Journal of Organizational Behavior
J. Organiz. Behav. **19**, 503–522 (1998)

Effects of external and internal interruptions on boredom at work: two studies[1]

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Summary It is proposed that attentional difficulties are central to the experience of boredom. Events which disrupt attention during task performance may contribute to feelings of boredom with the task. Two sources of disruption are explored: external interruptions from the physical environment, and internal interruptions in the form of non-task-related thoughts about current concerns. Study 1 found that external interruptions reduced boredom on a simple task which required little attention, but contrary to expectations, had no impact on reactions to a simple task that did require attention or on reactions to a complex task. Study 2 manipulated internal interruptions via a role-playing methodology, and found that observers attributed greater boredom and less satisfaction to performers who were more frequently interrupted by non-task-related thoughts while at work, especially when these thoughts were about non-urgent concerns. The concepts of internal and external interruptions may be quite useful in understanding variations in the day-to-day experience of work, and in the relationship of non-work to work spheres of life. © 1998 by John Wiley & Sons, Ltd.

Introduction

Boredom at work is experienced by nearly everyone at some time or other, yet has been largely ignored by organizational researchers. Boredom has noteworthy consequences in the form of job dissatisfaction, turnover, accidents, and performance decrements, so further attention to understanding its causes seems warranted (Fisher, 1993). In this paper, boredom is defined as in Fisher's review (1993, p. 396) as 'an unpleasant, transient affective state in which the individual feels a pervasive lack of interest in and difficulty concentrating on the current activity ... [and] feels that it takes conscious effort to maintain or return attention to that activity'.

Several researchers have suggested that attentional difficulties are at the root of the experience of boredom (Fisher, 1993; Hamilton, 1981; Leary, Rogers, Canfield and Coe, 1986). When people feel bored during task performance, they report not being able to keep their attention on the task, or having to exert considerable effort to keep their attention focused on the task. Damrad-Frye and Laird (1989, p. 316) state that, 'the essential behavioral component of boredom is the struggle to maintain attention'. Boredom might be considered almost the opposite

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[1] This research was funded by a small grant from the Australian Research Council in 1993–1994. The support of the Commonwealth of Australia is gratefully acknowledged.

CCC 0894–3796/98/050503–20$17.50

Received 30 August 1995
Accepted 30 September 1996

of the totally and effortlessly focused attentional state called 'flow' by Csikszentmihalyi (1975), in which there is complete involvement in the task and no awareness of any distractions.

A performer might experience difficulties in keeping attention focused on a task for a number of reasons, including characteristics of the task itself, stable characteristics of the person, and other aspects of the environment/situation. The majority of the research on boredom has focused on task characteristics as contributors to feelings of boredom. Jobs which are simple, repetitive, and can be carried out with minimal thought and attention, such as some assembly line jobs, are likely to be experienced as monotonous and boring (Cox, 1980; Smith, 1981). Another type of job often considered boring consists of vigilance or inspection activities. These tasks require continuous attention but provide very little variety or stimulation in return (Thackray, Bailey and Touchstone, 1977). Non-boring jobs are those which require attention and also provide stimulation in return for attention, in the form of variety, challenge, and feedback (Hackman and Oldham, 1980), or those in which task challenges and performers' abilities are both high and optimally matched (Csikszentmihalyi and LeFevre, 1989). Clearly, task characteristics are very important contributors to boredom or its absence.

A less researched contributor to boredom lies in the person. Some individuals (extroverts, the high boredom-prone, and high sensation seekers) appear to need more external stimulation than others, and so are more likely to experience boredom in everyday activities (cf. Farmer and Sundberg, 1986; Hill, 1975; Zuckerman, 1979). Another line of research suggests that chronic boredom is a consequence of an underdeveloped attention control mechanism (Hamilton, 1981). However, it is unlikely that *all* causes of boredom reside in either task characteristics or stable individual differences. If they did, then individuals would always respond in the same way to the same task. However, experience suggests that the same person may experience a given task as interesting at times and boring at other times. Perhaps more transient aspects of the person or environment are at work in these cases.

A study by Damrad-Frye and Laird (1989) provides evidence for one such transient factor—environmental interruptions which distract attention from the task, and thus require the performer to consciously force attention back to the task. If attentional difficulties and awareness of forced attention are central to the experience of boredom, then interruptions might help cause boredom. The purpose of this paper is to further explore the idea that interruptions (from two sources) are possible contributors to boredom.

External interruptions

One type of attention distractor which is increasingly common for many job holders is some form of brief interruption from the external environment. The advent of mobile phones, e-mail, fax machines, and noisy open plan offices means that clerical and professional employees are frequently interrupted as they attempt to concentrate on a task. There has been very little research on the effects of such interruptions in organizational settings. More generally, Gestalt psychologists have reported on the Zeigarnik effect—a tendency to have greater recall of tasks which were interrupted and not completed, than of those which were completed. Experimental psychologist George Mandler (1964, 1990) has developed what he calls 'Interruptions (Discrepancy) Theory', which postulates that interruptions in well learned task sequences cause physiological arousal and emotion—an effect he has demonstrated in rats as well as in humans. Carver and Scheier's (1990) paper on control theory and emotion takes a more cognitive approach, but agrees that interruptions or impediments which slow expected goal progress produce negative affect. However, the exact nature of the affect or emotion generated by interruptions can vary

based on the appraisal of the situation and expectancies for eventual task success. It has been suggested that interruptions may cause frustration, helplessness, changed task strategies, or increased vigour in pursuing the original goal.

In the work setting, Kirmeyer (1988) found that the frequency with which interruptions from other work tasks pre-empted an on-going task or caused police dispatchers to have to do two things at once was correlated with a measure of overload/stress/pressure. Williams, Suls, Alliger, Learner and Wan (1991) studied 'role juggling' and mood among working mothers. Using experience sampling methodology, they defined 'interrole juggling' as performing tasks from more than one role (e.g. work and family) in the previous 30-minute period. Results showed that interrole juggling was related to reduced task enjoyment and increased negative mood. Subsequent research with both males and females (Williams and Alliger, 1994) verified that having been interrupted in the previous 30 minutes by demands of either another role or a different task in the same role was associated with negative mood and distress. The evidence is mounting that external interruptions can have negative emotional consequences, but what about boredom as a specific negative emotional consequence?

