The development of psychological contract breach and violation: a longitudinal study

SANDRA L. ROBINSON1* AND ELIZABETH WOLFE MORRISON2

1Faculty of Commerce and Business Administration, 2053 Main Mall, University of British Columbia, Vancouver, BC V6T 1Z2, Canada
2New York University, 44 West 4th, New York, NY 10012, U.S.A.

Summary
This study examines factors affecting employees’ perceptions that their psychological contract has been breached by their organization, and factors affecting whether this perception will cause employees to experience feelings of contract violation. Data were obtained from 147 managers just prior to their beginning of new job (time 1) and 18 months later (time 2). It was found that perceived contract breach at time 2 was more likely when organizational performance and self-reported employee performance were low, the employee had not experienced a formal socialization process, the employee had little interaction with organizational agents prior to hire, the employee had a history of psychological contract breach with former employers, and the employee had many employment alternatives at the time of hire. Furthermore, perceived breach was associated with more intense feelings of violation when employees both attributed the breach to purposeful reneging by the employer and felt unfairly treated in the process. Theoretical and practical implications of these results are discussed. Copyright © 2000 John Wiley & Sons, Ltd.

Introduction
At the foundation of the employee–organization relationship is a psychological contract, comprised of beliefs about reciprocal obligations between the two parties (Rousseau, 1989; Schein, 1965). Nonetheless, employees often perceive that their organization has failed to adequately fulfil that contract. Robinson and Rousseau (1994) found that 55 per cent of their sample of managers perceived that their organizations had failed to fulfil one or more promised obligations in the first two years of the employment relationship. These perceptions, regardless of whether or not they are accurate, have been found to reduce employees’ trust, job satisfaction, intentions to remain with the organization, sense of obligation, and in-role and extra-role performance (Robinson, 1996; Robinson et al., 1994; Robinson and Morrison, 1995). Because of the potential for these negative effects, it is vital to understand the conditions under which perceptions of psychological contract breach arise.

* Correspondence to: Sandra Robinson, Faculty of Commerce and Business Administration, 2053 Main Mall, University of British Columbia, Vancouver, BC V6T 1Z2, Canada. E-mail: sandra.robinson@commerce.ubc.ca

We contributed equally to this paper. We would like to thank Corey Phelps and Batie Wiesenfeld for their comments on earlier drafts of this manuscript.

Copyright © 2000 John Wiley & Sons, Ltd.

Received 8 June 1998
Accepted 4 March 1999
The main objective of this study is to examine factors that contribute to an employee’s perception that the organization has breached his or her psychological contract, or in other words, not adequately fulfilled promised obligations. The study also examines the conditions under which these perceptions will be related to an emotional reaction of anger and betrayal (i.e., feelings of ‘violation’). Although there is a growing body of literature on the effects of perceived psychological contract breach (Robinson, 1996; Robinson and Morrison, 1996; Robinson and Rousseau, 1994), this is the first empirical study of factors that affect the development of those perceptions. Our hope is that by better understanding when and why perceptions of psychological contract breach develop, researchers can identify ways to minimize their occurrence and their destructive consequences.

An overview

The perception that one’s psychological contract has been breached in an inherently subjective phenomenon. In some cases it may arise from a ‘real’ breach of contract. For example, a recruiter may clearly promise a new employee that he or she will be promoted within three years and yet this does not occur. In other cases, it is much less clear whether a ‘real’ breach occurred. Perhaps the recruiter made some vague statement such as ‘people tend to get promoted rapidly here—often within three years,’ and the employee interpreted this as a promise that he or she would be promoted within three years. When this promotion does not happen, the employee may perceive a breach in the psychological contract.

In most cases, it is impossible to ascertain which of these scenarios has occurred. That is, one cannot tell whether a promise was actually broken, or even whether an obligation was ever established. After the fact, the employee typically forms an attribution for the alleged breach (i.e., the employee may believe that he or she was purposefully deceived), but this may not reflect what actually occurred. This state of affairs makes the study of psychological contract violation particularly challenging. To deal with this challenge, rather than trying to measure the true ‘objective’ dynamics that have created a perceived breach, our objectives in this study were: (a) to identify specific conditions that are likely to create those dynamics; and (b) to demonstrate an empirical relationship between these conditions and the perception of a psychological contract breach. In identifying these conditions, we draw on a recent model proposed by Morrison and Robinson (1997).

Morrison and Robinson (1997) presented a theoretical model in which they outlined several conditions that may contribute to perceptions that one’s psychological contract has been breached. Their model provides a useful starting point for the study described here. Our goal is not to test their model in its entirety (which would be impossible to do in a single study), but rather, to use that model to identify a set of testable hypotheses regarding the development of perceptions of psychological contract breach. A diagram of the model that we test in this study appears in Figure 1. This model is a simplified version of the model developed by Morrison and Robinson (1997).

As discussed by Morrison and Robinson, there are two root causes of perceived psychological contract breach: reneging and incongruence. Reneging is when agent(s) of the organization recognize that an obligation exists but knowingly fail to meet that obligation. An example would be the first scenario described above, when the recruiter made an explicit promise and then failed to uphold that promise. Incongruence, on the other hand, is when the employee and organizational agent(s) have different understandings about whether a given obligation exists or about the nature of a given obligation. An example would be the second scenario described above, when the
Figure 1. Factors predicting psychological contract breach and violation
employee misinterpreted a statement made during recruitment. Either incongruence or reneging may lead to the perception of a contract breach by creating a discrepancy between an employee’s understanding of what was promised and the employee’s perception of what he or she has actually experienced.

A third important construct that contributes to perceived contract breach is employee vigilance, defined as the extent to which the employee actively monitors how well the organization is meeting the terms of his or her psychological contract (Morrison and Robinson, 1997). Not only will vigilant employees be more likely to detect instances of true contract breach, but because they are on the lookout for contract breach, they may be more likely to perceive that the organization has failed to meet an obligation even when there is some ambiguity about whether this is the case.

Another important point argued by Morrison and Robinson (1997) is that the perception of contract breach will not necessarily lead to the intense emotional reaction often equated with the term psychological contract violation (e.g., Rousseau, 1989). They proposed that whether the cognitive perception of a breach leads to an emotional reaction, and the intensity of that reaction, depends on an interpretation process whereby the employee attaches meaning to the perceived breach (cf., Oatley, 1992). In this study, we test whether empirical support can be found for that argument. We focus on two aspects of the interpretation process: the attributions that the employee makes and the employee’s judgments about interactional fairness.

