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The Effects of Time Pressure on Belief Revision in Accounting: A Review of Relevant Literature within a Pressure-Arousal-Effort-Performance Framework

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ABSTRACT: This study advances several propositions about the effects of time pressure on individuals' belief revisions within a pressure-arousal-effort-performance framework. There is a significant body of research that documents the importance of both time pressure and order effects in an accounting environment. However, prior research has not investigated how the order of information affects individuals' belief revision processes under varying levels of time pressure, even though the inclusion of a time pressure variable has been noted as relevant in belief revision research, both in general (Hogarth and Einhorn 1992) and in accounting (Kahle, Pinsker, and Pennington 2005; Trotman and Wright 2000). In this review, we extend prior belief revision research in accounting by describing how time pressure interacts with personal and task variables and the subprocesses described in the belief-adjustment model (Hogarth and Einhorn 1992). Propositions are advanced on the effects of time pressure on individuals' belief revisions. A better understanding of such interactive effects helps to explain the mixed results identified in prior studies.

Keywords: order effects; time pressure; belief revision.

INTRODUCTION

Substantial research has been conducted in behavioral accounting that demonstrates that the order in which information is received and processed affects individuals' judgment and decision making (hereafter JDM).[1] Most of this research is based on Hogarth and Einhorn's (1992) belief-adjustment (hereafter BA) model. The BA model arrives at certain order effects predictions that depend on task variables and subprocesses that are specified within the model. Belief-revision research in financial accounting, auditing, and tax generally confirms recency effects, as predicted by the BA model.[2] However, such studies also identify several variables not included in Hogarth and Einhorn's (1992) model of belief revision that mitigate or even eliminate recency effects in an accounting environment. Trotman and Wright (2000) and Kahle et al. (2005) conclude that further research on order effects is not likely to add much to our understanding of belief revision in accounting unless additional variables or conditions that are unique or important to accounting, including accountability, the requirement to justify oneself, experience, and time pressure, are incorporated into the model.

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[1] See Trotman and Wright (2000) and Kahle, Pinsker, and Pennington (2005) for overviews of findings on order effects in accounting.
[2] Recency occurs when information presented later in the sequence is weighted more heavily (e.g., Tubbs, Messier, and Knechel 1990; Messier and Tubbs 1994). Primacy occurs when individuals attach more weight to information received early in the sequence (e.g., Anderson 1965; Anderson and Maletta 1999).

The current paper calls for further research into the BA model by incorporating time pressure and its interactive effects with personal variables (experience) and task variables (task complexity) on judgment and decision making.[3] Prior research has documented the importance of time pressure in accounting (e.g., Rhode 1978; Kelley and Margheim 1990; Kelley et al. 1999) and shows that time pressure can both increase and decrease individuals' JDM quality[4] depending on the level of time pressure, personal and organizational factors, and the nature of the task being performed (e.g., Solomon and Brown 1992; Payne, Bettman, and Johnson 1993; DeZoort and Lord 1997; Bowrin and King 2010).

An understanding of the effects of time pressure on belief revision is important for several reasons. First, auditing research has demonstrated that time pressure is one of the main causes of quality-threatening behavior (hereafter QTB)[5] by auditors (e.g., premature sign-off and failure to test all items in a sample). While prior research has shown that auditors' judgments are affected by the order of information presented, the effect of time pressure on order effects has not been investigated. Second, users of financial information have been shown to be affected by the order in which they receive financial information (Tuttle, Coller, and Burton 1997; Pinsker 2007, 2011; Daigle, Pinsker, and Pitre 2015). Investors, who are trying to make a short-term profit, may perceive a need to react quickly to new information, requiring an update in our knowledge of how human investors revise their stock price evaluations under time pressure (e.g., Pietsch and Messier 2017; Nursimulu and Bossaerts 2014; Steiner, Gross, and Entorf 2009; Busse and Green 2002). Third, a better understanding of time pressure in an accounting environment may provide the necessary knowledge to train professionals to use the coping mechanisms for mitigating the negative effects of time pressure while retaining its positive effects on performance.

The remainder of the paper is organized as follows. In the second section, we describe the background and develop the theory for the current study and propose a series of research questions related to the effects of time pressure on individuals' performance in accounting tasks. In the third section, we apply the theory from our model to the BA model and describe how including time pressure interacts with the task variables included in the BA model, review prior findings regarding other pressure variables' effects on belief revision, and propose a series of research questions regarding individuals' belief revisions under varying levels of time pressure. The final section concludes with some additional comments, limitations, and propositions for future research.

TIME PRESSURE—BACKGROUND, MODEL, AND THEORY

Importance of Time Pressure

Time pressure is relevant in all disciplines in accounting (i.e., financial, managerial, auditing, and tax). In today's capital markets, information service organizations provide a continuous flow of information, and stock prices rapidly adjust to this new information (e.g., Busse and Green 2002; Steiner et al. 2009). This may require investors to make decisions quickly as new information is received. These new dynamics in financial markets require that researchers update how investors revise their stock price evaluations under time pressure (Nursimulu and Bossaerts 2014; Pietsch and Messier 2017). In managerial accounting, completing an investment project by a specific deadline creates time pressure. In auditing, most audit tasks must be completed within a certain timeframe to meet budget constraints as well as the client's reporting and regulatory deadlines.[6] Thus, auditors must gather sufficient evidence to meet professional standards while minimizing audit costs.[7] Finally, tax accountants face time pressure imposed by regulatory deadlines.

[3] Two primary types of time pressure are particularly relevant in an audit context: time budget pressure and time deadline pressure (e.g., Bennett and Hatfield 2017; Kelley, Margheim, and Pattison 1999; Solomon and Brown 1992). Bennett and Hatfield (2017) point out that time deadline pressure may be a larger threat to audit quality than time budget pressure because budgets can be adjusted, while most deadlines cannot be delayed. In our discussion, we primarily refer to "time pressure" in general. We argue that the model of time pressure that we propose in this study applies to both time budget and time deadline pressure. We distinguish between the two types of time pressure throughout the paper if we expect differences.

