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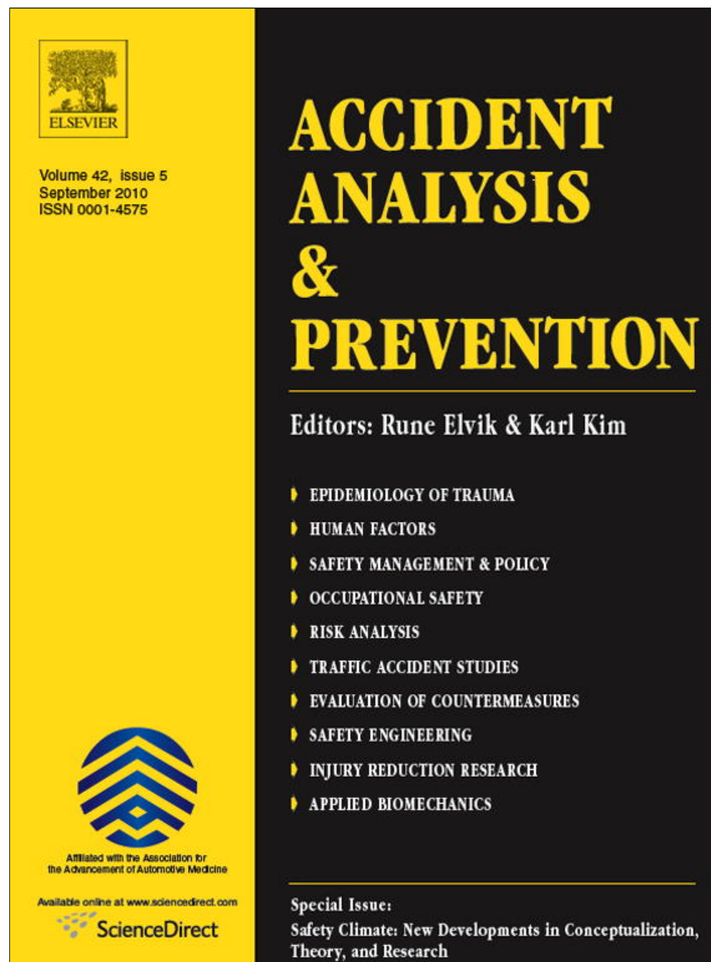

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Investment in workforce health: Exploring the implications for workforce safety climate and commitment

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ABSTRACT

The relationship between investment in employee health and non-health outcomes has received little research attention. Drawing from social exchange and climate theory, the current study uses a multi-level approach to examine the implications of worksite health investment for worksite safety and health climate and employee safety compliance and commitment to the worksite. Data were collected from 1932 personnel working on 31 offshore installations operating in UK waters. Installation medics provided corporate workforce health investment details for 20 of these installations. The findings provide support for a strong link between health investment practices and worksite safety and health climate. The results also found a relationship between health investment practices and organizational commitment among employees. These results suggest that health investment practices are associated with committed workforces and climates that reflect a priority on health and safety.

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1. Introduction

Typically cited economic benefits of workforce health management tend to focus on objective Human Resource (HR) outcomes such as reduced absenteeism and reduced healthcare costs. Worksite health promotion programs have been associated with a number of decreased costs for employers including reduced health claims, inpatient and outpatient hospital costs, absenteeism and life insurance costs (Forrester et al., 1996; Jeffery et al., 1993; for a review see Aldana and Pronk, 2001). Given the documented costs associated with occupational ill-health and injuries, this emphasis on the economic benefits of investment in workforce heath is not surprising. In the U.S. work-related injuries cost US$125 billion (1999) and businesses continue to face escalating healthcare costs—a documented 50% increase in the 5 years prior to 2001 (Goetzel et al., 2002). Similarly, the cost to the British economy of work-related illnesses and injuries alone are between £14.5 and £18 billion (Health and Safety Executive, 2000). Furthermore, in 2007 there were 299,000 reportable injuries in the UK with 34 million workdays lost (HSE, 2008). In the EU, around 10 million workers suffer work-related injuries on an annual basis (Walters, 2004). Despite the evidence for the return associated with investment in employee health, research to this point has not examined the association between health investment practices and employee attitudes and behavior. Although health investment explicitly targets employee health and well-being, such practices may have benefits which extend beyond these outcomes. Health investment may foster more positive attitudes and behaviors benefiting the worksite and/or organization. Furthermore, these practices may be associated with worksite climate for health and safety, which reflect a consensus among worksite members about the priorities the worksite places on well-being and safety of employees. In this sense, health investment may have effects that generalize to other aspects of well-being such as safety.

The purpose of this study is to examine the association between health investment, health climate, and safety climate at the worksite level and employee loyalty and dedication to the worksite and safety compliance at the individual level. The theoretical basis for the proposed relationship between health investment and employee attitudes and behavior is social exchange theory (Blau, 1960), which, when applied to organizations, describes the relationship between employee and employer as an exchange of valued resources. Therefore, in addition to improving employee health, health investment may be reciprocated in some form by employees to benefit the organization in other ways.

1.1. Social exchange theory and the norm of reciprocity

Social exchange theory (Blau, 1960) proposes when individuals provide valued services to others, others typically respond with a

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certain level of obligation in response to and exchange for these services. Reciprocity refers to the condition where when one party in a two-way relationship receives something, that party is required to provide something in return in a "mutually gratifying pattern of exchanging goods and services" (Gouldner, 1960, p. 170). The social exchange perspective (Eisenberger et al., 1990) suggests the perception of employer support and investment generates an implied obligation in employees towards future positive reciprocity favoring the organization (Dejoy et al., 2004). Thus, when organizations provide services which are perceived as discretionary this could inspire reciprocating behavior in the form of employee compliance with organizational policies. Within this framework, the provision of discretionary services and/or benefits would be expected to increase commitment to the organization and compliance with organizational rules and expectations.

