The psychological mechanism of construction workers' safety participation: The social identity theory perspective

ABSTRACT

Introduction: Safety participation has gained increasing attention as an important dimension of workers' safety behaviors. Although previous studies attempted to identify factors affecting workers' safety participation, only a few studies paid attention to the psychological mechanisms behind it. Therefore, this study aimed to develop and test a research model that explains how management factors are implicated in workers' safety participation. Specifically, this study focused on project-based organizations (e.g., construction projects) because employee psychological mechanisms may have a unique nature in such transient employment. *Method*: The hypotheses in the research model of the psychological mechanism of construction workers' safety participation are tested using survey data from 261 construction workers. *Results*: The results indicated that construction workers' safety participation is influenced by project identification after controlling the shared variance of safety compliance. Project identification also mediates the effects of transformational leadership and communication climate on safety participation. *Practical Applications*: This study offers researchers and practitioners an explanation of how management factors influence construction workers' safety behaviors and clarifies the role of project identification play in explaining the effects of management factors on safety compliance and safety participation.

Keywords: Construction Safety, Safety Participation, Project Identification, Transformational Leadership, Communication Climate, Psychological Mechanism

1. Introduction

The construction industry has been characterized by consistently high occupational accident and fatal injury rates across the globe. In 2018, for example, the U.S. construction industry reported 1,038 fatal occupational injuries, which accounted for more than 19% of total U.S. occupational deaths (ILO 2020). The construction industry recorded 16.2 fatal occupational injuries per 100,000 workers in 2018, whereas, for the same period, the overall national average rate was only 5.2 occupational fatalities per 100,000 workers (ILO 2020). An additional 77,500 construction workers suffered nonfatal occupational injuries and illnesses in the same year. In another example, the Korean construction industry reported 517 occupational fatal injuries in 2019, accounting for more than 25% of the total work-related deaths in the same period (KOSIS 2020). Its injury rate was 1.9 times higher than the all-industry rate of 1.08 fatalities per 100,000 workers (KOSIS 2020). Although the construction industry has seen significant advances in technologies and management practices, occupational accident statistics indicate that construction workers are still exposed to higher risk than other occupations.

Construction accidents tend to occur when unsafe work conditions coincide with the unsafe behaviors of workers (Lee et al. 2021). Traditional safety management practices primarily rely on individual-oriented formal controls, such as penalties, to regulate workers' unsafe behaviors (Törner and Pousette 2009; Choi and Lee 2017). However, the factors affecting safety behaviors have recently been focused upon to determine better ways to improve workers' safety behaviors instead of blaming workers. For example, many previous studies have demonstrated associations between construction workers' safety behaviors and

individual factors such as personality (Hasanzadeh et al. 2019, Sun et al. 2020), job type (Glendon and Litherland 2001, Choudhry and Fang 2008), age (Fung and Tam 2013, Shuang et al. 2019), safety knowledge (Fung and Tam 2013, Hasanzadeh et al. 2017), and job experience (Cooper and Phillips 2004). In addition, other studies have empirically supported the effects of management factors such as leadership (Sheehan et al. 2016, Grill et al. 2017), supervisors (Gillen et al. 2002, Fang et al. 2015), communication (Siu et al. 2004, Kines et al. 2010a), training (Lingard 2002, Namian et al. 2016), group norms (Fugas et al. 2011, Choi et al. 2017a), and safety climate (Jiang et al. 2010, Fugas et al. 2012) on safety behaviors.

More recently, researchers have paid attention to the psychological mechanisms behind worker safety behavior. Fang et al. (2016) proposed the Cognitive Model of Construction Workers' Unsafe Behaviors (CM-CWUB) that entails "obtaining information, understanding information, perceiving responses, selecting responses, and taking actions" to identify root causes of workers' unsafe behaviors (p. 1). Choi and Lee (2017) developed an agent-based model of the socio-cognitive process underlying construction workers' unsafe behaviors that integrates cognitive processes, social influence, and site risk. Liang et al. (2018) developed a hybrid model that incorporates system dynamics and agent-based modeling to understand the social contagion effects of safety violations within a construction crew. Zhang et al. (2019) also developed an agent-based model of construction workers' unsafe behaviors to understand worker-management interaction's impact on construction workers' safety behaviors. Ye et al. (2020) developed an agent-based model of workers' safety behavior that integrates individual cognitive factors (i.e., safety awareness, experience, safety knowledge, safety attitude, and perceived safety norms) and organizational factors

(i.e., safety communication, safety training, and social groups).

Although previous studies have contributed significantly to extending the understanding of the psychological mechanisms of construction workers' safety behaviors, they have mainly focused on safety compliance (i.e., workers' compliance with safety rules and procedures). Previous studies have conceptualized safety behaviors comprising two dimensions that distinguish in-role and extra-role behaviors: safety compliance and safety participation (Clarke 2006, Neal and Griffin 2006). Safety compliance is defined as "adhering to safety procedure and carrying out work in a safe manner" (i.e., in-role safety behavior), whereas safety participation refers to "helping coworkers, promoting the safety program within the workplace and demonstrating initiative and putting efforts into improving safety in the workplace" (i.e., extra-role safety behavior) (Neal et al. 2000, pp. 101). Further, previous studies developed a model of the psychological mechanism of construction workers' safety compliance, but these models are limited to understanding the intrinsic psychological mechanisms of construction workers' safety participation (Xia et al., 2021). In addition, previous studies on safety participation have explored external factors that affect safety participation, such as safety climate (Griffin and Neal 2000), safety knowledge (Vinodkumar and Bhasi 2010), stress (Wang et al. 2020), leadership (Clarke and Ward 2006; Griffin and Hu 2013), and organizational support (Curcuruto and Griffin 2017), but their insights are limited in their understanding of the psychological mechanisms connecting these management factors to workers' safety participation (Liu et al. 2020). Furthermore, workers' safety participation in construction projects has been relatively unexplored compared to other organizational settings. Moreover, the psychological mechanisms underlying construction

workers' safety participation may not be the same in long-term organizations because of temporary and contract employment in construction projects. Consequently, the psychological mechanism of construction workers' safety participation is an aspect yet to be explored in detail.

With this background, this study aimed to investigate the psychological mechanism underlying the link between management factors (i.e., transformational leadership, communication climate) and safety participation. Considering that workers' safety participation is beyond their job requirements (i.e., extra-role behaviors), safety participation requires additional motives compared to safety compliance (i.e., in-role behaviors). The positive experience of workers in the work environment motivates them to engage in extra-role behaviors. Thus, transformational leadership and communication climate were included in the model to represent workers' interactions with management at construction sites. Transformational leadership refers to "the leader inspiring their followers to adopt the vision of the organization as if they were their own and focus their energy toward the achievement of collective goals" (Moriano et al., 2014, p.106). As transformational leaders motivate employees to move beyond achieving their immediate goals and pursue collective goals, employees are encouraged to engage in extra-role behaviors in an organization. Further, communication climate is defined as "the perception of employees with regard to the quality of the mutual relations and the communication in an organization" (Bartels et al., 2007, p. 177). Because a positive communication climate aids the workers in believing that their extra-role behaviors result in changes in an organization, workers with a more positive communication climate are more willing to engage in safety participation. In addition, this

111 study applied Social Identity Theory (SIT) and introduced project identification to the
112 research model to link management factors and safety participation. Social identity is defined
113 as "an individual's awareness or knowledge that he/she belongs to certain groups together
114 with some emotional and value significance to him/her of this group membership" (Tajfel,
115 1972, p. 292) SIT states that an individual's identification with a group is an important
116 mechanism that motivates extra-role behaviors in the group; that is, people who strongly
117 identify with a group or organization are more likely to exert extra effort into improving the
118 performance of the group or organization. Similarly, construction workers' project
119 identification has been introduced in the research model as an antecedent of safety
120 participation which is a type of extra-role behavior in the safety context. Although previous
121 studies have found the conducive effect of project identification on construction workers'
122 safety compliance (Andersen et al. 2015, Choi et al. 2017b, Andersen et al. 2018), to our
123 knowledge, no previous study has specifically examined the relationship between project
124 identification and safety participation. Furthermore, the nature of project identification and
125 its role in the psychological mechanisms underlying safety participation in construction
126 projects may be unique compared with those of long-term organizations because construction
127 workers are temporarily hired for a specific project. Due to the complex and transient nature
128 of construction employment, it is not yet obvious how management factors translate into
129 worker safety participation with the help of project identification. Therefore, this study
130 contributes to the body of safety knowledge by expanding our understanding of the
131 psychological mechanism of safety participation in a construction project, which is one type
132 of project-based organization.

2. Theories and Hypotheses

In this study, a research model of the psychological mechanism behind construction workers' safety participation is proposed, based on related theories; it is tested in an attempt to fill the aforementioned knowledge gaps. Figure 1 illustrates the research model. The following describes the research model: construction workers' project identification has a positive impact on safety participation after controlling the effect of safety compliance on safety participation; project identification mediates the relationship between transformational leadership and safety participation; the communication climate effect on safety participation is mediated by project identification. The next sections discuss the research model's hypotheses in detail.