In the only study to focus directly on boredom, Damrad-Frye and Laird (1989) found that an environmental distractor did contribute to feelings of boredom with a task, albeit somewhat differently for introverts than extroverts. They set up three conditions for a listening comprehension task: no external distraction (quiet environment), low volume distraction (television playing on low volume in an adjoining room), and high volume distraction (television playing loudly in an adjoining room). Subjects in the no distraction condition had few attentional difficulties and did not report being bored. The low volume condition was such that subjects seldom noticed the television and did not mention it as a possible cause of distraction, but in fact it did make their job of attending to the task material more difficult. Introverted subjects responded to these attentional difficulties by reporting that the task was boring and not enjoyable under low volume distraction. Extroverts did not experience boredom and reduced enjoyment until the volume became loud and attentional problems more severe. Damrad-Frye and Laird concluded that individuals experiencing attentional difficulties were likely to infer that the task on which they were working was boring.

Internal interruptions

Interruptions which cause attentional difficulties need not come solely from outside the individual. Attentional difficulties may also occur due to non-task-related thoughts which are internally generated. These internal interruptions have been called mind wandering, spontaneous cognitive events, day-dreams, stimulus-independent thought, and intrusive thought by past researchers (Antrobus, Singer and Greenberg, 1966; Gold and Reilly, 1985–1986; Klinger, 1977; Klos and Singer, 1981).

Research has shown that people experience fairly frequent shifts in thought topics, on average every 5 to 30 seconds (Klinger, 1978; Pope, 1977). Some of these shifts are to thoughts which are unrelated to on-going task activity. The incidence of non-task-related thoughts decreases on a more complex task (greater frequency and complexity of stimuli in a signal detection task), which is consistent with findings that people report less boredom on complex and varied tasks. Non-task-related thoughts also decrease in the presence of greater monetary incentives for performance, which apparently serve to hold attention on the task. However, non-task-related thoughts are seldom completely absent (Antrobus, Singer, Goldstein and Fortgang, 1970; Antrobus *et al.*, 1966).

Eric Klinger (1977) has devoted two decades to studying patterns of thought content, and has much to contribute to understanding when and why non-task-related thoughts may intrude in on-going activities. A central concept in Klinger's work is the *current concern*. A current concern is a goal which the person has committed to pursue. Concerns may be as short term as getting lunch or as long term as career success. Not all current concerns are constantly in the forefront of one's thoughts, but concerns which Klinger's subjects identified as most important to them did occur quite frequently in the themes of thought samples collected at random intervals in the next few days (Klinger, Barta and Maxeiner, 1980). Other researchers have found that 65 per cent of day-dreams are related to important current concerns (Gold and Reilly, 1985–1986).

Concerns most likely to be represented in thought are those which are highly valued, likely to be attained, under threat of not being attained, or requiring action in the near future (Klinger *et al*., 1980). Thoughts about such important concerns may intrude from time to time when an individual is performing another activity. 'A person working on a mental task who is in the grip of a very strong concern about something else will have trouble keeping his or her mind on what he or she is doing—he or she will be fighting a lot of mind wandering' (Klinger, 1977, p. 61). If thoughts about strong concerns divert attention from the present task, and require an effort of will to return attention to the task, it seems quite possible that performers will feel bored with the task.

Of course, it is also possible that performers who are already bored with a task will be more vulnerable to non-task-related thoughts about interesting current concerns, and may actively seek such thoughts (even about relatively unimportant concerns) as a way of diverting themselves from the monotony of the task. While these thoughts might provide temporary mental relief, boredom should still be acute if and when the performer forces attention away from these thoughts and back to the task.

Some current concerns which disrupt concentration on a given work task may be related to the job, in the form of another work task unrelated to the present activity. In many cases, however, important concerns may stem not from the work environment, but from the non-work and family life of the individual involved (cf. Williams *et al*., 1991). For instance, Antrobus *et al*. (1966) found that subjects performing a signal detection task reported many more intrusive thoughts when they had been exposed to a bogus news bulletin about China declaring war on the U.S. in Vietnam just prior to the experiment than when they had not. As expected, most of these thoughts were about the news bulletin and its likely effect on themselves and their families.

To sum up at this point, I am suggesting that interruptions from either internal or external sources may distract attention from a task, and by causing attentional difficulties and the need to force attention back to the task, prompt the performer to feel bored. The remainder of this paper presents two studies which provide some preliminary tests of these ideas. In Study 1, external interruptions are directly manipulated, and an attempt is made to indirectly manipulate internal interruptions. In Study 2, internal interruptions are more directly addressed.

Study 1—External Interruptions[2]

External interruptions might be of several types. One would be a passing, irrelevant external interruption which disrupts concentration while it is occurring, but which is soon over and

[2] Thanks to Charles Hadrill for acting as the experimenter in Study 1.

forgotten. The interruption may be irritating, cause some attentional problems, and contribute to boredom as one attempts to force attention back to the task. Another type of interruption would be an external interruption which first disrupts attention by its mere occurrence and then prompts continuing non-task-related thoughts about a related current concern. An example would be an employee being interrupted by an important phone call (external interruption) which then triggers continuing thoughts about the call or the caller after the phone is put down (internal interruptions). This type of concern-related external interruption should have more severe and lasting effects on attention and thus on boredom.

This study will compare a no-interruption control condition, to an external concern-irrelevant interruption condition, to an external concern-relevant interruption condition. Subjects in the latter condition are expected to experience further internal interruptions and greater total attentional problems due to the concern-related prompts in the interruptions. Thus, an initial hypothesis might be that there would be a main effect for interruption, such that subjects who are *not* interrupted would be least bored. However, the effect of interruptions may vary with the attention requirements of the task being performed, as discussed below.

Task type and reactions to interruptions

Because interruptions are expected to affect boredom via their effect on attention, it is necessary to consider the amount of attention required by the focal task. Boredom researchers have studied two distinct types of low stimulation tasks: simple visual or auditory monitoring tasks which require continuous attention but provide little variety or stimulation (e.g. inspection and vigilance tasks); and simple physical tasks which do not require much attention and can be performed automatically (e.g. repetitive manual tasks). Simple tasks which require continuous attention should be highly disrupted by interruptions, and the performer may be acutely aware of the effort involved in returning full attention to the unrewarding task after the interruption. Thus, performers on this type of task should be quite likely to feel bored after having been interrupted. Concern-related interruptions should cause continuing difficulty in paying attention to the task, and therefore should result in greater boredom than irrelevant interruptions on a simple attention-requiring task.

Individuals performing simple tasks requiring little attention may be less bothered by interruptions. If they do not need to keep or force their attention back to a task in order to perform it, interruptions should not contribute to boredom. In fact, interruptions may provide welcome mental relief and stimulation while the routine task is performed automatically. Conceivably, concern-relevant interruptions would be the most entertaining due to their longer lasting impact, and thus boredom may actually be *lower* following concern-related external interruptions than irrelevant external interruptions for a routine, low attention task.