Research has supported the application of social exchange theory and reciprocity to organizations. The value and use of work-life benefits (Muse et al., 2008), organizational justice perceptions (Liden et al., 2003), and the provision of equitable internal rewards (Whitener, 2001) have been shown to be related to organizational commitment. The extent to which employees feel their employers meet obligations regarding pay and interpersonal treatment is also related to in-role and citizenship performance (Turnley et al., 2003). Similarly, leader-member exchange has been found to be related to safety citizenship behavior (Hofmann et al., 2003). In general, these results suggest when employers are perceived to meet their obligations, treat employees fairly, and provide valued services and benefits employees reciprocate with higher levels of commitment and performance.

1.2. Worksite health investment

One of the main goals of this study is to establish the relationship between health investment (i.e., practices that are specifically intended to improve employee health) at the worksite level and commitment and compliance at the individual level. Worksite level practices are those implemented for an entire worksite and which target all worksite members; individual-level outcomes refer to each individual employee and can vary within worksites. There are several types of health investment practices considered in this research. The first is the dissemination of information about health. Organizations can invest in employee health by informing their employees about health risks through multiple media and methods, such as formal informational meetings, leaflets and posters, and on-the-job training and support from supervisors. A second way in which organizations can invest in employee health is through the formal provision of health promotion programs and occupational health training courses. These courses can be given on a variety of topics, including (a) stress management, (b) safe manual handling, (c) the safe use of tools in the workplace, (d) tips in maintaining a healthy back, and (e) avoiding skin problems. A third way to invest in employee health is through the administration of health checks which go beyond statutory requirements. This reflects a commitment to employee health beyond the minimum acceptable level. A fourth practice is the involvement of professional medics in health promotion development. Finally, participation in recognized occupational health award programs might also be considered indicative of health investment.

These policies and practices at the worksite level likely impact employees' shared perceptions of the worksite's policies, practices, and priorities regarding healthy behavior and health in general. The health investment practices outlined above are primarily 'discretionary' activities, which are not implemented in order to comply with mandatory legislation. They instead reflect what Shannon et al. (1997) term a 'genuine concern of management about their workforce' (p. 215).

Eisenberger et al. (1986) proposed employees develop beliefs about the extent to which their organization cares about their well-being. These beliefs help to shape employees' assessment of whether their organization will reward greater effort and help them to complete their jobs and cope with stressful situations. Taking a social exchange perspective, such beliefs would be likely reciprocated through employee behaviors and deference. There is strong evidence to suggest beliefs about an organization's concern for employee well-being have a positive impact on behaviors that contribute to the performance of the worksite, which, in turn, influences organizational performance (Podsakoff et al., 2000).

One type of behavior that can have an effect on safety performance is compliance with and adherence to organizational rules, regulations and procedures, even when not being monitored (Podsakoff et al., 2000). *Safety compliance* is defined as rule-following in core safety activities (Griffin and Neal, 2000) and has been demonstrated to be related to safety climate. Additionally, Mearns et al. (2001, 2003) found higher levels of safety violations, in other words noncompliance, were significantly associated with increased incident involvement at both the individual and worksite level.

A number of studies have addressed behavioral approaches to improving safety compliance. Some of the earliest such studies (e.g., Komaki et al., 1980) focused on task-related feedback and found that providing feedback on safety-related behavior increased compliance. More recently, Williams and Geller (2000) examined the impact of social comparison feedback in a behavior-based safety program in a US bottling factory and Hickman and Geller (2003) investigated the role of self-management in safety-related work practices in mining operations. These studies, taking a behavioral approach, focused on feedback on safety performance generated by oneself or others as a primary motivating factor in subsequent safety performance.

In contrast, Hofmann and Morgeson (1999) conceived of safety-related behavior in terms of a social exchange. According to this perspective, individuals who receive support from their organization may feel obligated to reciprocate this support, whether or not they receive explicit feedback rewards for doing so. Therefore, investment by an organization in the health and well-being of its workforce, which goes beyond mandatory requirements and employees, might be reciprocated by employees through compliance with safety rules that benefit themselves and the worksite as a whole. As part of the reciprocal exchange between the organization and the employees, it would be expected that employees at worksites that explicitly invest in their health and well-being would engage in fewer safety violations and higher levels of safety compliance.

Hypothesis 1. Health investment practices are positively related to safety compliance.

Investment in the health and well-being of the employees by the organization could be construed as a human resource activity showing high support and high commitment to the workforce. Whitener (2001) found employees' trust and commitment to the organization were stronger when they perceived the organization supported them. Whitener's findings also indicated that the human resources practices of an organization affect the relationship between perceived organizational support and organizational commitment. Social exchange theory and the norm of reciprocity would predict health investment practices result in employee attraction and commitment to the organization in return for an organization's demonstration of concern for and investment in employee health and well-being.

Hypothesis 2. Health investment practices are positively related to worksite commitment.

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1.3. Safety and health climate

Most climate research in the area of health and safety management has focused on safety climate and the factors directly affecting safety performance rather than on the understanding of the processes behind successful occupational health and safety management. Consequently, there has been little research looking at organizational policies such as health and safety promotion activities as worksite-level antecedents of safety and health climate. Yet, there is strong reason to believe health investment practices are closely linked to these climate factors.