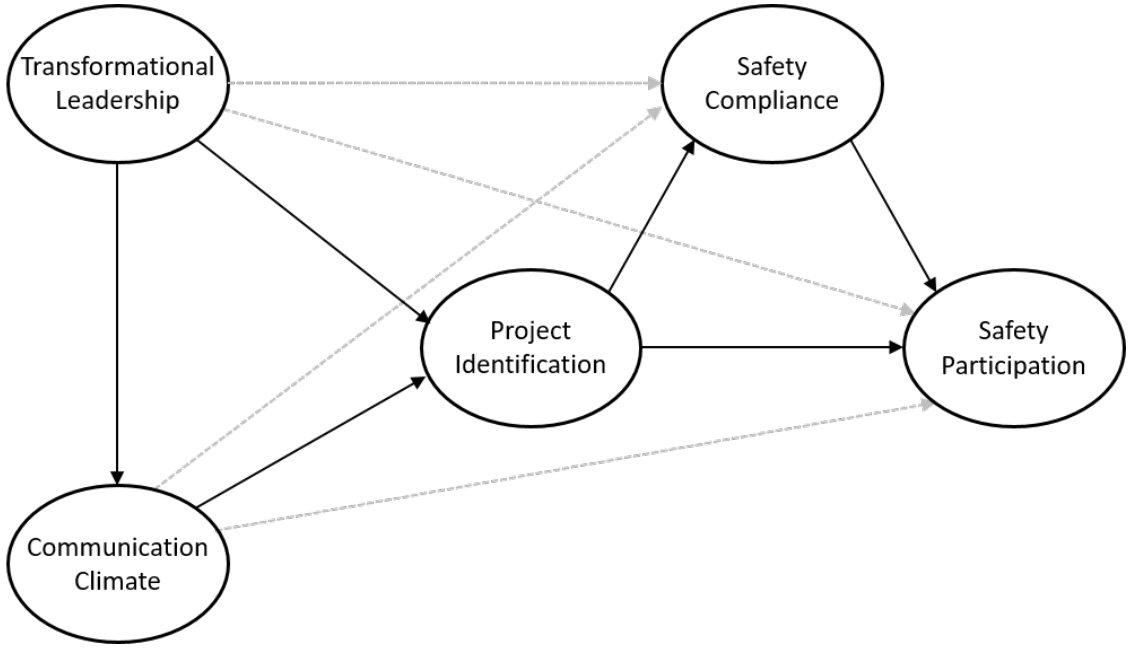

Figure 1 Research Model of the Psychological Mechanism Underlying Construction Workers' Safety Participation

2.1 Project identification, safety compliance, and safety participation

Safety participation refers to “employees’ extra-role participation in safety activities, such as actively participating in safety meetings, enthusiastically helping colleagues to complete safety tasks, and proactively giving safety recommendations” (Liu et al. 2019, p. 375). Considering that safety participation is beyond workers' formal responsibility for safety (i.e., safety compliance - conforming safety rules and procedures), safety participation would be understood as Organizational Citizenship Behavior (OCB) in the safety context (Hofmann et al. 2003, Jiang et al. 2010, Fugas et al. 2012). OCB refers to “individual behavior that is discretionary, not directly or explicitly recognized by the formal reward system, and in the aggregate promotes the organization's efficient and effective functioning” (Organ 1988, p. 4). In this respect, safety participation has been called Safety Citizenship Behavior in previous studies (Hofmann et al. 2003, Jiang et al. 2017). SIT provides a theoretical foundation for the underlying psychological mechanism that motivates employees’ OCB. Social identity is defined as "the part of an individual's self-concept, which derives from his knowledge of his or her membership of a social group together with emotional significance attached to that membership" (Tajfel, 1972, p. 292). Employing SIT, researchers have conceptualized organizational identification as a specific form of social identity, defining it as a "perception of oneness with or belongingness to an organization," (Ashforth and Mael 1989, p. 21; Mael and Ashforth 1992, p. 104) to understand the psychological mechanism of organization of the behaviors of the members. According to SIT, if an individual strongly identifies with a group, they internalize the group goals as personal values and exert more effort into achieving the group goal (i.e., internalization, Hogg and Smith 2007). Similarly,

employees with more salient organizational identification may exert extra effort (i.e., OCB) to improve the performance of the organization (Haslam et al. 2000, Van Knippenberg 2000, Riketta and Dick 2005). Previous studies have identified the effects of organizational identification on employees' extra-role behaviors (Van Dick et al. 2006, Tufan and Wendt 2020, Haslam et. al. 2014). However, examining the internalization process of organizational goals would be worthwhile in the context of project-based organizations. Despite the relatively short life of a project-based organization, employees can still develop group norms or a shared perception of organizational goals that affect their behaviors (Gillen et al. 2002; Lingard et al. 2011; Ahn et al. 2014). Similarly, previous studies have found the role of project identification, defined as workers' perception of belongingness to their project, in different behavioral contexts such as safety compliance (Choi and Lee 2017, Anderson et al. 2018), turnover and work engagement (Ding et al. 2017), and intra-and inter-organizational tasks (Fang and Zhang 2021) in project-based organizations. Therefore, project identification, may motivate construction workers to become involved in extra-role safety behaviors beyond those of safety compliance (i.e., safety participation). Therefore, it is hypothesized that project identification can predict the safety participation of construction workers.

Safety compliance is included in the research model as an antecedent of safety participation to control the shared variance effects between safety compliance and safety participation in examining project identification's impacts on safety participation (i.e., a control variable). While workers' safety participation is identified as extra-role behaviors in the safety context, they may overlap with in-role job requirements (Moorman et al. 1993,

192 Deluga 1995, Ishak and Alam 2009). Extra-role and in-role behaviors can be seen as distinct
193 constructs, but their perceptual boundaries may vary across employees depending on their
194 perceptions of job requirements (Morrison 1994). In other words, measures of extra-role
195 behaviors may, in part, also assess in-role behaviors (Schnake 1991, Walz and Niehoff 2000).
196 In this respect, Williams and Anderson (1991) suggested that in-role behavior must be
197 "included and used as a control variable so as to isolate variance in OCB measures that are
198 not associated with the performance of in-role behaviors" (p. 614). Similarly, the possibility
199 of overlaps between safety participation and safety compliance may not be eliminated. In this
200 sense, previous studies have repeatedly reported significant correlations between safety
201 compliance and safety participation, and they have correlated safety compliance with safety
202 participation (Griffin and Neal 2000, Neal and Griffin 2006, Vinodkumar and Bhasi 2010,
203 Griffin and Hu 2013, Hoffmeister et al. 2014, Barbaranelli et al. 2015, Guo et al. 2016).
204 Furthermore, safety compliance is also influenced by workers' project identification.
205 According to SIT, when a specific group membership becomes salient to an individual's self-
206 concept, people tend to assimilate their self-concept into their group prototype (Bergami and
207 Bagozzi 2000, Hogg and Terry 2000). Prototypes are a fuzzy set of attributes associated with
208 the description and prescription of exemplary group behaviors (Terry et al. 1999).
209 Individuals' perception of the group prototype is revealed in their perception of group norms,
210 defined as the shared perception of normal and acceptable group behaviors (Ellemers et al.
211 2004, Hogg and Reid 2006). Therefore, when an individual strongly identifies with specific
212 group membership, he/she tends to internalize and comply with its norms (i.e., norm
213 internalization process) (Ashforth and Mael 1989, Ellemers et al. 2004). Construction

214 workers, who have a salient project identification, are more likely to internalize project-level
215 rules and procedures and comply with them. Considering that project-level safety rules and
216 procedures are relatively strict compared with norms in the workgroup, project identification
217 may positively impact safety compliance (Choi et al. 2017b). Previous studies have identified
218 the role of project identification in construction workers' safety compliance (Andersen et al.
219 2015, Choi et al. 2017a, Andersen et al. 2018, Ye et al. 2020). Based on these notions, it is
220 hypothesized that project identification predicts construction worker's safety compliance.
221
222 **2.2 Transformational leadership, communication climate, and safety participation**
223 Employees' interaction with management has a significant impact on their selection of
224 behaviors in an organization. Worker safety behaviors are influenced by work conditions
225 (e.g., environment and tasks, etc.) and interaction with management (Fang et al. 2015).
226 Because safety participation involves voluntary activities beyond in-role safety requirements
227 (i.e., safety compliance), interaction with organizational leaders plays a pivotal role in
228 motivating workers' safety participation. In the same vein, leadership style has received
229 increasing attention in safety studies. Specifically, transformational leadership has been
230 found to affect workers' safety behaviors, including safety participation (Christian et al. 2009,
231 Clarke 2013, Griffin and Hu 2013). Transformational leadership refers to leader behaviors
232 that inspire followers to adopt organizational goals and interests, moving them beyond their
233 immediate self-interest to achieve collective goals (Bass and Bass Bernard 1985, Moriano et
234 al. 2014, Buil et al. 2019). Transformational leaders recognize employee needs and motivate
235 them to unite and pursue higher goals to produce positive organizational changes

(Hoffmeister et al. 2014). Employees' interaction with transformational leaders makes them internalize organizational visions and goals and perform beyond in-role requirements and expectations to achieve organizational goals (Ding et al. 2017). The effects of transformational leadership on OCB have been empirically proved by previous studies (Podsakoff et al. 1990, Wang et al. 2005, Cho and Dansereau 2010, Humphrey 2012, López-Domínguez et al. 2013). Clarke (2013) identified the positive effects of transformational leadership on workers' safety participation based on a meta-analytic path analysis of 103 previous studies in the safety context.

Another management factor included in the research model is communication climate. Effective internal communication is generally recognized to be essential to a successful organization. The communication climate is a facet of the psychological climate, defined as an individual's perception and interpretation of the work environment's communication regarding its psychological meaning and significance (Rogers 1987, Smidts et al. 2001). A positive communication climate embraces supportiveness, openness and candor, confidence and credibility, participative decision making, and trust (Dennis 1974, Bartels et al. 2007). Since extra-role behaviors are beyond in-role requirements, effective organizational information communication would be crucial for encouraging employees' OCB. Effective communication improves employee's self-efficacy n extra-role behaviors. A positive communication climate gives employees faith that his/her extra-role behaviors can create a real contribution to an organization. For example, if management pays more attention to employee voices, they are more likely to make suggestions to improve organizational performance. While transformational leadership is related to the content of employee

interactions with management, the communication climate reveals the manner of interaction with management in an organization. Previous studies have empirically demonstrated the role of communication climate in promoting OCB in an organization (Abu Bakar and McCann 2015, Chan and Lai 2017). Furthermore, safety researchers and practitioners have gradually recognized the significance of communication for improving safety performance (Cigularov et al. 2010, Kines et al. 2010b, Huang et al. 2018), including safety participation (Mashi et al. 2020). For example, if workers feel comfortable discussing safety issues, they will put more effort into providing work safety suggestions.

Communication is generally a path for performing leadership in an organization. Transformational leaders may exert increased efforts to facilitate the formation of a positive communication climate to inspire collective goals among their subordinates. In addition, employees may perceive a more positive communication climate if transformational leaders maintain close interactions with them and genuinely care about their needs (Neff and Cirin 1999). Men (2014) demonstrated a positive relationship between transformational leadership and internal communications in medium-sized and large corporations in the U.S. In addition, Zohar and Tenne-Gazit (2008) also showed the positive effects of transformational leadership in strengthening friendly communications in an organization. Therefore, the research model includes a path from transformational leadership to a communication climate.

2.3 The mediating role of project identification

It has been argued that transformational leadership positively impacts workers' behaviors by promoting organizational identification (Tse and Chiu 2014, Ding et al. 2017). As mentioned,

transformational leaders are more focused on collective identity and organizational goals and visions. According to the social identity of leadership theory (Hogg 2001), employee interaction with transformational leaders fosters employees' psychological needs for self-esteem and self-enhancement as organizational members. A positive psychological experience in an organization leads to emotional attachment with it, which leads organizational identification to become salient to an employee's self-concept (Walumbwa et al. 2008). Kark et al. (2003) and Cregan et al. (2009) found empirical evidence of transformational leadership's positive effect on employees' organizational identification. Transformational leaders enable employees to internalize organizational visions and goals associated with self-fulfillment and esteem through organizational identification. Accordingly, subordinates, who strongly identify with the organization, tend to fully engage with their work role and are motivated to participate in proactive behaviors to improve organizational performance. Safety performance is one of the critical criteria evaluating the performance of construction projects. Based on these notions, it is hypothesized that construction worker's project identification mediates the relationship between transformational leadership and safety participation.