Boredom has been studied almost exclusively on simple jobs, but clearly individuals sometimes do experience boredom while performing more complex activities (Guest, Williams and Dewe, 1978). Complex tasks almost by definition require attention (we were unable to devise a complex, interesting task which did not require attention), so concentration or 'flow' will certainly be disrupted by interruptions. Complex tasks usually have high information processing and short-term memory requirements, such that performers need to 'begin again' to recapture their train of thought following an interruption. These characteristics should make interruptions quite bothersome for performers of complex tasks. The presence of interruptions, especially perhaps concern-related intrusive thoughts, may account for the attentional problems and boredom which can sometimes be encountered even on enriched tasks.

In sum, the hypothesis for Study 1 is that interruption and task condition will interact to affect boredom, such that interruptions will reduce boredom on simple, low attention tasks but increase boredom on simple tasks which require attention and on complex tasks. These effects should be more pronounced for concern-related external interruptions than for irrelevant external interruptions.

Method

Subjects, design and procedure

Subjects were 181 university students who were paid $15 (Aus) for an hour of their time. Females comprised 41 per cent of the sample. The average age was 21, and the subjects had an average of 13 months of full-time and 16 months of part-time work experience.

The design was a 3 × 3 between subjects design, with three levels of external interruptions (none, irrelevant, concern-related) and three types of tasks (simple/low attention, simple/high attention, complex). Cell sizes varied from 18 to 23. Subjects were run in groups of about 10. They were first oriented to their task, then told to work on the task until asked to stop by the experimenter. All work periods lasted 20 minutes, and any interruptions occurred during the work period. After the work period, subjects completed a questionnaire about their perceptions of the task.

Manipulations

Tasks Three tasks were used. The simple low-attention task was a repetitive manual assembly task. Subjects were given a 1 foot by 2 foot square of pegboard and a supply of 3/16 by 2 inch bolts with nuts. The task was to insert bolts through the board and screw the nuts down snugly, one bolt at a time. The simple high-attention task involved proof-reading name and address labels against a master list. In order to increase the concentration requirements of this task, the correct address master featured page-wide lines of text (about two lines per address) while the addresses to be proofed were in label format (four lines per address). Two hundred addresses were to be proofed, and one hundred errors had been introduced into the labels. The complex task was an in-basket for the job of advertising manager. Subjects made a series of decisions of varying complexity involving human resource management, work scheduling, copy writing, and strategic direction at an advertising agency.

The three tasks had previously been piloted to assure that the two simple tasks were about equally boring, that the complex task was in fact interesting, and that the two simple tasks were significantly different in the amount of attention required to perform them. Manipulation checks (reported below) confirmed that the tasks were perceived as intended in the main study as well.

Interruptions The experimental room was arranged to control extraneous distractions. All work tables faced walls and all window blinds were closed. The experimenter sat quietly except when planned interruptions took place. Subjects in the no-interruption condition completed their 20-minute work period without any external interruptions. Subjects in both interruption conditions experienced four interruptions in the space of 20 minutes, at 4, 10, 14 and 16 minutes into the session. The first, second and last interruptions involved a person entering the room and speaking, while the third interruption was a phone call to the experimenter which subjects overheard. The person doing the interrupting was the same in both conditions, though she played a different role in each condition.

The irrelevant interruptions featured a person dressed as a maintenance worker entering the room, speaking to the experimenter and in some cases the subjects, and carrying out tasks associated with furniture inventorying. The other irrelevant interruption was a phone call in which the experimenter's side of the conversation was about scheduling the research room for the coming week.

In the concern-relevant interruption condition, the interrupter posed as a graduate student doing research on student life. In her first interruption, she explained that she was studying things that were sources of joy, stress, satisfaction, and worry among students, and that she was looking for students to interview about these topics for her research. She asked students to think about the things that were presently affecting their mood either positively or negatively, and about whether they might be willing to be interviewed. Her second interruption involved placing one page handouts containing more information about her research on each student's table. These handouts contained clip art representations of money, parties, working on a computer, etc. as well as large print text listing common concerns that students had mentioned in past research. The presence of this handout was intended to provoke continuing thoughts about current concerns. The third interruption was a phone call apparently from a friend of the experimenter, and a conversation about the friend's problems in finding a job and his happiness about his impending marriage (common concerns among students). The final interruption was the supposed graduate student saying she would be back as soon as the students finished working to see if they wished to sign up for an interview.

The script for the concern-related external interruptions contained an equal number of positive/happy (i.e. an upcoming holiday or wedding) and negative/unhappy (financial or employment problems) examples, in order to avoid confounding this manipulation with mood. The actual examples used were drawn from a survey conducted several months previously at the same university, in which students were asked to list their most pressing current concerns and rate their valence. By using many of the frequently listed events/concerns, we hoped to strike a chord in nearly all subjects, and stimulate them to further thought about one or more issues of relevance to them.

Measures

Aspects of boredom were assessed by 22 items developed from the literature on boredom and previously piloted on student samples. Seventeen of the items were rated on a 5-point scale ranging from 'not at all' to 'extremely' in terms of how well the statement characterized the feelings experienced by respondents while working on the task. The other five items also used a 5-point response format, with anchors specific to the question being asked. Two earlier studies on the scale properties of similar sets of boredom items suggested that several factors were present, and this was again the case in the main study. A principle components analysis of the 22 items produced four factors accounting for 69 per cent of the variance.

Four scales relating to aspects of boredom were constructed utilizing the items with loadings greater than 0.50 (shown in bold type in Table 1). The first factor suggests a scale called 'mind-wandering' containing six items, with a coefficient alpha of 0.91. Most of these items indicate a passive, detached feeling in which thoughts unrelated to the present task occur. The 5-item scale based on the second factor was called 'boredom' (versus interest) and had a reliability of 0.92. Items indicating interest and task enjoyment were reverse scored when added into the boredom scale. The third scale was called 'symptoms of boredom' and included almost physical sensations such as restlessness, irritability, and frustration. Prior research has confirmed that these 'itchy' feelings usually accompany boredom (O'Hanlon, 1981). Reliability of this scale was 0.82. The

