Social facilitation in motor tasks: a review of research and theory

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Abstract

Background and purpose. To overview research and theories on the impact of social facilitation for persons performing motor tasks.

Methods. A narrative review is adopted. The origins of the research tradition are presented and the different theoretical explanations are reviewed.

Results and conclusions. It is noted that these explanations claim validity for both the cognitive and motor domains. Results of research are reported on the impact of the presence of others while working on different kinds of motor tasks such as coordination tasks, power and stamina tasks, and a mixture of these. These empirical findings are often in contradiction to the presented theoretical models. The paper discusses whether results of different kinds of motor tasks need different theoretical explanations. It is concluded that if any effects of the mere presence of others are to be found at all, they tend to be weak.

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Social facilitation research originated with a study on how other people impact on motor task performance. Norman Triplett (1898) observed what happened when coacting persons were competing with his participants. He started by examining archives containing outcome statistics for the cycle racing season of 1897. These revealed that racing cyclists accompanied by pacemakers were at least 25% faster than those without. Triplett proposed that this was because the physical presence of another person sharpened the competitive instinct. He tested this preliminary assumption more precisely with an experiment in which school children had to turn a handle as quickly as possible on his specially constructed ‘competition machine’ — in a solitary condition and

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in a condition in which they competed with a fellow child. Results showed that some children performed better in the competitive conditions, whereas others performed worse. This initial historical study was followed by a variety of other studies. Even as early as 1910, Burnham was in a position to write an overview on the topic. He also reported on the studies of the German educationalists Mayer (1904) and Meumann (1904) who were the first to compare the performance of school children working alone with that of school children in coaction conditions (without competition). Mayer (1904) ascertained the positive effect on performance of spectators while, among others, taking dictation (as a class test) or solving arithmetic tasks. In his work with tests of memory, ergographs, and dynamometers, Meumann (1904) reported that children always performed less well when working alone than when others were present. He suspected that although distracted by the presence of spectators, children’s performance would improve through greater effort. Also in Germany, Moede (1920) carried out a series of experiments in which school and college students had to tackle various tasks (e.g., concentration and memory tasks, but also power tasks) either alone or in the presence of others.

In the English language literature, Moore (1917) was the first to report on studies of persons who had to perform complex mental arithmetic tasks in front of spectators. He assumed that this would induce embarrassment in his participants. However, Allport (1924) was the first to use the term ‘social facilitation’. He defined this as “an increase in response merely from the sight or sound of others making the same movement” (Allport, 1924, p. 262). Allport’s (1924) use of social facilitation addresses coacting situations, situations in which other persons are doing exactly the same as the performers. This is because the tasks in early studies were often carried out with coacting others (e.g., Allport, 1920, 1924; Mayer, 1904; Meumann, 1904) or even in direct competition with them (e.g., Triplett, 1898). However, in coacting or competing situations, the ‘pure’ audience influence cannot be studied independently from other social factors such as rivalry. This is why so-called social facilitation studies from the 1960s to the present have examined whether and how persons modify their performance when other persons are merely present and do not exhibit any specific behavior (see Zajonc, 1965, 1980). The general research strategy has been to study performance when persons are alone and then compare this with research conditions in which others are merely present or in which persons at least believe they are being observed.

Most social facilitation studies have used cognitive tasks to develop and test corresponding theories (see Guerin, 1993, in his seminal overview). Although motor tasks have been used far less frequently, the resulting theories claim to be valid for both the cognitive and motor domains. The present review focuses on the impact of the presence of others when working on motor tasks and considers how far the available theories generalize to such tasks.

The article starts with a short overview of important research on social facilitation. It then goes on to discriminate between different types of motor task before focusing on empirical findings with motor tasks. Finally, the article closes with a longer discussion designed to integrate the previous findings and constructs.

Social facilitation theories

Allport’s publications at the beginning of the 1920s were followed by a flood of research activity. Rosch (1985, p. 14) described the subsequent period up to the 1960s as “four decades of experimental anarchy.” This is because the greatest variety of different types of participant
(and types of animal such as monkeys, ants, chickens, or cockroaches; see the book edited by Zajonc, 1969, for some of the original contributions) had to tackle an almost inestimable range of cognitive, and sometimes motor, tasks that frequently bore no relation to any particular theory. To summarize, these experiments sometimes showed performance increments in the presence of others, but, at other times, also performance decrements, and no satisfying theoretical explanation was proposed for either direction. This was equally true for both cognitive and motor tasks. Zajonc (1965) was the first who seemed to offer a possibility of integrating the contradictory findings into one model based on drive or activation theory. His much cited work formed the starting point for numerous empirical studies and theoretical modifications.

This section presents the most important social facilitation theories. From 1965, several so-called activation theories were developed. These were mainly Zajonc’s “generalized drive hypothesis” and some derivations from or modifications to it (‘evaluation approaches’: Cottrell, Wack, Sekerak, & Rittle, 1968; Henchy & Glass, 1968; ‘alertness hypothesis’: Zajonc, 1980; ‘monitoring hypothesis’: Guerin & Innes, 1982, ‘challenge and threat’: Blascovich, Mendes, Hunter, & Salomon, 1999). Since 1980, the explanations shifted to attention theories (‘distraction–conflict hypothesis’: Sanders, Baron, & Moore, 1978; ‘overload hypothesis’: Baron, 1986; ‘feedback-loop model’: Carver & Scheier, 1981; ‘capacity model’: Manstead & Semin, 1980). At the same time, a few further models were presented that focused on self-presentation (Bond, 1982) or integrated the fields of social facilitation and social loafing (Harkins, 1987; ‘cognitive–motivational model’: Paulus).