Several previous studies have empirically demonstrated the role of communication climate in organizational identification (Scott et al. 1999, Bartels et al. 2007, Bartels et al. 2010, Neill Marlene et al. 2019). Management with a constructive communication climate pays more attention to employee's voices in an organization. Also, employees may have more opportunities to create and share their ideas while discussing organizational issues and participating in the decision-making process. This may facilitate employees' feelings of

ownership because they feel involved with the organization (Nakra 2006). Also, employees may feel greater control in the organization through proactive participation. These processes may enhance employees' self-worth and fulfillment, strengthening their organizational identification (Bartels et al. 2006).

Moreover, open communication with management may foster employees' self-esteem because they perceive that they are taken seriously (Smidts et al. 2001). Organization-based self-esteem is one of the critical dimensions of organizational identification (Bergami and Bagozzi 2000). Accordingly, employees in a positive communication climate are more likely to recognize themselves as significant organization members. The salient organizational identification driven by a constructive communication climate may also motivate employees to devote themselves to work and perform beyond job requirements to accomplish organizational goals and visions. Based on earlier results, it is hypothesized that construction workers' project identification mediates the relationship between communication climate and safety participation.

3. Methods

3.1 Sample and procedure

A survey questionnaire was designed and administered to collect data in this study. The surveys were conducted at four construction sites from September to October 2019. Sites A and C were residential building construction projects, and the survey was conducted in September 2019. Sites B and D were commercial building construction projects, and data were collected in October 2019. Projects A and B's general contractor was the same

company, and another general contractor carried out Projects C and D. Before data collection, the Institutional Review Board (IRB) of the authors' institute approved the survey instruments and procedures. The surveys took place in a conference room of each project during regular safety training sessions to avoid interrupting participants' ongoing tasks. Owing to the limited space available in the conference rooms at the construction sites, the research team administered surveys multiple times in each project. For example, the research team collected data from Site C, the largest project with regard to sample size, for four days. This grouping of respondents made it possible to secure ample space to ensure the confidentiality of participants' respondents. One week before the data collection, a research team member explained the survey's purpose and procedures to each project's forepersons and supervisors during their weekly meetings, and the forepersons and supervisors verbally advertised this study to their crews. The workers in each project voluntarily participated in the survey at the end of regular safety training sessions. Before administering the survey, a research team member (i.e., the survey administrator) provided a brief explanation regarding the purpose, procedure, and potential risk of the survey to the workers. Project participants who did not participate in the survey were prohibited from entering the conference room to prevent unforeseen effects on the response. Questions about personal identification were not included in the questionnaire to guarantee the responses' anonymity. For example, an item regarding participants' gender was excluded during the IRB process because female workers could be specified at a construction site. After questionnaires were filled out, survey administrators immediately collected the completed questionnaires to ensure confidentiality. The survey took approximately 20 minutes to complete.

346 The total sample size was 261; there were 43 respondents from Site A, 53 from Site
347 B, 88 from Site C, and 77 from Site D. All participants were field workers (78.5%, 205
348 workers) or forepersons (21.5%, 56 workers) in the projects. Of these, 131 participants
349 (50.2%) worked on residential building projects, and 130 participants (49.8%) were from
350 commercial building projects. Ninety-six participants (36.8%) worked for the first general
351 contractor, and 165 workers (63.2%) were from another general contractor. The sample
352 includes various types of trade workers employed by subcontractors, including concrete
353 workers, rebar workers, electricians, plumbers, and HVAC workers. The average age of the
354 participants is 48.72, with standard deviations (S.D.) of 10.39. Of the participants, 20.7% are
355 younger than 40 years old, 28.7% were between 41 and 50 years old, 41.8% are between 51
356 and 60 years old, and 8.4 % were older than 60. The average years of participant job
357 experience is 12.84 (SD = 9.91). Approximately 33% of the participant have less than five
358 years of job experience, 33.6% have between five to 15 years of job experience, and 46.4%
359 have more than 15 years of job experience. Approximately half of the participants (52.5 %)
360 had worked on the current project for less than three months, 23.9 % had between three and
361 six months of project tenure, and 23.6 worked on the current project for more than six months.
362
363 **Table 1. Participant Demographic Information**
364

Characteristics	Frequency	Percent
Age		
≤ 30 y	20	7.7
31 – 40 y	34	13.0
41 – 50 y	76	28.7
51 – 60 y	109	41.8
≥ 60 y	22	8.4

Job experience		
≤ 2 y	44	16.9
2 – 5 y	42	16.1
6 – 10 y	50	22.1
11 – 15 y	30	11.5
16 – 20 y	51	29.5
≥ 16 y	44	16.9
Job title		
Foreman	56	21.5
Worker	205	78.5

365

366 **3.2 Measures**

367 This study adopted prior validated measurements and modified them to the context of
368 construction projects. For example, the measures of communication climate adopted from
369 Postmes (2001) was changed from "Management of this organization pays attention to
370 employees' suggestions" (p. 246) to "Management of this project pays attention to
371 employees' suggestions". Before completing the draft questionnaire, several pilot studies
372 were conducted to improve the measurements and instructions. All constructs were measured
373 using a 7-point Likert scale ranging from -3 (strongly disagree) to 3 (strongly agree). In the
374 first section, respondents were asked to provide their perception of transformational
375 leadership, communication climate, and project identification. The second section contained
376 measurements of safety compliance and safety participation. The third section included
377 questions on the respondents' information, including age, job experience, job title, and tenure
378 at the current project.

379

380 *3.2.1 Transformational leadership and communication climate*

381 Transformational leadership has been conceptualized as a four-dimensional construct,

382 including idealized influence, inspirational motivation, intellectual stimulation, and
383 individualized consideration (Hoffmeister et al. 2014, Ding et al. 2017). The four items from
384 Bass and Avolio (1994) were used to measure each dimension of transformational leadership.
385 One example included, "Managers on this project talk enthusiastically about what needs to
386 be accomplished." (Inspirational motivation). Communication climate was measured by
387 three items from Smidts et al. (2001) and Postmes (2001) that reference employees' work-
388 related communication experience. An example of the items measuring communication
389 climate is "Management of this project pays attention to employees' suggestions."
390 Cronbach's alpha was 0.89 for transformational leadership and 0.92 for the communication
391 climate.
392
393 *3.2.3 Project identification*
394 SIT researchers have empirically validated a three-dimensional model of social identity (e.g.,
395 ethnicity, religion, gender, fans of a sports team, and family) that consists of cognitive (i.e.,
396 knowledge of membership), affective (i.e., emotional significance of membership), and
397 evaluative dimension (i.e., the value of membership) (Ellemers et al. 1999, Bagozzi and Lee
398 2002, Cameron 2004). In addition to the three-dimensional model, recent studies have
399 suggested a fourth dimension called the behavioral dimension (i.e., behavior supportive of
400 the group). While SIT scholars have successfully developed a comprehensive
401 conceptualization of social identification, the multi-dimensional nature of organizational
402 identification and its impact on employees' behavior has not been well investigated.
403 Although a few previous studies proposed a multi-dimensional organizational identification

model, empirical studies scrutinizing this model in relation to project-based organizations like construction projects are still tenuous. This study adopted established measures from previous studies (Mael and Ashforth 1992, Bergami and Bagozzi 2000, Jackson 2002, Van Dick et al. 2004, Johnson et al. 2012) for the four dimensions to develop a comprehensive conceptualization of project identification and to measure the salience of construction workers' project identification. Sample items included: "being a member of this project is an important part of who I am" (cognitive dimension), "I am happy to be a member of this project" (affective dimension), "I am a valuable member of this project" (evaluative dimension)," and "This project's successes are my successes" (behavioral dimension).

3.2.4 Safety compliance and safety participation

Safety compliance was assessed using three items from Neal et al. (2000) and Neal and Griffin (2006). The respondents were asked to provide their performance of compliance with safety rules and procedures during work at the current site. One example included: "I use all the necessary safety equipment (e.g., personal protective equipment) to do my job." Cronbach's alpha shows good reliability of the scales (0.90). Three items from Neal et al. (2000) and Griffin and Neal (2000) were also used to measure safety participation. The items were designed to evaluate the respondent's propensity to engage in activities beyond their role to improve the project's safety performance. An example was "I voluntarily carry out tasks or activities that help improve workplace safety," and Cronbach's alpha for safety participation was 0.80.

3.3 Data analysis

As the first step in data analysis, an Exploratory Factor Analysis (EFA) was conducted to develop a multi-dimensional model of construction workers' project identification because the multi-dimensional nature of organizational identification with project-based organizations (e.g., construction project) had not been investigated in prior studies. Based on this model, the measures' adequacy was tested by Confirmatory Factor Analysis (CFA). The CFA was evaluated by RMSEA (Root Mean Square Error of Approximate), CFI (Comparative Fit Index), NNFI (Non-Normed Fit Index), and SRMR (Standardized Root Mean Square Residual). Factor loadings, composite, reliability, and average variance extracted from the measures were calculated to assess the convergent validity. Discriminant validity was evaluated by checking whether the correlation coefficients among the latent variables were significantly less than 1.00 (Bagozzi and Yi 2012). A 95% confidence interval of each correlation coefficient was estimated to check whether the confidence intervals included 1.00. Finally, the psychological mechanism of construction participation was investigated (i.e., the hypothesized relationship between the latent variables) using the Structural Equation Model (SEM). RMSEA, CFI, NNFI, and SRMR were also used to evaluate the SEM's fitness.