Safety climate has received considerable attention and is defined in many different ways in the literature. Zohar (2003) refers to shared perceptions of an organization's policies, procedures, practices, and priorities with respect to safety, whereas Mearns et al. (2000) define safety climate as a "snapshot" of employees' perceptions of the current environment or prevailing conditions, which impact upon safety. Safety attitudes are also believed to constitute safety climate (Cheyne et al., 1998).

Essentially, safety climate reflects the value of safety in the work environment (Neal et al., 2000). It is generally acknowledged that if there is agreement among workers about the value placed by top management in the safety of the work environment then this reflects 'safety climate', a characteristic of the worksite or organization as a whole. Safety climate has been a robust predictor of employee behavior and accidents (Clarke, 2006).

Similar to safety climate, health climate is defined here as shared perceptions of an organization's priorities and practices regarding employee health. Whereas safety climate has received considerable attention in the literature, less attention has been focused on health climate. According to Pender (1989) and Stokols (1992), the 'health' and health behaviors of an organisation are influenced by the social structure of that organisation. They suggest what has been variously described as a "health strengthening environment" (Pender, 1989), a "healthy organizational culture" (Opatz, 1985), a "climate for health" (Ilgen, 1990) and a "wellness-oriented workplace" (Chapman, 1987) directly promotes and facilitates healthy behavioral norms. These conceptualizations of health climate are similar to safety climate in that they focus on the perceived commitment of management or value placed by management on health. Basen-Engquist et al. (1998) conducted one of the few studies that explicitly investigated both health and safety climate. Their findings suggest health climate and safety climate have distinct correlates. In their study, health climate was more strongly related to worksite features related to health promotion such as (a) smoking cessation, (b) exercise, (c) weight control, and (d) nutrition programs, whereas safety climate was more strongly related to safety features of the worksite such as exposure to (a) physical hazards, (b) toxic chemicals and (c) safety training.

An organization's social structure and health-related practices should influence health climate. Climate has been described as the "way we do things around here" (Schneider, 1990); therefore, health climate would be the "way we do things around here" relative to individual healthy lifestyles. Worksites with positive health climates must have environments that encourage healthy lifestyles and promote individual wellness. Investment in health can be at the organization's discretion and would be expected to enhance the health climate since this reflects the value the organization places on health.

Hypothesis 3. Health investment practices are positively related to health climate.

Safety climate might also be impacted by an organizational level antecedent such as investment in health. Health investment may create a broader change in the organizational environment that extends beyond the specific target of the intervention. One example of this can be found in the Johnson and Johnson 'Live for Life' health promotion program. Employees at companies participating in the full health promotion program showed significant shifts in organizational commitment and attitudes towards supervision, working conditions, job competence, pay and fringe benefits and job security (Holzbach et al., 1990). This positive change in attitudes was also evident (and sustained over the 2-year period of evaluation) for employees who *did not* actively participate in the formal activities of the program but were employed by participating companies. Holzbach et al. (1990) concluded "these attitude changes suggest a broader change in organizational environment created by the introduction of the program" (p. 978). Therefore, even those who are not impacted by or do not take advantage of health investment practices may still perceive management to place a value on their health and safety due to a change in the organizational environment associated with these practices. This broader environmental change may in turn result in a more positive safety climate in addition to a more positive health climate. Interestingly, a similar response generalization has been found in studies of safety interventions. For example Ludwig and Geller (1997) reported that pizza deliverers who had been involved in open group discussion and goal-setting were more likely to increase their use of seat-belt usage, use of indicators and stopping at junctions, despite the fact the intervention had been targeted at vehicle stopping. Therefore, interventions of this type may influence attitudes and behaviors that go beyond those targeted.

There has not been a great deal of research looking at organizational level antecedents (such as health investment) to safety climate. One exception is the work of Zacharatos et al. (2005), which looked at high performance work systems and occupational safety. They found information sharing and transformational leadership at the organizational level were related to safety performance, suggesting by placing value on individual employees, organizations can create an environment that enhances safety performance. By implementing health investment practices, organizations demonstrate they value and prioritize the well-being of the employees and this may further encourage employees to identify with and achieve the goals of the organization. The primary underlying factor in safety climate is the relative priority of employee safety among organizational goals. Investment in employee health may foster shared perceptions of an organization's priorities with respect to employee well-being that generalize to employee safety in addition to health. This may reflect shared perceptions of the value the organization places on individual employees, with this value applying to both the safety *and* health of employees. Therefore, in the current study, we expect the health investment practices outlined above to be positively related to safety climate in addition to health climate through the priority placed on employee safety and well-being.

Hypothesis 4. Health investment practices are positively related to safety climate through the priority the organization places on general employee well-being.

It is also expected that health and safety climate are related to individual employees' compliance and commitment. Findings reported by Mearns et al. (2003) suggest health management activities are significantly associated with lower lost time injury rates, thus linking workforce health management with safety performance. In terms of safety outcomes, previous research has documented the association between safety climate and safety compliance (Brown et al., 2000; Cheyne et al., 1998; Clarke, 2006; Mearns et al., 1998). This is based on the priority on safety reflected in a positive safety climate. Environments such as these are characterized by managers who commit to and support safety among their employees (Zohar, 2000). The priority a worksite places on employee health is also likely to enhance the employee-employer exchange relationship, increasing the likelihood employees will

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comply with safety rules in reciprocation of the perceived efforts and concerns employers show for their well-being.

Hypothesis 5. Health climate and safety climate are positively related to safety compliance.