Explanations based on activation theory

Generalized drive hypothesis

Zajonc (1965) explained the contradictory findings with an activation theory model claiming validity for both human beings and animals. He postulated that the mere presence of others would increase the general drive and activation level of the actor. He referred particularly to Hull’s (1943) ideas on Drive D.

Zajonc viewed this non-specific increase in activation as an innate reaction of the organism, preparing it to respond to any potential unexpected actions by others. This enhanced activation level should increase the probability of dominant reactions occurring and decrease, in contrast, the probability of subordinate reactions. Zajonc understood dominant reactions as those reactions to a specific stimulus situation that have priority over the others in a person’s behavior repertoire. In simple (well-learned) tasks, the dominant reaction is a correct solution. Therefore, the presence of others leads to performance increments. In complex (not well-learned) tasks, the dominant reaction tends to be a false solution. This means that performance in this situation is influenced negatively by the presence of others. Fig. 1 illustrates these main components of his theory.

Zajonc supported his theory with an in-depth literature review as well as two experiments involving human beings (word association tasks: Matlin & Zajonc, 1968; learning nonwords: Zajonc & Sales, 1966) and one animal experiment (on cockroaches: Zajonc, Heingartner, & Herman, 1969).

1 However, although he often used the term ‘activation,’ Zajonc (1965) did not discriminate between drive and activation concepts. The latter refer to the inverted-U hypotheses that differ greatly from Hull’s Drive concept (see, e.g., Heckhausen, 1989).
Evaluation approaches

Even before the end of the 1960s Henchy and Glass (1968) were already casting doubt on Zajonc’s (1965) initial claim that the ‘mere presence’ of others was the reason for increased activation. They argued that activation or drive increases only when actors are afraid of being evaluated by an audience (evaluation apprehension). In a more general approach, Cottrell et al. (1968) postulated their so-called learned drive hypothesis that activation should increase when actors are able to associate an audience with evaluations of their performance. The difference compared with Henchy and Glass (1968) was that actors should not fear the positive or negative evaluation of an audience. In contrast to Zajonc (1965), this would mean that the cause of activation is learned.

Hence, both Cottrell et al. (1968) and Henchy and Glass (1968) did not discriminate between whether participants anticipate positive or negative performance evaluations. There have been additional claims and empirical studies on this issue (e.g., Paulus & Murdoch, 1971). One of the most important is Weiss and Miller’s (1971) concept that activation will increase only when others represent a threat and actors fear a negative evaluation. This constitutes an aversive state associated with fear. This point has been emphasized in various reviews, particularly by Geen (1991), who has tried to relate social facilitation effects to concepts of social anxiety. The main argument is that social facilitation effects will occur only when persons fear that a potential failure in the presence of an audience will have negative consequences (e.g., negative feedback, loss of face, or embarrassment). However, this concept is contradicted by studies (e.g., Good, 1973) showing that social facilitation effects occur only when positive evaluations are anticipated.

Alertness

Zajonc (1980) himself contributed a further modification to his theory. He argued, deviating from his stance in 1965, that others, as social stimuli, will trigger uncertainty in the actor, because an actor generally does not know how another person is going to behave at any next moment in time. “Hence in the presence of others some degree of alertness or preparedness for the unexpected
is generated…” (Zajonc, 1980, p. 50). This leads finally to a preparation of, or increase in, energies in the actor that produces the described effects in terms of performance only when others are present.

**Monitoring**

Guerin (1983) (see, also, Guerin & Innes, 1982) took up this postulate from Zajonc (1980) when developing their ‘monitoring model.’ One of its predictions is that social facilitation effects will not occur when the situation does not trigger uncertainty. This is particularly the case when the actor knows the persons who are present or is familiar with the situation and able to monitor the others continuously. However, if it is not possible to observe the other person, and particularly if the other person or the situation is also unfamiliar, the actor will become uncertain and arousal will increase. Guerin (1983) tested these assumptions in an experiment with simple and complex pair-association tasks (taken from Cottrell et al., 1968). However, he was able to confirm his hypotheses only for complex tasks. Performance was worse in participants who, according to Guerin (1983), had experienced uncertainty.

**Challenge and threat**

Blascovich et al. (1999) focuses on the cardiovascular responses which occur when persons are working on well learned or unlearned tasks. Persons performing a simple task show a cardiovascular response which can often be observed when a task is a challenge for the person (increased cardiac response and decreased vascular resistance). On the other hand, working on a complex task leads to a cardiovascular response which can be described as a threat pattern (increased cardiac response and increased vascular resistance).

**Explanations based on attention theory**

Alternative approaches to Zajonc (1965) and Cottrell et al. (1968) started to emerge at the end of the 1970s. In particular, models were proposed that emphasized the importance of attention.

**Distraction–conflict hypothesis**

This hypothesis (Sanders et al., 1978) is derived from Meumann’s (1904) finding that actors are distracted by the presence of others and will no longer focus their attention completely on the task at hand. Sanders et al. (1978) assumed that this does not just lead to a deterioration in performance, but also to an increase in activation, arising from the attentional conflict of wanting to concentrate on both task and audience at the same time. Consequently, Sanders et al. (1978) postulated that, as in Zajonc (1965), performance decrements on difficult tasks are always to be expected when others are present. When dealing with simple tasks, performance can either improve or deteriorate depending on the size of the effect of the increased drive.