4. Results

4.1 Measurement model assessment

EFA was employed to develop a comprehensive conceptualization of construction workers' project identification. Before performing EFA, the Kaiser-Meyer-Olkin (KMO) test and

448 Bartlett's test of sphericity were carried out to examine the applicability of the data for EFA.
449 The KMO measure of sampling adequacy was 0.96, which exceeded the acceptable level of
450 0.8 (Zhang *et al.* 2016), and Bartlett's test of sphericity was also significant (χ^2 (66) =
451 2931.45, $p < 0.01$). Accordingly, the data were considered suitable for the EFA. The Velicer
452 (1976)'s Minimum Average Partial test and comparative data technique proposed by Ruscio
453 and Roche (2012) were combined to determine the appropriate number of factors. Based on
454 procedures presented by Courtney and Gordon (2013), the MAP test and comparative data
455 technique were conducted using SPSS 25. The MAP result indicated that the minimum
456 squared average partial correlation of 0.040 was achieved for a two-factor model. Also, the
457 comparative data technique revealed that moving from one factor to two factors provided
458 statistically significant improvement ($p < 0.001$), while moving from two to three factors
459 provided non-significant improvement ($p = 0.998$). Therefore, a two-dimensional model was
460 selected as the final model of the project identification. Principal axis factoring with direct
461 oblimin rotation, which is widely applied with high correlation among the factors, was used
462 to determine project identification's underlying dimensions (Wan et al. 2015). To enhance
463 the interpretability of the factors, the cut-off factor loading of 0.45 was used to exclude the
464 weak indicators of common factors. The EFA result indicated that Factor 1 accounted for
465 64.4% of the total variance with a satisfactory reliability ($\alpha = 0.94$), and six items intended
466 to measure the cognitive and affective dimensions of project identification were loaded on
467 Factor 1 (i.e., the cognitive and affective dimension). Factor 2 accounted for 4.8% of the total
468 variance with 0.91 of Cronbach's alpha. Four items measuring the evaluative and behavioral
469 dimension of project identification were loaded on Factor 2 (i.e., the evaluative and

behavioral dimension).

Based on the project identification's two-dimensional model, CFA was conducted to assess the measurements' adequacy in this study. To examine the reliability of each construct in the research model, the Cronbach's alpha test was conducted. As shown in Table 2, the values of Cronbach's alpha range from 0.80 (safety participation) to 0.94 (cognitive and affective project identification), which is above the acceptable threshold of 0.70 (Hair et al. 2006). In addition, a confirmatory factor analysis (CFA) was conducted by using AMOS 26 (IBM) to assess the convergent and discriminant validity of the constructs. A CFA model with six latent variables (i.e., transformational leadership, communication climate, cognitive & affective project identification, evaluative & behavioral project identification, safety compliance, and safety participation) and 22 measures was built. Three manifest variables were excluded in the CFA model because the factor loadings are lower than 0.5, a threshold suggested by Hair et al. (2006). To assess CFA model fit, the following thresholds were applied in this study: RMSEA $\leq$ 0.07, CFI $\geq$ 0.90, NNFI $\geq$ 0.90, SRMR $\leq$ 0.07 (Hu and Bentler 1999, Bagozzi and Yi 2012). The goodness of fit indices for the CFA model met the above criteria: RMSEA $\leq$ 0.069, CFI $\geq$ 0.94, NNFI $\geq$ 0.92, and SRMR $\leq$ 0.057. Convergent validity was assessed by factor loading, composite reliability, and average variance extracted. To establish the convergent validity, factor loadings for all manifest variables should be greater than 0.5, and the value of composite reliability should be greater than 0.5 (Bagozzi and Yi 1988, Hair *et al.* 2006). Also, a value of 0.5 or greater is recommended for the average variance extracted. As shown in Table 2, all factor loadings exceed the threshold of 0.50, and composite reliability ranges from 0.83 to 0.94. The average variance extracted ranges from

0.62 to 0.79, which are greater than the recommended threshold. Convergent validity, therefore, is established in this study. The 95% confidence intervals for all correlation coefficients in the CFA model are constructed to examine the discriminant validity. All the confidence intervals did not include 1.00, which indicates that the correlation among all the constructs was significantly less than 1.00. Therefore, this study also achieved discriminant validity.

Table 2. Reliability and Convergent Validity of the CFA

Construct	Indicator	Factor Loading	Error Variance	Reliability (α)	Composite Reliability	Average Variance Extraction
Transformational Leadership	TL1	0.83	0.32	0.89	0.88	0.71
	TL2	0.84	0.30			
	TL3	0.87	0.25			
Communication Climate	CC1	0.84	0.29	0.92	0.92	0.79
	CC2	0.91	0.17			
	CC3	0.91	0.18			
Cognitive & Affective Project Identification	CAP1	0.74	0.46	0.94	0.94	0.74
	CAP2	0.77	0.41			
	CAP3	0.92	0.16			
	CAP4	0.92	0.16			
	CAP5	0.93	0.14			
	CAP6	0.86	0.26			
Evaluative & Behavioral Project Identification	EBP1	0.83	0.31	0.91	0.91	0.76
	EBP2	0.84	0.29			
	EBP3	0.83	0.31			
	EBP4	0.87	0.24			
Safety Compliance	SC1	0.93	0.14	0.92	0.92	0.79
	SC2	0.94	0.12			
	SC3	0.80	0.36			
Safety Participation	SP1	0.64	0.59	0.80	0.83	0.62
	SP2	0.83	0.31			
	SP3	0.87	0.25			

Note: N = 261

4.2 Descriptive statistics

Table 3 represents the mean, standard deviation, and intercorrelation coefficients of the variables in this study and demographic variables (i.e., project type, company, forepersons, age, and project tenure). Table 3 shows that construction workers' project identification has a significant correlation with transformational leadership ($r = 0.78$, $p < 0.01$) and communication climate ($r = 0.79$, $p < 0.01$). It indicates that workers who perceive more transformational leadership and positive communication climate tend to have salient project identity. However, there was no significant correlation found between project tenure and project identification. Previous studies have shown that short-term tenure in an organization does not inhibit promoting an individual's organizational identification (Akerlof and Kranton 2005; Peters et al. 2013; Ramsey et al. 2013). In addition, previous studies on construction workers' project identification have shown that workers' tenure in the current project is not a significant barrier to increasing their project identification (Choi et al.2017a, b). Thus, certain workers may have salient project identification, even if they spent a relatively short time in the current project. Moreover, strong correlations between transformational leadership and project identification and between communication climate and project identification imply that transformational leadership and communication climate may promote workers' project identification even if workers do not spend a long time in the current project. A significant correlation is found between project identification and safety participation ($r = 0.42$, $p < 0.01$) and between project identification and safety compliance ($r=0.53$, $p < 0.01$). It implies that workers who more strongly identify with their project tend to follow the safety rules and procedures and put more extra effort into improving safety at their job site. Besides, a strong

525 positive correlation between safety compliance and safety participation ($r = 0.85$, $p < 0.01$)
526 justifies the necessity of controlling the share variance of safety compliance to predict safety
527 participation.

528 Also, several significant correlations are found between demographic variables and
529 constructs in the research model. First, project type (i.e., office building vs. residential
530 building) significant correlates with transformational leadership ($r = -0.23$, $p < 0.001$), project
531 identification ($r = -0.14$, $p = 0.029$) and safety participation ($r = -0.15$, $p = 0.018$). At office
532 building projects, workers perceived more transformational leadership and project identity
533 and followed safety rules and procedures in their work. Besides, a significant correlation
534 between company and safety compliance ($r = 0.14$, $p = 0.035$) indicates that workers for the
535 second general contractor (Projects C and D) show better safety compliance. Furthermore,
536 the foreperson shows significant correlations with project identification ($r = 0.15$, $p = 0.023$)
537 and safety participation ($r = 0.15$, $p = 0.026$), and there is a significant correlation between
538 age and project identification ($r = 0.20$, $p = 0.003$). It indicates that forepersons and older
539 workers tend to perceive more salient project identity. Also, forepersons tend to put more
540 additional effort into safety improvement in their projects. As such, demographic variables
541 that significantly correlate with either project identification, safety compliance, or safety
542 participation were included in the SEM model as control variables and excluded if the control
543 variable's regression coefficient was not significant.

544 **Table 3. Descriptive Statistics and Correlation Matrix**
545

Variables	1	2	3	4	5	6	7	8	9	10	11
1	1.000										
2	-.082	1.000									
3	.058	-.046	1.000								
4	-.100	.095	.111	1.000							
5	.062	.094	.029	.065	1.000						
6	-.106	-.041	.179**	.495**	.139*	1.000					
7	-.231**	-.042	.103	.127	.032	.025	1.000				
8	-.081	-.069	.092	.067	.048	.011	.845**	1.000			
9	-.142*	-.052	.148*	.196**	.053	.103	.777**	.792**	1.000		
10	-.154*	.137*	.069	.041	-.060	.019	.414**	.347**	.424**	1.000	
11	-.116	.108	.150*	.075	-.011	.056	.410**	.434**	.528**	.853**	1.000
Mean	0.63	0.501	0.21	48.72	12.836	13.218	0.567	0.268	0.403	1.388	1.105
SD	0.483	0.501	0.411	10.39	9.905	9.741	1.256	1.26	1.118	1.139	1.028
	Notes: N = 261 *p < 0.05, **p < 0.01, SD = standard deviation, 1. Project type, 2. General contractor, 3. Foremen, 4. Age, 5. Project tenure, 6. Job experience 7. Transformational leadership, 8. Communication climate, 9. Project identification, 10. Safety compliance, 11. Safety participation										

546
547

548 **4.4 Structural model assessment**

549 To clarify the psychological mechanism of construction workers' safety participation, SEM
550 analysis was conducted using the same latent and measurement variables in the CFA model.
551 Figure 2 shows the results of the path analysis of SEM. The structural model achieved an
552 adequate statistical model fit: χ^2 =566.75, df = 237, $p < 0.001$, RMSEA $\leq$ 0.07, CFI $\geq$
553 0.94, NNFI $\geq$ 0.93, and SRMR $\leq$ 0.07. In Figure 2, solid lines demonstrate significant
554 path coefficients, and dotted lines indicate non-significant path coefficients in the model. As
555 shown in Figure 1, workers' project identification is a significant predictor of safety
556 participation ($\beta = 0.26$, $p = 0.003$) after controlling the effects of shared variance between
557 safety compliance and safety participation. The result supports the hypothesis regarding the
558 positive effects of project identification on workers' safety participation. Also, the path
559 coefficient of safety compliance is significant ($\beta = 0.80$, $p < 0.001$), justifying the
560 incorporation of safety compliance to control the shared variance between safety
561 participation in examining the influence of project identification on safety participation. The
562 path coefficient between project identification and safety compliance is also significant ($\beta =$
563 0.30, $p = 0.009$), supporting the hypothesis of project identification effects on safety
564 compliance. The three positive significant path coefficients (project identification
565 (independent variable) $\rightarrow$ safety participation (dependent variable), project identification
566 (independent variable) $\rightarrow$ safety compliance (dependent variable), and safety compliance
567 (mediator) $\rightarrow$ safety participation (dependent variable)) imply that the effects of project
568 identification on safety participation are partially mediated by safety compliance. 23%of the

569 variance in safety compliance is explained by the combined effects of transformational
570 leadership, communication climate, project identification, and a control variable (i.e.,
571 company). In addition, independent variables and mediators (i.e., transformational
572 leadership, communication climate, project identification, and safety compliance) explain
573 78% of the variance in safety participation, which is considerably higher than other similar
574 types of studies. This is primarily because of the strong correlation between safety
575 participation and safety compliance. As mentioned above, previous studies did not include
576 safety compliance as a control variable in predicting safety participation, despite fuzziness in
577 perceptual boundaries between safety compliance and safety participation. Thus, to
578 overcome the limitations of the previous studies, this study considers safety compliance a
579 control variable in predicting safety participation by including a path from safety compliance
580 to safety participation. Consequently, the percentage of variance in safety participation
581 accounted for by the model is higher than in previous safety participation studies. If the model
582 excludes the path from safety compliance and safety participation and renders them
583 correlated, similar to models in previous studies, it explains only 17% of the variance in
584 safety participation.