There is also evidence to suggest satisfaction with and trust in management is associated with commitment to organizational goals and values (e.g. Kivimaki et al., 1995). Tao et al. (1998) reported that organizational climate is a key predictor of organizational commitment. A positive health climate and safety climate signal the organization cares about the health and safety of the employees, respectively. Once, again, applying social exchange theory and the norm of reciprocity, employees would be expected to be attracted and deferent toward the organization and attempt to reciprocate this exchange. Therefore, we hypothesize that health climate and safety climate are positively associated with commitment to one's worksite.

Hypothesis 6. Health and safety climate are positively related to worksite commitment.

2. Method

2.1. Sample and procedure

The offshore work environment involves exposure to a number of hazards including catastrophic events such loss of containment and helicopter accidents and injuries related to crushing, falling, slipping and tripping. In addition, lifestyle factors have been found to compromise the health of offshore workers, for example rich, fatty diet, smoking and excessive alcohol consumption during onshore field breaks (see Mearns and Hope, 2005). Psychological and physiological factors also serve to undermine offshore workers' health, e.g. shift work, sleep disturbance and fatigue. As a result, optimum health and safety are required to work in this hazardous environment and therefore it provides an interesting context in which to study both health and safety climate. Data were collected from 31 offshore installations operated by seven different oil and gas companies in UK waters. Different types of installation were involved in the study, e.g. fixed production platforms and drilling rigs and the number of respondents on the installations ranged from 30 to 125. Two separate instruments were developed. A general workforce questionnaire measured health and safety climate, safety compliance, and worksite commitment. In addition, for each participating installation, the on-duty installation medic was asked to complete a separate questionnaire detailing installation initiatives for occupational and personal health management.

Completed workforce questionnaires were returned by 1932 personnel (average response rate 57%; range 40–89%). In terms of worksite demographics, 38% were supervisors, 77% identified themselves as a member of installation core crew, 24% indicated they had been on their installation less than 1 year, 49% indicated tenure between 1 and 5 years on their installation, and 28% had worked on their installation in excess of 6 years. Twenty two percent of respondents were aged 20–30 years, 42% were aged 31–40 years, 20% were aged 41–50 years and 16% were aged 50 or more years. Respondents were not required to indicate their gender given the overwhelming majority of male workers offshore. The demographic data indicated that our sample was representative of the offshore workforce at that time. Preliminary analyses revealed no differences on any of our measures as a function of size of installation and response rate.

Twenty out of the 31 installations had medics who participated in the survey; 11 of the installations did not provide details of their health initiatives reducing the number of installations in the sample used for analysis involving worksite health investment. Possible reasons for non-participation include lack of time (94% of medics indicated they had other duties to fulfill offshore, which used 70–90% of their time) or a belief that another medic had completed the questionnaire on behalf of the installation. Each offshore location has two (or sometimes three) medics who cover each rotation of workers. For example, if the installation works a 2 on/2 off pattern then one medic will cover the first rotation and another medic will cover the second rotation while the first medic takes his or her shore leave. In some instances the 'back-to-back' may have incorrectly believed his/her counterpart had completed and returned the questionnaire.

Of the medics who responded, 67% were directly employed by the operating company and 33% were employed via a medical agency or other contracting company. 50% of the sample had more than 10 years experience as an offshore medic (17% had worked for more than 10 years on the current installation); 11% had 6–10 years experience (19% 6–10 years on that installation) and 39% had 1–5 years experience (56% had that level of experience on the current installation).

Following revisions to earlier versions of the two questionnaires based on feedback from health professionals and offshore health and safety managers, the questionnaires were pilot tested on an installation not participating in the main phase of the study (107 respondents; response rate 76%). The pilot study resulted in amendments to the questionnaire to improve the clarity of several items. A survey schedule was negotiated with all participating installations to allow an 8-week survey phase on each installation. Each participating installation received a survey pack containing copies of the questionnaire, an information/instruction letter for the medic, promotional materials, and pre-addressed envelopes allowing the confidential return of individual questionnaires. Instructions advised that the questionnaire be distributed to all personnel on-board with the exception of transitory or visiting staff who would not have had the requisite knowledge to comment on longer term management of workforce health on the installation.

2.2. Workforce measures

2.2.1. Health and safety climate

To assess health and safety climate, 13 items from Basen-Engquist et al.'s (1998) eighteen-item climate scale were used. Seven items assessed safety climate and 6 assessed health climate. Respondents were required to indicate, on a 5-point scale, the extent to which they agreed with each statement (1 = Strongly Disagree, 5 = Strongly Agree). Examples of safety climate items included "I can usually work safely and still get my work done" and "Most people here are very safety conscious." Examples of health climate items included "My supervisor encourages me to make changes to improve my health" and "I think my health is important to my employer." The coefficient alpha for the safety climate scale was .78 while that for the health climate scale was .72.

2.2.2. Safety compliance

A five-item scale measuring safety compliance was developed from a scale used by Rundmo (1997) in the Norwegian offshore industry. The behavioral patterns referred to in the scale involved breaking rules and taking chances in core activities. Example items were "I take chances to get the job done" and "I bend the rules to achieve a target". The coefficient alpha for the 5-item scale was .74. Since this scale was negatively worded, it was reverse-coded for analyses.

2.2.3. Worksite commitment

A five-item scale was used to measure the commitment of the workforce to their installation derived from pre-existing affec-

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Table 1
Factor loadings for individual-level measurement model.