In the following sections, we identify factors that may increase the likelihood of employees perceiving that their psychological contract has been breached. We first discuss factors that may lead to perceptions of psychological contract breach by making reneging more likely. We then discuss factors that are likely to lead to perceptions of contract breach by creating incongruent perceptions. Thirdly, we identify factors that will increase the perception of contract breach by encouraging employee vigilance. Finally, we present hypotheses about the relationship between perceived breach and feelings of violation.

Reneging

The most obvious condition that may lead an employee to perceive that his or her psychological contract has been breached is that the organization has actually reneged on an employment promise. Reneging is when agents of the organization recognize that an obligation exists but knowingly fail to follow through on that obligation. One reason why reneging may occur is that the organization is unable to fulfil a particular obligation (Morrison and Robinson, 1997). As circumstances change, obligations that were created at one point in time may become difficult to subsequently fulfill. Although obligations may have been created in good faith, an unexpected decrease in available resources may prevent the fulfilment of those obligations. This logic suggests that reneging will be more likely when an organization is not performing as well as it has in the recent past, or when its performance is worse than anticipated. Under such conditions, it will be more difficult for organizations to fulfil promised obligations, and thus more likely that they will renge on promises. This reneging, in turn, will directly contribute to employees’ perceptions of contract breach.

**Hypothesis 1**: Perceived contract breach will be more likely to the extent that an organization’s performance has declined or has fallen short of what was expected.

Reneging occurs not only when an organization is unable to fulfil promised obligations, but also when organizational agents are unwilling to fulfil promised obligations (Morrison and
Robinson, 1997). Agents may make promises that they have no intention of keeping, or they may renege on promises that they had originally intended to keep. One situation where the latter may occur is when the employee is not meeting performance expectations. The employment relationship is based on reciprocal obligations; the organization provides benefits to the employee in return for hard work and performance. However, if an employee is not performing acceptably, and hence not maintaining his or her side of the agreement, organizational agents may view reneging as justified, and hence behave opportunistically (MacLean Parks and Smith, 1997). Based on this logic, we predict that as employee performance decreases, the incidence of reneging will be greater and perceptions of contract breach will be more likely.

Hypothesis 2: Perceived contract breach will be more likely to the extent that the employee’s performance has been low.

Incongruence

Whereas reneging accounts for many instances of perceived contract breach, in some cases the organization has fulfilled its obligation to an employee, yet the employee believes otherwise. In such cases, the perception of a contract breach may be rooted in incongruence, which is when the employee holds beliefs about a given obligation or set of obligations that differ from those held by agents of the organization. Because of these incongruent perceptions, organizational agents may inadvertently fail to act in a way that is consistent with the employee’s expectations. Incongruence can exist when an obligation is first established, or it can develop over time as the psychological contract evolves or as perceptions become distorted in memory. Three primary factors contributing to incongruence are the degree to which the employee and agents of the organization hold divergent cognitive schemata regarding employment obligations, the complexity and ambiguity of the perceived obligations between them, and lack of sufficient communication regarding obligations (Morrison and Robinson, 1997).

Schemata are cognitive frameworks that represent organized knowledge about a given concept (Fiske and Taylor, 1984). Morrison and Robinson (1997) argued that each employee holds a schema about what a typical employment relationship entails. This schema, however, may differ from the schema held by those organizational agents responsible for fulfilling the employee’s psychological contract. When this occurs, it creates the potential for incongruence because the two parties’ assumptions and interpretations of the obligations between them are likely to differ. According to Morrison and Robinson (1997), organizational socialization is a factor that will affect the degree of similarity between an employee’s schema regarding the employment relationship and the schema held by organizational agents. A primary purpose of socialization is to indoctrinate into new employees the beliefs and assumptions appropriate for a given organization (Van Maanen and Schein, 1979). Hence, in organizations where this process is fairly formalized or structured in nature, we would expect new employees to form a set of beliefs and assumptions (i.e., a schema) that is similar to those held by agents of the organization. This implies less incongruence, and hence less potential for perceptions of psychological contract breach.

Hypothesis 3: Perceived contract breach will be less likely to the extent that the employee has experienced a formalized socialization process.

Perceived contract breach via incongruence is also more likely when the promises comprising the psychological contract are complex and ambiguous in nature. When individuals must interpret ambiguous stimuli, they engage in a construal process whereby they fill in missing information by
relying on contextual cues or prior information (Griffin and Ross, 1991). This construal process may cause two people to perceive the same stimulus very differently. Implicit promises, which are conveyed through organizational actions or indirect statements (Rousseau and Greller, 1994; Rousseau and McLean Parks, 1993), are particularly vulnerable to this construal process, and, hence, to incongruent perceptions. This is because implicit promises are ambiguous and often ‘incomplete’ (Rousseau and McLean Parks, 1993), such that the employee and organizational agents may fill in gaps and make assumptions in ways that differ from each other. Although the distinction between implicit and explicit promises is not always clear-cut (Rousseau, 1989; Rousseau and McLean Parks, 1993), we hypothesize that when a promise is conveyed more implicitly than explicitly, it will be more likely to lead to perceptions of psychological contract breach.

**Hypothesis 4:** Perceived contract breach will be more likely to the extent that the promises underlying the psychological contract are conveyed implicitly rather than explicitly.

A factor that will minimize perceived contract breach via incongruence is communication between the employee and organizational agents (Morrison and Robinson, 1997). Although the psychological contract evolves over time, it begins to form during recruitment (Rousseau and Greller, 1994; Shore and Tetrick, 1994). This suggests that communication during this process will help to reduce incongruence. The more that an employee talks and interacts with representatives of the organization before joining that organization, the more likely it is that the employee and organizational agents will minimize inconsistent perceptions of the promised obligations between them (Morrison and Robinson, 1997). As a result, the employee will be less likely to subsequently perceive that his or her psychological contract has been breached. This argument is consistent with the observation that employees who obtain realistic previews of their job during recruitment (often by talking and interacting with numerous members of the organization) are less likely to experience subsequent unmet expectations (Wanous et al., 1992). We recognize that more communication does not necessarily imply more ‘realistic’ information or accurate perceptions. However, research on newcomer sensemaking suggests that an individual who obtains more information has a better chance at making accurate sense of his or her surroundings than one who obtains less information (Miller and Jablin, 1991; Reichers, 1987).