Table 1. Rotated factor loadings for boredom items

While working on the task, to what extent did you feel ... ?	Mind wandering	Boredom	Symptoms of boredom	Inattention
1. Alert	−0.18	0.23	−0.19	**0.62**
2. Time was dragging	0.29	−0.45	0.47	−0.01
3. Bored	0.35	**−0.69**	0.42	−0.05
4. Restless	0.35	−0.48	**0.57**	−0.03
5. Fascinated by the task	−0.12	**0.81**	0.08	0.20
6. Irritable	0.14	−0.17	**0.77**	−0.08
7. Unable to concentrate	0.32	0.07	**0.55**	−0.36
8. Focused on the task	−0.25	0.23	−0.17	**0.76**
9. Mind was wandering	**0.74**	−0.20	0.23	−0.08
10. Frustrated	0.18	−0.05	**0.81**	−0.11
11. Enjoying the task	−0.15	**0.81**	−0.10	0.37
12. Attentive	−0.23	0.28	−0.11	**0.74**
13. Distracted	**0.65**	−0.10	0.24	−0.23
14. Interested in the task	−0.14	**0.84**	−0.09	0.34
15. Day-dreaming	**0.85**	−0.20	0.20	−0.15
16. Involved in task	−0.34	0.49	−0.09	**0.57**
17. Off in another world	**0.85**	−0.06	0.20	−0.21
18. How frustrating was working on this task? 5 = very	0.03	−0.04	**0.73**	−0.37
19. To what extent did your mind wander to other topics while working on this task? 5 = none	**−0.74**	0.25	−0.06	0.36
20. How hard was it to keep your attention on this task? 5 = very hard	0.26	−0.29	0.32	**−0.54**
21. How boring or interesting was the task? 5 = very boring	0.21	**−0.81**	0.22	−0.27
22. During the work period, how often did you think about other things outside of this experiment? 5 = almost never	**−0.70**	0.32	−0.05	0.26

final scale was called 'inattention'. It had a reliability of 0.85 and included reverse coded items like alert, focused on task, and attentive. The average intercorrelation among these scales was 0.56, with values ranging from 0.46 to 0.66.

Additional questions were asked about 'how much attention was required to do the task' and 'how much a person needed to concentrate on this task in order to do it reasonably well'. Responses to these items were correlated 0.84, so they were averaged and used as a manipulation check for attention requirements of the tasks. A high score means high attention demand.

Results

Manipulation checks

The two simple tasks were designed to be seen as boring, and the complex task as interesting. Looking at responses in the control (no interruption) condition, the simple low-attention task was rated 4.26 on the 5-item boredom (versus interest) scale, the simple high-attention task was rated 3.98, and the complex task was rated 2.19. Given that the scale could range from 5.00 (very boring) to 1.00 (very interesting, fascinating, etc.), it is clear that the two simple tasks were seen as quite boring, and the complex task as interesting. A one-way analysis of variance on task was

significant ($F = 44.7$, $p < 0.001$), with a Scheffe test showing that the two simple tasks were not significantly different from each other, but both were significantly more boring than the complex task.

The tasks were also supposed to differ systematically on the degree of attention and concentration required to complete them successfully. The simple low-attention task averaged 2.08 on the 1–5 attention/concentration scale, the simple high-attention task was rated 3.95, and the complex task was rated 4.45. Again, a one-way ANOVA on task using control condition subjects was significant ($F = 57.8$, $p < 0.001$), and Scheffe tests supported the desired differences: the low-attention task was significantly lower than the other two, which were not significantly different from each other.

Analyses

The dependent variables were the four scales constructed from the boredom items: mind-wandering, boredom (versus interest), symptoms of boredom, and inattention. These were first entered into a 3 (task) by 3 (interruption condition) MANOVA. As expected, there was a huge effect for task, reconfirming the above manipulation check. More interestingly, there was also a significant multivariate main effect for interruption ($F = 2.37$, $p < 0.02$), and a significant task by interruption interaction ($F = 2.16$, $p < 0.01$). Subsequent univariate ANOVA results are summarized in Table 2, with the interactions being more noteworthy (three reaching conventional levels of significance) than the interruption main effects. The significant interactions are shown graphically in Figures 1a–c. The hypothesis that the effect of interruptions on indicators of boredom would depend of the type of task being performed was supported.

Table 2. F statistics for univariate ANOVAs

Dependent variable	Task main effect	Interruption main effect	Interaction
Mind wandering	38.35*	0.93	4.28*
Boredom (versus interest)	55.35*	1.05	1.72
Symptoms of boredom	4.40†	2.69‡	2.51†
Inattention	15.62*	2.34‡	3.12†

N approximately 181.
* $p < 0.01$; † $p < 0.05$; ‡ $p < 0.10$.

For the simple low-attention task, all indicators of boredom showed the same pattern: boredom was highest when there were no interruptions, and lower when interruptions occurred. One-way ANOVAs followed by Scheffe tests for this task showed that means on the inattention and mind-wandering scales were significantly lower following any interruption than when there was no interruption ($p < 0.05$). The mean on the symptoms of boredom scale was significantly lower following the current concerns interruptions than no interruptions ($p < 0.05$). Interruption condition did not have a significant effect on the boredom versus interest scale for the simple low-attention task, though the pattern of means is similar to the other dependent variables. As suggested earlier, interruptions generally improved reactions to a simple low-attention task, perhaps by providing needed additional stimulation. Apparently, being distracted from a task is not problematic when the task requires very little attention.

For both the simple, high-attention task and for the complex task, interruption condition did not seem to matter. Contrary to expectations, none of the one-way ANOVAs were significant.

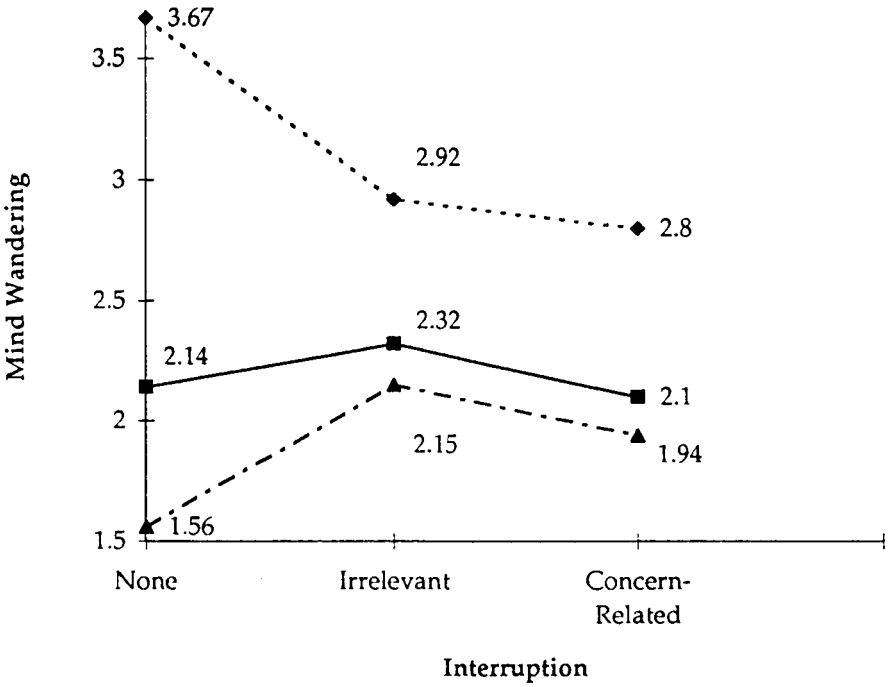

Figure 1(a)