585 The path analysis results demonstrate a significant path coefficient between
586 transformational leadership and project identification ($\beta = 0.35$, $p = 0.001$). The result
587 supports the hypothesis on the effects of transformational leadership on project identification.
588 Besides, while the path coefficient between transformational leadership and safety
589 compliance is significant ($\beta = 0.30$, $p = 0.045$), the path coefficient between transformational
590 leadership and safety participation is not significant. It implies that the project identification

591 (mediator) partially mediates the relationship between transformational leadership
592 (independent variable) and safety compliance (dependent variable) and fully mediates the
593 relationship between transformational leadership (independent variable) and safety
594 participation (dependent variable). The results also show that communication climate is a
595 significant predictor of project identification ($\beta = 0.49$, $p < 0.001$), supporting the hypothesis
596 on the influence of communication climate on project identification. However, the direct
597 effects of communication climate on safety compliance and safety participation are not
598 statistically significant. Therefore, project identification fully mediates the effect of
599 communication climate on safety compliance and safety participation. In addition,
600 transformational leadership, communication climate, and a control variable (i.e., age)
601 account for 67 percent of the variance in project identification.

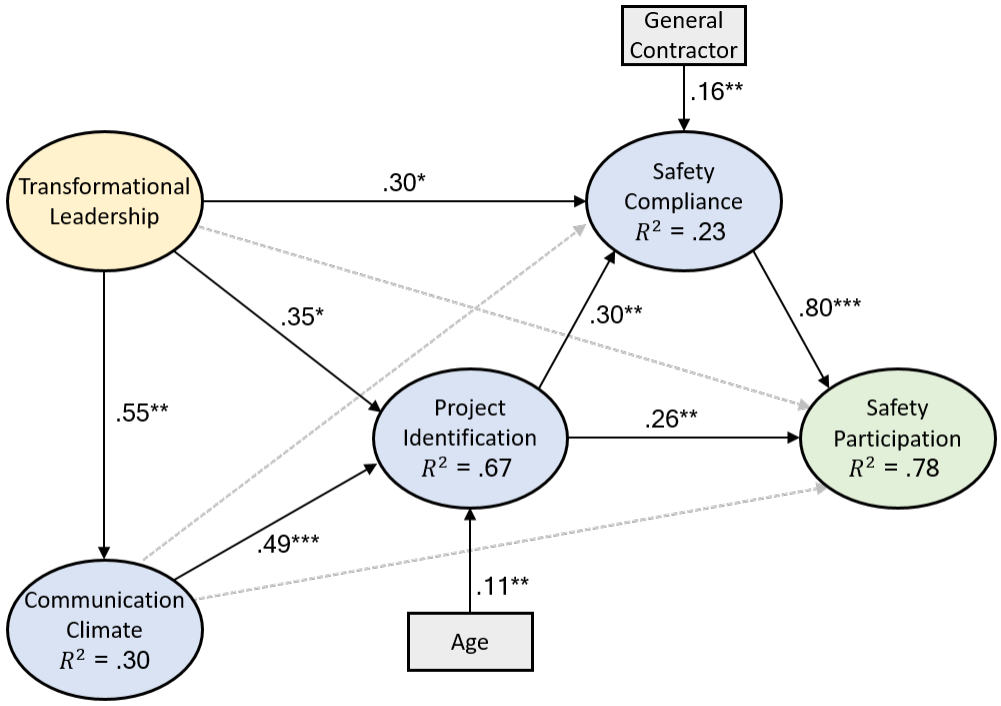

Figure 2

Structural Equation Model of the Psychological Mechanism Underlying Construction Workers' Safety Participation

5. Discussion

5.1 Theoretical and practical applications

This study developed and tested a theoretical model to examine the psychological mechanism of construction workers' safety participation. This study adds support to the growing evidence on the role of the socio-cognitive process in worker safety behaviors. It was found that workers' project identification would mediate the effects of transformational leadership and communication climate on their safety compliance and safety participation. This knowledge of the mediation effect is significant because it allows an understanding of the psychological dynamics through which management factors (i.e., transformational leadership,

615 communication climate) influence safety behaviors (i.e., safety compliance and safety
616 participation) and reduce occupational accidents at construction sites. Previous studies
617 focused on the direct effects of management factors on workers' safety behaviors. This study
618 extends our understanding of safety behaviors by examining the psychological mechanisms
619 driving the link between management factors and safety behaviors. Specifically,
620 understanding safety participation's psychological mechanics is crucial in construction safety
621 given the uncertainty and complexity of construction site work. In this sense, this study found
622 the effects of management factors on safety participation independent from safety
623 compliance because, in the research model, safety compliance was incorporated as an
624 antecedent of safety participation. Although previous studies on safety participation or safety
625 citizenship behaviors included safety compliance in their research model (Griffin and Neal
626 2000, Barbaranelli et al. 2015, Guo et al. 2016), they may not have controlled the shared
627 variance between safety participation and safety compliance as they only allowed safety
628 participation and safety compliance to be correlated (not employed as antecedents). For
629 example, the path coefficient between project identification and safety participation changes
630 from 0.26 to 0.50 if the shared variance was not controlled in the model. Therefore, previous
631 study findings on safety participation factors could be overestimated due to the shared
632 variance between safety compliance and safety participation. In the same vein, previous
633 studies on OCB contended that in-role behaviors should be a control variable in predicting
634 OCB (Williams and Anderson 1991, Walz and Niehoff 2000).

635 Furthermore, this study contributes to existing safety research by examining project
636 identification's role in promoting construction workers' safety participation. Although

637 previous studies in organizational behaviors found that employees' organizational
638 identification could be a psychological driver to facilitate their extra-role actions (Haslam *et*
639 *al.* 2000, Van Knippenberg 2000, Riketta and Dick 2005; Humperhy 2012; Demir 2015; Wu et
640 al. 2016), it has not been investigated in the context of safety behaviors. Furthermore, most
641 previous studies on organizational identification focused on traditional and long-term
642 organizations where the interactions between employees and organizations are assumed to
643 be stable and continuous. However, the transient nature of employment in project-based
644 organizations (e.g., construction projects) makes it challenging to apply findings from
645 previous studies to project-based organizations directly. Even the few studies investigating
646 the role of project identification in shaping employee's vocational behaviors only focused on
647 improving in-role behaviors such as work engagement, turnover, and safety compliance
648 (Walumbwa et al. 2011, Choi et al. 2017b, Ding et al. 2017). As such, the effects of project
649 identification on construction workers' safety participation in this study advance our
650 knowledge of organizational identification and safety participation. Considering many
651 industries are increasingly adopting the project-based organization model, study findings
652 may have impactful implications for a broad array of project-based organizations.

653 Besides, this study extends previous findings on the applicability of transformational
654 leadership and communication climate in different behavioral and organizational contexts by
655 examining leadership and communication behaviors in the context of safety participation in
656 project-based organizations (i.e., construction projects). In line with prior studies examining
657 the relationships between transformational leadership and safety behaviors and between
658 communication climate and safety behaviors in long-term organizations, this study confirms

659 that a transformational leadership and communication climate still affects employees' safety
660 participation and safety compliance in project-based organization settings. Specifically,
661 respondents who perceived higher transformational leadership levels and a positive
662 communication climate are more likely to perform their tasks more safely and put more extra
663 effort into improving safety at their work. As safety compliance and safety participation are
664 essential predictors of safety performance at construction sites, this study suggests that
665 construction site managers should develop transformational leadership. It also provides an
666 important criterion for selecting construction managers and implementing training programs
667 to help them develop an effective leadership style. Construction projects are not favorable
668 conditions for developing transformational leadership. However, recent studies, including
669 this study, have consistently observed the role of transformational leadership in improving
670 construction safety. Consequently, several studies have proposed practical guidance to
671 promote transformational leadership in construction projects. Grill et al. (2019) found that
672 intellectual stimulation is the most frequently observed transformational leadership behavior
673 among construction managers. In practice, intellectual stimulation can be practiced in an
674 interactive problem-solving process. For example, construction managers can practice
675 intellectual stimulation by encouraging workers to become active participants in the problem-
676 solving process. Thus, a positive communication climate would be helpful in developing
677 intellectual stimulation in construction projects. Further, Aga et al. (2014) showed that team
678 building activities can aid in the development of transformational leadership in project-based
679 organizations. Furthermore, this study's findings suggest that managers at construction sites
680 should focus on cultivating a more attractive communication climate. Construction managers

should provide each worker with adequate information and opportunities to speak out and get involved with the decision-making process.

