

# Working Hard and Working Smart: Motivation and Ability During Typical and Maximum Performance

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The distinction between what people *can* do (maximum performance) and what they *will* do (typical performance) has received considerable theoretical but scant empirical attention in industrial–organizational psychology. This study of 138 participants performing an Internet-search task offers an initial test and verification of P. R. Sackett, S. Zedeck, and L. Fogli's (1988) model of typical versus maximum performance: Motivation—in the form of direction, level, and persistence of effort exerted—rose significantly under the maximum performance condition. Consequently, the correlation between motivation—in the form of direction and level of effort—and performance diminished, whereas the correlation between ability—in the form of declarative knowledge and procedural skills—and performance increased under the maximum performance condition. Overall, results confirm the general propositions of the model. Implications for the generalizability of these findings, theory, practice, and directions for future studies of typical and maximum performance are discussed.

**Keywords:** typical performance, maximum performance, motivation, ability

The distinction between typical and maximum performance holds wide-reaching practical and theoretical implications for performance assessment (e.g., Guion, 1991, 1998), personnel selection (e.g., Ackerman & Humphreys, 1990; Arvey & Murphy, 1998; Borman, 1991; Boudreau, 1991; Campbell, 1990), and training (e.g., Dewberry, 2001; Smith-Jentsch, Salas, & Brannick, 2001). Yet empirical research on this distinction is still scarce (Klehe & Anderson, 2005; Klehe, Anderson, & Viswesvaran, 2007; Sackett, 2007), and research validating fundamental assumptions of the typical–maximum performance distinction is as yet unavailable.

When applying Cronbach's (1960) distinction between typical and maximal predictors of performance to the criterion domain, Sackett, Zedeck, and Fogli (1988) argued that the primary difference between performance during short, evaluative situations, when people show what they *can* do (maximum performance), and performance during nonevaluated, day-to-day situations, which reveal what people *will* do (typical performance), lies in the role of motivation. Whereas motivation varied during typical performance situations, it was constrained to be high during situations of max-

imum performance. The purpose of this study is to present an initial detailed examination of Sackett et al.'s propositions regarding the roles of motivation and ability during periods of typical and maximum performance conditions and thus to provide an empirically solidified foundation for research on this important distinction.

## Typical and Maximum Performance

Job performance, the behaviors relevant to the goals of the organization (Campbell, 1990; McCloy, Campbell, & Cudeck, 1994), is a function of the performer's ability and motivation (Locke, Mento, & Katcher, 1978; Maier, 1955). Campbell (1990) classified ability into (a) declarative knowledge, the ability to state the relevant facts and things, and (b) procedural knowledge and skills, the knowledge attained when knowing what to do (i.e., declarative knowledge) has been successfully combined with knowing how to do it. Motivation, Campbell argued, is the combined effect of three choices: (a) the choice to expend effort (direction), (b) the choice of which level of effort to expend (level), and (c) the choice to persist in the expenditure of that effort (persistence). Campbell further argued that performance on any task requires a minimum of both ability and motivation. The impact of ability versus motivation on performance, however, can vary across situations.

Sackett et al. (1988) introduced a continuum spanning from typical to maximum performance situations as one instance of such variation. During situations of typical performance, performers (a) are relatively unaware that their performance might be observed and evaluated, (b) are not instructed to perform their best, and (c) have their mean performance observed over an extended time period. Consequently, performers may choose to focus on their work or not (direction), to invest their full or just some partial amount of effort (level), and, over time, to maintain that level of effort or to reduce it (persistence). "In a typical performance

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setting, choices about time on task, level of effort, and persistence of effort are less constrained" (DuBois, Sackett, Zedeck, & Fogli, 1993, p. 206).

In contrast, maximum performance situations are characterized by (a) performers' explicit awareness of being evaluated, (b) their awareness and acceptance of instructions to maximize effort, and (c) a short enough time duration to enable performers to keep their attention focused on the task. Sackett et al. (1988) and DuBois et al. (1993) argued that these characteristics force motivation to be high in maximum performance situations: Direction of effort is constrained by individuals' knowledge of being monitored. DuBois et al. argued, "Unless one is inviting disciplinary action, one has little choice but to expend effort on the task in question" (p. 206). The level of effort in these experiments was high, because individuals were aware of and accepted the instruction to expend effort. Persistence was not demanded during maximum performance situations, as performance was only observed for a period brief enough that remaining focused on the task should not have been difficult (see also Sackett, 2007).

Of course, typical and maximum performance represent a continuum (Sackett et al. 1988), making any comparison between assessments relative rather than categorical. Consequently, any reference to a typical performance situation needs to be understood as being relative in comparison with a situation that is located closer toward the maximum end of the continuum, and vice versa. This given, Sackett et al.'s assumptions have considerable consequences for the impact of knowledge and skills on performance. Sackett et al. argued that, given high motivation, performance under maximum performance conditions primarily reflects performers' abilities. Consequently, work-related abilities should correlate higher with performance under maximum than under typical performance conditions. Accordingly, DuBois et al. (1993) found general mental ability to be a slightly better predictor of the maximum than of the typical speed with which supermarket cashiers processed goods. Klehe and Latham (2006) found structured selected interviews to be better predictors of typical than of maximum team playing performance among master's of business administration students. Ployhart, Lim, and Chan (2001) found that openness to experience was primarily linked to maximum and not to typical transformational leadership among Singaporean military recruits. More recent studies by Marcus, Goffin, Johnston, and Rothstein (2007), ForsterLee (2007), Ones and Viswesvaran (2007), as well as Witt and Spitzmüller (2007) largely replicated and extended these findings to other types of predictors.

None of these studies, however, tested the underlying assumption that motivation rises under maximum performance conditions or presented a comparison of performance scores across typical and maximum performance conditions. Campbell (1990), for example, questioned whether the difference between typical and maximum performance was solely a function of motivation. Kirk and Brown (2003) found significant relationships between performance on a (maximum performance) walk-through performance test and post hoc measures of the motivational predictors work domain self-efficacy and need for achievement, thus questioning the held-true but never tested assumption that motivation is constrained to be high during maximum performance situations.

## Hypotheses

Past research has measured either motivation or ability prior to (e.g., Klehe & Latham, 2006; Ployhart et al., 2001) or after (Kirk & Brown, 2003) task performance. Yet one must assess motivation and procedural skills simultaneously with performance to test Sackett et al.'s (1988) underlying assumptions concerning the development of direction, level, and persistence of effort across both typical and maximum performance periods. We therefore hypothesized the following:

*Hypothesis 1:* Participants' average motivation will be higher under maximum than under typical performance conditions: (a) Direction of effort will be more task related, (b) level of effort will be higher, and (c) level of effort will sink less throughout the maximum performance period, compared with times of typical performance.

Given the reasonable assumption that knowledge and procedural skills remain stable across performance situations and given that performance results from knowledge, skills, and motivation (Campbell, 1990), an increase in motivation during a maximum performance period should also lead to an increase in the resulting performance. As with Hypothesis 1, hardly any of the past studies comparing typical and maximum performance (Klehe & Latham, 2006; Ployhart et al., 2001; Sackett et al., 1988) reported any findings regarding this fundamental proposition.

*Hypothesis 2:* Participants' performance will be higher under maximum than under typical performance conditions.

Furthermore, it has to be tested whether the difference between typical and maximum performance is truly a function of changed motivation and not due to factors such as changes in participants' procedural skills. More precisely put, a drop in motivation from the maximum to the typical performance condition should account for the respective drop in performance.

*Hypothesis 3:* Varying performance under typical versus maximum performance conditions will be primarily due to changes in performers' motivation.

Given that maximum performance conditions force motivation to be high, whereas typical performance conditions place fewer constraints on direction, level, and persistence of effort, Sackett et al. (1988) argued that measures of motivation should be better predictors of performance under typical than under maximum performance conditions.