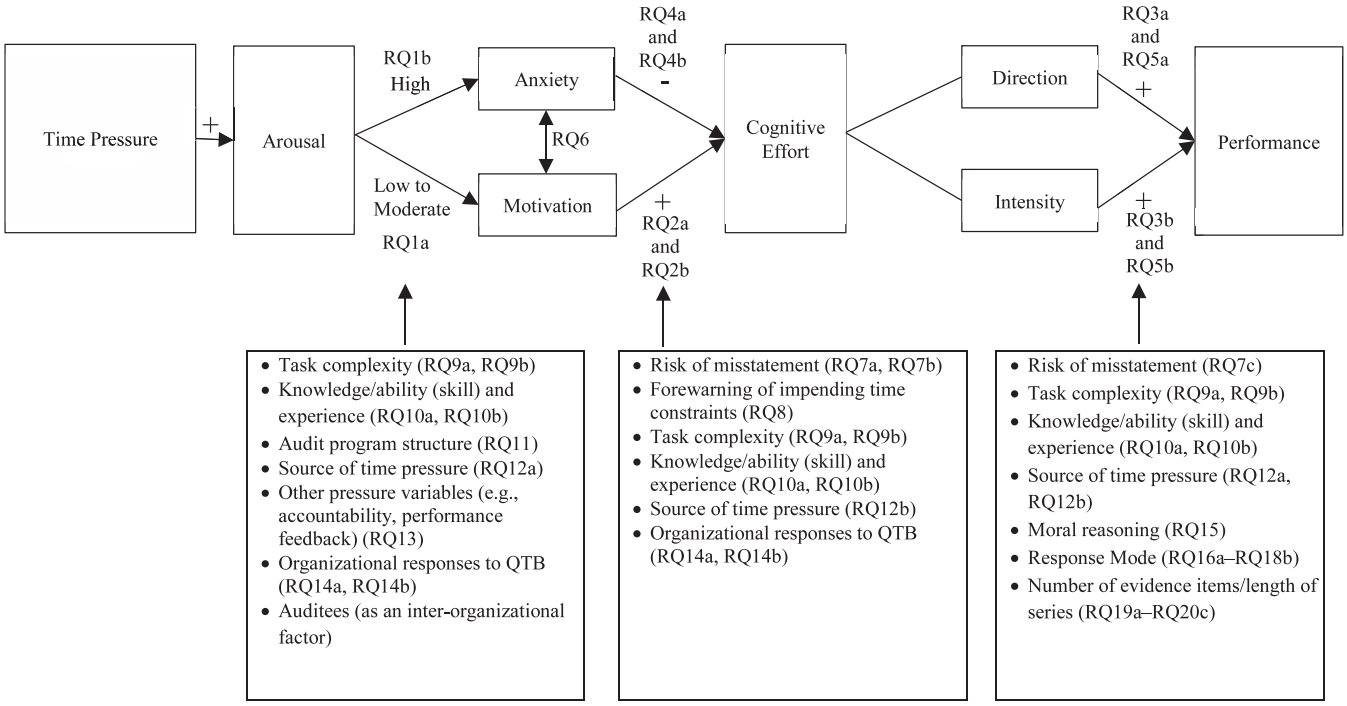
[4] JDM quality is defined as accuracy *vis-à-vis* outcomes or correspondence with normative theories like Bayes's theorem (see Bonner 2008). Nevertheless, other kinds of decision quality can be affected by time pressure as well; e.g., Rice and Trafimow (2012) show that time pressure can increase JDM quality, defined as consistency with oneself.

[5] QTB is often used interchangeably with the term reduced audit quality acts. For different definitions, see Peytcheva and Gillett (2012), Bedard, Deis, Curtis, and Jenkins (2008), Sweeney and Pierce (2004), Otley and Pierce (1996), or Malone and Roberts (1996). For a list of QTB identified in prior research see Coram, Glavovic, Ng, and Woodliff (2008).

[6] There is considerable research that documents the relevance of time pressure in auditing (e.g., Kelley and Seiler 1982; Alderman and Deitrick 1982; S. Lightner, Adams, and K. Lightner 1982; McDaniel 1990; Choo 1995; Braun 2000; Low and Tan 2011; Blankley, Hurtt, and MacGregor 2014; Christensen, Glover, Omer, and Shelley 2016; Lambert, Jones, Brazel, and Showalter 2017; Glover, Hansen, and Seidel 2016).

[7] Interestingly, *auditees* know that auditors face time constraints. Based on interviews with auditees, Sweeney and Pierce (2011) find that auditees know that they can influence the level of time pressure facing auditors by setting shorter auditee-imposed deadlines for filing reports and by withholding or delaying the availability of audit evidence. The auditees report that inducing time pressure on auditors enables them to influence quality-threatening behaviors.

FIGURE 1
Theoretical Framework for the Effects of Time Pressure on Performance



Time Pressure—A Model and Theory

There is extensive theory that time pressure has an *inverted-U* relation with JDM quality. That is, as time pressure increases from low to moderate levels, the quality of decision making increases. However, as time pressure reaches high levels, JDM quality decreases (e.g., Svenson and Benson 1993; Glover 1997; Payne et al. 1993; Rice and Trafimow 2012; Chuang 2013). Research in this area often relies on theories of *arousal* (Yerkes and Dodson 1908; Easterbrook 1959; Broadbent 1971; Eysenck 1982; 1984; Humphreys and Revelle 1984). Prior time pressure research in auditing is often based on these theories without systematically investigating the applicability of such theories to an audit context, even though the unique aspects of auditing (e.g., auditors' characteristics, such as domain-specific knowledge and experience, and situational factors such as justification and accountability) may preclude generalizing prior findings in psychology to auditing (Koonce 1993). This may also explain the mixed findings in prior time pressure research in auditing. To enhance our understanding of the cognitive processes that underlie auditors' JDM under time pressure, we first develop a model and then propose several research questions that are based on theories of arousal in psychology.

Figure 1 presents our model and Table 1 lists the research questions (RQ) related to our pressure-arousal-effort-performance framework. Some of the research questions in Table 1 are supported by prior psychology and/or accounting research and we cite relevant studies. In addition, prior auditing research has identified variables that may impact the effects of time pressure described in Figure 1. In Figure 1, we propose that arousal (induced by time pressure) increases *Motivation* (RQ1a), which improves JDM quality (RQ3a, RQ3b) by increasing *Cognitive Effort,* specifically effort *Direction* (that is, increased attentional control; Easterbrook 1959; Eysenck 1982)[8] (RQ2a), and effort *Intensity* (that is, increased processing speed [referred to as acceleration]; Miller 1960) (RQ2b) (Eysenck 1982; Kanfer 1990).

However, once stimulation surpasses an optimal, moderate level, theories of arousal posit that the motivational effect of arousal is coupled with *Anxiety* (RQ1b).[9] Such theories claim that there are two main links that need to be considered. The first

[8] Attention is controlled "in a goal-driven, top-down fashion or in a stimulus-driven, bottom-up fashion" (Eysenck, Derakshan, Santos, and Calvo 2007, 337; see also Yantis 1998). Motivation is assumed to increase attentional focus on the current task by inhibiting the allocation of attentional resources to task-irrelevant stimuli, or by shifting attention adaptively between multiple tasks or operations based on task demands (Miyake et al. 2000; Eysenck et al. 2007).

[9] *Anxiety* is defined as "unpleasant, consciously perceived feelings of tension and apprehension, with associated activation or arousal of the autonomic nervous system" (Spielberger 1972, 29).