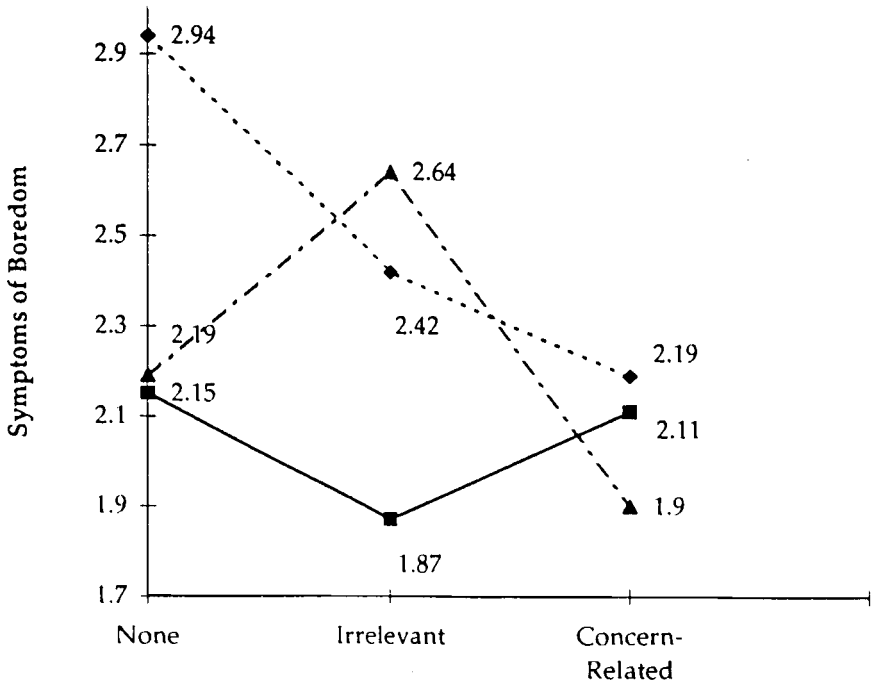

Figure 1(b)

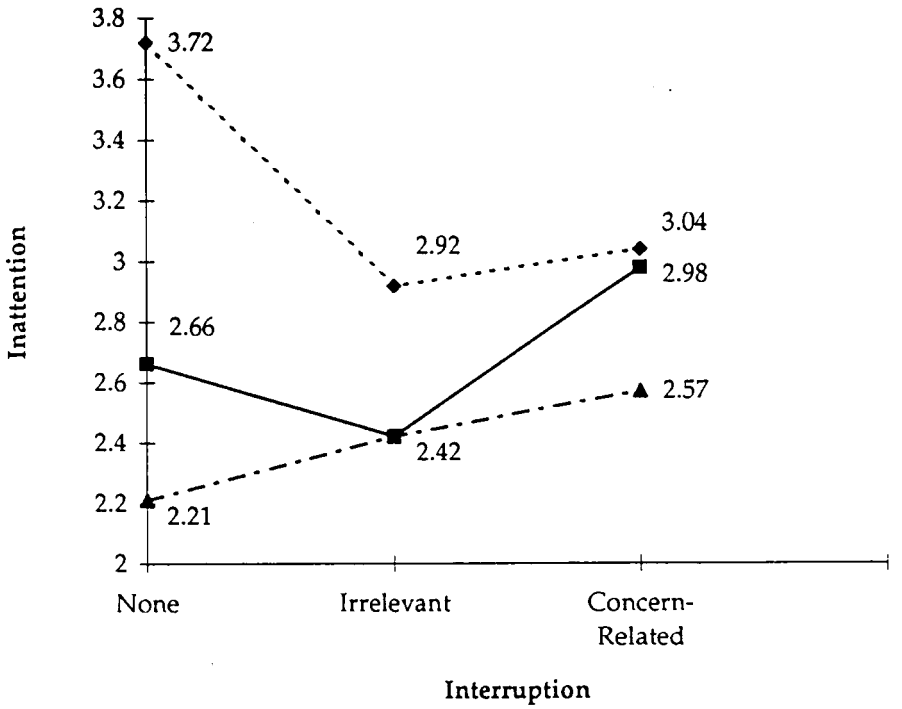

Figure 1(c)

Figure 1. a–c, Interactions of task type and interruption. --◆--, simple low attention; —■—, simple high attention; --▲--, complex

Discussion

The predicted task by interruption interaction was supported. However, the strongest evidence was that external interruptions helped prevent boredom on simple low-attention tasks, not that interruptions increased boredom on tasks with higher attention requirements. The hypothesized mechanism by which external interruptions would produce boredom was by disrupting attention and then requiring attention to be forced back to the task, with awareness of forced attention producing feelings of boredom. This did not seem to occur. Perhaps subjects did not care enough about the task to force their attention on to it, or perhaps the work period was too short for forced attention to become unpleasant and effortful enough for subjects to feel bored. Alternatively, perhaps the interruptions were too blatant. Damrad-Frye and Laird (1989) found that introverts in the high volume condition did not report being as bored as they were in the low volume distraction condition. Apparently, when they had a clearly salient external cause for their attention problems—the unmistakably loud television—they did not have to conclude that the task must be boring in order to explain their attentional difficulty. Thus, more subtle interruptions might have generated greater feelings of boredom.

Both irrelevant and concern-relevant external interruptions had similar effects. Perhaps this is not surprising, as the two interruption manipulations were similar in a number of ways. Both featured the same players, lasted the same length of time, and occurred at the same intervals. There is little direct evidence that the current concern interruption manipulation had the intended effect of producing additional intrusive thoughts between staged interruptions. Mind-wandering

was not significantly greater within task for the concern-related versus irrelevant interruption, but such a difference would be expected if the former triggered additional internally-generated interruptions. The current concern manipulation was a generic effort to induce thoughts about current concerns by priming concerns common to many students. Perhaps it failed because it was too generic—the issues mentioned might have been major concerns on that day for only a small number of the subjects.

Nevertheless, the idea that internally generated intrusive thoughts, whether or not they are externally prompted, can distract attention and make a task appear boring seems reasonable. I know that I feel bored and have trouble concentrating on work tasks when more urgent or exciting off-the-job concerns are intruding into my thoughts. Such internally-generated intrusive thoughts are subtle interruptions, compared to the unmistakable physical interruptions in Study 1, so they may be more likely to invite attributions that the task is boring and the distracted person is bored, as opposed to merely interrupted. Study 2 was designed to generate preliminary evidence with regard to whether internally-generated interruptions by thoughts about current concerns are associated with boredom.