*Hypothesis 4 (a, b, and c):* Motivation will correlate higher with performance under typical performance conditions than under maximum performance conditions: Under typical performance conditions, (a) direction, (b) level, and (c) persistence of effort will correlate higher with participants' performance than they will under maximum performance conditions.

Besides these very proximal indicators of motivation, the same should hold true for more distal motivational constructs that influence the direction, level, and persistence of effort. Two variables that appear to be of particular interest in this respect are partici-

pants' self-efficacy in handling the task at hand and their intrinsic enjoyment of the task.

Self-efficacy, the perceived ability to master a particular task, is one of the most established motivational predictors of direction, level, and persistence of effort studied in industrial and organizational psychology (Bandura, 1997). Self-efficacy is of particular interest for the study of typical versus maximum performance given Kirk and Brown's (2003) countertheoretical finding of a significant relationship between self-efficacy and performance under maximum performance conditions. However, given that performers' self-efficacy is based in part on individuals' self-assessments of their relevant abilities, such a correlation may be of little surprise. Also, given the continuous nature of typical versus maximum performance, a single correlation between the motivational construct self-efficacy and performance under either typical or maximum performance conditions is no adequate basis for challenging the theoretical propositions underlying the typical–maximum performance distinction. Consequently, we propose that although participants' task-related self-efficacy may correlate significantly with their performance under a maximum performance condition, this correlation is likely to be smaller under maximum performance than under typical performance conditions.

A second motivational predictor that appears particularly relevant in the context of the current study is task valence, the degree to which individuals are interested in the task and in engaging further in it (e.g., Freitas, Liberman, Salovey, & Higgins, 2002). This concept is relevant for the study of typical versus maximum performance situations insofar as it represents participants' intrinsic motivation to engage in the task, as opposed to the extrinsic motivation initiated by a maximum performance situation.<sup>1</sup> It is likely that performers will differ in their default interest and engagement in the task. Under typical working conditions, this differing interest should then influence performers' subsequent performance. However, if Sackett et al.'s (1988) assumptions are correct and motivation is high across individuals during maximum performance situations irrespective of whether they enjoy the task, the impact of task valence on performance should diminish as soon as performers enter a maximum performance situation.

*Hypothesis 4 (d and e):* (d) Task-related self-efficacy and (e) task valence will correlate higher with participants' performance under typical than under maximum performance conditions.

Given that performance is a function of (a) motivation, (b) declarative knowledge, and (c) procedural skills (Campbell, 1990) and that the relative impact of variance in motivation on performance declines during maximum performance situations, the relative impact of ability on performance should grow under maximum performance conditions, in the form of both (a) declarative knowledge in the content and task domain and (b) the procedural skills used to accomplish the task—that is, the degree to which people “work smart.” Consequently, we hypothesized the following:

*Hypothesis 5:* (a) Declarative knowledge and (b) procedural skills will correlate higher with participants' performance under maximum than under typical performance conditions.

Finally, when we switch perspectives away from the predictors toward the criteria, the above assumptions further suggest that performance under maximum performance conditions should be limited primarily by participants' ability, or what they *can* do, and less by their motivation to actually do it (Sackett et al., 1988). Typical performance, the average performance under ongoing work conditions, places fewer constraints on direction, level, and persistence of effort and should, rather, assess what people *will* do (Sackett et al., 1988). Consequently, maximum performance should be primarily a function of ability, whereas typical performance should be a function of both ability and motivation.

*Hypothesis 6:* The best predictors of performance under maximum performance conditions will be measures of task-related knowledge and procedural skills, whereas the best predictors of performance under typical performance conditions will include measures of motivation as well.

## Method

In order to test the above hypotheses, the study had to meet three prime criteria: First, an analysis of the proposed hypotheses required a setting in which to observe the development of procedural skill, direction, level, and persistence of effort over both typical and maximum performance periods. Second, to ensure internal validity, these performance periods needed to be comparable in content and specificity of the task and exclude any possible confounds to the manipulation (Sackett et al., 1988). Third, the task should offer a certain degree of external validity. Primarily the first two considerations caused us to conduct the study in an experimental setting. We maximized ecological validity by using the realistic task of comparing product prices via the Internet, a task that is common in many jobs, particularly administrative–clerical ones.

## Sample

One hundred fifty student volunteers at a university psychology department received research points or a small payment for participation. Participants' average age was 23.3 years, and 68% of them were female. Data from 4 participants could not be used because of technical problems, and 8 participants left the experiment prematurely, arguing that the task was too strenuous (3 participants) and/or too boring (6 participants; 1 participant named both reasons). Hence, results are based on 138 participants. Of these, 78% reported using the computer on 3 days or more per week; mean usage was 1.5 hr per weekday. Seventy-seven percent of the sample reported using the Internet on 3 days or more per week. Mean usage was 1 hr per day. All participants reported having used the Internet for 6 months minimum, and 89% of them reported having used it for 2 years or more.

## Procedure

All participants underwent the same procedure. After sitting down in front of a conventional personal computer, participants learned the following:

<sup>1</sup> We thank an anonymous reviewer for raising this point.



This study compares the searcher friendliness of different approaches to present information on the Internet. Imagine you are working for a hardware retailer. Part of your job is to find out the prices of your competitors to ensure that your company keeps competitive prices.

Participants were then given the Web addresses of two genuine competing hardware retailers as well as general information on the structure of the retailers' Web sites. We used the above wording to prime participants to the task to invoke some feelings of being responsible for comparing prices and also to ensure some degree of ecological validity to job performance situations in which such tasks and duties are involved. While participants searched both Internet sites for 10 min, the experimenter remained in the room to answer questions and to ensure that participants sufficiently understood the task. Next, participants filled out online questionnaires regarding task valence and self-efficacy, followed by a multiple-choice knowledge test. Then, participants searched the Web sites of both competitors for products for 1.5 hr and then answered a number of demographic questions. Finally, participants were debriefed and rewarded. In sum, the total experiment took about 2.5 hr per participant. Half of the data were collected by Ute-Christine Klehe, and half were collected by a research assistant ignorant of the study's purpose.

### Task

The items to search for were actual products sold at the time of the experiment at both hardware retailers. Items to search for were indicated one at a time in a separate program window, and participants' task was to type in the respective prices found in the two online catalogues. Different groups of products (e.g., processors, printers) were evenly distributed across the search list, with no two subsequent products belonging to the same product group. However, participants could click forward and backward through the search list if they wanted to find the next product of the same product group. The list included 103 products, more than pretest participants had solved within 90 min.

### Justification

The laboratory setting and specific task were chosen for three reasons: First, this closely defined task, undertaken in a laboratory setting, allowed for the collection of comparable data on typical and maximum performance in that it reduced the number of possible confounds (e.g., varying task demands, settings, leader-member exchange differences) likely to influence results in most field settings. Moreover, it allowed the simultaneous assessment of the procedural motivational and ability-related variables underlying this performance, a requisite if we were to study the above hypotheses but virtually impossible to achieve in less controlled field settings.

Second, we deemed it necessary to choose a task that would be easy to learn yet attentionally demanding in that it required high motivation in order to sustain the attention to detail needed to accomplish this task well. Quick learning of the task was important to ensure that changes in performance were not due to continuous learning (e.g., Ackerman, Kanfer, & Goff, 1995). Pretest data for the current study indicated that participants understood the nature of the task and how to solve it within 5 to 10 min. Furthermore, the

experimenter present during the 10-min practice trial ensured that participants were able to master the task.