TABLE 1

Research Questions within the Pressure-Arousal-Effort-Performance Framework

		Psychology/General Studies	Accounting Studies
RQ1a	Do low to moderate levels of arousal, induced by low to moderate levels of time pressure, increase individuals' motivation?	Yerkes and Dodson (1908); Easterbrook (1959); Broadbent (1971); Eysenck (1982, 1984); Humphreys and Revelle (1984)	Ashton (1990); Margheim, Kelley, and Pattison (2005); Pietsch and Messier (2017)
RQ1b	Do high levels of arousal, induced by high levels of time pressure, cause individuals to experience anxiety?		
RQ2a	Does motivation, induced by low to moderate levels of time pressure, cause individuals to exert greater cognitive effort in the form of increased attention to the task (effort direction)?	Miller (1960)	Glover (1997); Lambert et al. (2017)
RQ2b	Does motivation, induced by low to moderate levels of time pressure, cause individuals to exert greater cognitive effort in the form of increased processing speed (effort intensity referred to as acceleration)?		
RQ3a	Does increased attention to the task (effort direction) increase performance/JDM quality?	Ben Zur and Breznitz (1981); Rieskamp and Hoffrage (2008)	Glover (1997)
RQ3b	Does increased processing speed (effort intensity/acceleration) increase performance/JDM quality?		
RQ4a	Does anxiety, induced by high levels of time pressure, cause individuals to start worrying, thereby taking attention away from the task (effort direction)?	Wine (1971); Nottelmann and Hill (1977); Deffenbacher (1978); Rothstein (1986); Lawler (1994); Eysenck and Byrne (1992); Eysenck et al. (2007)	Braun (2000)
RQ4b	Does anxiety, induced by high levels of time pressure, cause individuals, who feel that they do not possess the required skills for the task, to decrease their effort (intensity)?		
RQ5a	Does increased worrying under anxiety, induced by high levels of time pressure, reduce performance/JDM quality despite increased effort (intensity) that is invested inappropriately (through effort direction)?	Pachella (1973); Ben Zur and Breznitz (1981); Sarason (1988); Eysenck et al. (2007)	Braun (2000); Choo (1995)
RQ5b	Does decreased effort intensity under anxiety, induced by high levels of time pressure, lead to poorer performance/JDM quality?		

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link in the model is between arousal and cognitive effort, and the second link is between cognitive effort and performance (Bonner 2008). First, individuals experiencing anxiety may start to *worry* and this takes attention away from the task (RQ4a) (Wine 1971; Nottelmann and Hill 1977; Deffenbacher 1978; Eysenck et al. 2007). This may reduce JDM quality (Sarason 1988) despite increased effort (intensity) that is invested inappropriately (i.e., through effort direction) and the *Cognitive Effort-*

TABLE 1 (continued)

		Psychology/General Studies	Accounting Studies
RQ6	Do individuals, who experience anxiety under high levels of time pressure, apply certain coping mechanisms, such as accelerated processing (effort intensity) and filtration mechanisms (effort direction), in order to ease cognitive strain?	Miller (1960); Ben Zur and Breznitz (1981); Eysenck (1985); Eysenck et al. (2007); Rieskamp and Hoffrage (2008)	Glover (1997); Choo (1995); Spilker and Prawitt (1997); Asare et al. (2000)

Performance link is affected rather than the *Motivation-Effort* link (RQ5a). However, the proposed "relationship between worry and attention has not been investigated systematically" in psychology and "relatively little research on worry, anxiety, and performance has provided a direct test of the theory" (Eysenck et al. 2007, 338).[10] Second, individuals who experience anxiety under pressure may decrease their effort if they feel that they do not possess the required *skills* for successfully performing a task (Lawler 1994) and the *Arousal-Cognitive Effort* link is affected (RQ4b, RQ5b).[11]

Performance may decrease because the individual may not possess the requisite *skills* for such a task, so that the effort induced by high motivation is invested inappropriately. Ben Zur and Breznitz (1981) argue that *accelerated information processing* may result in temporary *overload* of memory or of the processing capacity, therefore potentially causing increased errors (Pachella 1973) and affecting the *Cognitive Effort-Performance* link in Figure 1. Easterbrook (1959) argues that high arousal and consequent anxiety may increase attentional selectivity in order to decrease the strain on an individual's short-term memory capacity of task-relevant information. Thus, time-pressured individuals may use a *filtration* mechanism by relying only on a subset of the available information (RQ6).[12] This may increase JDM quality if the increased attentional selectivity results in a reallocation of processing resources to more relevant information (Ben Zur and Breznitz 1981). However, if anxiety decreases an individual's attentional control, then filtration may cause decision makers to ignore relevant information and have a negative effect on JDM quality. Ben Zur and Breznitz (1981) suggest a strategy that combines filtration and acceleration as an optimal decision-making strategy under information overload in a time-pressured environment.

Table 2 presents a set of research questions related to the moderating variables that interact with the model of Figure 1. In an auditing setting, Glover (1997) shows that time pressure significantly reduced the dilution effect by applying a *filtration* mechanism that focuses auditors' attention on more relevant information (RQ2a, RQ6), thereby increasing efficiency without decreasing effectiveness (RQ3a). Braun (2000) reports that auditors under time pressure focus their attention (effort *Direction*) on the dominant task (i.e., accumulating evidence regarding the frequency and amount of misstatements) at the expense of attention to the subsidiary task (attending to the qualitative aspects of misstatements indicative of potential fraudulent financial reporting). Asare, Trompeter, and Wright (2000) find that time pressure decreases the extent and depth of testing but does not affect the breadth of testing. Gold, Knechel, and Wallage (2012) find that time pressure may affect the auditor's propensity to consult with firm experts about potential fraud. Coram, Ng, and Woodliff (2004) find that auditors appear to fail to test all items in a sample under time pressure, but only when the level of risk is low, thereby indicating a moderating effect of the risk of misstatement on unfavorable filtration mechanisms used by auditors (RQ7a). Houston (1999) finds that auditors under fee pressure reduce budgeted hours for low-risk tasks (RQ7b). Agoglia, Brazel, Hatfield, and Jackson (2010) find that workload pressure can increase the likelihood of partners reviewing workpapers electronically instead of in person (thereby potentially increasing efficiency but decreasing effectiveness), but only when the risk of misstatement is low (RQ7c). In an investing context, Rieskamp and Hoffrage (2008) demonstrate that, consistent with Ben Zur and Breznitz (1981) (and with RQ6), under high time pressure, their participants *accelerated* their information search (effort *Intensity*), used less information (*filtration*), focused on the more important information (effort *Direction*), and applied a cue-wise information search. In an experimental inventory task, Low and Tan (2011) find that forewarning

[10] Power and Dalgleish (1997) assume that individuals experience anxiety when a current goal is threatened. This may cause attention to be allocated to detecting (and processing) the source of the threat (i.e., to threat-related stimuli, which can be internal [e.g., worrisome thoughts] or external [e.g., task-irrelevant information]) and to deciding how to respond so that anxiety reduces attentional focus on the current task (Eysenck et al. 2007).

[11] In an archival study, López and Peters (2012) find that workload compression during the busy season causes greater magnitudes of abnormal accruals, thereby providing evidence that the negative effects of busy season pressures, such as time pressure, on individual auditors' performance (as predicted in Figure 1) affects the quality at the overall audit engagement level.

[12] Eysenck et al. (2007) argue that individuals, who experience anxiety and as a result worry about the threat to a current goal, try to apply effective strategies to reduce anxiety and achieve the goal.