This study contributes to the body of research on organizational identification studies by exploring the multi-dimensional nature of organizational identification in a project-based organization. The existing studies on organizational identification heavily focused on the cognitive aspect of organizational identification (i.e., perception of oneness with or belongingness to an organization) to distinguish it from organizational commitment (Johnson et al. 2012). As a result, little attention was given to the multidimensionality of organizational identification. Social identity scholars have successfully developed a comprehensive conceptualization of social identification with groups (e.g., based on ethnicity, religion, gender, sports team fans, and family), including cognitive (i.e., knowledge of membership), affective (i.e., the emotional significance of membership), and evaluative dimensions (i.e., the value of membership) (Ellemers et al. 1999, Bagozzi and Lee 2002). However, the multi-dimensional nature of organizational identification and its impact on employees' behavior has not been well investigated. A comprehensive conceptualization would be essential for an in-depth understanding of organizational identification because each dimension could be differently associated with its antecedents and consequences (Bergami and Bagozzi 2000, Johnson et al. 2012). Although a few previous studies proposed a multi-dimensional organizational identification model, to the best of the authors' knowledge, no studies focused on project-based organizations. The short-term tenure, along with transactional employment relationships in project-based organizations, may not have the same impact on each dimension of employees' organizational identification. Therefore, the two-dimensional

703 model identified by EFA in this study extends theories on organizational identification by
704 developing a comprehensive conceptualization of organizational identification in project-
705 based organizations.
706
707 **5.2 Limitations**
708 Although this study contributes to advancing our understanding of the psychological
709 mechanism of construction workers' safety participation, several limitations should be
710 acknowledged. First, this study's cross-sectional research design may be limited to explain
711 dynamic relationships among the constructs. Specifically, it is difficult to investigate
712 reciprocal determinism's ramification, which refers to the bidirectional influence between
713 variables in cross-sectional studies. Although cross-sectional research design has been
714 widely adopted in safety research, longitudinal studies could clarify the causal relationships.
715 Second, since a self-reported questionnaire measures this study's manifest variables, it may
716 induce the possibility that common method bias dilutes the results' theoretical significance.
717 Due to the concerns about the common method bias, this study followed Podsakoff et al.
718 (2003)’s single unmeasured latent factor method factor to test whether the bias would explain
719 the relationship among the study constructs. Specifically, an additional, unmeasured latent
720 method factor was added to the CFA model. Then, all manifest variables were allowed to
721 load on their theoretical latent variable and method factor. The factor loadings and correlation
722 coefficients among the latent variables remain virtually unchanged after including the
723 method factor. The results indicated that the common method bias might not attenuate the
724 significance of this study's findings. Furthermore, Christian et al. (2009) has suggested that

"common method bias may not be a major concern in safety domain" (p. 1122) based on the meta-analysis results of 90 studies.

6. Conclusion

This study incorporated transformational leadership, communication climate, and project identification to build and test a research model regarding construction workers' safety participation. The results of hypothesis testing suggest that (1) project identification has a positive impact on safety participation after controlling the effects of safety compliance, (2) project identification mediates the relationship between transformational leadership and safety participation, and (3) project identification mediates the influence of communication climate on safety participation. These findings deepened and extended prior research on safety behaviors and organizational identification by clarifying the mechanism that underlies the link between management factors and safety participation. Also, the study results suggest new directions for safety management in project-based organizations. Since the behavioral changes driven by organizational identification involve a process of genuine internalization, improving safety participation as well as safety compliance through project identification would be more durable and cost-effective compared with management reliance on formal approaches such as regulations and penalties. Therefore, cultivating transformational leadership and a positive communication climate to promote workers' project identification would be effective approaches to complement formal control limitations in safety management.

Appendix A. Measurement Items in this Study

Construct	Indicator	Item
Transformational Leadership	TL1	Managers on this project emphasize the importance of having a collective sense of mission.
	TL2	Managers on this project talk enthusiastically about what needs to be accomplished.
	TL3	Managers on this project reexamine critical assumptions to question whether they are appropriate.
Communication Climate	CC1	Managers on this project are open and honest towards me.
	CC2	Managers on this project pay attention to employees' suggestions.
	CC3	In this project, I have ample opportunity to have my say.
Cognitive & Affective Project Identification	CAP1	Being a member of this project is an important part of who I am.
	CAP2	My self-image overlaps with this project's image.
	CAP3	I am happy to be a member of this project.
	CAP4	I feel a strong sense of belonging to this project.
	CAP5	I like being a member of this project.
	CAP6	To me, being a member of this project is an important source of self-esteem.
Evaluative & Behavioral Project Identification	EBP1	I am a valuable member of this project.
	EBP2	I am an important member of this project.
	EBP3	Members of this project can always count on each other.
	EBP4	
Safety Compliance	SC1	I use the correct safety procedures for carrying out my job.
	SC2	I ensure the highest levels of safety when I carry out my job.
	SC3	I use all the necessary safety equipment (e.g., personal protective equipment) to do my job.
Safety Participation	SP1	I voluntarily carry out tasks or activities that help to improve workplace safety.
	SP2	I help my coworkers when they are working under risky or hazardous conditions.
	SP3	I promote the safety program within this project.

References

Abu Bakar, H., Mccann, R.M., 2015. The mediating effect of leader–member dyadic communication style agreement on the relationship between servant leadership and group-level organizational citizenship behavior. Management Communication Quarterly 30 (1), 32-58.

Aga, D. A., Noorderhaven, N., & Vallejo, B. (2016). Transformational leadership and

project success: The mediating role of team-building. International Journal of Project Management, 34(5), 806-818. doi:https://doi.org/10.1016/j.ijproman.2016.02.012

Akerlof, G. A. and Kranton, R. E. (2005). "Identity and the Economics of Organizations." Journal of Economic perspectives, 9-32.Andersen, L.P., Karlsen, I.L., Kines, P., Joensson, T., Nielsen, K.J., 2015. Social identity in the construction industry: Implications for safety perception and behaviour. Construction Management and Economics 33 (8), 640-652.

Andersen, L.P., Nørdam, L., Joensson, T., Kines, P., Nielsen, K.J., 2018. Social identity, safety climate and self-reported accidents among construction workers. Construction Management and Economics 36 (1), 22-31.

Ashforth, B.E., Mael, F., 1989. Social identity theory and the organization. Academy of Management Review 14 (1), 20-39.

Bagozzi, R., Yi, Y., 1988. On the evaluation of structural equation models. Journal of the Academy of Marketing Science 16 (1), 74-94.

Bagozzi, R., Yi, Y., 2012. Specification, evaluation, and interpretation of structural equation models. Journal of the Academy of Marketing Science 40 (1), 8-34.

Bagozzi, R.P., Lee, K.-H., 2002. Multiple routes for social influence: The role of compliance, internalization, and social identity. Social Psychology Quarterly, 226-247.

Barbaranelli, C., Petitta, L., Probst, T.M., 2015. Does safety climate predict safety performance in italy and the USA? Cross-cultural validation of a theoretical model

of safety climate. Accident Analysis & Prevention 77, 35-44.

Bartels, J., Douwes, R., De Jong, M., Pruyn, A., 2006. Organizational identification during a merger: Determinants of employees' expected identification with the new organization*. British Journal of Management 17 (S1), S49-S67.

Bartels, J., Peters, O., De Jong, M., Pruyn, A., Van Der Molen, M., 2010. Horizontal and vertical communication as determinants of professional and organisational identification. Personnel Review 39 (2), 210-226.

Bartels, J., Pruyn, A., De Jong, M., Joustra, I., 2007. Multiple organizational identification levels and the impact of perceived external prestige and communication climate. Journal of Organizational Behavior 28 (2), 173-190.

Bass, B.M., Avolio, B.J., 1994. Improving organizational effectiveness through transformational leadership Sage.

Bass, B.M., Bass Bernard, M., 1985. Leadership and performance beyond expectations.

Bergami, M., Bagozzi, R.P., 2000. Self-categorization, affective commitment and group self-esteem as distinct aspects of social identity in the organization. British Journal of Social Psychology 39 (4), 555-577.

Buil, I., Martínez, E., Matute, J., 2019. Transformational leadership and employee performance: The role of identification, engagement and proactive personality. International Journal of Hospitality Management 77, 64-75.

Cameron, J.E., 2004. A three-factor model of social identity. Self and Identity 3 (3), 239-262.

Chan, S.H.J., Lai, H.Y.I., 2017. Understanding the link between communication

799 satisfaction, perceived justice and organizational citizenship behavior. Journal of
800 Business Research 70, 214-223.
801 Cho, J., Dansereau, F., 2010. Are transformational leaders fair? A multi-level study of
802 transformational leadership, justice perceptions, and organizational citizenship
803 behaviors. The Leadership Quarterly 21 (3), 409-421.
804 Choi, B., Ahn, S., Lee, S., 2017a. Construction workers' group norms and personal
805 standards regarding safety behavior: Social identity theory perspective. Journal of
806 Management in Engineering, 04017001.
807 Choi, B., Ahn, S., Lee, S., 2017b. Role of social norms and social identifications in safety
808 behavior of construction workers. I: Theoretical model of safety behavior under
809 social influence. Journal of Construction Engineering and Management, 04016124.
810 Choi, B., Lee, S., 2017. An empirically based agent-based model of the sociocognitive
811 process of construction workers' safety behavior. Journal of Construction
812 Engineering and Management 144 (2), 04017102.
813 Choudhry, R.M., Fang, D., 2008. Why operatives engage in unsafe work behavior:
814 Investigating factors on construction sites. Safety Science 46 (4), 566-584.
815 Christian, M.S., Bradley, J.C., Wallace, J.C., Burke, M.J., 2009. Workplace safety: A meta-
816 analysis of the roles of person and situation factors. Journal of Applied Psychology
817 94 (5), 1103-1172.
818 Cigularov, K.P., Chen, P.Y., Rosecrance, J., 2010. The effects of error management climate
819 and safety communication on safety: A multi-level study. Accident Analysis &
820 Prevention 42 (5), 1498-1506.

Clarke, S., 2006. The relationship between safety climate and safety performance: A meta-analytic review. Journal of occupational health psychology 11 (4), 315-327.

Clarke, S., 2013. Safety leadership: A meta-analytic review of transformational and transactional leadership styles as antecedents of safety behaviours. Journal of Occupational and Organizational Psychology 86 (1), 22-49.

Clarke, S., Ward, K., 2006. The role of leader influence tactics and safety climate in engaging employees' safety participation. Risk Analysis 26 (5), 1175-1185.

Cooper, M.D., Phillips, R.A., 2004. Exploratory analysis of the safety climate and safety behavior relationship. Journal of Safety Research 35 (5), 497-512.

Courtney, M., Gordon, R., 2013. Determining the number of factors to retain in efa: Using the spss r-menu v2 0 to make more judicious estimations. Practical Assessment, Research, and Evaluation 18 (1), 8.

Cregan, C., Bartram, T., Stanton, P., 2009. Union organizing as a mobilizing strategy: The impact of social identity and transformational leadership on the collectivism of union members. British Journal of Industrial Relations 47 (4), 701-722.

Deluga, R.J., 1995. The relationship between attributional charismatic leadership and organizational citizenship behavior. Journal of Applied Social Psychology 25 (18), 1652-1669.

Demir, K. (2015). The effect of organizational justice and perceived organizational support on organizational citizenship behaviors: The mediating role of organizational ıdentification. Eurasian Journal of Educational Research, 60, 131- 148. Doi: 10.14689/ejer.2015.60.8

Dennis, H.S., 1974. A theoretical and empirical study of managerial communication climate in complex organizations. Purdue Univeristy

Ding, X., Li, Q., Zhang, H., Sheng, Z., Wang, Z., 2017. Linking transformational leadership and work outcomes in temporary organizations: A social identity approach. International Journal of Project Management 35 (4), 543-556.