In addition, the task needed to be attentionally demanding and tiring to ensure that participants were quickly past an initial enthusiasm. During the process of socialization into a job and an organization, individuals oftentimes experience a "honeymoon," followed by a realization of the specific job's disadvantages and a potential drop in their motivation (e.g., Fichman & Levinthal, 1991; Louis, 1980). Although a laboratory setting does not allow for the observation of individuals' performance over weeks and months, it was important to choose a task that would "wear out" participants rather quickly, challenging their initial motivation in the task. Because access to the catalogues' quick-search options were blocked, searching demanded back-and-forth-clicking through diverse catalogue segments, remembering each product's specifics, and paying high attention to detail to distinguish between distinct but similar-sounding products (e.g., Philips Brilliance 170B2T 17-in. TCO 99 monitor vs. Philips Brilliance 170B2Y 17-in. TCO 99 monitor). The fact that 8 participants left the experiment prematurely, forgoing their rewards (a rather unusual effect at the university where this study was conducted), indicates that the current task met this requirement. That said, the assessment of typical performance was likely to grow more valid the longer the experiment carried on, as any of the abovementioned effects was more likely to have worn off. Conversely, this implies that comparisons between earlier assessments of typical performance and assessments of maximum performance are likely to yield more conservative estimates of the impact of typical versus maximum performance situations on performance than do comparisons with later assessments of typical performance.<sup>2</sup>

Third, as is true for every laboratory study (as well as every field study; Sackett & Larson, 1990), the chosen operationalization needed to guarantee a certain level of external validity. Comparing prices across competitors is a very common task undertaken for private and business purposes. The task involved Internet searching, checking, and comparing specific details, all of which are commonly found in clerical and administrative jobs. Thus, the search task required high attention to detail and endurance, which are important in many administrative and technical jobs (e.g., Chatman, 1991). Participants' current level of education (high school to undergraduate degree) and the frequent reported usage of the Internet indicate that participants possessed the basic skills needed to accomplish the task. Also, about 80% of students worked in addition to their studies, frequently in retail or low-level administrative jobs (LSVb, 2004). Regarding the stimulus materials, the two catalogues represented the actual online product information of two major hardware retailers, thus giving further ecological validity to the study's findings.

To further enhance the realism of the situation, we constructed the experiment so that participants' working conditions were comparable to those in many organizations. After receiving instructions, participants knew that the experimenter would not return soon. The computer they worked on was a usual work station, equipped with the standard desktop programs (including games) and with essentially unlimited access to the Internet. No control mechanisms were installed to ensure that participants did not use

<sup>2</sup> We thank an anonymous reviewer for raising this point.

the Internet for private purposes or spend their time with other, task-unrelated activities (e.g., phone calls, reading, Web chatting).

### Measures

*Typical and maximum performance.* Performance was measured as the average time needed to correctly report a price for either hardware retailer. Most of the observation period was used to induce typical performance. During this time, participants were not made aware that they were being observed and evaluated, nor were they instructed to do their best. During this time, they were alone in the room. Such manipulation is in line with Sackett et al.'s (1988) definition, as (a) participants were not treated as if under close evaluation, (b) they were not implicitly or explicitly instructed to invest their full effort, and (c) the duration was, although not as long as a usual workday, long enough to strain participants' persistence.

A 5-min maximum performance situation was induced after participants had performed the task for about 45 min. At that time, the experimenter returned to the room and watched participants work on the task. If asked, the experimenter merely told participants not to feel disrupted and that he or she was "just checking how you're doing." The experimenter remained in the room, obviously observing participants' behavior, for 5 min, then left participants alone until completion of the experiment. Relative to the assessment of typical performance, these 5 min are likely to be a valid assessment of maximum performance, given that (a) the evaluative nature of the observation was obvious and (b) participants were implicitly instructed to focus on the task. Finally, (c) the duration of the evaluation period was rather short.

*Self-efficacy.* Self-efficacy was assessed in regard to both the content (computer) and the means (Internet) of the task. Computer self-efficacy was assessed with a shortened version of the Computer Self-Efficacy Scale (Murphy, Coover, & Owen, 1989) and included 18 items, such as "I feel confident understanding terms/words relating to computer hardware." To meet Bandura's (1997) recommendation that measures of self-efficacy be task specific, we deleted from the scale items that were irrelevant for the content of the current experiment (e.g., "I feel confident handling a floppy disk" and "I feel confident using the printer to make a 'hard-copy' of my work"). Participants scored their answers on a 5-point Likert scale ranging from 1 (*totally disagree*) to 5 (*totally agree*). Scale internal consistency (Cronbach's alpha) was .95.

For the same reasons (Bandura, 1997), Internet self-efficacy was assessed with 15 items selected from two published scales on the basis of their relevance to the search task. Six items were taken from Eastin and LaRose (2000), and nine were taken from Joo, Bong, and Choi (2000). Included were items such as "I feel confident using the Internet to gather data" and "I feel confident linking to desired screens by clicking." Excluded were task-unrelated items such as "I feel confident turning to an on-line discussion group when help is needed." Participants scored their answers on a 5-point Likert-scale ranging from 1 (*totally disagree*) to 5 (*totally agree*). Scale internal consistency was .92.

*Task valence.* Freitas et al. (2002) assessed task valence through three items asking participants about their level of interest, fun, and anticipated success in the experiment. As we considered anticipated success to be a measure of self-efficacy rather than task valence, we dropped this aspect from the scale and assessed task

valence through five statements ("I am looking forward to searching for further products," "I am interested in the products," "Learning about the competitors' prices is fun," "Learning about the competitors' prices is interesting," and "I would like to know more about the products") developed and pretested for this experiment. Participants scored their answers on a 5-point Likert scale ranging from 1 (*totally disagree*) to 5 (*totally agree*). Cronbach's alpha was .83.

*Motivation/working hard.* In accordance with Humphrey, Hollenbeck, Ilgen, and Moon (2004), the current study included indicators of how hard and how smartly individuals worked on the task. While participants worked on the task, all their actions were recorded and recoded into indicators of direction, level, and persistence of effort.

Direction of effort—that is, whether individuals engage in the task (Campbell, 1990)—was assessed by the percentage of time participants spent working on the task itself. Whenever participants selected a program or Web page not related to the task or whenever they stopped moving on any screen for more than 30 s (the maximum time needed in pretests to scan the relevant content of a page; this can happen whenever individuals do something completely unrelated to the experiment—e.g., make phone calls—or when they allow themselves to get distracted and start reading extended product descriptions unnecessary for the task at hand), the time was deducted from their score. Internal consistency of the direction measure ranged from .70 to .74 during the three assessment periods.

Level of effort was assessed through the number of task-related clicks per minute. This measure resembles Humphrey et al.'s (2004) overall measure of working hard, which included the number of task-related actions taken within the given time frame of the experiment. Internal consistency ranged from .67 to .78 during the three assessment periods.

Persistence is the degree to which level of effort is sustained over time (Campbell, 1990). To assess the development of level of effort over time, we sampled each participant's level data at the beginning, at the end, and after three equally long intervals during each evaluation period. For the two typical performance periods, such a measure entailed samples from the 4th, 14th, 24th, 34th, and 44th minutes, whereas it represented all of Minutes 1 to 5 of the maximum performance period. On the basis of the within-subject correlation between time of assessment (Measurement Points 1 to 5 within each measurement period) and this participant's level of effort at that time, we used each participant's linear regression weight of level of effort over time as a measure of his or her persistence. An index around or above zero indicates that individuals maintained or even increased their level of effort over the evaluation time and thus represents high persistence. A negative index, in contrast, indicates a decrease in effort over time and, hence, lower persistence.

*Declarative knowledge.* To test participants' declarative knowledge regarding the content and means of the task, we developed and pretested a 13-item multiple-choice test for this study, in collaboration with a certified computer engineer who was knowledgeable about computer retailing. Items focused on specifics of the search task, such as the following:

Which of the following is NOT true about subject trees? (a) Subject trees contain links to every existing Web page (b) Another name for

one is a directory (c) Subject trees are organized hierarchically (d) Different sites support different subject trees.

Other items asked for the meaning of particular features frequently mentioned in the search task, such as the following

What is TCO regarding computer hardware? (a) A Windows compatibility standard (b) A pollution norm issued by the Swedish Confederation of Professional Employees (c) A measure of the Total Cost of Ownership (d) Total Clear Objective.