Sanders et al. (1978) tested their model by giving participants a simple and a difficult copying task to perform with both in the presence of others as well as in the presence of a nonsocial distractor (visual signal). They obtained the anticipated pattern of results. Because of the activation assumption, this model represents a bridge from the activation to the attention models, but, unlike Zajonc (1965), it includes nonsocial distracters.
Overload hypothesis

Baron (1986) proposed the following modification to the distraction–conflict hypothesis: The attention conflict between others as distractor and the task does not lead to increased activation, but to increased cognitive overload in the form of an exhaustion of attentional capacity. Complex tasks are supposed to consist of numerous stimuli that tie up attention. This then leads to performance decrements on difficult tasks. Simple tasks are characterized by also having a whole series of irrelevant stimuli that will tend to impede a correct solution. In an overload situation, attention no longer focuses on the irrelevant stimuli (see Easterbrook, 1959), leading to performance increments in the presence of a distractor. Using Stroop tasks, Huguet, Galvaing, Monteil, and Dumas (1999) managed to produce empirical evidence in support of these assumptions.

Feedback-loop model

Carver and Scheier (1981) pointed out that many of the studies oriented toward activation models (e.g., Martens, 1969) measured unspecific arousal before the task was carried out in front of an audience, but not during the task being carried out. As a result, such arousal can be conceived more as a reaction to a new situation and perhaps also as anxiety or ‘stage fright.’ While the task is being carried out, however, unspecific arousal should decline and no longer impact on performance. Carver and Scheier’s (1981) actual theory is based on Duval and Wicklund’s (1972) theory of objective self-awareness. This postulates that people focus attention on themselves when, for example, they view themselves in a mirror or feel that they are being observed by others. A state of self-awareness highlights the discrepancies between actual behavior and an ideal, anticipated behavior (the standard). As a result, the individual tries to reduce the discrepancy. On the basis of this approach, Carver and Scheier assumed that this is done through feedback loops within the framework of repeated comparisons between the actual and the desired state of affairs.

Each specific comparison with the salient standard leads to a different action-control process resulting in the selection of one from a range of possible alternative reactions. If enough time is available, the optimal reaction can be selected from the feedback loop that comes closest to the personal standard. This model can be used to explain slight performance increments in the presence of an audience.

In complex tasks, the first point is that a personal performance standard has not yet been established. The second is that it is also possible for two noncompatible standards to attain salience. In both cases, the necessary search for an appropriate standard will lead to performance decrements.

Capacity model

Manstead and Semin (1980) capacity model draws on Shiffrin and Schneider’s (1977) two-process theory of information processing. Instead of distinguishing between simple and complex tasks, it favors a classification into tasks that require cognitively controlled information processing and tasks for which an automatic information processing (like automatic scripts) is necessary for success.

When tasks of the latter type are processed in the presence of others, performance increments, according to Manstead and Semin (1980), can be anticipated. Normally, without the presence of an audience, automatic task processing will tend to lead to suboptimal performance. The presence of others focuses attention on the automatic execution and, because automatic processes do not
generate any capacity problems in short-term memory, performance improves. Working on tasks whose solutions require cognitively controlled processes takes up a major part of attention. An audience represents, according to Manstead and Semin (1980) a further attention-demanding factor alongside the task. Because of the capacity limitations in controlled processes, this leads to performance decrements in more demanding tasks in the presence of others (see, also, Baron, 1986).

Further models

The self-presentation approach

Guerin (1993) pointed out that early work within the social facilitation context (see, e.g., Triplet, 1898; Moede, 1920) had already shown that the opportunity to engage in self-presentation in front of an audience is an important factor influencing performance. However, no attempt was made to explain not only performance increments but also performance decrements in the presence of others until Bond (1982) presented his model.

Bond (1982) assumed, first, that actors strive to create an impression of competence when in the presence of others and, second, that they try to deduce whether the task is easy or difficult. If an easy task is performed in the presence of others, then actors deduce that they can appear to be competent by improving performance and thus present themselves in a positive light. However, this approach has more difficulty in explaining performance decrements in complex tasks in the presence of others. Bond (1982) assumed that actors notice that they will not be able to appear competent because of the difficulty of the task. They would then experience embarrassment (see, already, the work of Moore, 1917), and their performance would deteriorate. However, this contradicts ideas from attribution theory (e.g., Möller, 1993). From an attribution perspective, positive competence attributions result particularly from the successful processing of tasks that are held to be difficult. A successful processing of obviously simple tasks is generally not attributed by others to individual competence but to the easiness of the task.

Social loafing and social facilitation

Social loafing is a phenomenon that can emerge under coaction conditions and thus does not relate directly to social facilitation studies in which others are merely present. Nonetheless, because some studies have tried to integrate the phenomena of social facilitation and social loafing into one model, they shall be mentioned briefly here.

Ringelmann (1913) studied how several participants performed on a tug-of-war task. Although this is a simple task in terms of social facilitation research, Ringelmann reported individual performance decrements, whereas social facilitation models would predict performance increments. Latané, Williams, and Harkins (1979) were the first to label the loss of motivation in individuals working in a team as ‘social loafing’.

Social loafing can be observed not just in the simple motor tasks reported by Ringelmann (1913) and Latané et al. (1979) (clapping), but also in, for example, swimming (Williams, Nida, Baca, & Latané, 1989), cognitive judgments (Weldon & Gargano, 1988), creativity (Harkins & Jackson, 1985), and labyrinth tasks (Jackson & Williams, 1985).