TABLE 2

Research Questions on the Interactive Effects of Time Pressure with Other Pressure/Moderating Variables on Auditors' Performance

		Psychology/General Studies	Accounting Studies
RQ7a	Does the risk of misstatement have a mitigating effect on the negative effects of high time pressure on performance by inhibiting filtration mechanisms in the form of ignoring relevant information?	Ben Zur and Breznitz (1981)	Coram et al. (2004); Houston (1999); Agoglia et al. (2010)
RQ7b	Are auditors under high time pressure more likely to reduce their effort in low-risk audit areas than in high-risk audit areas to increase efficiency?		
RQ7c	Does the risk of misstatement affect auditors' choice of review format (electronically versus in person) under time pressure, thereby affecting audit efficiency and effectiveness?		
RQ8	Does forewarning of impending time constraints have a mitigating effect on the negative effects of high time pressure on performance through the use of coping mechanisms, such as focusing effort on more relevant information?	Payne, Bettman, and Johnson (1988)	Low and Tan (2011)
RQ9a	Does the positive performance effect of arousal, induced by time pressure through motivation and consequent cognitive effort, decrease as task complexity increases, while anxiety further decreases JDM quality (e.g., through increased worrying and effort direction)?	Yerkes and Dodson (1908); Graydon and Eysenck (1989); Eysenck (1985); Lavie, Hirst, de Fockert, and Viding (2004)	Ashton (1990)
RQ9b	Does an increase in complexity cause a leftward shift of the curve of the inverted-U relation between time pressure and performance?		
RQ10a	Do experience and/or knowledge increase effort direction in complex and/or time-pressured tasks, thereby improving performance? In other words, does experience mitigate the negative effects of increasing task complexity in time-pressured tasks (as predicted in RQ9a)?	Lawler (1994); Jackson and Farzaneh (2012)	Bonner (1994); Spilker (1995); Spilker and Prawitt (1997)
RQ10b	Do experience and/or knowledge decrease the leftward shift of the curve of the inverted-U relation between time pressure and performance that is caused by increasing complexity (as predicted in RQ9b)?		

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TABLE 2 (continued)

		Psychology/General Studies	Accounting Studies
RQ11	Does audit program structure and low to moderate levels of time pressure have an additive, positive effect on performance by decreasing complexity and increasing motivation and consequent effort, while high levels of time pressure and consequent anxiety due to increased processing demands of the task will mitigate the positive effects of program structure on task complexity and consequent task performance?	MacGregor, Lichtenstein, and Slovic (1988)	McDaniel (1990)
RQ12a	Do auditors under high time deadline pressure, who are responsible for creating the pressure (by delaying audit test work) invest less effort (e.g., in performing test work or in discussing errors with the client) because they assess identified errors as less material, thereby reducing audit quality?	NA	Bennett and Hatfield (2017)
RQ12b	Are auditors, who are responsible for creating the time pressure (e.g., by delaying audit test work) more likely to apply filtration mechanisms (e.g., by sampling fewer items)?		
RQ13	Do other pressure variables (e.g., accountability, performance feedback, and financial incentives) and time pressure have an additive effect on auditors' arousal and consequent effort?	Broadbent (1971)	Bowrin and King (2010); Asare et al. (2000)
RQ14a	Do auditors under time pressure, who are aware that their superiors know that they are under severe time pressure, experience less time pressure compared to auditors whose superiors are not aware of the time constraints of their staff auditors?	Wood and Mitchell (1981); Tyler and Feldman (2007)	Hyatt and Prawitt (2011); Hyatt and Taylor (2013)
RQ14b	What will be the effects on arousal and consequent effort of staff auditors if they know that their supervisors are aware of their time pressure? Will only anxiety decrease or will motivation decrease as well if staff auditors know that their supervisors are aware of their time pressure?		
RQ15	Does moral reasoning affect individual auditors' JDM quality under high levels of time pressure?	NA	Ponemon (1992)

auditors of impending time constraints during the audit planning improves auditors' performance. The effect was greater when auditors were given explicit instructions to develop more effective and efficient audit procedures, and this was due to auditors allocating more time to effective audit tests (effort *Direction*; RQ2a) that enabled them to meet the audit objective rather than through *acceleration* (effort *Intensity*; RQ2b) or via reduced *stress* (RQ6). Their results may explain why some prior auditing studies find a (linear) negative relation between time pressure and auditors' performance rather than the inverted-U relation proposed in Figure 1.[13] These studies fail to consider that auditors generally perceive time constraints early during audit planning, which enables them to revise their audit plans accordingly (RQ8). Low and Tan (2011) acknowledge that in more *complex* audit tasks, forewarning and instructions may not improve performance if the auditor does not possess the requisite expertise. Hence, *knowledge* in the specific task might have an interactive effect with forewarning and complexity on JDM under time pressure. This further suggests the consideration of possible *moderators* of the effects of time pressure on performance, such as *task complexity, knowledge,* and/or *ability,* which can affect different links in the model described in Figure 1.

Bonner (1994) proposes a model of the effects of audit task complexity on audit judgment performance. She includes several task characteristics in her model that are related to either the *amount* of information (difficulty element of task complexity) or the *clarity* of information (structure element of task complexity). Bonner (1994) also recognizes the interactive effects of a person's *skill* and/or *motivation* and complexity on performance. She assumes that, in general, motivation has positive effects on performance. However, she argues that auditing tasks are typically skill-intensive tasks and that, as complexity increases, the effect of motivation on performance decreases in such skill-intensive tasks. Yerkes and Dodson (1908) assume that the optimal level of motivation or arousal is inversely related to task difficulty. Building on this assumption, Ashton (1990) argues that anxiety induced by performance feedback is heightened by task difficulty because as task difficulty increases, the likelihood of poor performance increases, which increases the anxiety of poor performance feedback. In line with this assumption and based upon the theory in Figure 1, we argue that, as task complexity increases, the positive performance effect of arousal induced by time pressure through motivation and consequent cognitive effort decreases, while anxiety further decreases JDM quality (e.g., through increased worrying and effort direction) (RQ9a). For example, Rothstein (1986) reports decreased cognitive control under time pressure (RQ4a) for complex cue-criterion environments, while time pressure did not cause performance decrements in simple decision environments. Hence, complexity is expected to heighten anxiety created by pressure-inducing variables such as time pressure.[14] In other words, an increase in complexity is expected to cause a leftward shift of the curve of the inverted-U relation between time pressure and performance (RQ9b).

Hogarth and Einhorn (1992) define complexity as a function of (1) the *amount of information* that needs to be processed for each piece of evidence, and (2) the *familiarity* with the task. While the first point refers to the difficulty element of task complexity and acknowledges the limitations of cognitive processing capacities with increasing information load, the second point refers to personal factors, specifically experience as part of skill, and acknowledges that strategies for coping with increasing information load are dependent upon these personal factors. The latter is captured in Bonner's (1994) model of complexity as a factor that is interacting with the complexity of the task. Specifically, Bonner (1994) proposes that *skill* becomes increasingly important as complexity increases; and that individuals possessing the required skills may perform better in complex (and/or time pressured) settings because they invest their effort appropriately (through effort direction) (RQ10a, RQ10b). Hence, a task that is inherently complex may be perceived as being "simple" by experienced individuals (Trotman and Wright 1996). Consistent with RQ10a and RQ10b, Spilker (1995) reports that tax accountants with procedural knowledge respond more positively to time pressure than participants without such knowledge, thereby demonstrating an interaction between time pressure and knowledge. Spilker and Prawitt (1997) report that experienced tax accountants respond to time pressure by selectively identifying and encoding information important in the context of an information search task.