The declarative knowledge assessed in the first type of question tests participants' basic understanding of the task they are facing. For example, a successful search requires participants to see that the relevant information is organized (c) hierarchically yet (d) differently across the two online catalogues and that one (a) cannot retrieve information about one retailer by following the subject tree of the other. The second type of item is relevant for participants as it represents a mental map that facilitates the understanding, chunking, and recognition of relevant information. For example, a participant who knows that TCO stands for (b) a pollution norm issued by the Swedish Confederation of Professional Employees will likely also know that this norm was issued at some time (1995) and adapted a few years later (1999). Consequently, for this participant, search tasks including information on TCO (e.g., Belinea 101556 15-in. [38.1 cm] TCO 99 monitor) will be simplified in that he or she knows to look for one of two possible values instead of having to memorize the respective information as an incoherent string of letters. The test's overall internal consistency was .69.

*Procedural skills/working smart.* In accordance with Humphrey et al. (2004), we used a measure of how efficiently individuals completed the task as a measure of working smart. Although the objective of the task was explained to participants, they did not receive any instructions as to how best to approach the task. In line with Humphrey et al.'s measure of inefficient actions taken to accomplish the task, we assessed procedural skills by evaluating the efficiency of the search strategies participants used when performing the task. The complexity of the task grows out of two sources: (a) the products' specifications and (b) the different approaches the two hardware retailers use for presenting their information on the Internet. Thus, a good search strategy is one that attempts to reduce complexity by altering each search's specifications as little as possible from the last search conducted, as any change in either product group searched for or hardware retailer searched at will cause additional complexity to the task and will cost participants cognitive resources and time.

We evaluated the search strategy used during every new search. Searching for the same product (e.g., Toshiba SD-W2002RAM DVD drive) with the same retailer as a participant had done in his or her last search (e.g., Retailer A) was not possible, as participants should already have found and noted the respective price. The two strategies closest to this, and thus the smartest, were either (1) to search for the same product at the other retailer (e.g., search for Toshiba SD-W2002RAM drive at Retailer B), as this allowed participants to keep focused on the same particular product, or (2) to stay with the same retailer (Retailer A) as in the last search but search for a different product from the same product group (another DVD drive). Although this strategy demanded that participants skip about a handful of products in the search list before

arriving at the next product from the same product group, it was still an advisable strategy, as it demanded only minimal alterations to participants' last search and no or few changes in the catalogue page that they were searching (e.g., they could stay on the Web page listing DVD drives and their prices instead of moving upward to the more general section of the catalogue, only to move down to another particular product section—e.g., printers—thereafter and reorient themselves within that page).

Less advisable was a strategy that either (3) changed the product group while sticking with the same retailer or (4) changed the retailer while staying in the same product group, although not with the same product. In the former case, mostly when searching for the next item on the search list (e.g., Epson AcuLaser EPL-6100N printer), participants would have to adapt their search for the new product group's specifications, focus on different product details, click their way up and down through the respective retailer's catalogue to a different page, and reorient themselves within that page. In the latter case, participants could search within the same product group as they had focused on during their last search (e.g., DVD drives) but would not carry major benefits from this, as they would have to switch to the alternative retailer (e.g., Retailer B), which used a widely different Web design and organization of material.

Finally, (5) participants could search for a product that was not part of the same product group, and they could do so at the alternative retailer. As this strategy demanded the most changes between the latest and the current search, it was the least advisable. Additionally, it was wise to use (6) more than one window of the Web browser for searching to facilitate and speed the search. This is because the usage of two or more browser windows saves individuals time otherwise needed to reconnect with the respective retailer and enter the online catalogue.

Procedural skills, or working smart, were calculated from the above six strategic components, which had been proposed and validated through the pilot test. Because these strategies are largely interdependent, they were combined into one measure. As a strategy grew more advisable the more the product or product group and the retailer remained the same from one search to the next, we weighted different strategies according to their usefulness by adding half a point for every aspect of the search that remained the same: working smart =  $2 \times (\text{Strategy 1 or 2}) + 1.5 \times (\text{Strategy 3 or 4}) + 1 \times (\text{Strategy 5 or 6})$ . Internal consistency for working smart was .69 to .75.

## Results

### *Experimenter Effects*

No differences emerged between the data collected by Ute-Christine Klehe and the data collected by the research assistant, who was uninformed about the experiment's purpose,  $F(137) = 1.87$ . This indicates that data were unaffected by the person collecting them.

### *Hypothesis 1: Working Hard*

Hypothesis 1 stated that motivation in the form of (a) direction, (b) level, and (c) persistence of effort would be higher under the maximum performance condition than under typical performance

conditions. Means, standard deviations, correlations, and internal consistencies of all study variables are reported in Table 1.

**Direction.** During the maximum performance period, participants focused 82% of the time on the task, compared with 70% and 59% during the first and second typical performance periods. A repeated-measurement analysis of variance (ANOVA) revealed a significant difference,  $F(2, 128) = 57.85$ ,  $\eta^2 = .48$ ,  $p < .001$ . Bonferroni-corrected pairwise comparisons revealed that participants' direction of effort on the task was significantly higher during the maximum performance period than during both the first ( $d = 6.65$ ) and the second ( $d = 10.90$ ) typical performance periods (both  $ps < .001$ ). In addition, participants focused more on the task during the first, compared with the second, typical performance assessment ( $d = 5.80$ ,  $p < .001$ ).

**Level.** During the maximum performance period, participants, on average, made 10.63 task-related clicks per minute, compared with 9.54 clicks during the first and 7.87 clicks during the second assessment of typical performance. A repeated-measurement ANOVA revealed a significant difference,  $F(2, 122) = 15.54$ ,  $\eta^2 = .20$ ,  $p < .001$ . Bonferroni-corrected pairwise comparisons revealed that participants' level of effort on the task during the maximum performance period lay significantly above their level of effort during the first ( $d = 2.95$ ,  $p < .01$ ) and the second typical performance periods ( $d = 5.58$ ,  $p < .001$ ). In addition, participants invested more effort in the task during the first, compared with the second, typical performance assessment ( $d = 3.68$ ,  $p < .001$ ).

**Persistence.** A 3 (performance condition)  $\times$  5 (persistence) repeated-measurement ANOVA revealed significant effects for

both persistence,  $F(4, 126) = 11.60$ ,  $\eta^2 = .27$ ,  $p < .001$ ; and performance condition,  $F(2, 128) = 13.47$ ,  $\eta^2 = .17$ ,  $p < .001$ ; as well as for the interaction between these two factors,  $F(8, 122) = 7.64$ ,  $\eta^2 = .33$ ,  $p < .001$  (see Figure 1). Trend analyses (Stevens, 2002) revealed that the decline in effort during the first typical performance period followed a linear,  $F(1, 129) = 6.51$ ,  $\eta^2 = .05$ ,  $p < .05$ , or a quadratic trend,  $F(1, 129) = 4.35$ ,  $\eta^2 = .03$ ,  $p < .05$ . The second typical performance period showed a comparable, although stronger, decline of effort in the form of a linear,  $F(1, 129) = 65.88$ ,  $\eta^2 = .34$ ,  $p < .01$ , or quadratic trend,  $F(1, 129) = 12.99$ ,  $\eta^2 = .09$ ,  $p < .01$ . No such trends were found during the maximum performance period,  $F(1, 129) = 0.07$ – $0.54$ ,  $\eta^2 = .00$ ,  $ns$ .

**Working smart.** Participants scored, on average, 1.29 and 1.37 on the measure of working smart during the two typical performance periods, respectively. During the maximum performance period, they scored, on average, 1.20 on this measure. A repeated-measurement ANOVA showed a significant difference,  $F(2, 123) = 6.40$ ,  $\eta^2 = .10$ ,  $p < .01$ . Bonferroni-corrected pairwise comparisons revealed that participants worked smarter during the second typical performance period than during the maximum performance period ( $d = 3.49$ ,  $p < .01$ ), with no significant differences emerging between the other comparisons.