Study 2—Internal Interruptions

There are a number of methodological obstacles in research on non-task-related thought (internal interruptions). The first is that thoughts cannot be directly observed, and subjects may require considerable training before they can reliably report on the frequency of changes in thought content (Klinger, 1977). The second problem is with inducing non-task-related thoughts. The manipulation used in Study 1 did not appear to work, even though concerns known to be widely shared in the population involved were used as cues. Klinger (1977) was able to successfully prompt thoughts about current concerns in his subjects by providing them with very specific cues, custom-made for each subject based on interviews about each person's concerns conducted on the previous day. Antrobus *et al.* (1996) prompted non-task-related thoughts with a bogus declaration of war. Short of Klinger's laborious individualized procedure or Antrobus *et al.*'s heavy-handed approach, it seems difficult to experimentally manipulate the extent of internally-generated thoughts about current concerns. To avoid these difficulties, Study 2 took a less direct approach to determining whether internal interruptions in the form of non-task-related thoughts might be associated with boredom. A role playing methodology was chosen for this preliminary investigation. Observers were given information about a target person's supposed task-related and non-task-related thoughts while at work, and were asked to infer the target's level of boredom and job satisfaction.

Evidence that observers use non-task-related thought as a basis for inferring boredom in others does not prove that actors do the same, but would suggest that further research, including efforts to directly manipulate or measure interruptions from non-task-related thoughts, is warranted. Support for the role playing methodology is contained in the self-perception literature which suggests that people make self-attributions in much the same way, and from the same type of information, as do observers (Bem, 1972). Additional support comes from more recent research which finds very similar results from role-played and actual experience studies (Greenberg and Eskew, 1993; Greenberg and Folger, 1988).

In Study 2, subjects were exposed to information about a job incumbent's thoughts while at work. The incumbent was portrayed as having virtually no non-task-related thoughts, occasional

non-task-related thoughts, or frequent non-task-related thoughts. The dependent variables in this study were ratings of boredom, satisfaction with the work itself, and overall job satisfaction of the focal performer. It is expected that the strongest effects of non-task-related thoughts would occur for the boredom dependent variable, as attentional difficulties are conceptually most closely linked to boredom. If a person is having trouble concentrating on his or her work, he or she is likely to be seen as bored with it. Judgments about another's job satisfaction should also be affected by the frequency of their non-task-related thoughts, though probably not as strongly as is boredom. The inference processes underlying this prediction are that (1) a job which fails to hold its incumbent's full attention may be seen as a generally lower quality and less satisfying job, or (2) individuals who do not like their jobs (for any reason) may desire to escape them by thinking about something else.

H1: there will be a main effect for frequency of internal interruptions on boredom and job satisfaction, such that those who are portrayed as having more frequent non-task-related thoughts will be seen as more bored and less satisfied than those who are portrayed as having less frequent non-task-related thoughts.

The Damrad-Frye and Laird (1989) study suggests that it is not just the presence of attentional difficulties, but the presence of attentional difficulties without a salient reason, that causes feelings of boredom. Klinger's research suggests that it is legitimate to expect important concerns to break into on-going thought, but that less urgent concerns should intrude less often. Individuals who experience internal interruptions about non-urgent concerns have little obvious reason for their attentional difficulties, and an attribution that they are bored seems more likely. Thus, a second factor manipulated in this study had to do with the reason for or justifiability of the non-task-related thoughts. In one case, the interrupting thoughts were about issues that most would agree are important or urgent and provide a good reason to experience attentional difficulty at work, while in the other the interrupting thoughts were related to seemingly minor concerns.

H2: There will be a main effect of reason for internal interruptions on boredom and job satisfaction, such that those who are portrayed as having non-task-related thoughts about unimportant concerns will be seen as more bored and less satisfied than those who have non-task-related thoughts about important and urgent concerns.

An additional manipulation related to the idea of reason for interruption was also utilized. This was job level. In a low level blue-collar job with modest attention requirements, incumbents may have an obvious good reason (the unstimulating job itself) to experience attentional difficulty. Thus, the presence of varying degrees of non-task-related thought, whether about urgent concerns or not, may not be seen as particularly diagnostic of the boredom or satisfaction levels of these incumbents. However, a higher level managerial job would be expected to provide adequate stimulation and thus hold the attention of the incumbent. As the more complex job does not justify attentional difficulty, the presence of increasing levels of non-task-related thoughts, particularly about non-urgent concerns, may need to be explained in some other way—perhaps with the attribution that the incumbent is bored or dislikes the job.

H3: Frequency of internal interruptions and reason for internal interruptions will interact with job level. Both will affect attributions of boredom and satisfaction more strongly for a managerial job than for a blue-collar job.

Method

Subjects and procedure

Subjects were 171 full- and part-time university students who participated in the study during a regular class period (none of these subjects participated in Study 1). Ages ranged from 17 to 44 with a mean of 22 years. Eighty-seven per cent of the students had some work experience, with an average of 26 months part-time and 23 months of full-time work. Of the subjects 66 per cent were male.

A cover story was used to conceal the purpose of the study. Subjects were informed that they would be acting as judges in a study of a new and less intrusive way to measure employees' job attitudes. Rather than asking job incumbents to respond directly to point-blank questions about attitudes, employees were (ostensibly) asked instead to record their activities, thoughts, and feelings in a diary during one day at work. The students' role was to serve as judges so that the researcher could find out whether educated lay-people such as themselves were capable of correctly intuiting the actual job attitudes of employees on the basis of a diary.

Subjects were provided with a half-page job description and a copy of a three-page hand-written diary supposedly from a male employee holding the specified job. Ten hourly entries were provided, on the hour from 8.00 a.m. to 5.00 p.m. The manipulations were contained in the job description and diary material. After reading this material, subjects rated the target employee's boredom and satisfaction.

Design and manipulations

Factors manipulated included frequency of internal interruption (never, occasionally, frequently), reason for distraction (good versus poor), and job level (blue-collar, managerial). Cell sizes ranged from 16 to 18.

Frequency of internal interruption In the no-interruption condition, the incumbent recorded no non-task-related thoughts except during conversations with friends at lunch. The occasional interruption condition included non-task-related thoughts three times plus irrelevant thoughts at lunch, while the frequent interruption materials contained non-task-related thoughts nine times: the same three as in the occasional interruption condition, plus five more thoughts related to the same concerns, plus lunch thoughts.