**Hypothesis 5:** Perceived contract breach will be less likely to the extent that the employee interacted with representatives of the organization prior to being hired.

**Vigilance**

A third factor that contributes to perceived contract breach is employee vigilance, or the degree to which an employee actively monitors how well the organization is fulfilling his or her psychological contract (Morrison and Robinson, 1997). In cases where there is an actual discrepancy between what the employee has experienced and what the employee had previously expected based on his or her psychological contract, vigilance will increase the likelihood of the employee detecting this discrepancy. Further, an employee who is highly vigilant may be more likely to perceive that the organization has breached the psychological contract merely as a function of the employee looking for instances of contract transgression. This prediction has indirect support from research demonstrating that people seek out, attend to, and interpret information in a way that supports their expectations (see Fiske and Taylor, 1984). This, employees who vigilantly
look for evidence that their organization has breached the psychological contract may be more likely to perceive that a breach has occurred, even when objective evidence is unclear or lacking.

According to Morrison and Robinson (1997), vigilance is related to three factors: uncertainty; the amount of trust underlying the employee–organization relationship; and the potential costs of discovering an unmet promise. To the extent that there is uncertainty about whether an organization will be able to maintain the employee’s psychological contract, that employee will be more likely to vigilantly monitor contract fulfilment. This prediction is consistent with the well-documented finding that uncertainty often motivates individuals to monitor for information (Berger, 1979). Many types of organizational change can create uncertainty about contract fulfilment—reorganization of personnel, workforce reductions, mergers, or reductions in pay or benefits. By creating uncertainty, these types of changes will cause employees to be more vigilant so that they can detect and respond to any psychological contract breaches that these events may cause. As a result of this heightened vigilance, employees will be more likely to perceive a breach of their psychological contract.

Hypothesis 6: Perceived contract breach will more likely to the extent that there has been a high level of organizational change.

Vigilance also is related to the amount of trust underlying the employee–organization relationship. Trust refers to expectations or beliefs regarding the likelihood that another’s future actions will be favorable, or at least not detrimental, to one’s interests (Gambetta, 1988). The lower an employee’s trust in his or her organization, the more likely he or she will be to expect that the organization will renege on promises. In an effort to detect and potentially prevent this reneging, employees may vigilantly monitor how well the organization is fulfilling its promised obligations. Because trust is based in large part on past experience (Dasgupta, 1988), we expect that it will be strongly affected by the employee’s perception that he or she has experienced psychological contract breach in past employment relationships. Past experience of psychological contract breach, whether the result of actual mistreatment or merely an individual’s propensity to see him- or herself as a victim, will cause an employee to be less trusting of his or her current employer, and therefore more vigilant. This heightened vigilance is expected to increase the likelihood that the employee will perceive a breach of his or her psychological contract.

Hypothesis 7: Perceived contract breach will be more likely to the extent that the employee has a history of perceived contract breach in past employment relationships.

Although vigilance is driven by the desire to obtain information about how well one’s psychological contract is being maintained, research on information seeking suggests that people often avoid obtaining information that they fear will be upsetting (Meyer and Starke, 1982; Swann and Read, 1981). Morrison and Robinson (1997) argued that under circumstances where it will be particularly disquieting or threatening to perceive a contract breach, employees will be less vigilant in monitoring contract fulfilment and as a result, less likely to perceive that a contract breach has occurred. In other words, vigilance will be curtailed whenever the psychological costs of perceiving a breach outweigh the information value of this discovery. This logic suggests that vigilance will be affected by whether an employee has attractive employment alternatives (Morrison and Robinson, 1997). When an employee has few employment alternatives, quitting will not be a viable response to a psychological contract breach, so the perception of a breach is especially threatening. We expect that under these conditions, employees will be less vigilant, which will decrease the likelihood of a contract breach being perceived. In contrast, employees with many employment alternatives will feel less threatened by the perception of a breach.
Because they have the option to quit, the perception of a contract breach may be viewed as valuable, rather than threatening, information.

_Hypothesis 8:_ Perceived contract breach will be more likely to the extent that the employee had employment alternatives at the time of hire.

**Interpretation: conditions contributing to feelings of violation**

Morrison and Robinson (1997) made a conceptual distinction between perceived contract breach, which is a perception, and the experience of ‘contract violation’ which is an affective or emotional state that may or may not accompany that perception. They argued that, immediately following the perception of a contract breach, employees engage in a cognitive sense-making process through which they attempt to attach meaning to the event (cf., Wong and Weiner, 1981). This interpretation process, in turn, moderates the relationship between perceived breach and feelings of violation (cf., Ortony et al., 1988). In other words, the interpretation process determines the intensity of negative emotions that the employee will experience. One objective of this study was to provide an empirical test of these ideas. This required first demonstrating that the violation experience could be empirically distinguished from perceived psychological contract breach, and second, assessing whether the employee’s interpretation of the breach affects the strength of the relationship between breach and violation.

Morrison and Robinson (1997) noted that as part of the interpretation process, the employee assesses not only the outcome itself (the alleged breach), but also why the situation occurred. When faced with an unfavorable or unexpected outcome, people tend to search for explanations that will enable them to determine the reasons for that outcome (Wong and Weiner, 1981). These attributions have a strong effect on the intensity of emotions that the person experiences (Ortony et al., 1988). In the specific case of psychological contract breach, employees will experience more intense feelings of violation following a perceived breach if they attribute it to reneging rather than to incongruence (i.e., misunderstanding). Whereas the former attribution will cause the employee to blame the organization, the latter will mitigate blame and thereby weaken the relationship between perceived breach and violation. Thus, the relationship between perceived contract breach and violation will be stronger to the extent that the employee attributes the situation to reneging.

Another important component of the interpretation process is the employee’s assessment of how fairly he or she was treated immediately preceding and following the perception of the contract breach. In particular, Morrison and Robinson (1997) argued that the interpretation of a psychological contract breach will be heavily influenced by perceived interactional fairness (Bies and Moag, 1986), or employees’ beliefs about the interpersonal treatment that they experienced (e.g., honesty, respect, consideration, adequate explanation). Unfair interpersonal treatment signals to an employee that he or she is not valued or respected in the relationship (Brockner and Wiesenfeld, 1996), which intensifies feelings of anger and betrayal. Thus, the relationship between psychological contract breach and violation will be stronger to the extent that an employee perceives that he or she also experienced a low level of interactional fairness.