Fairly recently, attempts have been made to integrate the two areas of research (see, e.g., Harkins & Szymbanski, 1987; Sanna, 1992). It has been shown that one decisive factor is whether individual performance can be identified and evaluated. This is when performance decrements or
increments in the sense of the social facilitation approach emerge, thus enabling evaluation apprehension to form in the actor. Harkins (1987) was not referring to Zajonc (1965) here, but to Henchy and Glass (1968) or Weiss and Miller (1971). Social loafing occurs in simple tasks when no evaluation apprehension is present.

The cognitive–motivational model

In this model, Paulus (1983) presented an approach that attempts to integrate various assumptions from the above-mentioned activation and attention theories of social facilitation research and the social loafing approach. It also addresses individual performance in group situations. By discriminating between positive and negative social consequences, Paulus (1983) derived some predictions on the performance of a person processing an easy or a complex task. In the case of negative consequences (e.g., contempt or disappointment in others), an individual will react with task-irrelevant processing (e.g., in the framework of the distraction–conflict model of Sanders et al., 1978), with increased arousal, and with increased effort to avoid potential failure.

If the task is simple, this task-irrelevant processing will not lead to a deterioration in performance, but improvement because of the predominance of higher effort or arousal. On a difficult task, in contrast, the impact of task-irrelevant processing will be far more negative and severe. Performance will decline despite greater effort and higher arousal.

Positive consequences (e.g., admiration, reward) will lead, according to Paulus (1983), to higher effort. Because arousal and task-irrelevant processes are not decisive for performance, it will improve performance for both simple and complex tasks.

The advantage of this model is the way it tries to integrate the sometimes competing assumptions into a single framework. However, an initial disadvantage is the difficulty in testing the model empirically, and also that such tests are, at best, possible only under restrictive conditions. Nonetheless, Griffith, Fichman, and Moreland (1989) managed to test the empirical appropriateness of the model with regression analysis, though with the restriction of not discriminating between positive and negative consequences.

A second disadvantage is that it is easy to ascertain conditions under which a far-reaching model is no longer valid. The last-mentioned assumption—performance increments for both simple and complex tasks when positive consequences are anticipated—is particularly problematic. For example, research on ‘choking-under-pressure’ (e.g., Baumeister, 1984) has shown that performance decrements may also emerge under such conditions.

The Bond and Titus (1983) meta analysis

These authors integrated 241 studies (with more than 24,000 participants working mostly on cognitive tasks) into a comprehensive meta-analysis of published research on social facilitation. They integrated only studies of human performance in the presence of others. They found that the size of the social facilitation effect across all studies was very small. This is a sobering finding. Bond and Titus (1983) concluded that social facilitation can be assumed to explain only 0.3–3% of the variance in performance. Important moderators are not only task complexity (‘simple’ vs ‘complex’) but also the type of performance. The latter can be differentiated according to whether a quantitative performance e.g., measured in terms of speed, latencies, response rates) or a qualitative performance e.g., measured in terms of accuracy, errors, number of attempts) is required.

This differentiation of performance was already used in the early work on social facilitation
(Allport 1920, 1924) and in very early reviews like that of Dashiell (1935). He found that “the mere presence of others tends to speed up the individual’s work but to make it less accurate” (p. 1106). Table 1 reports the mean effect sizes ($d$) as well as the number of integrated studies ($K$) and the fail-safe $K$ in the study of Bond and Titus (1983).

In all, no $d$s were larger than one third of a standard deviation. The lowest negative $d$ (i.e., performance decrement in the presence of others) of $-0.36$ was found for complex tasks in which performance was measured qualitatively. The highest positive $d$ of 0.32 was ascertained for tasks that were rated as simple and measured quantitatively. Both these effect sizes were very reliable with respect to the Fail-Safe $K$. The other two effect sizes were closer to zero and unreliable.

The main outcome of this meta-analysis is that the empirical studies basically fail to confirm the pattern of changes in performance in the presence of others predicted by Zajonc (1965) or Cottrell et al. (1968) for simple and complex tasks. However, the meta-analysis also indicated that it may be necessary to distinguish between whether a quantitative or qualitative aspect of performance is being measured. The performance decrements for complex tasks predicted by the models were highly reliable only for qualitative performances, and the predicted performance increments on simple tasks, only for quantitative performances.

It should be noted that these results are similar to the very early findings presented by Allport (1920, 1924). When examining coacting performances in cognitive tasks, he found that quantitative performance (e.g., speed) improved compared with the solitary conditions. He also found decrements in performance. An inspection of the quality of responses revealed that performance was lower in the coaction compared with the solitary condition.

The next section focuses on different types of motor tasks. This differentiation will be helpful to assess the appropriateness of the social facilitation theories in motor tasks.

**Differentiating types of motor tasks**

Motor abilities are major determinants of motor performance. A whole series of motor abilities have been proposed (see, for a summary, Bös, 1987). The general differentiation between types of tasks is between conditioning and coordination and on a more differentiated level stamina or endurance, power or strength, speed, and coordination. Fig. 2 shows how Bös (1987) summarizes and further differentiates these four motor abilities.