Reason for interruption The design included two levels of reason for interruption. The poor reason was operationalized by non-task-related thoughts about the seemingly minor concerns/unimportant events of a son's regular junior soccer game on the weekend and worry about a wife with a slight head cold. Good reasons included non-task-related thoughts about the more pressing concerns of a star junior soccer-playing son with a championship game on the weekend, and about a wife who was feeling quite ill and had a history of recurrent life-threatening illness. The reason levels could not be crossed with the no-interruption condition, so there were actually five cells for each job level—two frequency of interruption levels by two reason levels plus a no-interruption control. The reason manipulation had been piloted successfully (the 'good' reasons were seen as more legitimate reasons to have non-task-related thoughts than the 'bad' ones), and was verified in this study by a manipulation check item at the end of the questionnaire.

Job level Simulated diaries for two job levels were developed. These jobs were based on occupation definitions in the 1990 Australian Standard Classification of Occupations. The

blue-collar job was storeman while the managerial job (in a similar function) was supply and distribution manager. Subjects read a half-page job description prior to reading the diaries, and the specific diary activities and task-related thoughts mentioned were those typical for the job description given. The text of the non-task-related thoughts was identical for both job levels.

Measures

Perceived boredom was assessed with a simpler measure than in Study 1. The measure was comprised of the sum of three 7-point Likert items, such as 'This individual finds the job boring and uninteresting'. A higher score indicated greater boredom. Coefficient alpha was 0.82. Overall job satisfaction was measured as the sum of three items from Hackman and Oldham's (1980) Job Diagnostic Survey answered on a 7-point agree–disagree scale. Coefficient alpha was 0.75.

Satisfaction with the work itself was measured with the Work Itself scale of the Job Descriptive Index (Smith, Kendall and Hulin, 1969). This scale normally uses a 3-point response format consisting of 'no', '?', 'yes'. Pilot research showed that some subjects used the question mark frequently, probably due to the limited information about the job provided in the stimulus materials. As the purpose of this research was to capture respondents' impressions, it seemed reasonable to force them to record these impressions, even if they were not sure there was enough information to back up each judgment thoroughly. Thus, the only response options given were 'no' and 'yes'. Coefficient alpha was 0.70. As would be expected, the three dependent variables were correlated with each other. The mean of the absolute values of the intercorrelations was 0.61.

Results

Manipulation checks

Manipulation checks showed that the frequency of interruption manipulation was effective in producing perceptions of attentional difficulty. A one-way analysis of variance on the three interruption levels produced an F of 59.2 ($p < 0.001$) for the question, 'On the day that the employee kept this diary, did the employee seem to be focused on his work, or was he distracted from his work?' A response of 6 meant 'very focused' while 1 meant 'very distracted'. Means were as expected, 2.13 for the frequent interruption condition, 2.95 for the occasional interruption condition, and 4.23 for no interruptions. A Duncan's multiple range test showed that all three groups were significantly different from each other ($p < 0.05$).

The reason for interruption manipulation was also perceived as intended. Subjects were asked 'If you felt that the employee was less than very focused on his work, would you say that he had good or bad reasons for feeling that way?' A 6-point scale provided anchor points ranging from 1 = no reason to 6 = good reason. A t-test between the two reason conditions produced a t of 5.68 ($p < 0.001$), with a poor reason mean of 3.07 and good reason mean of 4.21.

Analyses

Hypothesis 1 (that there would be a main effect for frequency of interruption) was tested with 2 (job level) by 3 (frequency of internal interruptions) analyses of variance, the results of which are shown in Table 3. As expected, the managerial job was seen as more satisfying in terms of the work itself, and as less boring than the storeman job, reaffirming the role of the task as a contributor to boredom. More relevant to hypothesis 1, frequency of interruption effects for all three dependent variables were significant at the 0.05 level or better. A Duncan's multiple range

Table 3. Two-way ANOVAs*

Dependent variable	Effect	*MS*	*F*
Boredom	Job	59.03	4.28†
	Frequency of interruption	224.40	16.25†
	Job × frequency of interruption	9.91	0.72
	Error	13.81	
Work itself	Job	337.06	25.00†
	Frequency of interruption	96.37	7.15†
	Job × frequency of interruption	30.64	2.27
	Error	13.48	
Overall satisfaction	Job	20.25	1.90
	Frequency of interruption	33.66	3.16‡
	Job × frequency of interruption	4.17	0.39
	Error	10.65	

* All three frequencies of interruption were used in these analyses.
$N = 171$.
† $p < 0.01$; ‡ $p < 0.05$.

test on boredom found that incumbents in the frequent interruption condition were seen as significantly ($p < 0.05$) more bored (15.84) than those in the occasional (13.29) or no interruptions (11.68) condition. The latter two conditions did not differ from each other. Similar results were found for overall satisfaction, with those interrupted frequently being significantly less satisfied (13.72) than those interrupted occasionally (14.94) or not at all (15.14). For the work itself, the most frequently interrupted were seen as significantly less satisfied with work (24.75) than those who were not interrupted at all (27.60). These results largely support hypothesis 1, confirming that a high frequency of internal interruption by non-task-related thoughts is used as a cue in judging the boredom and satisfaction of others.

Hypothesis 2 stated that internal interruptions for an apparently unimportant reason would suggest that the incumbent was more bored or dissatisfied compared to the same amount of interruption due to more important concerns. Because reason for interruption could not be manipulated in the no-interruption condition, the no-interruption groups were not used in tests of hypothesis 2. Two(occasional versus frequent interruption) × 2(good versus bad reason- × 2(blue-collar versus managerial job) analyses of variance on the three dependent variables revealed the expected frequency of interruption effects on all variables and significant or near-significant reason for interruption effects for all three scales (see Table 4). Cell means are shown in Table 5. Satisfaction was generally greater when a good reason for non-task-related thoughts was present, while boredom was lower when a good reason was present. Thus, hypothesis 2 was supported.

Hypothesis 3 suggested that the effects of frequency of interruption and reason for interruption might be stronger for a higher level than a lower level job. However, neither the three-way nor two-way interactions involving job level reached conventional levels of significance. The effects of interruptions on boredom and satisfaction appear to be similar for both job levels.

Discussion

The results showed that observers do use information about the frequency of and reason for internal interruptions in making judgments about the boredom and job satisfaction of others.