We also predict that attributions and perceived fairness will interact with each other in affecting the strength of the relationship between perceived contract breach and feelings of violation. That is, we predict a three-way interaction where the impact of attributions on the relationship between perceived breach and violation will be stronger when the employee also perceives that he or she
was treated with little consideration or respect. Employees are less likely to care about the organization’s level of responsibility if they feel that they were treated fairly. However, if an employee feels that he or she was treated dishonestly or disrespectfully, then the organization’s level of responsibility will be very important. Under these conditions, the employee will experience stronger feelings of violation if he or she blames the organization for the breach than if he or she attributes it to incongruence.

The proposed three-way interaction can be thought of in a different way as well. Assuming that a breach has been perceived, if the employee attributes the breach to incongruence (i.e., his or her own misunderstanding rather than an action on the part of the organization), then how fairly the organization responded is basically irrelevant. However, if the employee holds the organization responsible for the breach, then interpersonal fairness will matter a great deal. A high level of perceived fairness has the potential to mitigate the negative reaction to perceived reneging, whereas a low level of perceived fairness may compound that negative reaction. In other words, the strength of the two-way interaction between perceived breach and fairness will depend on the attributions that the employee makes.

Hypothesis 9: The relationship between perceived contract breach and violation will be strong to the extent that the employee attributes the breach to reneging.

Hypothesis 10: The relationship between perceived contract breach and violation will be stronger to the extent that the employee perceives a low level of interactional fairness.

Hypothesis 11: there will be a three-way interaction between perceived breach, attributions and perceived fairness on the experience of violation; specifically, the influence of attributions on the relationship between perceived breach and violation will be stronger to the extent that perceived fairness is low, and the influence of fairness on the relationship between perceived breach and violation will be stronger to the extent that the employee attributes the breach to reneging.

Method

Sample and procedure

The sample for this study was comprised of 147 employees who had recently earned their MBAs and begun new full-time jobs. At the beginning of the study (spring, 1994), the average age of the 147 participants was 27.67 years (S.D. = 1.9) and 36.1 per cent were female. All but one respondent had at least a year of prior work experience, and on average, respondents had 3.83 years (S.D. = 1.56) of prior full-time work experience. Their average starting salary was U.S.$63,099 (S.D. = $12,084). In total, respondents had accepted jobs in more than 110 different organizations, and were working in a wide variety of industries, including financial services, accounting, consulting, and consumer products. At the completion of the study (autumn, 1995), average salary excluding bonuses was U.S.$67,944 (S.D. = $16,591).

Surveys were mailed to the graduating MBA class of a large northeastern business school and the graduating MBA class of a large mid-western business school (N = 1024) approximately three weeks before graduation (time 1). Out of these 1024, 106 indicated that they had not yet accepted full-time jobs, and they were therefore eliminated from the study. We received 308 completed surveys, for a time 1 response rate of 34 per cent. Each of the 308 respondents was then
mailed a second survey 18 months later (time 2). Forty-four surveys were returned undelivered due to incorrect addresses. Of the remaining 264 participants, 176 responded (67 per cent). However, 29 respondents were eliminated from the sample because they either failed to fill out a significant portion of one or both surveys (n = 13), indicated at time 2 that they had changed employer (n = 14), or both (n = 2). The final sample size was therefore 147.

\( t \)-tests were conducted to ensure that there was no significant differences between those time 1 respondents who responded to the second survey and those who did not. We found no significant differences in gender, age, education, salary, number of job offers received, number of years of prior work experience, intentions to remain with one’s employer, or prior history of breach with other employers. Based on these results, we concluded that attrition did not create significant bias.

We assessed the two dependent variables, perceived contract breach and feelings of violation, at time 2. Whenever it made conceptual sense to measure a particular independent variable at time 1, we did so. Variables measured at time 1 were the following: implicitness of promises (H4), pre-hire interaction (H5), breach history (H7), and employment alternatives (H8). Measuring these independent variables 18 months before the dependent variables reduced common method bias and enabled us to draw more confident conclusions about causal direction. For some of the independent variables, however, it either was not possible or did not make sense to assess them before employees had started their jobs, and we therefore measured them at time 2. These variables were the following: organizational performance (H1), employee performance (H2), formal socialization (H3), organizational change (H6), causal attributions (H9) and perceived fairness (H10).

Dependent variables

Feeling of violation. The time 2 survey contained a global measure of felt violation (\( \alpha = 0.92 \)). Respondents were asked to indicate, on a 1–5 scale, how much they agreed or disagreed with four statements (e.g., ‘I feel betrayed by my organization’ and ‘I feel that my organization has violated the contract between us’). A high score indicated a high level of felt violation.

Perceived contract breach. A global measure of perceived contract breach, which assessed employees’ perceptions of how well their psychological contracts had been fulfilled by their organizations, appeared on the time 2 survey. Measuring perceived contract breach as a global perception is consistent with existing conceptualizations of psychological contract breach as an overall evaluation of how well one’s contract has been fulfilled by one’s employer (Rousseau, 1989; Robinson, 1996). The measure contained five items, with responses on a 1–5 scale ranging from ‘strongly disagree’ to ‘strongly agree’ (\( \alpha = 0.92 \)). Sample items are as follows: ‘I have not received everything promised to me in exchange for my contributions.’ and ‘Almost all the promises made by my employer during recruitment have been kept thus far’ (reverse scored).

Independent variables

Organizational performance. We measured organizational performance at time 2 in order to assess whether organizational performance had declined or fallen short of organizational expectations since the employee was hired. Respondents rated their organization’s overall performance during the past year relative to three years ago, and relative to the organization’s...
goals and objectives ($\alpha = 0.84$). Responses to the two items were on a five-point ranging from ‘much worse’ to ‘much better.’

**Employee performance.** This variable was assessed with a five-item self-report scale used by Ashford and Black (1996). It was measured at time 2 because at time 1 respondents had not begun working. Respondents indicated how their supervisors would rate them on five performance dimensions: ability to get along with others; quality of performance; ability to get the job done efficiently; achievement of work goals; and overall performance ($\alpha = 0.95$). Following Ashford and Black (1996), we asked them to rate their performance relative to their co-workers (e.g., top 5 percent, top 50 percent).

