



# Understanding safety culture and safety citizenship through the lens of social identity theory

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## ABSTRACT

There is considerable overlap between the concepts of culture and social identity. Here, in the context of organisational safety culture, we investigate the extent to which social identity processes can inform our understanding of organisational culture on safety citizenship behaviour. We test this relationship via two different social identity processes: (1) individuals' organisational identity (a classically individual-level conceptualisation of social identity); and (2) individuals' perceptions of others' organisational identities (*meta-identity*; a social identity framing of culture). Safety culture survey data from 1,427 air traffic workers were analysed using a simple holdout cross-validation approach for model testing. We find that both identity processes mediate the link between safety culture and safety behaviour. The data also demonstrate that the strength of indirect effect of safety culture on safety citizenship via *meta-identity* is stronger with increasing levels of organisational identity. Moving forward, safety culture research and interventions may benefit from taking a social identity lens to understanding their culture (e.g. developing identity for safety and safe practice), which has implications for safety behaviour. Consideration of *meta-identity* has implications for behaviour change initiatives, as individuals who perceive strong group commitment in other group members may be more influenced by interventions that leverage group norms.

## 1. Introduction

Organisations in safety-critical industries (e.g. oil and gas, air traffic control, healthcare) often refer to *safety culture* — a concept used to describe the shared attitudes, values, and perceptions towards safety that are held by individuals within the organisation (Choudhry et al., 2007; Cooper, 2000; Hale, 2000; Pidgeon, 1998). Where beliefs and activities in relation to safety are shared and positive, safety culture is considered 'strong', and to indicate a reduced likelihood of safety mishaps. Conversely, fragmented and negative perceptions indicate a 'weak' safety culture, and an increased susceptibility to accidents (Clarke, 2000; Guldenmund, 2000; Health and Safety Commission, 1993; Singer et al., 2009). Indeed, safety culture is often referred to as a *leading indicator* (Choudhry et al., 2007; Xu et al., 2021) or a *distal antecedent* of safety (Beus et al., 2016), where safety culture has an indirect effect on accidents/injuries via safety-related behaviours (Zohar, 2003).

We note a great deal has been written on safety culture as distinct from safety *climate* – climate typically refers to *what* happens in the

organisation and what individuals can actually see (e.g. policies, practices, and procedures), whereas culture helps to understand *why* these things happen in the organisation (e.g. fundamental ideologies, assumptions, symbolic interpretations of organisational events). For example, safety climate is understood to reflect the surface features of the safety culture at a given point in time (Zohar, 2010), and is generally conceptualised as a narrower and more dynamic concept than safety culture (DeJoy, 2005; Guldenmund, 2007). Safety culture, however, covers a wider range of concepts – including teamwork, leadership, communication, learning, and 'just culture' (Sammer et al., 2010) – and reflects more stable norms, values, and practices that influence safety (Bisbey et al., 2021). While safety climate and safety culture share overlapping methodologies (e.g. surveys) and the focus on organisation's prioritisation of safety (Clarke, 1999; Cooper, 2000; Guldenmund, 2000), it is now generally acknowledged that an appreciation for both climate and culture are needed in order to "see the whole elephant" when examining organisations (Schneider et al., 2017).

The value in understanding an organisation's safety culture is ultimately for influencing worker behaviour to reduce or avoid incidents.

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Worker behaviour is thought to be responsible for approximately 85% of accidents (Choudhry & Fang, 2008; Heinrich, Petersen, Roos, Brown, & Hazlett, 1980; Suraji et al., 2001), which explains the historical increase in behaviour-based safety programs that aim to improve workers' safety attitudes and behaviour (Chen & Jin, 2013; Fang et al., 2015; Seo, 2005). Indeed, workers' safety attitudes and behaviour are influenced by the surrounding culture and group dynamics (e.g. norms, values, attitudes) for safety (Choi & Lee, 2016; Glendon & Litherland, 2001; Jiang et al., 2014). Other studies have also linked workers' safety behaviour with their perceptions of organisational policies, procedures, and practices (Clarke & Ward, 2006; Mohamed, 2002; Neal et al., 2000; Zhang et al., 2016; Zohar, 1980), and by their perceptions of safety norms (Brondino et al., 2012; Choi, Ahn, & Lee, 2015; Goh & Binte Sa'adon, 2015; Zhang & Fang, 2013). Attempts to consolidate and model the safety literature – for example by Beus and colleagues (2016) – have led to the conclusion that safety culture and climate are key antecedents of safety behaviour.

Safety citizenship behaviours (SCBs) are a specific form of safety behaviour, and refer to discretionary and prosocial safety behaviours (e.g. reporting safety incidents, potential safety improvements) that are important for managing risk and safety management (Conchie & Donald, 2009; Hofman et al., 2003). Although SCBs, by their very nature, are often unrewarded and optional for employees, organisations rely on them for preventing safety problems, and improving operations (DeJoy et al., 2010; Didla et al., 2009).