Stamina, power, and speed are usually classified as conditional abilities, although speed is

<table>
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<th>Task complexity and type of performance</th>
<th>$d$</th>
<th>$K$</th>
<th>Fail-Safe $K$</th>
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<tr>
<td>Simple task</td>
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</tr>
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<td>Quantity</td>
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<td>154</td>
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<td>Quality</td>
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<td>112</td>
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<tr>
<td>Complex tasks</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quantity</td>
<td>-0.20</td>
<td>54</td>
<td>160</td>
</tr>
<tr>
<td>Quality</td>
<td>-0.36</td>
<td>147</td>
<td>5697</td>
</tr>
</tbody>
</table>

* Based on meta-analysis by Bond and Titus (1983, p. 273). Positive effect size $d$ values indicate better performance when others were present; negative $d$ values represent poorer performances.
regarded as also possessing coordination elements. Conditioning abilities are determined energetically, in contrast to coordination abilities that are considered to be information-oriented and not determined energetically. These refer to the interplay of various body systems such as eye–head–hand coordination.

Fig. 2 shows how stamina, power, speed, and coordination can be differentiated further. This ranges from aerobic and anaerobic stamina as different forms of gaining energy (Hollmann & Hettinger, 1980) up to the discrimination of coordination into ‘ability to coordinate under time pressure’ and ‘ability to control movements precisely’ in accordance with Roth (1982).

Transferring this differentiation of motor abilities to various tasks requiring motor performance (e.g., motor tests) has the following implication: It makes it possible the differentiation of motor tasks according to which motor abilities tend to be required to solve them successfully, in other words, according to which ability explains performance.

This permits a differentiation of tasks into ones that mostly place demands on either conditioning abilities, coordination abilities, or mixed forms, placing demands simultaneously on both components.

*Tasks placing high demands on conditioning* are ones requiring a high level of energy or physical effort. Examples are running and power lifting. In terms of Zajonc’s (1965) distribution into simple (well-learned) and complex (not well-learned) tasks, these tasks tend to be simple (see, e.g., Beckmann & Strang, 1992; Worringham & Messick, 1983), because, as a rule, they require little or no learning, and successful performance is more dependent on the amount of energy that the organism can and wants to make available. These tasks cannot be classified meaningfully in Manstead and Semin (1980) proposed discrimination between automated and controlled processes.

*Tasks placing high demands on coordination* are those in which various body systems have to be synchronized. Roth (1982) differentiated between precision tasks performed either with or without time pressure. Schmidt and Lee (1999) differentiated between discrete and continuous coordination tasks. Whereas the former have a definite beginning and end, for example, switching on a light, the beginning and end in the latter are chosen at random, for example, in walking or driving. Coping with coordination tasks generally requires practice or one or more learning trials whose intensity varies as a function of task difficulty. Therefore, in principle, one cannot say whether coordination tasks are simple or complex in Zajonc’s (1965) terms. Basically, the implementation of coordination tasks requires attention. This calls for the discrimination in line

![Diagram](image_url)

**Fig. 2.** Differentiation of motor abilities (according to Bös, 1987, p. 94).
with Manstead and Semin (1980) between whether there is a need for cognitively controlled information processing (e.g., in new or very difficult tasks) or whether successful coping will tend to require automatic information processing (e.g., automatic scripts) instead.

Strictly speaking, of course, all tasks make demands on conditioning and coordination. Running obviously also requires the coordination of arms and legs, but successful coping requires the presence of outstanding conditioning abilities. The same applies to tasks that mostly make demands on precision, such as threading a needle. Although the organism has to make energy available before the task can be performed at all, energy is not the decisive component in explaining interpersonal differences in performance.

Isolated laboratory motor tasks are often used to measure conditioning components such as power and stamina or coordination components in more ‘pure’ terms. For example, power has been measured with dynamometers, stamina with ergometers, coordination with pursuit rotor tasks or stabilometers, and so forth.

An inspection of different types of sport reveals that they are composed of a mixture of coordination and conditioning components. The crucial aspect is how strongly these parts relate to each other. For example, some types of sports like marathon running, 10,000 m running, cycle racing (e.g., the Tour de France), or weightlifting place more demands on conditioning. Other types of sports, like shooting, darts, or golf place stronger demands on coordination. Furthermore, there are many sports with roughly equal demands on both coordination and conditioning as in several team sports (e.g., soccer, ice hockey, basketball).

Motor performance can also be discriminated according to its quantitative and qualitative aspects. Frequently, performance tends to be measured quantitatively in tasks placing high demands on condition (e.g., weight, duration, speed), whereas performance (accuracy, error rate, etc.) frequently, but not exclusively, tends to be measured qualitatively in tasks placing high demands on coordination. Particularly when the execution of the task is automatic, performance is measured quantitatively (e.g., reaction time). However, this is not always true. For example, although sequences of movement have to be made automatic in gymnastics, performance is assessed in terms of the quality of their execution.

**Social facilitation and motor tasks: empirical findings**

This section presents studies that have investigated motor tasks. In line with the previous section, it will distinguish between (a) tasks with a predominantly coordination component, (b) tasks with a predominantly conditioning component, and (c) tasks that place demands on both conditioning and coordination.

**Coordination tasks**

In early years, very few studies used motor tasks. Travis (1925) studied performance on a pursuit-rotor task. His participants first had to continue learning the task until no further gain in performance could be observed. Then, they had to solve the problem again, initially by themselves and then in front of four to eight persons. Results showed improvements in performance (though rather small) in the audience condition.
Performance decrements in the presence of an audience, in contrast, were found by Husband (1931), as well as Pessin and Husband (1933), in finger labyrinth tasks. In Singer’s (1965) study, 16 athletes and 16 persons with no sports experience had to learn a balancing task on a stabilometer without an audience being present. When repeating the task later in front of an audience, athletes performed notably worse than participants with no sports experience.

From 1970 up to the present, the majority of studies using coordination tasks have been related to Zajonc’s (1965) or Cottrell et al. (1968) approach. Generally, these studies have used laboratory tasks placing ‘pure’ demands on coordination.