Taken together, the results confirm Hypothesis 1: Motivation, in the form of direction, level, and persistence of effort, was higher during the maximum performance period than during either of the two typical performance periods.

Table 1  
Means, Standard Deviations, Internal Consistencies, and Correlations Between Variables

Dependent variable	<i>M</i>	<i>SD</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Performance																					
1. Typical 1	0.65	0.33	.75																		
2. Maximum	0.86	0.51	.65	.69																	
3. Typical 2	0.70	0.37	.73	.49	.67																
Motivation																					
Direction																					
4. Typical 1	0.71	0.24	.59	.36	.48	.74															
5. Maximum	0.82	0.24	.42	.41	.33	.66	.72														
6. Typical 2	0.59	0.21	.36	.27	.55	.49	.41	.70													
Level																					
7. Typical 1	9.54	4.15	.41	.18	.36	.46	.25	.15	.74												
8. Maximum	10.63	4.63	.36	.21	.26	.41	.33	.10	.57	.78											
9. Typical 2	7.87	4.03	.33	.29	.44	.19	.11	.55	.24	.20	.67										
Persistence																					
10. Typical 1	−0.08	0.32	−.05	−.15	−.05	−.07	−.03	−.10	−.05	−.04	−.04										
11. Maximum	0.01	0.50	.02	.06	−.01	−.12	−.12	−.03	−.12	−.07	.05	−.03									
12. Typical 2	−0.33	0.43	.09	.09	.11	.00	−.06	−.07	.05	.03	.09	.11	.16								
Self-efficacy																					
13. Computer	3.73	0.76	.45	.31	.44	.32	.22	.33	.30	.30	.34	−.07	−.01	−.11	.95						
14. Internet	3.85	0.58	.37	.18	.33	.31	.20	.27	.31	.30	.27	.01	−.02	−.08	.81	.92					
15. Task valence	2.54	0.82	.36	.23	.39	.28	.24	.42	.14	.20	.24	−.13	−.12	−.04	.45	−.41	.83				
Ability																					
Working smart																					
16. Typical 1	1.27	0.51	.45	.31	.29	.47	.31	.28	.25	.12	.25	−.22	.10	−.02	.30	.29	.26	.70			
17. Maximum	1.22	0.60	.45	.60	.32	.27	.29	.24	.07	.02	.33	−.33	.12	.00	.19	.08	.08	.53	.69		
18. Typical 2	1.37	0.35	.38	.37	.40	.21	.14	.17	.09	.07	.34	−.13	.04	−.03	.13	.12	.14	.39	.55	.75	
19. Knowledge	0.51	0.20	.33	.50	.25	.21	.27	.14	.19	.20	.07	−.26	.01	−.05	.22	.34	.18	.21	.33	.28	.69

Note.  $N = 138$ . Internal consistencies are in italics on the diagonal. Correlations above .17 are significant at  $p < .05$ , correlations above .23 are significant at  $p < .01$ , correlations above .27 are significant at  $p < .001$ .



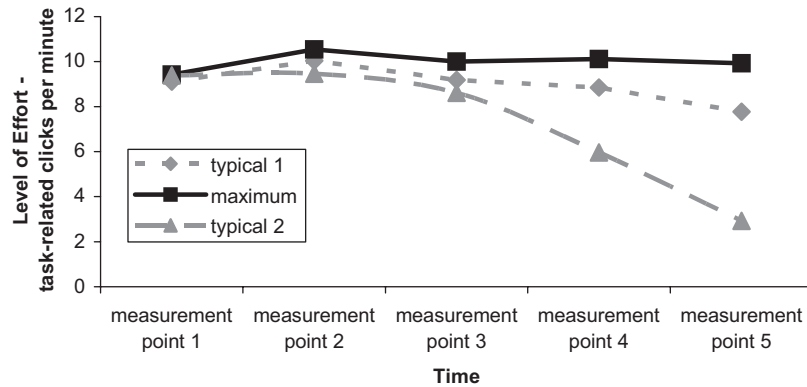


Figure 1. Persistence during the two typical performance periods and the maximum performance period.

### Hypothesis 2: Typical and Maximum Performance

Hypothesis 2 proposed that participants' performance would be higher under maximum than under typical performance conditions. On average, participants entered 0.65 and 0.70 correct prices per minute during the two typical performance periods and 0.87 correct prices per minute during the maximum performance period. A repeated-measurement ANOVA revealed a significant difference,  $F(2, 136) = 22.09$ ,  $\eta^2 = .25$ ,  $p < .001$ . Bonferroni-corrected pairwise comparisons revealed that this effect was not due to differences between the two assessments of typical performance ( $d = 2.18$ ,  $p > .10$ ) but that participants' performance during the maximum performance period significantly surpassed their performance during both the first ( $d = 6.45$ ,  $p < .001$ ) and the second typical performance period ( $d = 4.13$ ,  $p < .001$ ), thus confirming Hypothesis 2.

### Hypothesis 3: Changes in Motivation Cause Varying Performance Under Typical Versus Maximum Performance Conditions

Hypothesis 3, which proposed that varying performance under typical versus maximum performance conditions was primarily due to changes in performers' motivation, was tested via stepwise regressions on typical performance. We started with participants' level of maximum performance as a predictor in Step 1; added participants' direction, level, and persistence of effort as well as their procedural skills during the maximum performance condition in Step 2; and added the same variables during the respective typical performance period in Step 3. As can be seen in Table 2, Hypothesis 3 was fully supported for the prediction of performance during the first typical performance assessment ( $R^2_{\text{adjusted}} = .64$ ,  $p < .01$ ). Only direction ( $\beta = .27$ ,  $p < .01$ ), level ( $\beta = .15$ ,  $p < .01$ ), and persistence of effort ( $\beta = .14$ ,  $p < .05$ ), yet not the degree to which people used smart procedures ( $\beta = .10$ ,  $p > .05$ ), added incremental validity to the explanations of performance ( $\Delta R^2 = .12$ ,  $p < .01$ ). For the second assessment of typical performance, however, Hypothesis 3 was not supported ( $R^2_{\text{adjusted}} = .53$ ,  $p < .01$ ): In addition to direction of effort ( $\beta = .39$ ,  $p < .01$ ), working smart turned out to be a significant predictor as well ( $\beta = .22$ ,  $p < .01$ ), indicating that the distinction between performance under typical and maximum performance

conditions may not always rely exclusively on a change in performers' motivation ( $\Delta R^2 = .22$ ,  $p < .01$ ).

### Hypothesis 4: Correlations With Motivational Variables

To test whether motivation correlated higher with performance under typical than under maximum performance conditions, we ran two kinds of analyses: When both the predictors and the criteria were assessed at both moments involved in the comparison (direction, level, persistence, and working smart), we compared correlations via Steiger's (1980)  $z$ . Steiger's procedure, however, does not allow for comparisons in which a once-assessed predictor (self-efficacy, task valence, knowledge) is correlated with two assessments of the criterion. Consequently, we compared such correlations with Williams's (1959)  $t$  ( $t_w$ ). Analyzing data with alternative procedures (Hotelling, 1940; Meng, Rosenthal, & Rubin, 1992; Olkin, 1967) led to the same conclusions.

**Direction.** During the two typical performance periods, direction of effort correlated .59 and .55 (both  $ps < .01$ ) with performance, with no significant difference between correlations ( $z = 0.68$ ;  $n = 138$ ). During maximum performance, the correlation dropped to .41 ( $p < .01$ ), presenting a significant decrease in relationship ( $z = -2.53$ ;  $z = -1.73$ ;  $n = 138$ ,  $p < .05$ ).

**Level.** During the two typical performance periods, level of effort correlated .41 and .44 (both  $ps < .01$ ) with performance, and the correlations were not significantly different ( $z = 0.25$ ;  $n = 138$ ). During the maximum performance period, this correlation dropped to .21 ( $p < .01$ ), presenting a significant decrease in relationship ( $z = -2.24$ ;  $z = -2.17$ ;  $n = 138$ ,  $p < .05$ ).