Recent theoretical advances now consider at least two forms of safety citizenship behaviour: (1) change-oriented behaviours, typically for initiating organisational or system change, and; (2) affiliative-oriented behaviours, typically for helping and protecting individuals. This dichotomy has been adopted by a number of authors (Belschak & Hartog, 2010; Conchie, 2013; Curcuruto et al., 2015; Curcuruto & Griffin, 2018; Curcuruto et al., 2019; Qiang et al., 2020) and is now the dominant view in the field. There are several mechanisms or key determinants of employee engagement in SCBs, for example, psychological ownership of safety promotion (Curcuruto et al., 2016; Gagné & Deci, 2005; Parker et al., 2010; Pierce et al., 2009), affective commitment to others (Ribeiro et al., 2021), perceived control (Frese & Fay, 2001; Parker et al., 2010), and anticipation orientation (Hollnagel et al., 2012; Weick & Sutcliffe, 2007).

While there may be motivational and individual difference factors at play (see above), there is also a demonstrable effect of organisational safety culture on SCBs too. Typically, organisations have relied on a strong safety culture or climate to engender SCBs, with strong and positive values for safety within an organisation. Oil and gas organisations with positive safety cultures observed more safety citizenship participation in their workers (Didla et al., 2009). This phenomenon is also observed in coal mines, where safety climate positively affects safety citizenship behaviour, but that this can only occur when mine sites have cultures for improving the climate (Xuesheng & Xintao, 2011). Furthermore, safety culture, as viewed through colleagues' safety norms (e.g. supervisor injunctive safety norms, co-worker descriptive safety norms), is important for proactive safety practices — safety norms at time 1 predicted participants' proactive safety practices at time 2 (Fugas et al., 2011). Similarly, workers who actively engaged in citizenship behaviours had positive perceptions of safety in their workplaces, and vice versa (Gyekye & Salminen, 2005). These findings are consistent with the wider field of safety research, with safety culture and climate being positively associated with a variety of safety behaviours (Clarke, 2006; Hofman, Morgeson, & Gerras, 2003; Neal & Griffin, 2006).

What we see above is that organisations with strong and positive safety culture will also have visible norms for going beyond mere safety compliance. Indeed, many safety-critical industries have largely solved the issue of safety compliance and now focus on strategies beyond mere compliance monitoring (Martinez-Córcoles, Schöbel, Gracia, Tomás, & Pieró, 2012). In ultra-safe domains such as air traffic control, safety

compliance tends to be very high due to strong oversight (e.g., supervisors, regulators, automated systems), robust cultures (e.g., for incident reporting), and the severe consequences of non-compliance (i.e., air accidents). Therefore, safety citizenship, which is discretionary but essential for developing and enhancing safety management (e.g., identifying opportunities for safer working, participating in safety initiatives, helping others) can have greater scope for improving safety, and is highly dependent upon the wider culture environment.

While much of the field focuses on individual difference factors (e.g. motivation, personality), group-level phenomena – such as safety norms – suggest the need for considering other social behaviour theories to further understand the link between safety culture and SCBs. Indeed, earlier research on group dynamics and social psychology indicates that social and group-based mechanisms are also important for understanding the link between culture and citizenship behaviour (Haslam, 2004). In particular, the social identity approach may be useful for understanding the processes by which safety cultures form, and their relationship with SCBs.

According to the social identity approach, groups are not simply a passive context for individuals to behave in. Rather, the social identity approach emphasises how the individual is the product of group-life and its distinct psychological and social realities (e.g., commitment to groups members), and how this underpins culture (Haslam, 2004). From a social identity perspective, the relationship between organisational culture and behaviour would be mediated by the identification of individual employees with the organisation (i.e., beliefs of whether they belong to the group, and the values that flow from this). Despite social identity theory being used to explain organisational behaviour in many different settings (Ellemers et al., 2004; Ellemers et al., 1998; Riketta, 2005), its application to understanding employees' safety behaviour is minimal. We address this in the current study, and explore the role of social identity in explaining the relationship between safety culture and SCBs.