In Martens’ (1969) study, which is considered to be the most important empirical confirmation of Zajonc’s approach in the motor domain, participants had to learn a complex motor task (a goal pursuit task) either alone or in the presence of an audience. Results showed that during the learning phase, they performed less well in the presence of an audience than when they were alone. After some time had passed and the task had been learned (i.e., had become simpler compared with the learning phase), performance improved in front of an audience compared with the solitary condition. Landers, Bauer, and Feltz (1978) were able to replicate the relevant effects. However, Iso-Ahola and Hatfield (1985) noted critically that Martens (1969) failed to state in his journal article (although he reported this in his dissertation; Martens, 1968) that the audience in this experiment was not just present, but that participants had been informed that their performance would be televised and judged by physical education teachers. This would suggest that Martens’ study may provide less support for Zajonc (1965) than for Cottrell et al. (1968) who emphasized the role of evaluation apprehension.

However, the results of studies by Butki (1994) and Hollifield (1982) contradict Cottrell et al.’s model (1968). Butki (1994) studied 60 participants who had to learn a simple motor task on a pursuit rotor. Two of the learning conditions tested when they were alone compared with when they were in the permanent presence of an audience with evaluative potential. After the learning phase, there were no differences in performance. Hollifield (1982) studied the performance of 80 nine-year-old boys on a rotary pursuit task in the presence of an evaluative audience versus without an audience. In contradiction to Cottrell’s premise, the best performance was found in boys who had learned the task well and had to perform without an audience. A secondary finding in this study was that experience of performing in front of an audience did not correlate with performance.

Haas and Roberts (1975) carried out two experiments to examine more closely whether an audience with versus without evaluative potential exerts more influence on learning or performing a complex motor task. As in Martens (1969), participants had to learn a complex motor task either alone or in front of an audience. During the learning phase, performance was worse when the audience had an evaluative potential. In the test phase (in other words, after the task had become easier through learning), the best performances by far were exhibited before an audience with evaluative potential, whereas the worst performances were found in the solitary condition. In sum, these results provided the clearest support for Cottrell et al.’s premise.

Wankel (1972) compared mere presence conditions with coaction conditions. He found no differences in the presence of others who were either coacting or merely present compared with a solitary condition when performing either simple or complex motor reaction time tasks. This finding contradicts Zajonc’s hypothesis in general.

In a study by McCracken and Stadulis (1985), children with higher coordination skills perfor-
med a balancing task better in front of an audience than when they were alone compared with children who had not learned this skill so well. This finding can be reconciled with Zajonc’s (1965) approach when it is assumed that the task was complex for the less practiced children and simple for those with more practice. This way of operationalizing simple and complex tasks and the problems it involves will be addressed in the Discussion section later.

Finally, Guerin (1986a) also tried to examine whether Guerin and Innes (1982) monitoring postulate also held for motor tasks. He wanted to test whether social facilitation effects would be triggered only when the other person could not be observed continuously or the situation was unfamiliar. He gave a simple motor task, a pursuit rotor, to 39 participants. As anticipated, those who had to carry out the task in the presence of a passive spectator whom they could not see performed better than those in a solitary condition or those who were distracted by a mirror.

To summarize, there are a great number of contradictory findings in the domain of coordination-based motor tasks that sometimes support either Zajonc’s or Cottrell et al.’s approach, but, at other times, also contradict them both. The monitoring hypothesis has been tested only once for simple motor tasks.

**Conditioning tasks**

These are tasks that can be mastered successfully only by investing a considerable amount of energy. They are viewed as being either simple or well-learned. Participants generally exhibit only quantitative differences in performance by, for example, running faster or lifting heavier weights. Zajonc’s or Cottrell et al.’s approaches would anticipate performance increments in the presence of an audience.

In early years, Moede (1920) found that mean performance increased in the presence of others. For example, when participants worked on a power task with a dynamometer, performance was approximately 2.6% better in front of their school class compared with when they were alone. One of Moede (1920) explanations for these performance increments was ambition and the need to be admired by others. Interestingly, he also already made an indirect reference to the energy aspects of power tasks.

Beckmann and Strang (1992) found that the maximum application of power in a task in which participants had to press their feet down on a floor plate was higher when two spectators were present. Stamina tasks also revealed signs of performance increments.

Worringham and Messick (1983) examined the speed of 36 joggers who were blind to the purpose of the study over a 90-yd stretch of footpath at the University of Santa Barbara in California. All joggers covered the first 45 yd alone. Whereas one third of the participants also covered the next 45 yd alone, a further one third ran past a woman who sat reading with her back to the path (at the midway point). The authors took this to be an operationalization of the mere presence of an audience in the sense of Zajonc (1965). In a further research condition involving the remaining 12 joggers, the woman was seated facing them, once again, at the midway point. The authors assumed that this spectator now possessed an evaluative potential. Results showed that it was only in this latter condition that the joggers increased their speed significantly in the second compared with the first 45-yd stretch.

There is one study confirming performance increments in running in the presence of an audience through distraction that refers to the distraction–conflict hypothesis of Sanders et al. (1978).
Strube, Miles, and Finch (1981) studied the running performance of ‘indoor joggers.’ Joggers who subsequently reported feeling more distracted by an audience performed better. However, the validity of this study is low because it was based on self-reports. In summary, tasks that can be mastered essentially through power or stamina components reveal performance increments in the presence of an audience.