**Persistence.** During the two typical performance periods, persistence correlated  $-.05$  and  $.11$  with performance. During the maximum performance period, this correlation was  $.06$ . No significant differences emerged between any of the correlations ( $zs = -0.43$  to  $-0.90$ ;  $n = 138$ ).

**Self-efficacy.** Internet self-efficacy correlated .37 and .33 (both  $ps < .001$ ) with typical performance, with no significant difference emerging between correlations,  $t_w(135) = 0.68$ . During maximum performance, the correlation dropped to .18 ( $p < .05$ ), presenting a significant decrease in relationship,  $t_w(135) = -2.81$ ;  $t_w(135) = -1.81$ ,  $p < .05$ .

Computer self-efficacy correlated .45 and .44 (both  $ps < .001$ ) with typical performance, with no significant difference between



Table 2  
*Stepwise Regression of Typical Performance on Maximum Performance and Participants' Changes in Working Hard (Direction, Level, and Effort) and Smart (Hypothesis 3)*

Step and variable	Performance					
	Typical 1			Typical 2		
	$\beta$	Adjusted $R^2$	$\Delta R^2$	$\beta$	Adjusted $R^2$	$\Delta R^2$
Step 1						
Max. performance	.70**	.49	.49**	.56**	.31	.32**
Step 2						
Max. performance	.60**	.53	.06**	.50**	.32	.04
Max. direction	-.01			.03		
Max. level	.25**			.19*		
Max. persistence	.01			.01		
Max. working smart	.10			.01		
Step 3						
Max. performance	.54**	.64	.12**	.34**	.53	.22**
Max. direction	-.13			.03		
Max. level	.11			.11		
Max. persistence	.03			.01		
Max. working smart	.08			-.16		
Typ. direction	.27**			.39**		
Typ. level	.15**			.11		
Typ. persistence	.14*			.12		
Typ. working smart	.10			.22**		

Note.  $N = 138$ . The data had no multicollinearity and no outliers. Max. = maximum; Typ. = typical.  
 \*  $p < .05$ . \*\*  $p < .01$ .

correlations,  $t_w(135) = 0.02$ . During the maximum performance period, this correlation dropped to .31 ( $p < .001$ ), presenting a significant decrease in relationship,  $t_w(135) = -2.04$ ;  $t_w(135) = -1.69$ ,  $p < .05$ .

It is interesting that self-efficacy showed a similar pattern of relationships with direction of effort under typical ( $r_s = .31$  and .27, respectively, both  $p_s < .01$ ) and maximum ( $r = .20$ ,  $p < .05$ ) performance conditions, even though this difference in correlations did not reach significance,  $t_w(135) = -1.63$ ;  $t_w(135) = -0.78$ . Also, computer self-efficacy showed a similar pattern of relationships with direction of effort under typical ( $r_s = .32$  and .33, respectively, both  $p_s < .01$ ) and maximum ( $r = .22$ ,  $p < .05$ ) performance conditions, even though, again, this difference in correlations did not reach significance,  $t_w(135) = -1.47$ ;  $t_w(135) = -1.24$ . Internet and computer self-efficacy further correlated significantly with level of effort—although not, however, with persistence of effort—during the three observation periods, with no clear differences between typical and maximum performance periods.

**Task valence.** Task valence correlated .36 and .39 (both  $p_s < .01$ ) with performance in the typical performance conditions, with no significant difference between correlations,  $t_w(135) = 0.49$ . During the maximum performance period, the correlation dropped to .23 ( $p < .05$ ), a significant decrease,  $t_w(135) = -2.03$ ;  $t_w(135) = -2.06$ ,  $p < .05$ . A graphic representation of this finding, illustrative of the combined effects of intrinsic (task valence) and extrinsic (maximum performance conditions) motivators on performance, is presented in Figure 2. In sum, motivational variables correlated higher with performance during the typical than during the maximum performance periods, largely supporting Hypothesis 4.

#### Hypothesis 5: Correlations With Knowledge and Skills

Hypothesis 5 proposed that ability should correlate higher with participants' performance under maximum than under typical performance conditions.

**Knowledge.** During the typical performance periods, results on the knowledge test correlated .33 and .25 (both  $p_s < .01$ ) with performance, with no significant difference between correlations,

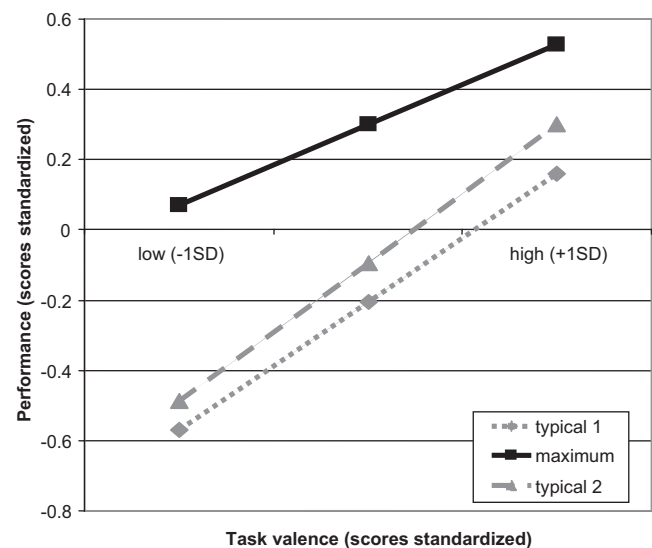


Figure 2. The interaction between typical versus maximum performance condition and task valence.

$t_w(135) = 1.31$ . During the maximum performance period, this correlation was .50 ( $p < .01$ ), representing a significant increase in relationship,  $t_w(135) = 2.59$ ;  $t_w(135) = 3.12$ ,  $p < .05$ . Furthermore, individuals who scored better on the knowledge test also showed more direction and level of effort during the first typical performance period ( $r_s = .21$  and  $.19$ , respectively, both  $p_s < .05$ ) and the maximum performance period ( $r_s = .27$  and  $.20$ , respectively, both  $p < .05$ ), although not, however, during the second performance period ( $r_s = .14$  and  $.07$ , respectively). Here, differences between correlations were not significant,  $t_w(135) = -0.13$  to  $t_w(135) = 1.44$ .

**Working smart.** During the typical performance periods, working smart correlated .45 and .40 (both  $p_s < .01$ ) with performance, with no significant difference between correlations ( $z = 0.61$ ;  $n = 138$ ). During the maximum performance period, this correlation was .60 ( $p < .01$ ), representing a significant increase in relationship ( $z = 2.03$ ;  $z = 2.52$ ;  $n = 138$ ). Thus, Hypothesis 5 was supported for both task-related declarative and procedural knowledge.

#### *Hypothesis 6: Predicting Typical and Maximum Performance*

Hypothesis 6 proposed that the best predictors for performance under maximum performance conditions would be measures of task-related knowledge and procedural skills, whereas the best predictors for performance under typical performance conditions would include measures of motivation as well. This hypothesis was analyzed with stepwise multiple regressions predicting performance with the help of all predictors included in the study. As can be seen in Table 3, the best predictor of typical performance during both performance periods was direction ( $\beta = .44$  and  $\beta = .42$ , respectively, both  $p_s < .01$ ). The second most relevant predictor was the procedural skills used during the task ( $\beta = .21$  and  $\beta = .25$ , respectively, both  $p_s < .01$ ). In addition, the motivational variable computer self-efficacy predicted performance both times ( $\beta = .20$ ,  $p < .05$ , and  $\beta = .24$ ,  $p < .01$ ; total  $R^2_{\text{adjusted}} = .44$ ,  $p < .01$ ). In the second assessment of typical performance, persistence ( $\beta = .18$ ,  $p < .01$ ) and task valence ( $\beta = .15$ ,  $p < .05$ ) emerged as two additional significant predictors (total  $R^2_{\text{adjusted}} = .53$ ,  $p < .01$ ).