## 2. The role of individuals' organisational identity in safety

The social identity approach consists of two complementary theories: self-categorisation theory and social identity theory (Haslam, 2004; Postmes & Branscombe, 2010; Turner, 1999; Turner & Oakes, 1997). Briefly, self-categorisation theory is a theory of social cognition that describes the circumstances under which a person will perceive others and themselves as members of categories or groups (Turner, 1985; Turner et al., 1987). For example, in a room full of physicists, a social scientist may perceive a distinct group boundary along hard- vs soft-science lines. If a plumber entered the room, however, the social scientist may now perceive the group boundary to distinguish between academics and tradespersons. Social identity theory explains social behaviour in terms of internalised and meaningful *social identities* — identities or group memberships from which individuals derive part of their self-concept (Tajfel & Turner, 1979; 1986). Through processes such as *self-categorisation* (to place individuals into categories or groups), *positive distinctiveness and social comparison* (to overlay meaning onto relations of groups), and *social identification* (for the individual to place themselves in the group context), the social identity approach provides theoretical insight for inter- and intra-group dynamics in a wide range of contexts. For example, there are now established literatures around social identity in political ideology and intergroup conflict (Hogg, 2016; Turner & Reynolds, 2001), health and longevity (Jetten et al., 2012; Haslam et al., 2018; Praharso et al., 2017), and even team sports management (Fransen et al., 2014; Fransen et al., 2015).

### 2.1. Applying the social identity approach to organisations

A key area in which the social identity approach has taken root is in the study of organisations (Haslam, 2004). The main insight from applying social identity theory to organisational culture (i.e.

organisational identity) is that workers' behaviour can be understood as an expression of how committed they are as an individual to the group, and the shared norms and values (i.e. culture) of the group (Haslam, 2004; Ellemers, Russell, & Doosje, 2002). It is well documented that identity at the organisational level has motivational and behavioural implications at work (Ellemers de Gilder, & Haslam, 2004). The more people identify themselves with an organisation (e.g. identify at the social level), the more the organisation's interests are incorporated into the self-concept, and the more likely the individual is to act for the good of the organisation and to contribute to collective goals (Ellemers, de Gilder, & van den Heuvel, 1998; Veenstra and Haslam, 2000). Organisational identity is also positively associated with work-related attitudes and behaviour, such as job satisfaction, job involvement and extra-role behaviour (for an overview, see Riketta, 2005). However, because of the stronger identification with the workgroup, rather than with the organisation as a whole, work-group identity may develop into counterproductive behaviour, for example due to conflict with management (van Knippenberg, 2000; Steffens et al., 2014).

## 2.2. Organisational identity and citizenship behaviour

While the social identity approach clearly has implications for understanding organisational safety culture and associated safety behaviours (via collective goals, group-based attitudes to work and safety, etc.), models of workplace behaviour and safety rarely incorporate a social identity perspective. For example, the overarching integrated safety model demonstrated by Beus and colleagues (2016), which combines five major theories of workplace safety (Burke & Signal, 2010; Christian et al., 2009; Nahrgang, Morgeson, & Hoffman, 2011; Neal & Griffin, 2004; Zohar, 2011), makes no mention of identity. Yet, research on social identity research within organisations shows that where individuals incorporate the organisation's interests into how they conceptualize themselves, a strong identification with the group will emerge, increasing the likelihood of organisational commitment and behaviour beneficial for that group (Ellemers, de Gilder, & Haslam, 2004; Veenstra & Haslam, 2000). Meta analyses show that organisational identity influences various organisational outcomes (e.g. work-related attitudes, context characteristics, and work-related intentions and behaviours) and extra-role behaviours (another name for citizenship behaviour) (Riketta, 2005). Furthermore, the level of identification — at the level of occupation, team, or organisation — produces citizenship behaviour consistent with that identity. That is, workers are more likely to engage in citizenship for the team when they have a strong team identity (Christ et al., 2003; van Dick et al., 2006). Organisational identity also provides one pathway for corporate social responsibility to increase citizenship behaviour (Newman et al., 2016).

Accordingly, it is logical to conclude that organisational identification is important for explaining employee engagement in SCBs. Given the nature of citizenship behaviours — spontaneous, informal, and discretionary contributions that are outside formal bureaucratic structure and emerge from high-levels of commitment to the organisation (Barnard, 1938; Katz & Kahn, 1966; Organ, 2018; Roethlisberger and Dickson, 1939) — increased identification with an organisation might be expected to increase SCBs. However, the relationship between organisational identity and SCBs is likely to hinge on safety culture. Reflecting the literature showing affective commitment is associated with SCBs (Curcuruto & Griffin, 2018), where employees perceive an organisation to have a strong safety culture, and they identify with the organisation (and thus the culture), employees are more likely to engage in behaviour consistent with the culture (i.e., SCBs). We develop this argument below and outline a series of hypotheses.