Task requiring both coordination and conditioning

Several classic experiments in which participants had to carry out gymnastic exercises such as forward and backward somersaults or handstands (see, e.g., Paulus & Cornelius, 1974; Paulus, Shannon, Wilson, & Boone, 1972) revealed performance decrements in the presence of an audience, particularly when participants were experts. This, once again, contradicts both Zajonc’s and Cottrell et al.’s approaches. Nonetheless, Strauss (1999) has pointed to major statistical deficits in these studies (such as correlating initial scores with change scores), indicating that results may have been based on misinterpretations of the data.

Bell and Yee (1989) studied karate students. In poor performers, the number of well-executed kicks declined in front of an audience. However, they found no significant audience effect in better performers.

Dube and Tatz (1991) studied 9- to 14-year-olds during a 3-week tennis training course at a summer camp. Before they started training, the children were split into a high- (Group A) and a low-skill group (Group B). Although high-skill children produced better strokes in front of an audience compared with no audience at the end of the training course, they also exhibited more mistakes in front of an audience compared with when they were alone. In addition, performances on the ‘good’ strokes in Group A and B no longer differed in the condition without spectators. Therefore, this study fails to confirm Zajonc’s approach.

Forgas, Brennan, Howe, Kane, and Sweet (1980) studied the performance of squash players competing with versus without the presence of an audience. Results showed no relation between absolute performance levels and the presence of an audience, thus contradicting Zajonc’s approach. However, one interesting finding was that in the condition without an audience, the better player in a pair performed much better than the inferior player. When an audience was present, this difference in performance was much lower. In particular, performance in superior players dropped clearly compared with the condition without an audience. Naturally, it has to be noted critically that, as in Dube and Tatz (1991), competitive conditions were operationalized, and it is questionable from the very outset whether Zajonc’s approach can still claim validity under such conditions.

Finally, mention should be given to a coaction study of Ben-Ezra, French, Mastro, and Montelione (1986) in which 13 sprinters with visual impairments had to run with versus without a companion. This study is included here, because the task must have placed not only conditioning but also coordination demands on participants with visual impairment. Results revealed no differences in performance between the two conditions.

In summary, numerous attempts to test mostly either Zajonc’s or Cottrell et al.’s approach have been carried out with athletic performances from the greatest variety of contexts (balancing tasks, stamina tasks, gymnastic exercises, ball games, etc.) serving as the dependent variable. However,
neither model can be confirmed in tasks that place simultaneous demands on condition and coordination.

**Discussion**

In general, the models based on activation theory and, of course, particularly Zajonc’s model, can be regarded as the major social facilitation models that have generated the most empirical research. More recent models, such as those from Bond (1982), Carver and Scheier (1981) and Sanders et al. (1978), tend to be supported only by their authors’ own empirical work designed to confirm them. Some narrative reviews (Cottrell, 1972; Geen 1980, 1991; Geen & Gange, 1977; Zajonc, 1980) come to the conclusion, confirming the activation theory models, that performance on easy tasks tends to be facilitated by the presence of others, whereas, on complex tasks, it tends to be impeded. In his review, Zajonc (1980) tends to favor his model from 1965. Geen and Gange (1977) as well as Cottrell (1972), in contrast, emphasize the importance of potential evaluation. The narrative reviews of Sanders (1981) and Baron (1986), or Guerin (1986b, 1993) favor the validity of their own models, that is, the distraction–conflict hypothesis, the overload hypothesis, and the monitoring hypothesis respectively.

However, the Bond and Titus (1983) meta-analysis indicates performance increments in the presence of others on simple tasks with quantitative performance measures and performance decrements on complex tasks with qualitative performance measures. Hence, this analysis provides only partial confirmation of the Zajonc and Cottrell approaches, although it has to be noted that it does not, in contrast, favor any of the other models, such as the self-presentation approach. As reported, far fewer studies have been carried out with motor tasks than with cognitive tasks.

An inspection of motor performance confirms that most studies try to test Zajonc’s (1965) or Cottrell et al. (1968) approaches. However, their findings do not permit any broad empirical confirmation of either model. The results prove to be highly inconsistent. Nonetheless, models with activation components, such as those of Zajonc and Cottrell, seem to be partially viable for tasks requiring physical effort or an allocation of energy.

A comparison of this pattern of findings with that described by Bond and Titus (1983) reveals a correspondence with the performance increments (in the presence of others) on tasks requiring conditioning. These types of task are considered a priori to be simple because actors generally have no principal difficulty in executing them (Beckmann & Strang, 1992; Strube et al., 1981; Worringham & Messick, 1983). Persons then differ on quantitative aspects, such as weight lifted or speed. This finding corresponds with the results of a narrative review focusing on motor performance. Landers and McCullagh (1976) summarized the empirical findings as indicating that activation theory models are valid only for quantitative performance on motor tasks.

A clear comparison with the Bond and Titus (1983) findings is not possible for tasks requiring coordination. Frequently, these tasks measure qualitative aspects, so that one can tend to anticipate performance decrements on complex coordination tasks. However, Martens’ (1969) study is one of the few also indicating that the presence of others facilitates performance on coordination tasks once the task has been learned. Nonetheless, most reported studies confirm that performance on coordination tasks drops when others are present. This is supported by studies from attention research on automatic and controlled task processes. However, these studies contradict the
assumptions of Manstead and Semin (1980) and Baron (1986), as well as the distraction–conflict model developed by Sanders et al. (1978) for coordination tasks. When processing tasks in which success requires automated processes (i.e., in principle, well-learned or overlearned tasks, whereby most studies have investigated tasks with coordination demands), some studies (e.g., Baumeister, 1984; Vallacher & Wegner, 1987) have shown performance decrements in the presence of an audience. Carver and Scheier (1981) have confirmed that self-awareness is increased through the presence of an audience. Martens and Landers (1972) have argued that self-awareness becomes detrimental to performance particularly when attention is drawn to the execution of the task. Baumeister (1984) has been able to confirm this experimentally with some simple or well-learned motor tasks containing coordination components. These experiments made actors focus their attention explicitly on what they were doing. The result was performance decrements.