**Formal socialization.** Formal socialization was assessed at time 2 because the time 1 survey was administered before the socialization process had begun. It was assessed with four items from the formal/informal socialization scale designed by Jones (1986) and frequently used in socialization research. One of the items was eliminated, however, due to low inter-item correlations. An example of the remaining items is the following: ‘When I joined this organization, I went through a rigorous set of training experiences designed to give newcomers a thorough knowledge of the job and the organization.’ Responses were on a five-point agree/disagree scale. Cronbach’s alpha was marginal, at 0.65.

**Implicitness of promises.** ‘My new employer and I only talked in general terms about our mutual obligations,’ and ‘My new employer and I were very explicit about our obligations to each other’ (reverse scored). Responses were on a five-point agree/disagree scale.

**Pre-hire interaction.** Interaction with organizational representatives prior to hire was assessed at time 1 with four statements, with responses on a five-point agree/disagree scale ($\alpha = 0.89$). Sample statements are: ‘During the recruitment process, I talked in depth with people at this organization,’ and ‘I met with only a few persons from the organization prior to taking the job’ (reverse scored).

**Organizational change.** This variable was assessed with a measure developed by Reilly et al. (1993). Given our interest in organizational change during the employee’s tenure at their organization, it was necessary to measure this variable at time 2. Respondents were presented with a list of 14 types of organizational change and were asked to indicate the amount of each change that their organization had experienced in the last year (e.g., workforce reductions, rapid growth, merger). Responses were on a four-point scale, with anchors ranging from ‘not much at all’ to ‘a lot’ ($\alpha = 0.73$).

**Perceived breach history.** At time 1, respondents answered four statements regarding how well their past employers had fulfilled obligations (all but one respondent had at least one year of prior work experience). Examples are: ‘In general, whenever my past employers promised me something, they kept that promise,’ and ‘I have had past employers break their promises to me on more than one occasion’ (reverse scored). Responses to these questions, which were on a five-point agree/disagree scale, provided a measure of perceived breach history ($\alpha = 0.91$).

**Employment alternatives.** This variable was assessed at time 1 by having respondents indicate the number of job offers that they had received.
Causal attributions. At time 2, respondents were asked to think about instances when their organization had failed to fulfill promises to them, and to then respond to six statements. We provided a five-point agree/disagree response format, with a ‘not applicable’ option in case their organization had upheld all of its promises. Examples of items include ‘In most instances where a promise was broken the organization purposefully misled me’ and ‘When I felt that a promise was unmet, it was usually my own fault because my expectations were unrealistic’ (reverse scored). After we dropped an item that was not highly correlated with the others, the scale had a Cronbach’s alpha of 0.87.

Perceived fairness. Also on the time 2 survey, respondents were asked to think about instances when their organization had failed to fulfill promises to them, and to then respond to five statements about fair treatment. Responses were on a five-point agree/disagree response format, with a ‘not applicable’ option. Examples of items are as follows: ‘Where promises to me have been unfulfilled, at least I have been dealt with in a truthful manner;’ and ‘When promises to me have been broken, I have at least been treated with respect and consideration.’ Cronbach’s alpha for this scale was 0.77.

Results

Descriptive statistics and zero-order correlations for all variables are in Table 1. In all analyses, we used two control variables: tenure measured in months since hire; and whether the employee had worked for his or her employer in the past (e.g., summer internship). Although most respondents began working at roughly the same time, there were enough outliers to raise concerns that differences in time spent in the employment relationship may have influenced the results. For example, one might expect that the longer the tenure, the more opportunity there would be for a psychological contract breach to be perceived. We were also concerned that prior work experience with the same organization might affect the experience of psychological contract breach. For example, a prior work relationship under a different psychological contract might contribute to incongruence, because the employee might confuse the old and the new contract. We therefore controlled for past experience as well.

Factors predicting perceived breach

Hypotheses 1 to 8 were tested by regressing perceived contract breach on the eight independent variables, together with the two control variables. The results of this analysis are presented in Table 2. As shown, the independent variables explained a significant amount of variance in the dependent variable ($R^2 = 0.23$, $F = 3.78$, $p < 0.01$), and six of the eight variables had significant regression coefficients.

In support of Hypotheses 1 and 2, perceptions of psychological contract breach were more likely to the extent that organizational performance had declined ($\beta = -0.18$, $p < 0.05$) and self-report employee performance was low ($\beta = -0.16$, $p < 0.05$). Hypothesis 3 predicted that psychological contract breach would be less likely when the employee had experienced a formal process of socialization. This prediction was supported ($\beta = -0.16$, $p < 0.05$). Perceived contract breach was also found to be less likely to the extent that the employee had interacted with
Table 1. Descriptive statistics and zero-order correlations for all variables

| Mean | S.D. | 1   | 2      | 3      | 4      | 5      | 6      | 7      | 8      | 9      | 10     | 11     | 12     | 13     |
|------|------|-----|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 1. Perceived contract breach | 2.63 | 0.95 | 0.92   |        |        |        |        |        |        |        |        |        |        |        |        |
| 2. Organizational performance | 3.76 | 1.04 | -0.24† | 0.84   |        |        |        |        |        |        |        |        |        |        |        |
| 3. Employee performance§ | 3.86 | 0.86 | -0.18* | 0.04   | 0.95   |        |        |        |        |        |        |        |        |        |        |
| 4. Formal socialization | 2.43 | 1.05 | -0.19† | 0.07   | 0.03   | 0.65   |        |        |        |        |        |        |        |        |        |
| 5. Implicitness of promises | 2.76 | 0.82 | -0.05 | 0.01   | 0.03   | 0.02   | 0.71   |        |        |        |        |        |        |        |        |
| 6. Pre-hire interaction | 4.33 | 0.75 | -0.09 | -0.15  | -0.02  | 0.16*  | 0.22†  | 0.89   |        |        |        |        |        |        |        |
| 7. Organizational change | 1.59 | 0.44 | 0.15 | 0.30†  | -0.00  | 0.06   | -0.03  | 0.06   | 0.73   |        |        |        |        |        |        |
| 8. Perceived breach history | 2.80 | 1.04 | 0.19* | -0.12  | -0.02  | 0.01   | -0.25† | 0.00   | 0.07   | 0.91   |        |        |        |        |        |
| 9. Employment alternatives | 2.64 | 1.29 | 0.20† | -0.10  | -0.02  | 0.03   | 0.06   | 0.27†  | -0.07  | -0.15* | —      |        |        |        |        |
| 10. Causal attributions | 2.95 | 0.75 | -0.58† | 0.03   | 0.06   | 0.14   | -0.01  | 0.02   | 0.15   | 0.15   | 0.11   | 0.87   |        |        |        |
| 11. Perceived fairness | 3.26 | 0.68 | -0.42† | -0.29† | 0.35†  | 0.07   | 0.01   | 0.05   | -0.13  | -0.17  | -0.08  | 0.24†  | 0.77   |        |        |
| 12. Feelings of violation | 2.05 | 0.95 | 0.68† | -0.24† | -0.16  | -0.16  | 0.02   | -0.03  | 0.19*  | 0.04   | 0.12   | -0.42† | -0.38† | 0.92   |        |
| 13. Past employment w/ org. | 0.27 | 0.45 | -0.03 | 0.03   | 0.17*  | 0.04   | 0.02   | 0.00   | 0.16   | 0.02   | -0.07  | 0.04   | 0.02   | 0.03   | —      |
| 14. Org. Tenure | 15.24 | 1.50 | 0.01 | -0.13  | 0.09   | 0.00   | 0.08   | 0.09   | 0.11   | 0.02   | 0.13   | 0.02   | 0.11   | -0.09  | -0.03  |

