven participants compared to avoidance-driven participants during a difficult visual memory search task. These findings thus suggest that the motivational direction of the motive might play a role. However, from a theoretical point of view, both components are indicative of a high achievement motive, and achievement behavior can be guided by both, fear of failure and hope for success (Elliot & Dweck, 2005; Schultheiss & Brunstein, 2005). Put differently, both components should make success in the task more important and therefore lead to high maximally justified effort, even though for different reasons: One person might want to excel and experience positive affect from mastering a challenge whereas another person might seek to avoid the negative affect associated with failure. Therefore, several coding schemes like Winter's (1994) manual conflate both components to indicate a high achievement motive. For the same reason, a differentiation is not necessarily appropriate in the context of the present research question.

There are a couple of limitations and issues of the present studies that should be addressed in future research. First, power considerations and samples sizes for the present studies were based on the a priori contrast of our primary dependent variable, that is, PEP reactivity. It is conceivable that our studies were underpowered regarding the other, more exploratory analyses. Second, whereas Study 1 conceptually replicates a previous study, Study 2 provides the first evidence for the impact of the implicit achievement motive under conditions of unclear task difficulty and calls for a conceptual replication. Specifically, due to the variation from very easy to extremely difficult trials in the unclear condition, this condition was perceived as more difficult and resulted in worse performance than the easy condition. To rule out the possibility that higher task difficulty caused the effects in Study 2, perceived clarity of difficulty might be assessed. From a theoretical perspective, a fixed and clear, high difficulty task should result in a twofold pattern where participants with a strong achievement motive mobilize high effort and participants with a weak achievement motive disengage. In contrast, an unclear difficulty should result in a proportional increase in effort with increasing motive strength. Inspection of the data of Study 2 revealed that cardiovascular reactivity indeed increased with increasing motive strength, thus corroborating our interpretation in terms of unclear difficulty.

Third, other hypotheses derived from motivational intensity theory (Brehm & Self, 1989) might be investigated as, for instance, the postulated disengagement of all participants independent of motive strength in an impossible task (see Wright et al., 1998, for a similar design). Moreover, a within-subjects design might be used to confirm the expected differences in effort mobilization as a function of task clarity and task difficulty (e.g., Stewart et al., 2016). Such a design might eliminate interindividual differences in cardiovascular baseline and responding and provide a conceptual replication of our findings.

Fourth, our participants were University students whose achievement motive can be expected to be rather high. Future studies might seek other contexts and populations where the achievement motive is not necessarily dominant (e.g., a family context or people in nursing professions). It is possible that with a larger spread of achievement motive scores the present effects on effort mobilization are even stronger, and that stronger correlations of effort and performance emerge than in the present studies.

Fifth, even though we successfully manipulated task difficulty according to the self-report and performance measures, the second experimental factor involved natural groups with low versus high achievement motive scores that might differ on other characteristics than their achievement motive. To be able to draw causal conclusions about the direct versus indirect impact of the implicit achievement motive on effort, future studies might manipulate its activation versus non-activation (Hart & Albarracin, 2009). Similar to the group with a high implicit achievement motive in the present studies, participants whose high achievement motive has been activated—for instance by relevant achievement incentives—should mobilize more effort for difficult or unclear tasks than for easy tasks and compared to participants whose high achievement motive has not been activated.

Finally, the present studies are limited to the implicit achievement motive. However, our theoretical model can be expanded to other motives as, for instance, the explicit achievement motive (Mazeres, Brinkmann, & Richter, 2021) or the affiliation and power motives. A recent study by Hilkenmeier and Wakefield (2018) has found that individuals with a high affiliation motive performed better when working in groups. According to a study by Trapp and Kehr (2016) individuals with a high power motive showed better negotiation performance than individuals with a low power motive. These studies about performance outcomes suggest that in situations that feature affiliation and power incentives, individuals with a high affiliation or power motive anticipate motive satisfaction. As a result, they might perceive a successful outcome of that situation as highly important and might ultimately be willing to invest high effort—e.g., in group work (affiliation) or in negotiations (power). Future studies should take these recent studies a step further and investigate effort mobilization together with performance outcomes, not only for the achievement motive but also for the affiliation and power motives.

The present research has important implications for many achievement contexts as, for instance, organizational behavior management. Many managers want their employees to put more effort into their work and by this way yield higher outcomes. Regarding achievement motivation, the role of positive reinforcement to promote success seeking in the managerial framework has been demonstrated (Wiegand & Geller, 2005). The present studies add the important notion that, even if a manager uses positive reinforcement, the achievement motivated employee will not necessarily mobilize effort if the task is not difficult. Similar results of a moderating impact on effort have been found, for instance, for individual differences in the need for closure (Richter et al., 2012) and for situations under social observation (Gendolla & Richter, 2006): Need for closure or a social-observation-manipulation do not make any difference regarding effort mobilization if a task is rather easy. Taken these results together, in an achievement context it is crucial to take into consideration both, objective and subjective task demands as well as individual differences in achievement motive strength.

To conclude, results of Study 1 add to the study by Mazeres et al. (2019) suggesting that the implicit achievement motive has an indirect impact on effort if task difficulty is known and clear. Accordingly, the strength of the achievement motive is a moderator of the relationship between task difficulty and effort and sets the upper limit of this relationship. In Study 2, results showed that the implicit achievement motive has a direct impact on effort if task difficulty is unclear. In a nutshell, the implicit achievement motive does not automatically lead to more effort. It requires difficult or unclear task difficulty conditions to exert a strong impact on effort.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A. Supplementary material

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jrp.2021.104145.

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