Under the maximum performance condition (Table 4), direction of effort remained an important predictor for performance ( $\beta = .29$ ,  $p < .01$ ), yet it fell back in relative importance compared with procedural skills ( $\beta = .40$ ,  $p < .01$ ). In addition, declarative knowledge regarding the content and means of the task incrementally predicted performance ( $\beta = .29$ ,  $p < .01$ ; total  $R^2_{\text{adjusted}} = .53$ ,  $p < .01$ ). Thus, the findings disconfirm Hypothesis 6, that maximum performance would only be accounted for by declarative knowledge and procedural skills. However, compared with the assessments of typical performance, the role of ability increased, whereas the role of motivation decreased, in accounting for performance.

### Discussion

The contribution of this study is fourfold. In the next four sections, we elaborate on the four areas in which the study contributed.

Table 3

*Stepwise Regression of the First and Second Assessments of Typical Performance on the Measures of Ability and Motivation Included in the Study*

Model and variable	Performance					
	Typical 1			Typical 2		
	$\beta$	Adjusted $R^2$	$\Delta R^2$	$\beta$	Adjusted $R^2$	$\Delta R^2$
Model 1						
Direction	.61**	.37	.37**	.60**	.36	.36**
Model 2						
Direction	.50**			.56**		
Working smart	.25**	.41	.05**	.28**	.43	.07**
Model 3						
Direction	.44**			.47**		
Working smart	.21**			.26**		
Computer SE	.20*	.44	.03*	.26**	.48	.06**
Model 4						
Direction				.47**		
Working smart				.26**		
Computer SE				.28**		
Persistence				.19**	.51	.03**
Model 5						
Direction				.42**		
Working smart				.25**		
Computer SE				.24**		
Persistence				.18**		
Task valence				.15*	.53	.02*

Note.  $N = 138$ . The data had no multicollinearity and no outliers. SE = self-efficacy.

\* $p < .05$ . \*\* $p < .01$ .

#### *Validity of the Sackett et al. (1988) Model*

The typical versus maximum performance distinction has received considerable theoretical (e.g., Ackerman & Humphreys, 1990; Arvey & Murphy, 1998; Boudreau, 1991; Dewberry, 2001; Guion, 1991, 1998) and emerging empirical attention (DuBois et al., 1993; Klehe & Latham, 2006; Lim & Ployhart, 2004; Ployhart et al., 2001; Smith-Jentsch et al., 2001), and researchers have nearly uniformly accepted Sackett et al.'s (1988) assumptions on faith alone (for exceptions, see Barnes & Morgeson, 2007, and Mangos, Steele-Johnson, LaHuis, & White, 2007). This study presents an initial detailed test of the mechanisms proposed by Sackett et al. (1988) and DuBois et al. (1993) to underlie the distinction between typical and maximum performance: It evaluated the development of both motivation (direction, level, persistence) and procedural skills (working smart) under both typical and maximum performance conditions. Confirming Sackett et al.'s (1988) assumptions, participants worked harder under the maximum performance condition (Hypothesis 1), which led their maximum performance to surpass their typical performance (Hypothesis 2). Participants' increased motivation during the maximum performance condition, compared with the two typical performance conditions, explained some of this difference (Hypothesis 3). Furthermore, measures of motivation (e.g., direction and level of effort), but also participants' perceived self-efficacy regarding the contents and the means of the task as well as their intrinsic enjoyment of the task in the form of task valence, correlated higher

Table 4  
*Stepwise Regression of the Assessment of Maximum Performance on the Measures of Ability and Motivation Included in the Study*

Model and variable	Maximum performance		
	$\beta$	Adjusted $R^2$	$\Delta R^2$
Model 1			
Working smart	.60**	.35	.36**
Model 2			
Working smart	.48**		
Direction	.36**	.46	.11**
Model 3			
Working smart	.40**		
Direction	.29**		
Knowledge	.29**	.53	.07**

Note.  $N = 138$ . The data had no multicollinearity and no outliers.

\*\*  $p < .01$ .

with performance under typical than under maximum performance conditions (Hypothesis 4), whereas both declarative knowledge and procedural skills correlated higher with performance under the maximum than under the typical performance conditions (Hypothesis 5). Finally, measures of motivation, such as direction of effort, computer self-efficacy, and persistence, played an important role in predicting typical performance, whereas measures of ability, namely procedural skills and knowledge regarding the means and the content of the task, played an increased role under maximum performance conditions (Hypothesis 6). All this lends support for Sackett et al.'s (1988) original concept of typical versus maximum performance.

These findings have important practical implications. First, they confirm that the typical–maximum performance distinction is real and should be included and studied in models of job performance (e.g., Campbell, 1990; Viswesvaran & Ones, 2000). Second, they have implications for when one is predicting performance through measures of ability or motivation, as in, for example, employee selection procedures (see also Smith-Jentsch, 2007). The usefulness of most predictors included varied greatly across typical versus maximum performance conditions (Campbell, 1990; DuBois et al., 1993; Guion, 1998). As Guion (1991) noted, researchers run extensive validation studies, and organizations make huge financial investments in the selection of new employees, without knowing which of these two aspects of performance they are predicting or even trying to predict (Klehe & Anderson, 2005). Campbell (1990) argued that basing selection decisions on predictors of maximum performance could be one cause for the weak relationship often found between results of personnel selection procedures and typical performance on the job. Such a mismatch could also bear considerable financial consequences for the organization in question: Boudreau (1991) noted that results from utility analyses regarding a selection procedure's prediction of typical job performance are likely to be biased if the dollar value of performance is based on maximum performance criteria, and vice versa.

#### *Distinction Between Typical and Maximum Performance*

The findings of this study demonstrate that the distinction between typical and maximum performance is slightly more complex

than originally proposed by Sackett et al. (1988). This is for two reasons. First, this study shows that although Sackett et al.'s (1988) general propositions hold true, motivation may still explain a considerable proportion of variance in performance under maximum performance conditions. Although correlations of direction and level of effort, self-efficacy, and task valence with performance shrank during the maximum performance period, they still remained significant, supporting findings reported by Kirk and Brown (2003).

Campbell (1990) argued that performance requires a minimum of both procedural skills and motivation to occur. The current results confirm this argument. Although the relative weight of measures of motivation and ability when we predicted typical and maximum performance pointed in the direction proposed by Sackett et al. (1988), direction of effort and procedural skills remained the two most important predictors of performance, no matter whether performance was assessed under typical or under maximum performance conditions. One may argue, of course, that typical versus maximum performance conditions reflect a continuum and that our manipulation of a maximum performance situation was not the strongest one conceivable. Yet the concurrence of our findings with those of Kirk and Brown (2003) suggests that maximum performance as a pure measure of ability may be difficult to establish and that Sackett et al.'s (1988) hope to gain, through a comparison of typical and maximum performance, an estimate of the role of ability during typical performance may be overly optimistic.

In addition, our results suggest that participants may not always work at their smartest under maximum performance conditions, which, in turn, could explain the significant difference in working smart between the maximum and the second typical performance period as well as the fact that working smart accounted for incremental validity in the prediction of the second typical performance assessment. Maybe the slightly detrimental effect found for the maximum performance condition on working smart was due less to the maximum performance condition per se than to participants being distracted from the task by the presence of the experimenter (Sanders, 1981; see also Zajonc, 1965). Equally likely, however, is that the evaluative nature of the maximum performance condition raised evaluation anxieties among at least some participants, impairing their ability to work smart, an effect similar to findings reported in educational psychology (Wine, 1971) and social psychology (Sanna, 1992) and now partially supported for maximum performance situations (Klehe, Anderson, & Hoefnagels, 2007). We thus call for future research to test whether and how typical versus maximum performance conditions influence not only motivation but also the procedural skills needed for accomplishing the task.