* p < 0.05; † p < 0.01.
‡ All variables except organizational change, employment alternatives, past employment with the organization, and organizational tenure were assessed on five-point scales. Organizational change was assessed on a four-point scale. Employment alternatives reflects the actual number of alternative jobs available. Past employment was a yes/no variable (1 = yes), and organizational tenure was measured in months.
§ Self-reported performance.
¶ Control variables.
organizational representatives prior to being hired, as predicted in Hypothesis 5 ($\beta = -0.17$, $p < 0.05$). Hypothesis 7 predicted that perceived contract breach would be more likely to the extent that the employee had a history of breach with former employers. This was supported ($\beta = 0.21$, $p < 0.05$). Hypothesis 8 predicted that perceived contract breach would be more likely to the extent that the employee had employment alternatives at the time of hire. This was also supported ($\beta = 0.21$, $p < 0.01$). Variables that did not relate significantly to perceived contract breach were implicitness of promises (Hypothesis 4) and organizational change (Hypothesis 6).

The relationship between perceived breach and feelings of violation

As shown in Table 1, the violation measure was significantly correlated with the measure of perceived contract breach ($r = 0.68$, $p < 0.01$). Given the magnitude of this correlation, we conducted a factor analysis to test whether the two constructs could be considered empirically distinct. The results of this analysis appear in Table 3. As shown, the analysis provides clear evidence of discriminant validity. All of the perceived breach items loaded onto the first factor, with loadings ranging from 0.70 to 0.87. All of the violation items loaded separately onto the second factor, with loadings ranging from 0.79 to 0.89.

Additional analyses also support the distinction between breach and violation. We regressed violation on the eight independent variables and compared those results to the results when perceived breach was the dependent variable. If the results of these two regression analyses were highly similar, it would raise concerns that breach and violation are not sufficiently distinct because they have the same antecedents. However, the results were quite different. Whereas the adjusted $R^2$ was 0.17 for the perceived breach analysis, it was only 0.08 for the violation analysis. Unlike perceived breach, which was predicted by past violation, organizational performance, formal socialization, employee performance, pre-hire interaction and employment alternatives, violation was predicted by only organizational performance and organizational change—the latter of which was unrelated to perceived breach. These results provide strong support for our argument that perceived breach and violation are distinct constructs. We also regressed violation

<table>
<thead>
<tr>
<th>Independent variable</th>
<th>$\beta$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Part employment w/org†</td>
<td>-0.01</td>
</tr>
<tr>
<td>Organizational tenure‡</td>
<td>-0.02</td>
</tr>
<tr>
<td>Organizational performance</td>
<td>-0.18*</td>
</tr>
<tr>
<td>Employee performance</td>
<td>-0.16*</td>
</tr>
<tr>
<td>Formal socialization</td>
<td>-0.16*</td>
</tr>
<tr>
<td>Implicitness of promises</td>
<td>0.04</td>
</tr>
<tr>
<td>Pre-hire interaction</td>
<td>-0.17*</td>
</tr>
<tr>
<td>Organizational change</td>
<td>0.12</td>
</tr>
<tr>
<td>Perceived breach history</td>
<td>0.21†</td>
</tr>
<tr>
<td>Employment alternatives</td>
<td>0.28†</td>
</tr>
<tr>
<td>$R^2$</td>
<td>0.23</td>
</tr>
<tr>
<td>$F$-ratio</td>
<td>3.78‡</td>
</tr>
</tbody>
</table>

* $p < 0.05$; † $p < 0.01$.
‡ Control variables.
on both perceived breach and the eight antecedent variables. Consistent with our model (Figure 1), perceived breach was the only significant predictor.

**Moderating effects of causal attributions and perceived fairness**

Hypotheses 9 through 11 predicted that the relationship between perceived psychological contract breach and felt violation would be stronger to the extent that the employee attributed the psychological contract breach to reneging (negative attribution), and to the extent that the employee perceived that he or she was treated unfairly, dishonestly or disrespectfully preceding or following the breach (low fairness). Specifically, Hypothesis 9 predicted a two-way interaction between perceived breach and attributions, Hypothesis 10 predicted a two-way interaction between perceived breach and perceived fairness, and Hypothesis 11 predicted a three-way interaction between perceived breach, attributions and perceived fairness.

Before testing these hypotheses, we wanted to ensure that all respondents included in the analyses had experienced some degree of breach, since the hypotheses treat breach as a given. We found that only nine respondents (6 per cent) reported no experience of breach. Seven of these individuals used the ‘not applicable’ option when responding to the questions on causal attributions and perceived fairness. They were thus automatically excluded from the analyses involving these variables. To be as conservative as possible, we also eliminated the other two respondents who indicated that they had not experienced a breach of their psychological contract.

To test the three hypotheses, we used moderated regression analysis with violation as the dependent variable. In this type of analysis, interaction terms generally correlate with the variables from which they are created. To reduce multi-collinearity, many experts recommend that, before creating the interaction terms, the independent variables be centered around zero by subtracting each value from its respective mean (Aiken and West, 1991; Cronbach, 1987). This transformation does not affect the correlations among the variables, yet it allows for better estimates of the interaction terms.
To test Hypotheses 9 and 10, we regressed violation on the three centered independent variables along with the two control variables. We then added the appropriate two-way interaction terms to the equation (breach attributions and breach fairness). To test Hypothesis 11, we added both the attribution fairness interaction term (in order to have all possible lower-order effects in the equation), and the three-way interaction term. The results are in Table 4.