	Safety climate	Health climate	Noncompliance	Organizational commitment
I can usually work safely and still get my work done	.54			
New starts get training in how to be safe on the job	.69			
I think safety is very important to this operating company	.71			
Equipment is always kept in a safe operating condition	.70			
Most people here are very safety conscious	.75			
Safety rules are always enforced on this installation	.78			
Supervisors here worry more about getting the job done than about employee's safety	.54			
My supervisors encourage me to make changes to improve my health		.64		
I think the health advice offered offshore is very good		.64		
I think the operating company management would support more programs to improve employee health		.55		
I think my health is important to my employer		.68		
Most employees here are very health conscious		.51		
At my workplace, sometimes we talk with each other about improving our health and preventing disease		.49		
I take chances to get the job done			.84	
I ignore safety regulations to get the job done			.85	
I take shortcuts which involve little or no risk			.72	
I bend the rules to achieve a target			.83	
I get the job done better by ignoring some of the rules			.82	
People here cooperate with management to achieve organization goals				.40
I am proud to be a part of this installation				.86
I am motivated by the goals set by management				.86
I am willing to put in a great deal of effort in order to help this installation to be effective				.86
I really care about the future of this installation				.81

tive organizational commitment and cohesion scales (Kivimaki et al., 1995; Simard and Marchand, 1997). Examples of these items include: "I am willing to put in a great deal of effort in order to help this installation to be effective" and "I am motivated to achieve the goals set by management". The response scale ranged from 1 = strongly disagree to 5 = strongly agree. The coefficient alpha for the five-item scale was .83.

2.2.4. Adequacy of individual-level measurement model

To assess the adequacy of the measurement model for the individual-level measures, we conducted a confirmatory factor analysis with all items loading on to their intended latent constructs. Results suggest this measurement model was adequate for subsequent analysis, $\chi^2(224) = 2337.30$, RMSEA = .071, NFI = .96, CFI = .96. See Table 1 for factor loadings and Table 2 for correlations between factors.

2.3. Health investment

For the purposes of the current study, a number of items in the medics' questionnaire served to estimate the degree of investment in health promotion activities and occupational health training available on that installation. The selection criterion for these items was that the measure should reflect some aspect of company commitment to the promotion and/or management of occupational health in the form of direct or indirect investment. The items were generated from discussions with health and safety practitioners and consultation with offshore medics, suggesting they have some degree of content validity. To generate an estimate of investment in workforce health activities on an installation an index was developed using these selected items. This index, termed the Health Management Index, was a composite score reflecting worksite health activities from data in the following six areas: (1) dissemination of information concerning the provision of healthy activities, (2) dissemination of information about health risks, (3) provision of health checks (in addition to the statutory medical and any necessary health surveillance under the Control of Substances Hazardous to Health regulations), (4) medic involvement in health promotion development, organization, and delivery, (5) number of occupational health training courses offered to the workforce in the previous 12 months, and (6) installation participation in a recognized occupational health/health promotion award schemes (see Table 3 for further details). For each measure included in the index, positive (e.g. additional health checks available) and negative (e.g. non-participation in national award scheme) response anchors were identified and coded accordingly. Scores per installation on each measure were then standardized and the mean of the 6 standardized scores was computed and used to generate an overall installation-based score on the health investment index. Responses were calibrated such that an overall low score on the health investment index indicated a low level of commitment/investment in occupational health, according to our measures. In other words, an installation returning a low score on this index is likely to offer less in terms of additional occupational health activities or is less likely to have delivered investment in this area. The use of a similarly constructed index to examine level of organizational

Table 2
Phi matrix of correlations between individual-level latent factors.

	1	2	3	4
1. Safety climate	–			
2. Health climate	.70	–		
3. Noncompliance	−.48	−.33	–	
4. Organizational commitment	.64	.59	.00	–

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Table 3
Component items of the Health Management Index (HMI).

1. Health Promotion Programmes available	Number of health promotion activities offered
2. Information about health risks	Ways in which employees are informed about risks to their health: Organised education/information meetings Information leaflets/posters in the workplace Information leaflets/posters in the recreation areas By their supervisor By the medic No formal information procedure
3. Additional health checks	Provision of health checks in addition to statutory obligations, e.g. UK Offshore Operators Association medical
4. Offshore Medic involvement in health promotion development, organization and delivery	Mean involvement score across 7 items (low score = less involvement by medic)
5. Provision of occupational health training courses for workforce	Number of the following training courses offered to employees: Stress Avoiding Skin Problems Safe Manual Handling Safe Use of hand held Power Tools Maintaining a Healthy Back Proper Use of PPE Other
6. Participation in recognized Occupation Health/Health Promotion Award schemes	Yes/no

Adapted from Mearns and Hope (2005, p. 75).

support for cardiovascular health is reported by Golaszewski et al. (2003).

The health investment index was available for 20 out of the 31 installations, so all analyses involving the investment variable were conducted using data from these 20 installations only. All analyses conducted that did not include health investment used data from all 31 installations. We examined demographic differences between respondents on the installations with health investment data available and those on installations where it was not available. There were no significant differences in the percentage of supervisors, $\chi^2(1) = 1.45$, $p > .05$, or age group membership, $\chi^2(4) = 6.14$, $p > .05$. Those on installations with investment data were slightly more likely to be a member of the core crew (78.4%) than those without investment data available (73.5%), $\chi^2(1) = 5.29$, $p < .05$, and reported themselves to be in slightly different tenure groups, $\chi^2(3) = 7.89$, $p < .05$. However, no tenure category had greater than a 7 percentage-point difference between the two groups. Finally, safety climate did not significantly differ between worksites with and without health investment data ($M = 4.02$ vs. 4.01), $t(29) = .12$, *n.s.* The same was true for health climate ($M = 3.26$ vs. 3.19), $t(29) = 1.02$, *n.s.* These analyses suggest that there were no major differences between those on installations with health investment data available and those without results from the medic questionnaire.