Ellemers, N., De Gilder, D., Haslam, S.A., 2004. Motivating individuals and groups at work: A social identity perspective on leadership and group performance. Academy of Management Review 29 (3), 459-478.

Ellemers, N., Kortekaas, P., Ouwerkerk, J.W., 1999. Self-categorisation, commitment to the group and group self-esteem as related but distinct aspects of social identity. European journal of social psychology 29 (23), 371-389.

Fang, D., Wu, C., Wu, H., 2015. Impact of the supervisor on worker safety behavior in construction projects. Journal of Management in Engineering 31 (6), 04015001.

Fang, D., Zhao, C., Zhang, M., 2016. A cognitive model of construction workers' unsafe behaviors. Journal of Construction Engineering and Management 142 (9), 04016039.

Fang, S. and L. Zhang (2021). "Effect of social identification on ego depletion of project managers: The role of project tasks and project complexity." International Journal of Project Management, online published manuscript.

Fugas, C.S., Meliá, J.L., Silva, S.A., 2011. The "is" and the "ought": How do perceived social norms influence safety behaviors at work? Journal of occupational health psychology 16 (1), 67.

865 Fugas, C.S., Silva, S.A., Meliá, J.L., 2012. Another look at safety climate and safety
866 behavior: Deepening the cognitive and social mediator mechanisms. Accident
867 Analysis & Prevention 45 (0), 468-477.
868 Fung, I.W.H., Tam, V.W.Y., 2013. Occupational health and safety of older construction
869 workers (aged 55 or above): Their difficulties, needs, behaviour and suitability.
870 International Journal of Construction Management 13 (3), 15-34.
871 Gillen, M., Baltz, D., Gassel, M., Kirsch, L., Vaccaro, D., 2002. Perceived safety climate,
872 job demands, and coworker support among union and nonunion injured construction
873 workers. Journal of Safety Research 33 (1), 33-51.
874 Glendon, A.I., Litherland, D.K., 2001. Safety climate factors, group differences and safety
875 behaviour in road construction. Safety Science 39 (3), 157-188.
876 Griffin, M.A., Hu, X., 2013. How leaders differentially motivate safety compliance and
877 safety participation: The role of monitoring, inspiring, and learning. Safety Science
878 60, 196-202.
879 Griffin, M.A., Neal, A., 2000. Perceptions of safety at work: A framework for linking
880 safety climate to safety performance, knowledge, and motivation. Journal of
881 occupational health psychology 5 (3), 347.
882 Grill, M., Nielsen, K., Grytnes, R., Pousette, A., & Törner, M. (2019) The leadership
883 practices of construction site managers and their influence on occupational safety:
884 an observational study of transformational and passive/avoidant leadership,
885 Construction Management and Economics, 37:5, 278-293, DOI:
886 10.1080/01446193.2018.1526388

887 Grill, M., Pousette, A., Nielsen, K., Grytnes, R., Törner, M., 2017. Safety leadership at
888 construction sites: The importance of rule-oriented and participative leadership.
889 Scandinavian Journal of Work, Environment & Health (4), 375-384.
890 Guo, B.H.W., Yiu, T.W., González, V.A., 2016. Predicting safety behavior in the
891 construction industry: Development and test of an integrative model. Safety Science
892 84, 1-11.
893 Hair, J.F., Tatham, R.L., Anderson, R.E., Black, W., 2006. Multivariate data analysis
894 Pearson Prentice Hall Upper Saddle River, NJ.
895 Hasanzadeh, S., Dao, B., Esmaeili, B., Dodd, M.D., 2019. Role of personality in
896 construction safety: Investigating the relationships between personality, attentional
897 failure, and hazard identification under fall-hazard conditions. Journal of
898 Construction Engineering and Management 145 (9), 04019052.
899 Hasanzadeh, S., Esmaeili, B., Dodd, M.D., 2017. Measuring the impacts of safety
900 knowledge on construction workers' attentional allocation and hazard detection
901 using remote eye-tracking technology. Journal of Management in Engineering 33
902 (5), 04017024.
903 Haslam, S.A., Powell, C., Turner, J., 2000. Social identity, self-categorization, and work
904 motivation: Rethinking the contribution of the group to positive and sustainable
905 organisational outcomes. Applied Psychology 49 (3), 319-339.
906 Haslam, S. A., Van Knippenberg, D., Platow, M. J. and Ellemers, N. (2014). Social Identity
907 at Work: Developing Theory for Organizational Practice, Psychology Press, New
908 York, NY.Hoffmeister, K., Gibbons, A.M., Johnson, S.K., Cigularov, K.P., Chen,

P.Y., Rosecrance, J.C., 2014. The differential effects of transformational leadership facets on employee safety. Safety Science 62, 68-78.

Hofmann, D.A., Morgeson, F.P., Gerras, S.J., 2003. Climate as a moderator of the relationship between leader-member exchange and content specific citizenship: Safety climate as an exemplar. Journal of Applied Psychology 88 (1), 170-178.

Hogg, M.A., 2001. A social identity theory of leadership. Personality and Social Psychology Review 5 (3), 184-200.

Hogg, M.A., Reid, S.A., 2006. Social identity, self-categorization, and the communication of group norms. Communication Theory 16 (1), 7-30.

Hogg, M. A. and Smith, J. R. (2007). "Attitudes in Social Context: A Social Identity Perspective." European Review of Social Psychology, 18(1), 89-131.

Hogg, M.A., Terry, D.I., 2000. Social identity and self-categorization processes in organizational contexts. Academy of management review 25 (1), 121-140.

Hu, L.T., Bentler, P.M., 1999. Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. Structural Equation Modeling: A Multidisciplinary Journal 6 (1), 1-55.

Huang, Y.-H., Sinclair, R.R., Lee, J., Mcfadden, A.C., Cheung, J.H., Murphy, L.A., 2018. Does talking the talk matter? Effects of supervisor safety communication and safety climate on long-haul truckers' safety performance. Accident Analysis & Prevention 117, 357-367.

Humphrey, A., 2012. Transformational leadership and organizational citizenship behaviors: The role of organizational identification. The Psychologist-Manager Journal 15 (4),

247-268.

International Labor Organization (ILO), 2020, Cases of Fatal Occupational Injury by Economic Activity - Annual, https://www.ilo.org/shinyapps/bulkexplorer42/?lang=en&segment=indicator&id=INJ_FATL_ECO_NB_A (Feburary 10, 2021)

Ishak, N.A., Alam, S.S., 2009. The effects of leader-member exchange on organizational justice and organizational citizenship behavior: Empirical study. European Journal of Social Sciences 8 (2), 324-334.

Jackson, J.W., 2002. Intergroup attitudes as a function of different dimensions of group identification and perceived intergroup conflict. Self and identity 1 (1), 11-33.

Jiang, L., Li, F., Li, Y., Li, R., 2017. Leader-member exchange and safety citizenship behavior: The mediating role of coworker trust. Work 56, 387-395.

Jiang, L., Yu, G., Li, Y., Li, F., 2010. Perceived colleagues' safety knowledge/behavior and safety performance: Safety climate as a moderator in a multilevel study. Accident Analysis & Prevention 42 (5), 1468-1476.

Johnson, M.D., Morgeson, F.P., Hekman, D.R., 2012. Cognitive and affective identification: Exploring the links between different forms of social identification and personality with work attitudes and behavior. Journal of Organizational Behavior 33 (8), 1142-1167.

Johnson, M.D., Morgeson, F.P., Ilgen, D.R., Meyer, C.J., Lloyd, J.W., 2006. Multiple professional identities: Examining differences in identification across work-related targets. Journal of Applied Psychology 91 (2), 498-506.

953 Kark, R., Shamir, B., Chen, G., 2003. The two faces of transformational leadership:
954 Empowerment and dependency. Journal of Applied Psychology 88 (2), 246-255.
955 Kines, P., Andersen, L.P., Spangenberg, S., Mikkelsen, K.L., Dyreborg, J., Zohar, D.,
956 2010a. Improving construction site safety through leader-based verbal safety
957 communication. Journal of Safety Research 41 (5), 399-406.
958 Kines, P., Andersen, L.P.S., Spangenberg, S., Mikkelsen, K.L., Dyreborg, J., Zohar, D.,
959 2010b. Improving construction site safety through leader-based verbal safety
960 communication. Journal of Safety Research 41 (5), 399-406.
961 Korean Statistical Information Service (KOSIS), 2020, Number and rate of occupational
962 incidents by industry, Ministry of Employment and Labor,
963 http://kosis.kr/statHtml/statHtml.do?orgId=118&tblId=DT_11806_N000&conn_pat
964 h=I3 (Feburary 10, 2021)
965 Lee, G., Choi, B., Jebelli, H., and Lee, S., 2021, Assessment of construction workers'
966 perceived risk using physiological data from wearable sensors: A machine learning
967 approach, Jounral of Building Engineering, 42 (2021), 102824
968 López-Domínguez, M., Enache, M., Sallan, J.M., Simo, P., 2013. Transformational
969 leadership as an antecedent of change-oriented organizational citizenship behavior.
970 Journal of Business Research 66 (10), 2147-2152.
971 Liang, H., Lin, K.-Y., Zhang, S., 2018. Understanding the social contagion effect of safety
972 violations within a construction crew: A hybrid approach using system dynamics
973 and agent-based modeling. International Journal of Environmental Research and
974 Public Health 15 (12), 2696.