McDaniel (1990) points out the possible interactive effects of time pressure and *audit program structure* on auditors' performance. Program structure by itself is expected to increase both audit effectiveness and efficiency.[15] However, McDaniel (1990) argues that, in combination, high levels of time pressure and program structure are expected to increase task-related demands possibly imposing additional *stress* (anxiety in the framework of the current study). In an experiment, she finds that audit effectiveness, efficiency, and consistency increase in structured audit programs under low levels of time pressure. However, as time pressure increases, audit efficiency further increases but effectiveness decreases, independent of audit program structure. McDaniel's (1990) findings suggest that high levels of time pressure have a mitigating effect on the desired

[13] McDaniel (1990) argues that, in auditing, performance is a decreasing function of time pressure because the lowest level of time pressure in auditing is one corresponding to the top of the inverted U-curve.

[14] In line with this notion, DeZoort and Lord (1997) point out the close relationship of workload and time pressure. They include workload as a separate pressure variable, arguing that workload itself can induce pressure independent of time pressure. Wood (1986) proposed an inverted-U relation between information load and performance. However, as pointed out by Bonner (2008), this confounds arousal and motivation with information content. We consider complexity as a task variable rather than a pressure variable in our theoretical framework, despite its close relation to time pressure.

[15] See Cushing and Loebbecke (1986) for why too much structure might reduce audit effectiveness.

effects of structured audit programs on task complexity and performance. Within the framework of the current study and the notion of an inverted-U relationship between time pressure and performance, we argue that audit program structure and low to moderate levels of time pressure may have an additive, positive effect on performance by decreasing complexity and increasing motivation and the consequent effort, while high levels of time pressure and consequent anxiety, due to increased processing demands of the task, will mitigate the positive effects of program structure on task complexity and the consequent task performance (RQ11).[16] Bennett and Hatfield (2017) find an interactive effect of time deadline pressure and the source of time pressure (audit firm or not) on auditors' materiality judgments of identified errors (internal control deficiencies). They report that auditors under high deadline pressure assess identified errors as less material only if the auditor was responsible for creating the pressure (by delaying audit test work) and this has a "downstream impact on decisions that are based on that assessment (e.g., communications with client, test work performed, reports issued" (Bennett and Hatfield 2017) (RQ12a). They further find that, if responsible for creating the pressure, auditors sample *fewer* items and tolerate more errors when testing client-remediated deficiencies. (RQ12b)

In addition to possible moderating variables, research based on arousal theory has identified several other (pressure) variables that have been shown to affect JDM quality through the same mediator as time pressure (e.g., Broadbent 1971). For example, Bowrin and King (2010) fail to find an inverted-U relationship between time pressure and audit effectiveness. However, they argue that in an audit environment the need to justify oneself (i.e., accountability) causes arousal, in addition to the arousal due to low levels of time pressure. In other words, accountability and time pressure are expected to have an additive effect on auditors' arousal and consequent anxiety (RQ13). When time pressure is increased to moderate levels, the combined effect of accountability and time pressure causes anxiety (RQ1b) leading to decreased performance (RQ5a, RQ5b) rather than increased JDM quality through increased effort (RQ3a, RQ3b). In contrast, Asare et al. (2000) do not find evidence for an interactive effect of time pressure and accountability on auditors' testing strategies or performance.

Ashton (1990) argues that performance feedback induces (performance) pressure with similar effects as those described in Figure 1. Therefore, performance feedback and time pressure are generally expected to have an additive effect on auditors' arousal and consequent effort (RQ13). However, Hyatt and Taylor (2013) report that audit supervisors are more likely to report the detection of a false sign-off when the audit staff member is facing low time budget pressure, as opposed to high pressure. Hyatt and Prawitt (2011) find that, when supervisors do report false sign-offs to the firm, formal disciplinary action is less likely to occur when there is high time-budget pressure on the audit. These findings demonstrate that time pressure may not only affect the time-pressured auditor directly, but it may also have an effect on the organizational responses to dysfunctional audit behavior and the feedback the time-pressured auditor expects in an evaluation of his/her performance. This may in turn have an indirect effect on the time-pressured individual's motivation and effort (RQ14a, RQ14b). Ponemon (1992) finds that, under high time pressure, auditors at lower moral reasoning levels underreport more time than auditors at higher moral reasoning levels (RQ15).

The above findings stress the importance of considering the specific environment when predicting the effects of time pressure on performance through arousal, including the identification and consideration of moderating factors (e.g., forewarning) and of other pressure-inducing variables (e.g., accountability) that might cause additional arousal, possibly leading to anxiety when coupled with time pressure. Differences in these factors may explain some of the contradictory findings in prior research.

TIME PRESSURE IN BELIEF REVISION

In this section, we discuss the effects of time pressure on individuals' belief revision processes based on important factors included in the BA model (i.e., response mode, the length of the series of evidence items, and the sensitivity toward positive and negative evidence). We derive several order effects predictions based on these task and personal characteristics.

Response Mode

Time pressure affects the individuals' belief revision processes given different response modes for the task—that is, whether a judgment is required after each piece of evidence (step-by-step [SbS] response mode) or one final judgment is required after all pieces of evidence (end-of-sequence [EoS] response mode). Bonner (1994), as well as Hogarth and Einhorn (1992), acknowledges that whether individuals process information sequentially or simultaneously is related to complexity and cognitive limitations. Both point out that the two processes differ in terms of the demands they place on memory and information-processing load. Based on Payne, Bettman, and Johnson (1990), Hogarth and Einhorn (1992, 13) assume in their model that individuals "try to match cognitive strategy with response mode but shift strategies if this proves too demanding."

[16] Lambert et al. (2017) report archival and survey evidence for the positive effects of performing more interim testing and of the percentage of partner time spent at the client on "the effectiveness of audit procedures, reducing the difficulty associated with resolving year-end audit adjustments, and overall audit and financial reporting quality" under time pressure.

TABLE 3

Research Questions on the Effects of Time Pressure and Response Mode on Individuals' Belief Revision

Panel A: When Receiving a *Short Series* of *Complex* Information in an *EoS Response Mode*...

		Psychology/General Studies	Accounting Studies
RQ16a	...are individuals under low to moderate levels of time pressure less likely to experience recency due to motivation and consequent cognitive effort, consistent with or indicative of an EoS processing strategy?	Schadewald and Limberg (1992)	Kennedy (1993)
RQ16b	...are individuals more likely to use SbS processes as time pressure increases above some moderate, optimal level in order to cope with the increasing information-processing demands, which will result in recency?		
RQ16c	...do people under very high levels of time pressure start to use filtration mechanisms by ignoring some information in order to ease cognitive strain induced by the increasing information load and consequent anxiety, or do they even make random decisions?		

Panel B: When Receiving a *Short Series* of *Simple* Information in an *EoS Response Mode*...