3. Results

All multilevel data in this study were analyzed using *R 1.6.2* (The R Development Core Team, 2003), with multilevel analyses conducted using the *R* multilevel package (Bliese, 2000). See Table 4 for correlations between variables measured at the individual level and Table 5 for correlations between group-level variables.

Table 4
Correlation matrix of individual-level scale variables.

	Mean	SD	1	2	3	4
1. Safety climate	4.02	.53	(.78)			
2. Health climate	3.25	.58	.50	(.72)		
3. Noncompliance	2.69	.35	.37	.23	(.74)	
4. Organizational commitment	3.78	.68	.52	.44	−.27	(.86)

Coefficient alphas are on the diagonal. All correlations are significant at the .01 alpha level. Pairwise deletion used; N ranges from 1763 to 1879.

Table 5
Correlation matrix of group-level variables.

	Mean	SD	1	2	3
1. Safety climate	4.01	.16	–		
2. Health climate	3.24	.19	.60*	–	
3. Health investment	.13	.67	.63*	.72*	–

$N = 31$ for all correlations except those involving investment. $N = 20$ for correlations involving investment.
* $p < .01$.

3.1. Interrater agreement and reliability

Two of the worksite-level variables, safety and health climate, were computed by aggregating individual-level data to the worksite level. The third group-level variable, health investment, was assessed solely at the group level through the medic questionnaire. The mean scores for each installation on safety climate and health climate were calculated and assigned to individuals. When such a procedure is used, it is important to assess interrater agreement before proceeding with further analyses involving the group-level constructs (Chan, 1998). The $r_{wg(j)}$ statistic (James et al., 1984) was computed for each installation on each of these three variables, using a rectangular null distribution. The mean $r_{wg(j)}$ values for safety climate and health climate were .94 and .91, respectively. However, the $r_{wg(j)}$ statistic has been criticized for the fact that its formula is based on the Spearman–Brown reliability estimator, which relies on the assumption that reliability increases as the number of measurements increase. Lindell and colleagues have argued that generalizeability theory may not apply to measures of agreement and have proposed a revised index of interrater agreement, $r^*_{wg(j)}$ (Lindell et al., 1999). The mean $r^*_{wg(j)}$ values for safety climate and health climate were .70, and .63, respectively.

Inter-Class Correlations (ICCs) were then computed to assess interrater reliability. The ICC(1) values for safety climate and health climate were .06, and .09, respectively. These ICC values are relatively low, but there were two reasons to support continuing with a hierarchical approach and aggregation. First, ignoring the nested

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nature of the data with ICCs for individual predictors as low as .02 can result in a nontrivial reduction in power, with this effect more damaging as ICCs increase from .02 (Bliese and Hanges, 2004). Hence a hierarchical approach was most appropriate. Second, ICCs are negatively related to group size (Bliese, 1998), and when group size is high, the ratio of within- to between-group degrees of freedom increases, which is likely to decrease the between-group variance explained by default. In this study the average group size of 62 may have driven down the contextual effects as measured by the ICC(1). Furthermore, the ICC(2) values for these constructs were .76, .79, and .85, respectively, suggesting that installations can be reliably differentiated by the group-level constructs of interest. Given these factors, we proceeded with the subsequent analysis involving the aggregated variables.

3.2. Multilevel modeling

Multilevel modeling was used to test hypotheses involving the relationship between worksite-level and individual-level variables. Prior to testing cross-level hypotheses we examined the between-worksite variance in the individual-level variables, compliance and commitment. To test if between-worksite variance was significant, we estimated two null models for each outcome variable, compliance and commitment. The first model for each variable allowed the intercept to vary randomly as a function of installation membership, while the second model specified an intercept with no random variation. We then compared the −2 log likelihood values for these models, with this difference having a χ^2 distribution. For noncompliance, there was no significant difference between a model with a random intercept and a null model with no random intercept ($\chi^2(1) = 2.05$, *n.s.*). Approximately 2.5% of the variance in compliance was between worksites. This did not necessarily mean that individual predictor slopes were not significant however, so we proceeded with the analysis of compliance as an outcome. The intercept variance for commitment was significant, with approximately 8% of the variance in commitment between groups ($\chi^2(1) = 69.86$, $p < .001$), suggesting that there were significant group-level effects on worksite commitment.

Multilevel models were then used to test Hypotheses 1 and 2 that health investment was related to compliance and commitment. This analysis was only conducted for 20 of the 31 installations because those were the only worksites for which investment data were available, as investment data were missing for 11 worksites. Compliance data for one worksite was not returned therefore the analyses of compliance as a dependent variable only included 19 worksites. As seen in Table 6, investment was not a significant predictor of compliance ($\gamma = .03$, *n.s.*), failing to support hypothesis 1; however, investment was a significant predictor of worksite commitment ($\gamma = .10$, $p < .05$), supporting Hypothesis 2.

Hypotheses 3 and 4 were tested by examining correlations between health investment and health and safety climate at the worksite level. As seen in Table 4, investment was significantly and positively correlated with health climate ($r = .72$, $p < .01$), and safety climate ($r = .63$, $p < .01$) supporting Hypotheses 3 and 4, respectively.