#### *Criterion Measurement Problems and Issues*

This study raises some doubt as to the validity of supervisory evaluations for estimating typical job performance. Although the manipulation used in the current study for inducing maximum performance was purposely not extreme, it was not much different from actions undertaken by supervisors to learn about their employees' performance. Thorsteinson and Balzer (1999) suggested that, unlike coworkers, who may be capable of gathering daily information about individuals' typical motivation and perfor-

mance, supervisors may only be allowed to observe and rate performers' maximum performance. During this laboratory experiment, the mere presence of the experimenter motivated participants to work significantly harder than they did during the rest of the experiment. It is quite likely that this effect is considerably stronger in real-life settings, when people work on tasks they have performed not just for 2 hr but for years, so that even the last novelty effect has worn off, and when employees know that the impressions formed about them by a supervisor, unlike those formed by an experimenter in a psychology department, can have actual consequences for their careers. Hence, it is not surprising that Sackett et al. (1988) found supervisory ratings of performance to be significantly more related to the maximum than to the typical speed and accuracy with which supermarket cashiers processed grocery items. Yet further research on the assessment of typical versus maximum performance by different rating sources is clearly needed.

### *Research Settings: Laboratory and Field Studies*

This experiment shows that the distinction between typical and maximum performance can be studied in the laboratory. Being able to study the distinction between typical and maximum performance in the laboratory is important in the face of the scarcity of empirical research currently available on this important distinction. A number of research questions may well be open for laboratory research, and the introduction of a laboratory design to the study of typical and maximum performance may facilitate future research that otherwise might not be conducted in the absence of truly parallel situations of typical and maximum performance in field settings. Examples of such research include the effect of typical and maximum performance situations on the use of impression management tactics, the combination of typical versus maximum performance with other theories on motivation (e.g., expectancy theory; Van Eerde & Thierry, 1996; Vroom, 1964), and the search for moderators to reactions to typical versus maximum performance situations (e.g., Klehe & Anderson, 2007). However, it is important that findings from such experimental studies be extended to and—as far as logistic considerations allow—replicated in naturalistic field study settings. Future research can usefully combine both approaches to address questions of causality and generalizability.

### *Study Limitations and Strengths*

Of course, the use of a laboratory setting is not only new for the study of typical versus maximum performance but is also associated with a number of limitations, primarily in regard to the study's task, sample, and duration. Concerning the duration of the task, one might conceivably argue that 90 min is too short a period to reflect typical performance. Yet, on a continuum between "pure" typical and maximum performance situations, the typical performance periods were less evaluative, less instructive to focus on the task, and longer, thus satisfying all three of Sackett et al.'s (1988) requirements. The fact that 8 participants quit the experiment prematurely (forgoing their reward) and the finding that persistence added incremental validity to the explanation of the second assessment of typical performance also suggest that 1.5 hr was too long for participants to maintain their maximum motivation and,

thus, their maximum performance. Plainly, it was long enough for at least some participants to lose sufficient interest in the task to quit.

As noted above, however, in some cases the results in the first and the second typical performance period did not converge perfectly (e.g., direction, level, and persistence of effort were, on average, higher during the first than during the second period). In these cases, it appears more prudent to rely primarily on the second assessment as an indicator of typical performance, as any experimental demand, learning, or honeymoon effects that were possibly still active in the first half of the experiment would have worn off. It is interesting to note that the comparison between the maximum and the second typical performance assessment was also the comparison that showed stronger differential effects in response to the hypotheses.

At the same time, one may wonder whether 5 min is long enough for individuals to present their maximum performance. Although the time was surely short enough for participants to remain focused on the task, such a short duration may turn problematic in tasks that are more complex and time consuming per trial (e.g., solving complex puzzles) than in the current case. Certainly, future studies are called for that use longer periods of measurement of maximum performance. On a related note, this study, just like nearly all other studies on typical versus maximum performance published to date (e.g., Kirk & Brown, 2003; Lim & Ployhart, 2004; Ployhart et al., 2001; Sackett et al., 1988; Smith-Jentsch et al., 2001), justified the manipulation of typical versus maximum performance conditions on theoretical grounds but did not include a manipulation check, a decision primarily due to logistic considerations (a manipulation check after the maximum performance period would have made data collection during the following typical performance period impossible), even though a manipulation check would obviously have been desirable.

The current experiment used a repetitive but rather strenuous task, judging from the relatively low task valence indicated by participants as well as from comments participants made in their final remarks or when leaving the experiment prematurely. Most participants were undergraduate psychology students, a sample unlikely to choose a task like this out of intrinsic motivation. Although this is likely to limit the generalizability of the study's results, it poses no automatic threat to the study's ecological validity. First, students are frequently confronted with similar high-attention yet relatively mindless tasks that call for high diligence during their part-time jobs or, in altered form, even during their studies (e.g., entering data, scanning literature). Second, participants still showed meaningful individual differences not only in task valence but also in exerted effort throughout the performance periods. The causes of these differences (e.g., interpersonal differences in interests or personalities; Kanfer & Heggestad, 1999) are beyond the scope of this article. However, they are likely a reflection of meaningful differences in participants' intrinsic motivation during the task. The manipulation of maximum performance, in contrast, represents a classic approach for ensuring extrinsic motivation. Although this manipulation achieved an average increase in participants' direction, level, and persistence of effort, the influence of interindividual differences in motivation, particularly intrinsic motivation in the form of participants' task valence, on performance decreased during this measurement period.



### Directions for Future Research

Given the above limitations, results from this study are likely to generalize primarily to job roles and tasks that are detail oriented, repetitive, and lower in cognitive demand and for which performers hold relatively little intrinsic interest. Different findings might have emerged in a sample more intrinsically interested in the task, such as hardware engineers or retailers. For example, the difference in motivation and performance during typical and maximum performance conditions might have been smaller, maybe even reversed. In addition, research on self-determination theory (Deci, Koestner, & Ryan, 1999; Ryan & Deci, 2000) suggests not only that—given sufficient intrinsic motivation—performers may work as hard under typical performance conditions as they do under maximum performance conditions but that their intrinsic motivation, and hence their subsequent typical performance, may suffer from the introduction of maximum performance periods. Self-determination theory suggests that evaluations and rewards foster motivation to the degree that they provide information on the performer's level of performance but that they reduce motivation to the degree that they are perceived as controlling and hence hindering performers' striving for autonomy. The observation of typical and maximum performance periods over time and the motivating and/or demotivating effects of either on the other at different levels of initial intrinsic motivation are likely to be an important avenue for future research (see also Klehe & Anderson, 2007).

Furthermore, research on social facilitation and inhibition, the increase or decrease of individuals' performance in the presence or, more precisely, under the evaluation of others (Cottrell, 1968, 1972; Henchy & Glass, 1968), suggests that Sackett et al.'s (1988) assumptions may only hold true as long as individuals actually have the ability to perform the task and know that they have it (Sanna, 1992). Klehe, Anderson, and Hoefnagels (2007) linked the typical versus maximum performance literature to that of social facilitation and inhibition and found that maximum performance conditions can actually hinder performance on a task that performers perceive as difficult or that they have not yet sufficiently learned at the time of assessment.

If this link with the mechanisms of social facilitation and inhibition, and thus also with social loafing (Sanna, 1992), also holds true in future studies, it could enrich both sets of literatures—for example, by introducing known moderators from the social loafing literature (Karau & Williams, 1993) as possible moderators to the different performance levels under typical versus maximum performance conditions or, conversely, by testing the impact of ability versus motivation on performance within a classic social facilitation design.

### Conclusion

Given the aims of this study, we purposefully chose a laboratory rather than a field setting for a number of reasons, foremost among them the ability to observe the development of motivation and performance across typical and maximum performance. Consequently, this study has succeeded in supporting most of Sackett et al.'s (1988) main assumptions regarding the development of motivation during typical and maximum performance periods and its consecutive impact on performance. Yet this study also invites

future research, given (a) that results on the prediction of performance with measures of ability and motivation were slightly more complex than expected, (b) that the results may not generalize to tasks and samples of high task valence and intrinsic motivation, and (c) that this study proves the usefulness of the laboratory for the study of typical versus maximum performance.

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