		Psychology/General Studies	Accounting Studies
RQ17a	...are order effects eliminated at some moderate, optimal level of time pressure?	Schadewald and Limberg (1992)	Kennedy (1993)
RQ17b	...will increasing time pressure above some moderate, optimal level, adding to the information load, result in recency, consistent with the BA model's predictions for a short series of complex information?		
RQ17c	...do individuals start to use filtration mechanisms by ignoring some information in order to ease the cognitive strain induced by the increasing information load and consequent anxiety, or do they even make random decisions as time pressure increases to very high levels?		

Panel C: When Facing a *SbS Response Mode* in a *Short Series* of Information...

		Psychology/General Studies	Accounting Studies
RQ18a	...will low to moderate levels of time pressure—causing increased motivation and consequent cognitive effort—have a mitigating effect on recency in a short series of information?	Schadewald and Limberg (1992)	Cushing and Ahlawat (1996)
RQ18b	...will high levels of time pressure—causing anxiety—increase recency effects in the sequential processing of a short series of information?		

Our research questions on the effects of time pressure and response mode on individuals' belief revisions are summarized in Table 3.

End-of-Sequence (EoS) Response Mode

Simultaneous processing requires more attention and cognitive effort than sequential processing and is, therefore, more complex than sequential processing. Hence, whether an individual processes information simultaneously or sequentially depends on the effects of task characteristics on cognitive capacity (Hogarth and Einhorn 1992). The BA model assumes that:

> When required to provide EoS responses, people are more likely to use a SbS process as the relative complexity and/or length of the series of evidence items increases. As information-processing demands increase, people are forced into using the SbS strategy in order to cope with the cognitive demands of the task. (Hogarth and Einhorn 1992, 13)

Kennedy (1993) tested the prediction of the effects of task complexity on individuals' processing strategy under an EoS response mode. In a going concern judgment task, she found that auditors, who were *familiar* with the task, did not show recency effects in an EoS response mode. This result is consistent with the BA model's predictions for a short series of *simple* evidence in an EoS response mode. On the contrary, M.B.A. students, who were *unfamiliar* with the task, experienced recency. This result is consistent with the BA model's prediction for a short series of *complex* evidence in an EoS response mode. The reasoning is that if task complexity is high (because M.B.A. students are unfamiliar with the task), then individuals will use a SbS processing mode to *ease the cognitive demands* of the task, and this results in recency (also see Trotman and Wright 1996).

Arnold, Collier, Leech, and Sutton (2000) show that in a task in which auditors face high *information load* (affecting the first element of task complexity in the BA model), experience (affecting the second element of task complexity) does not mitigate recency. We adopted Bonner's (1994) assumption that, *for skill-intensive tasks,* the effect of skill on judgment performance increases as task complexity increases. The above findings stress the importance of simultaneously considering different elements of task complexity (specifically, information load and familiarity) and their interactive effects with response mode on JDM (Kahle et al. 2005). Arnold et al.'s (2000) findings suggest that, contrary to Bonner's (1994) assumption, an individual's skill may not mitigate recency as information load, and therefore task complexity, increases.[17] Consistently, Kahle et al. (2005) state that research on belief revision in accounting suggests that individual psychological factors in general, and experience and knowledge specifically, fail to mitigate (Asare 1992; McMillan and White 1993; Johnson 1995; Bamber, Ramsay, and Tubbs 1997) or even increase recency bias (Pei, Reckers, and Wyndelts 1992; Krull, Reckers, and Wong-on-Wing 1993).

Kennedy (1993) argues that *recency* is an *effort-related* judgment bias and, therefore, can be reduced by effort-inducing factors. That is, increasing effort will inhibit individuals, who are unfamiliar with the task, to use a SbS processing mode to ease the cognitive demands of the task. In other words, increased *motivation* will lessen the need to ease cognitive strain so that an EoS processing strategy will be applied resulting in reduced or no recency. In line with this notion, Kennedy (1993) finds that the motivation induced by the requirement to justify oneself (*accountability* in her auditing setting) reduces recency effects. The requirement to justify one's judgments is one of the (performance) pressure-inducing variables identified by arousal theory that affects JDM quality through a common arousal mechanism (e.g., Broadbent 1971) (see the "Time Pressure—Background, Model, and Theory" section). Kahle et al. (2005) conclude that recency reported in short series of information has been found to be an effort-related judgment bias rather than an experience-related bias.

Based on prior research and following the theoretical framework presented in Figure 1, the motivational element of arousal induced by time pressure is expected to result in increased effort. Increased cognitive effort may enable individuals to match cognitive strategy with response mode (i.e., apply an EoS process). This will mitigate or even eliminate recency effects in a short series of complex evidence items when facing an EoS response mode (RQ16a).

However, as time pressure increases, it will add to the amount of information that needs to be processed per unit of time (i.e., information load), thereby increasing information-processing demands. This may force individuals into using a SbS processing mode, leading to recency (see RQ16b). This is consistent with RQ9a. That is, as task complexity increases (through an increase in time pressure and the consequent increase in information load) the positive performance effects of time pressure through motivation will decrease. Anxiety may further decrease performance (RQ5a, RQ5b).[18] People under very high levels of time pressure may start to use filtration mechanisms by ignoring some information to ease the cognitive strain induced by the increasing information load and consequent anxiety (RQ6) or even make random decisions (RQ16c).

While recency has been found to be an effort-related bias rather than an experience-related bias, Bonner's (1994, 223) assumption suggests that as time pressure increases (thereby heightening task complexity), the importance of skill for judgment performance increases. Therefore, the level of time pressure at which motivation will be coupled or replaced by anxiety (RQ1b), depends on an individual's skills.

For a short series of *simple* evidence, the BA model predicts primacy in an EoS response mode. As time pressure increases information load (as the information to be processed per unit of time) increases, thereby heightening task complexity. This may result in recency as predicted by the BA model for a short series of complex evidence (RQ17b). However, as time pressure increases, there is an optimal level of time pressure at which there will be no order effects (RQ17a). If the cognitive strain gets

[17] However, Bonner (1994) points out that an increase in information load may only add to complexity after it reaches a certain threshold (e.g., Payne, Bettman, and Johnson 1992; Schroder, Driver, and Streufert 1967).

[18] Similarly, Peecher, Solomon, and Trotman (2013) point out that (process) accountability might have an interactive effect on performance with familiarity and, therefore, experience.

too demanding, then time pressure may lead to other coping mechanisms (e.g., filtration; RQ6) or even random choice (see RQ17c).

Step-by-Step (SbS) Response Mode

Cushing and Ahlawat (1996), examine *documentation* as another processing factor potentially mitigating order effects in sequential processing (SbS). Specifically, they hypothesize that, similar to accountability, documentation elicits greater cognitive effort (effort *Intensity* in Figure 1), greater levels of attention to the task (effort *Direction* in Figure 1), and greater recall and comprehension of information relevant to judgments. Hence, these judgments are expected to be less subject to recency bias. The results confirmed their predictions. Recency was found in audit judgments without the need of documentation but documentation eliminated recency in a SbS response mode (RQ18a, RQ18b). On the other hand, Tuttle et al. (1997) find significant evidence of recency effects, consistent with the predictions of the BA model for a short series of information despite the implementation of performance-based monetary incentives in laboratory asset markets. However, they did not have a control group without performance-based monetary incentives, so it is difficult to draw clear conclusions on the effects of these incentives.