Next we tested Hypotheses 5 and 6 using multilevel modeling, with safety and health climate and entered simultaneously as worksite-level predictors of individual-level compliance and commitment. Safety climate was significantly related to compliance ($\gamma = .18$, $p < .05$) and commitment ($\gamma = .94$, $p < .05$), supporting this portion of Hypotheses 5 and 6. However, the coefficients for health climate were not significant, $\gamma = .06$ and −.01, respectively, both *n.s.* The colinearity between health and safety climate at the group level was likely the primary reason that health climate did not explain unique variance in compliance or commitment when safety climate was already included as a predictor in the same model. Hence,

Table 6
HLM Results for the relations between investment and safety compliance and organizational commitment.

	Compliance	Organizational commitment
Intercept	2.69*	3.79*
Investment	.03	.10*

* $p < .05$

Hypotheses 5 and 6 were partially supported, as safety climate was significantly related to compliance and commitment, but health climate did not predict either beyond the effects of safety climate (see Tables 6–7).

4. Discussion

Using social exchange and the norm of reciprocity as theoretical bases, this study hypothesized that health investment practices at the worksite level are related to employee safety compliance and worksite commitment, both benefits for the worksite that extend beyond employee health. Results demonstrated that health investment practices were related to worksite commitment at the individual level, indicating that employees do reciprocate an organization's investment in their own well-being with greater attraction and commitment to worksite goals. These results are consistent with social exchange theory and the norm of reciprocity and suggest that employees perceive provisions of health investment as valued resources that warrant their commitment to the worksite in return.

It was also hypothesized that health investment is related to safety and health climate at the worksite level. This hypothesis was supported, as there was a strong observed relationship among all three of these worksite-level factors. These findings are particularly notable given that the variables were collected from different sources; health investment was measured from installation medics whereas health and safety climate (and all other variables) were collected from individual worksite employees. This indicates that investment in health can have benefits for the workforce, such as improved safety climate, that are not specifically targeted by the investment. While more explicitly placing a priority on employee health, these practices may also implicitly communicate a worksite's priorities regarding employee well-being in general, which in turn appear to foster shared perceptions of an organization's priorities placed on safety. This generalization beyond the explicit target of the investment practices points to additional benefits of health investment beyond health and health climate. The correlation between worksite policies and safety climate is also noteworthy in that there has been little research looking at worksite-level policy correlates of safety climate. Furthermore, little research to this point has looked at health investment and promotion as they generalize to other well-being outcomes, such as safety climate as found in this study.

Table 7
HLM results for relations among safety and health climate, safety compliance, and organizational commitment.

	Compliance	Organizational commitment
Level 1		
Intercept	1.80*	.03
Level 2		
Safety climate	.18*	.94*
Health climate	.06	−.01

* $p < .05$.

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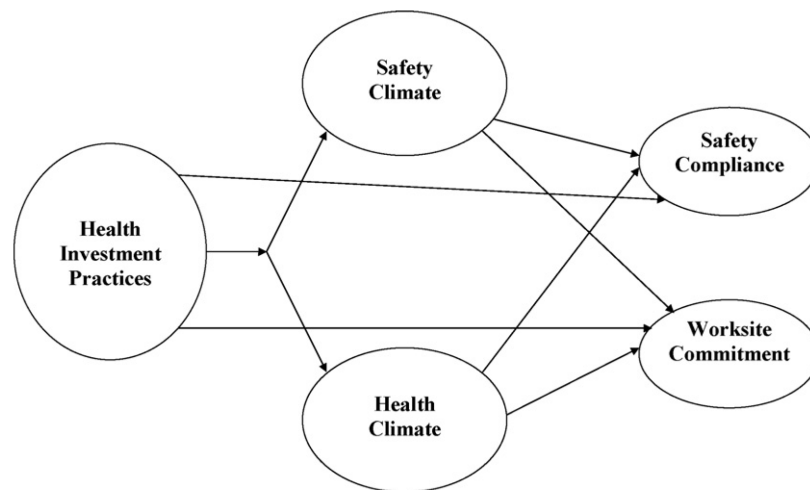

Fig. 1. Model of hypothesized relations.

These results also have implications for organizational climate theory. The strong relationship between health and safety climate, and the fact that they both had similar correlations with health investment, suggests that there may be a broader climate for employee well-being that encompasses safety and health. The underlying factor in safety climate is the priority of safety (Zohar, 2003), which similarly suggests that the underlying factor in health climate is the priority of health. Safety and health prioritization both reflect a priority on factors essential to employee well-being, specifically the prevention of injuries and illnesses. Conflict with production and other performance goals is often common to both safety and health goals and the extent to which an organization prioritizes one of those goals (e.g., health), as displayed through health investment, may be seen as evidence that an organization prioritizes the other goal as well (e.g., safety). Since this design was cross-sectional, the causal order of health investment and health and safety climate cannot be specified. However, these results point to a clustering of climate and policy factors that appear to share a common thread (see Fig. 1).

The hypothesized relationship between health investment and safety compliance was not supported. Perhaps the employee commitment resulting from health investment could have been channeled in multiple ways, not just through safety compliance. Greater commitment may, for some employees, have resulted in stronger pursuit of production goals. These could be associated with a greater tendency to take risks and cut corners to benefit the organization from the perspective of increased production. The lack of a relationship between health investment and safety compliance may have also been a reflection on the safety compliance measure used. Alternative or more specific measures may have yielded different results, although such a suggestion is speculative.