In summary, this means that on tasks with conditioning demands, performance increments are to be expected in the presence of others but, in contrast, performance deficits in tasks predominantly making demands on coordination. If both condition and coordination are demanded, there should tend to be no differences. This is confirmed impressively by the studies reported.

Inspection of the validity of social facilitation theories in the domain of motor performance reveals that this can be claimed by the classic activation theories of Zajonc or Cottrell in the narrow field of performance increments on conditioning tasks. On coordination tasks, it is possible, though this is only a hypothesis, that attention-relevant processes are involved.

It will only become possible to give a final answer on whether attentional theories are more applicable for coordination tasks and activation models more applicable for conditioning tasks, and which models can be applied for mixed demands, when tasks are classified more unequivocally than has been possible so far.

This should be explained briefly. The central concept for the direction of change in performance in social facilitation models is task difficulty. Most of the corresponding studies dichotomized this as ‘simple’ and ‘complex.’ Although some early research (e.g., Allport 1920, 1924) focused on the type of performance, for example whether it has to be quantitative or qualitative, this has hardly ever been the focus of attention.

Originally, Zajonc’s (1965) model postulated that although spectators exert a influence in principle, the direction of this influence (i.e., whether it facilitates or impedes performance) would depend on the degree of practice or on the acquisition of skills for coping with the tasks to be performed. Hence, his original formulation in 1965 referred to the acquisition or the learning of skills. As a result of this, Zajonc and Sales (1966), and also Cottrell et al. (1968) tested their models in terms of learning specific skills (in this case, the retention of nonsense syllables).

Zajonc’s later work (e.g., Zajonc, 1969, 1972, 1980; Zajonc et al., 1969), and also that of other authors (e.g., Bond & Titus, 1983; Geen 1980, 1991), abandoned this direct reference to the acquisition of skills and replaced it with the discrimination into simple and complex tasks. This had major consequences for research design and task operationalization, as can be shown very well through the motor tasks reported. Three operationalization approaches can be differentiated in the field of motor tasks.

First, simple or complex tasks are defined almost in the sense of an arbitrary decision (e.g., running in Strube et al., 1981 and Worringham & Messick, 1983, or power training exercises in Beckmann & Strang, 1992, as simple tasks; coordination tasks in Martens, 1969; Wankel, 1972, as complex tasks). At times (e.g., Wankel, 1972), ‘simple’ is equated with ‘well-practiced’, and
‘complex’ with ‘still to be learned.’ This is frequently used to justify applying two separate tasks with different content in one study (e.g., in Beckmann & Strang, 1992, a ‘simple’ power training task and a ‘complex’ copying task). In general, conditioning tasks tend to be labeled simple and coordination tasks tend to be labeled complex. The latter become simpler through learning (see Martens, 1969).

Second, the type of task is turned into a feature of the person (e.g., Forgas et al., 1980; Paulus et al., 1972; Paulus & Cornelius, 1974). For persons who perform better, the task is considered to be well-practiced; for those who perform worse, the task is still to be learned. Higher and lower performances are then frequently ascertained a posteriori through a median split of performance and a separation into ‘experts’ and ‘nonexperts.’ This is highly critical because it operationalizes one task feature a posteriori over a sample distribution and, depending on the distribution, the same performance can, in some circumstances, be used to operationalize either a simple task or a complex task.

Third, persons practice a task across different trials until they have learnt it (Haas & Roberts, 1975; Martens, 1969). This operationalization through the acquisition and application of skills is closest to Zajonc’s (1965) concept and is oriented toward the original studies (Cottrell et al., 1968; Zajonc & Sales, 1966).

Hence, an inspection of the studies in social facilitation research that separate tasks into simple and complex obliges us to assume that different things are being understood under these concepts, and that it is difficult to summarize them together.

Manstead and Semin (1980) have pointed to this critical point. They consider it to be responsible for the inconsistent findings in social facilitation research and fall back, as reported, on an information-processing perspective by distinguishing between tasks with automatic versus controlled information processing. This, by the way, would also lead to a different application of quantitative or qualitative performance measures. Sternberg (1984), for example, points out that performance on tasks requiring automatic information processing is ascertained with quantitative measures. Tasks with controlled information processing, in contrast, require qualitative measures.

However, Manstead and Semin (1980) proposal has largely been ignored. At best, it is reconcilable with the third operationalization proposal (the acquisition and application of knowledge) as found in the classic studies at the end of the 1960s (Zajonc & Sales, 1966). Here, it could be assumed that a transition from controlled to automatic information processing occurred during the learning process. However, their basic explanation, as just reported, is doubtful due to the consistent findings on the disruption of automatic processes.

In summary, a social facilitation theory that is able to predict the changes in performance due to the presence of others when working on motor tasks still has to be formulated. This will only become possible through a precise taxonomy of motor tasks. Nonetheless, the results of social facilitation studies with motor and cognitive tasks have one thing in common—if any effects of the mere presence of others are to be found at all, they tend to be very weak.

References