Length of Series

The BA model assumes two effects from an increase of the number of cues. First, as the number of information cues or attributes that need to be processed increases, individuals may become fatigued causing decreased cognitive effort and attention to the task (Anderson 1981). Consistent with this notion, prior research in psychology demonstrates that primacy can be eliminated or turned into recency by effort-inducing variables that enhance the attention to the task (e.g., Anderson 1981; Crano 1977; Hendrick and Costantini 1970; Anderson and Hubert 1963). Second, as the amount of information grows, additional pieces of evidence represent an increasingly small proportion of the information already processed. Thus, individuals are expected to become *less sensitive* to additional information as they become increasingly committed to their beliefs in a long series of information.[19] Thus, the task variable "length of series" contains an element that can be related to *task complexity* and *information load* (e.g., DeZoort and Lord 1997; Schroder et al. 1967) and an *information content element* that needs to be distinguished from complexity.

Table 4 summarizes our prediction on the effects of time pressure and length of series on individuals' belief revisions. According to the theoretical framework presented in Figure 1, low to moderate levels of time pressure induce motivation that will increase the effort exerted by the decision maker. This will reduce or even eliminate the predicted force toward primacy in a long series of evidence (RQ19a). As time pressure further increases above some moderate, optimal level, individuals may become fatigued causing information overload, which will result in a force toward primacy (RQ19b).

Hogarth and Einhorn (1992) point out that their predictions are sensitive to *context*. The information content element of the "length of series" is particularly interesting in an investing context because this argument is similar to the line of argumentation for a *size effect* on the *information content* of financial disclosure in financial markets (e.g., Cerf 1961; Singhvi and Desai 1971; Buzby 1975). Pinsker (2007) argues that a "long" series of information better represents the disclosure context than a "short" series because most listed firms are large enterprises that frequently issue information on the company's stock.

Rather than primacy, Pinsker (2007, 2011) and Daigle et al. (2015) report recency in the belief revision of nonprofessional investors in a long series of qualitative information. However, their findings are not entirely surprising because of the context-specific nature of the predictions of the BA model. It seems reasonable to assume that the information content element of the "length of series" is not likely to cause the predicted force toward primacy in an experimental investigation of nonprofessional investors' belief revision, because the information provided in these experiments is most likely not sufficiently large to induce a size effect as has been observed in archival research (e.g., Buzby 1975; Firth 1979; Zeghal 1984). The second reason in the BA model for the predicted force toward primacy (diminishing cognitive effort as a result of heightened cognitive strain) may not have been pertinent in these studies because participants were provided with very simple information items resulting in relatively low perceived task difficulty.

We argue that, while the information content element of the "length of series" is not likely to cause a force toward primacy in an *investment context* (RQ20a), the *interactive effects* of *time pressure* and the complexity element of the "length of the series," specifically *information load*, on cognitive effort may cause the predicted *force toward primacy*. Low to moderate levels of time pressure may cause arousal in the form of motivation and induce the required effort to cope with the increased

[19] In line with the second assumption, Messier and Tubbs (1994) argue that more *experienced individuals* are more confident in their initial opinion, which makes them *less sensitive* to confirming or disconfirming evidence. This decreased sensitivity will reduce the recency effect. Consistent with this prediction, Messier and Tubbs (1994) find that additional experience with the stimuli mitigates recency.

TABLE 4

Research Questions on the Effects of Time Pressure and Length of Series on Individuals' Belief Revision

Panel A: General

		Psychology/General Studies	Accounting Studies
RQ19a	Do low to moderate levels of time pressure increase the motivation and consequent cognitive effort exerted by the decision maker, thereby reducing or even eliminating the predicted force toward primacy in a long series of evidence?	Anderson (1981); Crano (1977); Hendrick and Costantini (1970); Anderson and Hubert (1963)	Pinsker (2007, 2011); Daigle et al. (2015)
RQ19b	In a long series of evidence items, will individuals be forced into primacy as time pressure increases above some moderate, optimal level?		

Panel B: Investing Context: When a *Long Series* of Mixed Evidence Is Disclosed, Will *Nonprofessional Investors*...

		Psychology/General Studies	Accounting Studies
RQ20a	...place greater weight on information later in the sequence when there is no time pressure?	Anderson (1981); Crano (1977); Hendrick and Costantini (1970); Anderson and Hubert (1963)	Pinsker (2007, 2011); Daigle et al. (2015)
RQ20b	...experience less recency as time pressure increases so that order effects disappear at some moderate, optimal level of time pressure?		
RQ20c	...place greater weight on information early in the sequence under high levels of time pressure causing a force toward primacy?		

cognitive strain as the number of cues increases. This may mitigate or even eliminate the recency effects found by Pinsker (2007, 2011) for a "long series" of information (RQ20b). However, as the length of the series and/or time pressure increases, thereby further heightening task difficulty and cognitive load, this might eventually cause attention decrement and a force toward primacy (RQ20c).

The predicted mitigating effect of time pressure on recency for a long series is consistent with the predicted effect of time pressure for a short series. However, as time pressure and/or the length of the series increases, we predict a force toward primacy, consistent with the prediction of the BA model for a long series of information. Anderson (1959) finds that there is a point in the phase transition of a long series of evidence at which there are no order effects before recency is forced into primacy. This is in line with the notion of an inverted-U and the theoretical framework of this study. Pinsker (2011) points out that finding no order effects would significantly contribute to decision quality. We propose the investigation of no order effects as the level of time pressure increases in a long series of information. The optimal point cannot be predicted. Future research intending to identify this optimal point on the inverted-U will most likely require an iterative process of implementing several levels of time pressure that will incrementally reveal an optimal level. However, this level will be specific to the specific task and context.

Sensitivity

An individual's *sensitivity* toward positive (confirming) and negative (disconfirming) evidence (α and β, respectively) is crucial for the BA model's order effect predictions. α and β are assumed to be constant for each individual in the BA model. Further, Hogarth and Einhorn (1992) state that an individual's sensitivity toward evidence is a function of both *individual* and *situational factors*. For example, some people might have a general tendency for a greater sensitivity toward negative information than positive information (disconfirmation bias; e.g., A. Ashton and R. Ashton 1988; Tubbs et al. 1990), while others are inherently more prone to search for or give greater weight to positive than to negative information (confirmation bias; e.g., Klayman and Ha 1987; Einhorn and Hogarth 1978; Church 1990).

However, the BA model does not directly account for differences in α and β, despite the great importance of an individual's sensitivity for the predictions of the model. Kahle et al. (2005) conclude that an individual's *sensitivity* toward positive and negative evidence depends on *pressures* faced by the decision makers in their *professional roles* within each *decision context,* and that overall auditors are more sensitive to negative information, implying a disconfirmation bias (e.g., R. Ashton and A. Ashton 1990; Butt and Campbell 1989; Knechel and Messier 1990; McMillan and White 1993).