It also may be the case that other factors that are unrelated to health investment are more important in safety compliance. For example, research has shown that self-protection and risk-taking is highly related to threat appraisal and individual expectancies specific to compliant behaviors (e.g., Melamed et al., 1996). It may be the case that regardless of whether employees perceive their organization to be committed to their well-being, they choose to obey safety rules based on their own appraisal of the risk situation. In this case, the norm of reciprocity may not be strong enough in and of itself to motivate employees to comply with organizational safety rules. Compliant safety behaviors may also be too distinct from the explicitly targeted health behaviors for responses to generalize to safety behavior. It should also be noted that only 2.5% of the variance in compliance was between worksites (in contrast with 8% of the variance in commitment), indicating that there was not much between-group variability for health investment to explain. With the relatively large group sizes in this study, which by default have a higher ratio of within-group variability than smaller groups, the influence of worksite-level factors on compliance may have been weaker than if groups were smaller. There may be subgroups within the installations that had dispersed perceptions due to dispositional differences or differential treatment; these factors may in turn impact their behavior, creating greater within-group variance. Finally, it is possible that health investment communicates aspects of caring to workers thus increasing commitment. However our measure of compliance might have been perceived as necessitating perfect compliance or none at all, i.e. a dichotomous relationship. This suggests the need to supplement studies of this nature with observational measures of safety behavior, rather than relying on self-reports.

This study also looked at the relations among safety and health climate and safety compliance and worksite commitment. Results showed that safety climate was significantly related to compliance, consistent with past research (Clarke, 2006), but that health climate did not explain additional variance in compliance beyond safety climate. Similarly, safety climate, but not health climate, was significantly related to worksite commitment when both were entered in to the same model. Since safety and health climate were so highly related at the worksite level, it is not surprising that health climate did not explain unique variance in these outcomes beyond safety climate. These findings are somewhat in alignment with the lack of a significant relationship between health investment and compliance. Both results suggest that safety behavior in particular is best targeted with safety-specific interventions, but that broader worksite commitment and potentially other attitudes can be enhanced with investment in employee well-being, which fosters shared perceptions of an organization's priorities for safety and health, in turn eliciting more positive attitudes.

4.1. Limitations of the current study

The primary limitation of this study is the cross-sectional design. The range in response rate (40–89%) with an overall average of 57% may also be considered limitations, although this response rate is higher than usual for offshore studies (see Mearns et al., 1998, 2001, 2003). Limited access to remote worksites and the restrictive nature of a large-scale survey across many worksites and competing com-

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panies precluded a longitudinal study. Future research in this vein should examine relations outlined in the current study over time to determine if changes in worksite health policies are associated with changes in climate and/or behavior, allowing for stronger causal inferences among them. Unfortunately, such studies are difficult to conduct at the organizational and/or worksite level. More positively, the use of multiple sources reduces some of the artificial inflation of relationships that is associated with data collection efforts where all data are collected from the same individuals by the same method. The strong relations between the medic questionnaire and the climate variables at the worksite level suggest that both converge on a common factor, priority for workforce health and safety, which cannot be attributed solely to a common method factor.

The use of self-report data rather than objective performance-related criteria, such as accident and injury rate, turnover and financial investment data, is also a limitation. Employees may have intentionally inflated their safety compliance ratings, resulting in artificially low variance in safety compliance data. Unfortunately, industry factors mentioned above make the acquisition and use of other safety performance data problematic. In addition, the definition and measurement of accidents in the workplace presents a number of problems. For example, accident rates can present highly skewed distributions and are often only associated with lost-days accidents or incidents at the organizational level. Similarly, the self-report rate of accident involvement in the current sample was only 6.9% (range 2–18%) providing a low level of variance on this variable. Furthermore, previous attempts to collate objective data on visits to medical personnel for illness or injury have been severely thwarted by the incompatible recording systems operated by different organizations and worksites. Supervisor and coworker ratings of safety behavior are also not without their own limitations, such as the opportunity to observe, errors in recall, and politically driven rater biases, all of which are well documented (e.g., Murphy, 2008). However, despite their limitations, self-report safety behavior data have been linked empirically to accidents (Neal and Griffin, 2006), suggesting they do have validity for drawing inferences about safety performance.

4.2. Implications

The current study builds on previous findings in both the safety climate and occupational health literatures and highlights an important link between these two domains. Perhaps the most important contribution of the current work lies in drawing together these elements to demonstrate that investment in workforce health may have far reaching implications not typically associated with a more narrow definition of health. Organizations often attempt to improve organizational commitment, which is associated with positive outcomes such as increased safety climate and reduced turnover (Carr et al., 2003). Consistent with the social exchange perspective (Eisenberger et al., 1990), results from this study suggest that organizations may achieve positive outcomes in these areas through increased focus on workforce health and well-being. Similarly, there is support for the positive relationship between safety climate and commitment demonstrated in previous research suggesting that when the workforce is treated with consideration or perceives a concern for their well-being, higher levels of commitment ensue (Decotiis and Summers, 1987). The results however, point toward the importance of safety climate specifically for safety compliance, with health investment being more important for worksite commitment.

Overall, the data indicate that investments in employee health have implications for the development of a committed workforce. These findings suggest that the introduction of employee-centered health improvement initiatives generates beneficial changes in the working environment that extend beyond health and wellness and foster the perception of the organization as a ‘caring’ place to work (Holzbach et al., 1990). Employees appear to reciprocate this perceived concern for their well-being with greater commitment to their worksites. Given the higher worksite commitment found in worksites with more health investment practices, this research helps strengthen the business case (Smallman, 2001) for investment in workplace health initiatives. Future research in this area should be directed towards documenting the precise mechanisms generating these improvements at multiple levels of analysis as organizations attempt to confront the costs of ill-health and injury in the workplace while also developing a committed workforce.

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