As shown, Hypothesis 9 was not supported. The breach attribution interaction term was not significantly related to violation ($\hat{\beta} = 0.05$, n.s.). Hypothesis 10 was also unsupported. The breach fairness interaction term was unrelated to violation ($\hat{\beta} = 0.14$, n.s.). However, support was found for Hypothesis 11. When the three-way interaction term (breach × attributions × fairness) was added to the equation, it was significantly related to violation ($\hat{\beta} = -0.36$, $p < 0.01$).

To determine the direction of the interaction effect, we examined the simple slope of violation regressed on perceived breach at different levels of perceived fairness and causal attributions. These relationships are graphically displayed in Figures 2a and 2b. As shown in Figure 2a, under fair conditions, positive versus negative attributions do not appear to result in significantly different simple slopes (i.e., attributions do not influence the relationship between perceived breach and violation). In contrast, in Figure 2b, under unfair conditions, negative attributions produce a steeper simple slope than positive attributions (in other words, the perceived breach–violation relationship is stronger when the employee attributes the breach to reneging than when he or she does not). This supports Hypothesis 11, which predicted that the moderating influence of attributions on the relationship between psychological contract breach and violation will be stronger under unfair conditions than under fair conditions.

**Discussion**

This study identifies several factors that may contribute to perceptions of psychological contract breach, and lends support to Morrison and Robinson’s (1997) conceptual model. As predicted, employees were more likely to perceive that their psychological contract had been breached when their organization had been performing poorly, when they reported their own performance as low, when they had not experienced a formal process of socialization, and when they had little
interaction with members of the organization prior to being hired. Employees were also more likely to perceive a contract breach if they had experienced psychological contract breach in prior employment relationships and if they had numerous employment alternatives at the time of hire.

These findings are consistent with the argument that perceived psychological contract breach is in some cases attributable to reneging, or in other words, to situations where the organization is either unable or unwilling to fulfil promises to an employee. Specifically, the relationship between poor organizational performance and perceived contract breach suggests that employees may be more likely to perceive a psychological contract breach when the organization is unable to fulfil promised obligations due to reduced resources. In addition, the relationship between employee performance and perceived contract breach suggests that employees may be more likely to experience psychological contract breach when they are not performing adequately, or in other words, when the organization is unwilling to fulfil promises because of poor employee performance. Of course, it is conceivable that causality runs the other way: that employees reduce their performance in response to a perceived breach. Our data do not enable us to determine which of these dynamics occurred. Yet either way, these results suggest a form of ‘mirroring’ or balanced exchange, whereby each party to the contract maintains its side of the bargain only to the extent that the other party does so (Adams, 1965; Blau, 1964).

Figure 2. (a) Relationship between perceived breach and felt violation under different attributions when process is perceived to be fair. (b) Relationship between perceived breach and felt violation under different attributions when process is perceived to be unfair.
It also appears that perceived psychological contract breach may be attributable not only to purposeful reneging, but also to different perceptions between employees and organizational agents (i.e., incongruence). Perceptions of contract breach were less likely to the extent that employees had been involved in structured socialization processes and to the extent that they had interacted with organizational agents during recruitment. These findings suggest that both formal socialization and pre-hire communication may reduce the gap between employees’ perceptions of the employment agreement and organizational agents’ perceptions of the employment agreement. Research on realistic job previews has shown that giving employees a good understanding of the job prior to hire is important to bridge the gap between employees’ expectations and reality (Wanous et al., 1992). These findings suggest that pre-hire discussions may also be useful for bridging the gap between employee and employer expectations. The results of this study also suggest that perceptions of psychological contract breach may depend upon how closely employees are monitoring the execution of the employment agreement. We argued that when employees feel, rightly or wrongly, that they have been victimized by psychological contract breach in the past, they will be more likely to watch out for (and hence more likely to perceive) contract breach in subsequent employment relationships. Consistent with this argument, we found greater perceptions of psychological contract breach to the extent that an employee reported having experienced psychological contract breach in past employment relationships. We also argued that vigilance will be curtailed, and hence the perception of contract breach less likely, whenever the psychological costs of perceiving a breach outweigh the information value of this perception. Consistent with this argument, we found that perceived contract breach was less likely to the extent that employees had few employment alternatives and hence limited mobility. This finding is especially interesting because it is inconsistent with a strategic contingency view of employee power (Salancik and Pfeffer, 1977). According to this perspective, job alternatives should make an employee more powerful and hence less subject to breach. Yet our results indicate that employees with many alternatives were more likely to perceive a breach in their psychological contract, highlighting the importance of perception and information processing in shaping the recognition and interpretation of breach. Morrison and Robinson (1997) maintained that perceptions of psychological contract breach do not necessarily lead to feelings of violation. Instead, the emotional experience of violation results from a sensemaking process that occurs following the perception of a breach. Our results are consistent with this argument. Although we found a relatively strong relationship between perceived contract breach and violation, the fact that this relationship depended upon both causal attributions and perceptions of fairness demonstrates that psychological contract breach does not automatically result in feelings of violation. Other analyses also supported the conceptual and empirical distinction between these two constructs. The items used to assess violation and perceived breach loaded on separate factors, and the two constructs were related to different sets of predictors. Taken together, these results suggest that perceived breach and violation are distinct but related constructs. Employees may perceive a breach in their psychological contract, yet experience relatively little sense of violation. Conversely, it appears that feelings of violation will be particularly intense following a perceived breach when employees attribute the breach to reneging and also perceive that basic standards of fair treatment were violated.

**Theoretical implications**

A growing body of research has shown that psychological contract breach and violation are common occurrences with serious individual and organizational implications (McLean Parks
and Kidder, 1994; Robinson, 1996; Robinson and Morrison, 1995). Yet despite their apparent prevalence and costs, we have had little understanding of why these phenomena occur because researchers have focused primarily on outcomes of psychological contract breach (Robinson, 1996; Robinson and Morrison, 1995; Robinson and Rousseau, 1994). This study makes an important contribution to the literature by demonstrating factors that influence whether an employee will perceive a breach of his or her psychological contract. Consistent with Morrison and Robinson’s (1997) conceptual model, the results suggest that perceptions of contract breach stem from factors that may cause organizations to renege on promises, factors that create incongruent perceptions between the employee and organizational agents, and factors that affect how actively the employee monitors the organization’s actions regarding contract fulfilment. The results of this study suggest that perceptions of contract breach may result not only from true contractual transgression, but from a complex, and sometimes imperfect, sensemaking process.