Psychology research suggests that individuals under time pressure have been found to apply a filtration mechanism by paying *greater attention* to and by attaching *increased weight* to negative information (Wright 1974; Svenson, Edland, and

TABLE 5

Research Questions on the Effects of Time Pressure on Individuals' Sensitivity and Belief Revision

		Psychology/ General Studies	Accounting Studies
RQ21a	As time pressure increases (so that acceleration does not suffice as a coping mechanism), will individuals become more sensitive toward negative (disconfirming) evidence, implying a negativity bias?	Wright (1974); Svenson et al. (1985)	Pietsch and Messier (2017)
RQ21b	Will this affect the contrast effect and thereby order effects? Specifically, will an increased weighting of negative information eliminate recency as predicted by the BA model in a short series of information?	NA	Bamber et al. (1997)

Karlsson 1985; Svenson and Edland 1987; Edland and Svenson 1993) and/or by *processing* negative information *more thoroughly* (Ben Zur and Breznitz 1981), as compared to positive evidence, and to *search more for negative* than positive *information* (Huber and Kunz 2007). Pietsch and Messier (2017) investigate nonprofessional investors' belief revisions upon the arrival of a news announcement containing a short series of mixed (i.e., positive and negative) complex information in an EoS response mode under varying levels of time pressure. They find that investors under relatively higher levels of time pressure estimate the stock price to be significantly lower compared to investors under relatively lower time pressure. Additionally, significantly more investors in their low time pressure condition decided to invest in the company's stock short term, compared to investors under a relatively higher level of time pressure. Their results further suggest that the increased cognitive strain, caused by higher levels of time pressure, results in attentional selectivity in the form of heavier weighting of negative information to cope with increased levels of time pressure, and that the attentional selectivity decreases the perceived time pressure, stress, and difficulty.

However, other studies report contradictory findings. Requiring participants to choose candidates for a university program, Svenson, Edland, and Slovic (1990) and Edland (1993, 1994) found that time pressure increased the importance of positive information. However, Edland (1992) suggests that time pressure might increase the importance of negative information when choosing something for oneself, while positive information is weighted more heavily when the decision does not affect oneself directly. This notion is in line with the findings of Wright (1974) that time-pressured individuals pay greater attention to negative information when they face personal investment.

Maule, Hockey, and Bdzola (2000) conclude that if there are other strategies, like filtration or a shift in strategy, to successfully cope with time pressure, then individuals' risk preferences will not be affected by time pressure. Once such changes in strategy are no longer possible to exert, individuals will become more risk averse. Therefore, people under time pressure might only change the weighting of information by placing greater attention on negative information if the other strategies for coping with time pressure identified in this paper fail (RQ21a and RQ21b). Table 5 summarizes our predictions for the effects of time pressure on individuals' sensitivity and belief revision. Table 6 summarizes the predicted effects of time pressure on individuals' belief revision within the BA model.

CONCLUDING COMMENTS

Hogarth and Einhorn's (1992) belief-adjustment model proposes several order-effects predictions, depending on three key task variables (complexity, length of the series of items, and response mode) and the subprocesses included in the model. Prior belief-revision research in auditing, tax, and financial accounting generally confirms the recency effects predicted by the BA model (Kahle et al. 2005). However, prior research also identifies several factors that mitigate or even eliminate order effects in an accounting context. As a consequence, Kahle et al. (2005) and Trotman and Wright (2000) highlight the need to extend the BA model by incorporating additional variables that are particularly relevant to an accounting environment, including experience, client pressures, accountability, professional roles, and time pressure. They further stress the importance of future research into possible ways for mitigating recency effects.

This paper addresses both of these calls for future research. Specifically, we extend the BA model's predictions by incorporating time pressure as an additional variable. Time pressure is particularly important in an accounting environment because it has the potential to mitigate the recency effects found in prior research. Based on prior findings on the effects of time

TABLE 6

Summary of the Predicted Effects of Time Pressure on Individuals' Belief Revision

	Response Mode					
	EoS			SbS		
	Time Pressure					
	No	Low/ Moderate	High	No	Low/ Moderate	High
Short Series—Simple	Primacy	No Order Effects (RQ17a)	Recency (RQ17b) Filtration (RQ17c) Random Choice (RQ17c)	Recency	Recency ↓ (RQ18a)	Recency ↑ (RQ18b)
Short Series—Complex	Recency	Recency ↓ (RQ16a)	Recency ↑ (RQ16b) Filtration (RQ16c) Random Choice (RQ16c)	Recency	Recency ↓ (RQ18a)	Recency ↑ (RQ18b)
Long Series	Force toward Primacy	Force toward Primacy ↓ (RQ19a)	Force toward Primacy ↑ (RQ19b)	Force toward Primacy	Force toward Primacy ↓ (RQ19a)	Force toward Primacy ↑ (RQ19b)

Time Pressure ↑ → Weighting of Negative Information ↑ (RQ21a).
↓ Indicates a mitigating effect of time pressure (e.g., on recency).
↑ Indicates an additive effect of time pressure (e.g., on recency).

pressure on JDM quality in accounting and psychology, and based on research in belief revision, we describe how time pressure is expected to interact with the task variables included in the BA model, as well as personal variables that have been pointed out as relevant for inclusion in the BA model in an accounting context. Based on our review within an arousal-effort-performance framework, we arrive at a number of research questions on the effects of time pressure on individuals' belief revisions in an accounting context. Future research should test these predictions in an accounting setting, as well as the generalizability of our predictions across different contexts.

There are several opportunities for future research beyond testing the proposed research questions included in this study. First, this paper focuses on individuals' judgment and decision making. Future research should also investigate the effects of time pressure on group performance. For example, Ahlawat (1999) finds that while individuals experienced recency, groups do not have to rely on effort-reducing strategies (such as recency) due to the increased cognitive load in groups. In an experiment on information processing in groups, Paul and Nazareth (2010) find that information processing using a decision support system follows an inverted-U shaped relation with input information complexity and a positive relationship with time pressure. They further report that some groups under high information load ignore some of the information. They reason that this mechanism increases the groups' information-processing capacity. This is in line with individuals' responses for coping with time pressure, as described in this study. Future research should investigate the effects of time pressure on belief revisions in groups.

The proposed research questions on the effects of time pressure on individuals' belief revisions are, at least in part, based on prior findings on the effects of other pressure variables (e.g., accountability) on individuals' belief revisions. DeZoort and Lord (1997, 55) point out that future research should consider possible additive and/or interactive effects of pressure variables and individual characteristics with time pressure to provide a more complete understanding of these pressure variables. The current study contributes to a more complete understanding by proposing several research questions on the interactive effects of different arousers/pressure variables on individuals' belief revisions.

The current study points out that an individual's responses for coping with time pressure and the perceived level of time pressure and consequent arousal heavily depend on personal (e.g., experience) as well as task variables (particularly task complexity). Future research should manipulate these variables to investigate the interactive effects of these variables with time pressure. The findings of such studies could substantially contribute to our understanding of individuals' judgment and decision making under varying levels of task complexity and information load, the consequent strain on memory, and its effects on motivation, effort and, ultimately, performance under time pressure.

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