975 Lingard, H., 2002. The effect of first aid training on australian construction workers'
976 occupational health and safety motivation and risk control behavior. Journal of
977 Safety Research 33 (2), 209-230.
978 Lingard, H., Cooke, T. and Blismas, N. (2011). "Coworkers' Response to Occupational
979 Health and Safety: An Overlooked Dimension of Group-Level Safety Climate in the
980 Construction Industry?" Engineering, construction and architectural management,
981 18(2), 159-175.Liu, Q., Xu, N., Jiang, H., Wang, S., Wang, W., Wang, J., 2020.
982 Psychological driving mechanism of safety citizenship behaviors of construction
983 workers: Application of the theory of planned behavior and norm activation model.
984 Journal of Construction Engineering and Management 146 (4), 04020027.
985 Liu, Y., Ye, L., Guo, M., 2019. The influence of occupational calling on safety
986 performance among train drivers: The role of work engagement and perceived
987 organizational support. Safety Science 120, 374-382.
988 Mael, F., Ashforth, B.E., 1992. Alumni and their alma mater: A partial test of the
989 reformulated model of organizational identification. Journal of organizational
990 Behavior 13 (2), 103-123.
991 Mashi, M.S., Subramaniam, C., Johari, J., 2020. The effect of management commitment to
992 safety, and safety communication and feedback on safety behavior of nurses: The
993 moderating role of consideration of future safety consequences. The International
994 Journal of Human Resource Management 31 (20), 2565-2594.
995 Men, L. R. (2014) Why Leadership Matters to Internal Communication: Linking
996 Transformational Leadership, Symmetrical Communication, and Employee

997 Outcomes, Journal of Public Relations Research, 26:3, 256-279, DOI:
998 10.1080/1062726X.2014.908719
999 Moorman, R.H., Niehoff, B.P., Organ, D.W., 1993. Treating employees fairly and
1000 organizational citizenship behavior: Sorting the effects of job satisfaction,
1001 organizational commitment, and procedural justice. Employee Responsibilities and
1002 Rights Journal 6 (3), 209-225.
1003 Moriano, J.A., Molero, F., Topa, G., Lévy Mangin, J.-P., 2014. The influence of
1004 transformational leadership and organizational identification on intrapreneurship.
1005 International Entrepreneurship and Management Journal 10 (1), 103-119.
1006 Morrison, E.W., 1994. Role definitions and organizational citizenship behavior: The
1007 importance of the employee's perspective. Academy of Management Journal 37 (6),
1008 1543-1567.
1009 Nakra, R., 2006. Relationship between communication satisfaction and organizational
1010 identification: An empirical study. Vision: The Journal of Business Perspective 10
1011 (2), 41-51.
1012 Namian, M., Albert, A., Zuluaga, C.M., Behm, M., 2016. Role of safety training: Impact on
1013 hazard recognition and safety risk perception. Journal of Construction Engineering
1014 and Management 142 (12), 04016073.
1015 Neal, A., Griffin, M.A., 2006. A study of the lagged relationships among safety climate,
1016 safety motivation, safety behavior, and accidents at the individual and group levels.
1017 Journal of applied psychology 91 (4), 946.
1018 Neal, A., Griffin, M.A., Hart, P.M., 2000. The impact of organizational climate on safety

climate and individual behavior. Safety Science 34 (1–3), 99-109.

Neff, T. J., Citrin, J. M., & Brown, P. B. (1999). Lessons from the top: The search for America's best business leaders. Broadway Business.

Neill Marlene, S., Men Linjuan, R., Yue Cen, A., 2019. How communication climate and organizational identification impact change. Corporate Communications: An International Journal 25 (2), 281-298.

Organ, D.W., 1988. Organizational citizenship behavior: The good soldier syndrome Lexington Books/D. C. Heath and Com, Lexington, MA, England.

Peters, K., Haslam, S. A., Ryan, M. K. and Fonseca, M. (2013). "Working with Subgroup Identities to Build Organizational Identification and Support for Organizational Strategy: A Test of the Aspire Model." Group & Organization Management 38(1), 128-144.

Podsakoff, P.M., Mackenzie, S.B., Lee, J.-Y., Podsakoff, N.P., 2003. Common method biases in behavioral research: A critical review of the literature and recommended remedies. Journal of Applied Psychology 88 (5), 879-903.

Podsakoff, P.M., Mackenzie, S.B., Moorman, R.H., Fetter, R., 1990. Transformational leader behaviors and their effects on followers' trust in leader, satisfaction, and organizational citizenship behaviors. The Leadership Quarterly 1 (2), 107-142.

Postmes T, Tanis M, de Wit B. (2021) "Communication and Commitment in Organizations: A Social Identity Approach" Group Processes & Intergroup Relations. 4(3), 227-246.Ramsey, L. R., Betz, D. E. and Sekaquaptewa, D. (2013). "The Effects of an Academic Environment Intervention on Science Identification among Women in

Stem." Social Psychology of Education, 16(3), 377-397.

Riketta, M., Dick, R.V., 2005. Foci of attachment in organizations: A meta-analytic comparison of the strength and correlates of workgroup versus organizational identification and commitment. Journal of Vocational Behavior 67 (3), 490-510.

Rogers, D.P., 1987. Relationships between communication climate variables and organizational commitment: The case of a food processing plant. Academy of Management Proceedings 1987 (1), 230-234.

Ruscio, J., Roche, B., 2012. Determining the number of factors to retain in an exploratory factor analysis using comparison data of known factorial structure. Psychological Assessment 24 (2), 282-292.

Schnake, M., 1991. Organizational citizenship: A review, proposed model, and research agenda. Human Relations 44 (7), 735-759.

Scott, C.R., Connaughton, S.L., Diaz-Saenz, H.R., Maguire, K., Ramirez, R., Richardson, B., Shaw, S.P., Morgan, D., 1999. The impacts of communication and multiple identifications on intent to leave: A multimethodological exploration. Management Communication Quarterly 12 (3), 400-435.

Sheehan, C., Donohue, R., Shea, T., Cooper, B., Cieri, H.D., 2016. Leading and lagging indicators of occupational health and safety: The moderating role of safety leadership. Accident Analysis & Prevention 92, 130-138.

Shuang, D., Heng, L., Skitmore, M., Qin, Y., 2019. An experimental study of intrusion behaviors on construction sites: The role of age and gender. Safety Science 115, 425-434.

1063 Siu, O.-L., Phillips, D.R., Leung, T.-W., 2004. Safety climate and safety performance
1064 among construction workers in hong kong: The role of psychological strains as
1065 mediators. Accident Analysis & Prevention 36 (3), 359-366.
1066 Smidts, A., Ad Th, H.P., Cees, B.M.V.R., 2001. The impact of employee communication
1067 and perceived external prestige on organizational identification. The Academy of
1068 Management Journal 44 (5), 1051-1062.
1069 Sun, C., Ahn, S., Ahn Changbum, R., 2020. Identifying workers' safety behavior–related
1070 personality by sensing. Journal of Construction Engineering and Management 146
1071 (7), 04020078.
1072 Tajfel, H., 1972, Social categorization (English translation of "La cat6gorisation sociale").
1073 In S. Moscovici (Ed.), *Introduction a la psychologie sociale,* vol. 1: 272-302. Paris:
1074 Larousse.
1075 Tajfel, H., 1978. Differentiation between social groups: Studies in the social psychology of
1076 intergroup relations Published in cooperation with European Association of
1077 Experimental Social Psychology by Academic Press, London ; New York.
1078 Terry, D.J., Hogg, M.A., White, K.M., 1999. The theory of planned behaviour: Self-
1079 identity, social identity and group norms. British Journal of Social Psychology 38
1080 (3), 225-244.
1081 Tse, H.H.M., Chiu, W.C.K., 2014. Transformational leadership and job performance: A
1082 social identity perspective. Journal of Business Research 67 (1), 2827-2835.
1083 Tufan, P., Wendt, H., 2020. Organizational identification as a mediator for the effects of
1084 psychological contract breaches on organizational citizenship behavior: Insights

from the perspective of ethnic minority employees. European Management Journal 38 (1), 179-190.Van Dick, R., Grojean, M.W., Christ, O., Wieseke, J., 2006. Identity and the extra mile: Relationships between organizational identification and organizational citizenship behaviour. British Journal of Management 17 (4), 283-301.

Van Dick, R., Wagner, U., Stellmacher, J., Christ, O., 2004. The utility of a broader conceptualization of organizational identification: Which aspects really matter? Journal of Occupational and Organizational Psychology 77 (2), 171-191.

Van Knippenberg, D., 2000. Work motivation and performance: A social identity perspective. Applied Psychology 49 (3), 357-371.

Velicer, W.F., 1976. Determining the number of components from the matrix of partial correlations. Psychometrika 41 (3), 321-327.

Vinodkumar, M.N., Bhasi, M., 2010. Safety management practices and safety behaviour: Assessing the mediating role of safety knowledge and motivation. Accident Analysis & Prevention 42 (6), 2082-2093.

Walumbwa, F.O., Avolio, B.J., Zhu, W., 2008. How transformational leadership weaves its influence on individual job performance: The role of identification and efficacy beliefs. Personnel Psychology 61 (4), 793-825.

Walumbwa, F.O., Mayer, D.M., Wang, P., Wang, H., Workman, K., Christensen, A.L., 2011. Linking ethical leadership to employee performance: The roles of leader–member exchange, self-efficacy, and organizational identification. Organizational Behavior and Human Decision Processes 115 (2), 204-213.

Walz, S.M., Niehoff, B.P., 2000. Organizational citizenship behaviors: Their relationship to organizational effectiveness. Journal of Hospitality & Tourism Research 24 (3), 301-319.

Wan, X., Li, Q., Yuan, J., Schonfeld, P.M., 2015. Metro passenger behaviors and their relations to metro incident involvement. Accident Analysis & Prevention 82, 90-100.

Wang, D., Wang, X., Griffin, M.A., Wang, Z., 2020. Safety stressors, safety-specific trust, and safety citizenship behavior: A contingency perspective. Accident Analysis & Prevention 142, 105572.

Wang, H., Law, K.S., Hackett, R.D., Wang, D., Chen, Z.X., 2005. Leader-member exchange as a mediator of the relationship between transformational leadership and followers' performance and organizational citizenship behavior. Academy of Management Journal 48 (3), 420-432.

Williams, L.J., Anderson, S.E., 1991. Job satisfaction and organizational commitment as predictors of organizational citizenship and in-role behaviors. Journal of Management 17 (3), 601-617.

Wu, C.-H., Liu, J., Kwan, H. K., & Lee, C. (2016). Why and when workplace ostracism inhibits organizational citizenship behaviors: An organizational identification perspective. Journal of Applied Psychology, 101(3), 362–378. https://doi.org/10.1037/apl0000063

Xia, N., Tang, Y., Li, D., and Pan, A. (2021). Safety Behavior among Construction Workers: Influences of Personality and Leadership. Journal of Construction

Engineering and Management, 147(4), 04021019.

Ye, G., Yue, H., Yang, J., Li, H., Xiang, Q., Fu, Y., Cui, C., 2020. Understanding the sociocognitive process of construction workers' unsafe behaviors: An agent-based modeling approach. International Journal of Environmental Research and Public Health 17 (5), 1588.

Zhang, L., Liu, Q., Wu, X., Skibniewski, M., 2016. Perceiving interactions on construction safety behaviors: Workers' perspective. Journal of Management in Engineering 32 (5), 04016012.

Zhang, P., Li, N., Jiang, Z., Fang, D., Anumba, C.J., 2019. An agent-based modeling approach for understanding the effect of worker-management interactions on construction workers' safety-related behaviors. Automation in Construction 97, 29-43.

Zohar D, Tenne-Gazit O. (2008) Transformational leadership and group interaction as climate antecedents: a social network analysis. Journal of Applied Psychology, 93(4):744-57. DOI: 10.1037/0021-9010.93.4.744.