This study also empirically supports Morrison and Robinson’s (1997) contention that psychological contract breach and violation are distinct, albeit highly related, constructs. They argued that whereas perceptions of breach reflect a cognitive assessment of how well one’s psychological contract has been fulfilled, feelings of violation reflect an emotional response to that assessment. This study provides empirical support for distinguishing between these two constructs, and demonstrates that their relationship depends on both the causal attributions that the employee makes and the employee’s perceptions of fairness.

**Practical implications**

This study highlights several ways in which managers can offset the likelihood of perceived contract breach and feelings of violation, and hence their negative effects. For example, the results suggest that to reduce the likelihood of perceived contract breach stemming from actual reneging, organizations need to be careful about what they promise, especially during periods of organizational decline. Even if promises are made in good faith, the organization may not be able to fulfil them at a later point in time if financial conditions change. The results also suggest that to reduce perceptions of psychological contract breach resulting from incongruent perceptions, organizations may want to consider increasing the amount of contact and communication between organizational agents and potential or new employees (cf., Wanous, 1980). Furthermore, this study suggests that organizational agents may want to be particularly careful about managing the perceptions held by employees know to have had prior experiences of psychological contract breach and violation. Employees who have been through downsizing or similar circumstances may be especially likely to perceive a breach of their current psychological contract regardless of the action of the organization. With such employees it may be particularly important to monitor and guide their perceptions of organizational obligations and their perceptions of how well the organization is fulfilling those obligations.

Finally, our results suggest not only ways to minimize perceptions of breach, but also ways for managers and other organizational agents to respond when employees perceive that a breach has occurred. Sometimes psychological contract breach is unavoidable, yet the destructive reactions that often follow are not. One way to reduce feelings of anger and betrayal is to manage the employee’s attributions for a perceived contract breach and, in cases where reneging has occurred, to offer honest and adequate explanations for the situation. As our results show, even if an employee blames the organization for a perceived psychological contract breach, feelings of violation will be less intense if the employee feels that he or she was treated with fairness, honesty and respect. A reduction in the intensity of felt violation, in turn, may offset the lowered trust,
reduced citizenship behavior, and turnover that have been shown to follow from feelings of violation (Robinson, 1996; Robinson and Morrison, 1995).

Limitations

Some important limitations should be kept in mind when interpreting our results. First, because we did not actually measure reneging, incongruence, and vigilance, it is not possible for us to draw firm conclusions about the mediating process linking the independent variables to perceptions of contract breach. A second limitation is that this study, like most of the existing work on psychological contract breach, focused on employees who had recently begun new jobs. We cannot conclude, therefore, that the same results would be found for employees with longer job tenure. Future research should explore psychological contract breach and violation among more senior employees, especially since they are more apt than newcomers to experience contract breach involving significant career issues (e.g., not receiving a promised promotion).

Future research should also study the experience of psychological contract breach using a more diverse sample than the one used here. Our respondents had recently graduated from prestigious MBA programs and were assuming well-paying jobs in investment banking, consulting, and management. Hence, they may have had higher than average expectations about what they would receive from their organizations, and their organizations may have made grand promises in order to attract them. Either of these factors may have increased the likelihood of psychological contract breach. It is important, therefore, that future research assess whether our results will generalize to other populations of employees.

Another limitation relates to our decision to measure perceived contract breach by asking employees to determine how well their psychological contract had been fulfilled. This measure was subjective in nature, and hence open to error. On the other hand we felt that it was the most appropriate way to assess psychological contract breach, which by nature, is a subjective judgment. An alternative methodology would have been to measure employees’ perceptions of what they were promised at time 1, and then their perceptions of what they had received at time 2. Perceived contract breach could have then been operationalized as the difference between these two perceptions. A problem with this approach, however, is that psychological contracts change over time. A critical input to the perception of psychological contact breach is the employee’s perception of the contract at the time that he or she is assessing contract fulfilment, which may be quite different from his or her perception of the contract at some earlier point in time (Morrison and Robinson, 1997). It is also worth noting that serious problems have been noted with the use of difference scores (Cronbach and Furby, 1970; Edwards, 1991; Wall and Payne, 1973). Thus, we had both conceptual and methodological grounds for believing that it was most appropriate to ask employees to judge how well their contract had been fulfilled. Although this approach may have introduced some perceptual distortion, we believe that it provides the most accurate assessment of psychological contract breach.

An additional methodological limitation is that some of the independent variables were measured on the same survey as the dependent variables, which may have inflated the observed relationships between these variables. We should point out, however, that Spector (1987) has argued that concerns regarding common method bias are largely unwarranted and not substantiated by empirical evidence. Further, the pattern of our findings is not in accordance with a common method bias interpretation. Pre-hire interaction, breach history, and employment alternatives were all assessed at time 1 and each was significantly related to perceived breach at time 2. Indeed, the two strongest predictors of perceived breach (employment alternatives and
breach history) were measured at time 1. Thus, of the six significant relationships found, three represent effects where common method bias was minimized by assessing variables more than a year-and-a-half apart in time.

Finally, there are limitations associated with our use of self-reports. In particular, our measure of employee performance was most likely inflated due to self-enhancement bias. It should be noted, however, that this bias would actually make it more difficult for us to find a significant effect for this variable. Inflated reports of performance would create a range restriction on this variable, which would reduce the magnitude of the observed relationship between employee performance and perceived breach. Hence, a less-than-ideal measure in this case merely meant a more conservative test of our hypothesis.

**Conclusion**

To date, the vast majority of research on psychological contracts has focused exclusively on the outcomes of perceived contract breach and violation, revealing both their prevalence and their negative ramifications. In contrast, this study focused on the important but neglected issue of when perceptions of psychological contract breach and feelings of violation are likely to arise. The results not only provide insight into when psychological contract breach and violation are most likely to be experienced, but also suggest interesting and useful implications for future research and for organizational practice.

**References**