Table 4. Three-way ANOVAs*

Dependent variable	Effect	*MS*	*F*
Boredom	Job	85.68	6.34†
	Frequency of interruption	210.10	15.45‡
	Reason for interruption	50.14	3.71§
	Job × frequency	11.33	0.84
	Job × reason	0.02	0.00
	Frequency × reason	5.93	0.44
	Job × frequency × reason	0.48	0.04
	Error	13.51	
Work itself	Job	423.27	43.10‡
	Frequency of interruption	47.45	4.83†
	Reason for interruption	33.67	3.43§
	Job × frequency	38.02	3.87§
	Job × reason	0.49	0.05
	Frequency × reason	0.01	0.00
	Job × frequency × reason	0.01	0.00
	Error	9.82	
Overall satisfaction	Job	23.43	2.21
	Frequency of interruption	48.20	4.55†
	Reason for interruption	45.43	4.29†
	Job × frequency	7.61	0.72
	Job × reason	0.14	0.01
	Frequency × reason	19.15	1.81
	Job × frequency × reason	9.50	0.90
	Error	10.59	

* Only occasional and frequent interruption conditions are included in these analyses.
† $p < 0.05$; ‡ $p < 0.01$; § $p < 0.10$.

People who are portrayed as being more frequently interrupted by non-task-related thoughts, and being interrupted for a less justifiable reason, are seen as more bored and less satisfied. These findings are consistent with the central role given to attention and attentional difficulties in recent research on boredom. The hypothesis that job level might be a moderator, such that frequency of interruption for a poor reason would be more diagnostic of incumbent attitudes in a higher level job, was not supported. However, the lack of effect for job level may be taken as evidence for the generalizability of the frequency and reason for interruption effects, with the two job scenarios providing replications for hypotheses 1 and 2.

Potential weaknesses of this study lie in the role-playing method which was adopted, and the causality issues which arise from this methodology. In Study 2, respondents were presented with information about the thoughts of incumbents which would not normally be available to them. The somewhat unusual or artificial nature of the stimuli may be seen as problematic by some readers. However, the method is not without successful precedent (cf. Greenberg and Eskew, 1993).

In terms of causality, the experiment clearly showed that manipulation of the independent variables frequency and reason for non-task-related thoughts *caused* differences in the boredom and satisfaction levels attributed to stimulus persons. What it could not test is whether non-task-related thoughts *cause* boredom in performers. Perhaps they do, and subjects were reporting, based on their personal experiences, that when they have other things on their minds, they have trouble paying attention to work tasks and find them less interesting. Alternatively, subjects could have been responding to an implicit theory which says that when people are bored

(for whatever reason), they *then* think about something else to entertain themselves. It seems likely that both processes can operate, though further research will be necessary to verify that internal interruptions from non-task-related thoughts can be direct causes of boredom in actors.

General Discussion and Conclusions

Past research on the causes of boredom at work has focused almost exclusively on task characteristics. The importance of task characteristics was again verified in these studies with significant effects for type of task (Study 1) and job level (Study 2) on boredom. At the same time, however, these studies took the first few steps toward exploring another possible contributor to boredom: being interrupted by unrelated thoughts or events while trying to work on a focal task. Both internally- and externally-generated interruptions were studied. Overall, the results are consistent with Damrad-Frye and Laird's (1989) finding that subtle interruptions are more likely to be associated with boredom than no interruptions or blatant external interruptions. Repeated physical interruptions in Study 1 did not increase boredom, while internally-generated non-task-related thoughts with no apparent environmental cueing were seen as highly diagnostic of boredom in Study 2.

External interruptions

Study 1 found that external interruptions were actually useful in reducing boredom on simple low-attention tasks, perhaps by providing variety and additional stimulation to a monotonous work environment. This is not inconsistent with the findings from job design research that variety in the form of horizontal job enlargement has some modest benefit in making work more interesting. Although not measured in this study, another potential positive response to interruption could be renewed energy and strengthened efforts to complete the original task. This response seems likely as long as the performer maintains a high expectancy of eventual success (Carver and Scheier, 1990; Mandler, 1990). Study 1 failed to provide convincing proof that external interruptions contribute to negative effects such as boredom on tasks with high attention requirements. However, the possibility remains that interruptions may be problematic in some situations.

Although the present studies focused on boredom, other affective reactions may also be affected by interruptions. Negative mood, anxiety, feelings of distress and overload, and frustration are likely candidates. Damrad-Frye and Laird's (1989) subjects reported being significantly more 'fed up' as the volume level of the distractor increased. Carver and Scheier (1990) suggest that events which cause a sudden deceleration in the rate of progress toward the attainment of important and time-sensitive goals should cause the most negative affect. Interruptions which remove attention from a task which requires attention should effectively bring goal progress to an abrupt halt, and thus result in negative affect. One might speculate that external interruptions would be especially irritating if they were very frequent, if they were uncontrollable, if incumbents had been enjoying the focal task a great deal before the interruption, if the task had heavy short-term memory requirements which were easily scrambled, or if task accomplishment was urgent. In Csikszentmihalyi and Le Fevre's (1989) framework, interruptions which place additional demands on performers may change a 'flow' state in which high task challenge is matched to high ability, to an 'anxiety state' of higher task challenge and relatively lesser ability to cope. Boredom

may be a more likely response to attention problems when the distractions causing the problems are too subtle to elicit anger at their source, when the performer is not committed enough to task accomplishment to experience frustration at the interruption of goal progress, or when the performer is not sufficiently challenged to be pushed into anxiety by the added demands of the interruption.

In sum, interruptions have been studied very little, yet are an inescapable aspect of work for many employees. The frequency with which workers experience external interruptions seems likely to increase with advances in communication technology, greater adoption of team structures, pressures to respond to customer demands immediately, and flattened organizational structures. The job design and affective consequences of interruptions seem to merit further study and theorizing.

Internal interruptions

Study 2 provided strong preliminary evidence that internal interruptions from non-task-related thoughts are associated with boredom. People who are portrayed as thinking about non-work concerns at work are seen as more bored and less satisfied, especially when they think about these concerns frequently and when the concerns seem non-urgent. The concepts of interruptions and current concerns may provide a useful addition to understanding the process by which work-life affects and is affected by the non-work side of life. Several decades of research on work–non-work relationships have focused largely at the global/aggregate level, exploring the relationships between stable long-term constructs such as job satisfaction and life or family satisfaction. Relatively little thought as to the process by which one affects the other has occurred until recently (Lambert, 1990). While there may be long-term effects, it seems likely that many work–non-work influences are more immediate. Thinking about an upcoming weekend activity causes one to be inattentive and perhaps bored at work today, while thinking about an important work meeting tomorrow while at home tonight makes one less interested in (and perhaps bored with) a spouse's conversational overtures.

Future research using idiographic designs will be necessary to clarify the links between an individual's current concerns, the incidence of non-task-related or intrusive thought, and moment-to-moment affective reactions while at work. Such research will provide a much richer understanding of the real-time experience of work, and how non-work issues and thoughts affect this experience. The work of Williams and his colleagues is a very good start in this direction. A parallel line of research on external physical interruptions would also be likely to bear fruit.

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