As outlined above, there is evidence to suggest that safety culture and social identity processes are simultaneously and independently important catalysts for safety citizenship. Establishing their combined influence on SCBs is important for understanding the psychological mechanisms that lead to safety citizenship, and potentially the pathways

through which perceptions of safety culture lead. Whilst culture is often described a singular characteristic of an organisation (e.g., shared values), and is usually measured in terms of average experiences (e.g., using a safety culture survey), it is encountered at the individual level, with experiences and perceptions of culture being highly variable and not uniform (Howard-Grenville, Lahneman, & Pek, in press). Individual factors, such as the individual's role within the organisation, shape how safety culture is perceived and understood (Tear, Reader, Shorrock, & Kirwan, 2020). Similarly, identity with an organisation, and the level of social identification experienced by individuals in the organisation, is likely to shape how perceptions of culture become instantiated into behaviour. Put simply, if safety culture represents how values and norms on safety are perceived by employees within an organisation, organisational identification relates to the extent to which employees believe themselves to be a part of the culture. Where employees perceive a positive safety culture, and identify with the organisation, they will be more likely to engage in SCBs. We investigate this in the field of Air Traffic Management, where a strong safety culture and engagement in safety citizenship is important for maintaining safe operations (Reader et al., 2015; Schwarz & Kallus, 2015). To test this, we measure safety culture and individual organisational identity, and explore their relationship in order to test the following:

**Hypothesis 1.** *organisational identity mediates the link between safety culture and SCBs (H1).*

## 3. The role of others' organisational identities in safety

Alongside investigating the relationships between safety culture, organisational identity, and safety citizenship behaviour, we also explore the role of 'meta-identity'. meta-identity is a novel concept that relates to how much an individual thinks other group members identify with the group. meta-identity draws on social psychological research which assumes that, as social beings, humans look to the behaviour of others for information on how they themselves should behave (Bicchieri, 2006; Goldstein et al., 2008).

Our rationale for investigating meta-identity stems from two observations. First, meta-identity is a particularly cultural framing of organisational identity (i.e. perspectives of others' organisational identities) and allows us to investigate group identity processes from the perspective of individuals. Second, meta-identity as a cultural signal of group worth may provide some indication as to when citizenship behaviour may occur. For example, does citizenship occur because of strong meta-identity ("every-one else values the group, so I should do it because it's important for the group") or in absence of strong meta-identity ("nobody else values the group, so someone (me) needs to do it").

The fields of social psychology and behavioural economics have long established findings demonstrating how perceptions of social norms influence individuals' behaviours, for example, increasing energy reduction behaviours (Goldstein et al., 2008), increasing seatbelt use (Linkenbach & Perkins, 2005), and decreasing sexist behaviours (Kilmartin et al., 2008). The idea underlying the concept of meta-identity is that where an individual perceives members of their group (e.g., team members) to identify strongly with the group (e.g., the team), this signals to the individual the importance of the group to its members and the need to behave consistently with the values and norms of that group. Research in other domains, for example in the field of gender and career choices (London, Rosenthal, Levy, Lobel, 2011; Rosenthal et al., 2011) support this theorization. Beliefs about group pride are important for an individual's sense of group worth (Lazarus, 1991), which suggests that individuals are sensitive to how others in their group feel about the group itself, and that beliefs about group membership are important for transitioning between old and new identities (e.g., job changes, Iyer et al., 2009; wellbeing, Praharsa, Tear, & Cruwys, 2017).

Meta-identity appears important for understanding the link between safety culture and safety citizenship due to it representing beliefs on the



identification of the work group to the culture. Where an individual perceives the safety culture as positive, and believes co-workers identify strongly with the organisation (*meta-identity*), it might be expected that the individual is more likely to engage in SCBs. This is because *meta-identity* signals the perceived group commitment to the culture, which leads to employees being more likely to engage in safety behaviours due to them being valued by group members (i.e., through their commitment to the safety culture). To explore this, we examine the relationship between safety culture, 'meta-identity' (beliefs about co-worker commitment to the organisation) and SCBs, and speculate that that *meta-identity* is an individual's attempt to quantify the value of a particular group membership, which reinforces the importance of engaging in safety behaviours. We seek to confirm:

**Hypothesis 2.** *meta-identity mediates the link between safety culture and SCBs (H2).*

#### 4. Reconciling individual identity with *meta-identity*

Finally, we consider whether there is an interaction between employees' organisational identity (i.e., their personal commitment to the organisation) and *meta-identity* (i.e., their beliefs on the commitment of others to the organisation) in explaining the relationship between perceptions of safety culture and safety citizenship. Various models of interaction might be speculated. We speculate that an individuals' organisational identification adjusts the extent to which their perception of others' identification (*meta-identity*) impacts the relationship between safety culture and safety citizenship behaviour. An employee who strongly identifies with the organisation might be more receptive to signals of positive *meta-identity* from other group members (leading to greater engagement in SCBs), whilst an employee who does not strongly identify with the organisation may not attend to signals of *meta-identity* from other employees (reducing SCBs). Alternatively, perceiving others to be highly committed to organisational membership might lead employees to internalize the membership themselves (positively influencing SCBs), whilst signals of weak *meta-identity* might lead to reduced feelings of commitment from employees (negatively influence SCBs). To explore the interaction between employee organisational identity and *meta-identity*, and their joint role in mediating the relationship between safety culture and safety citizenship. We examine this through parallel mediation, moderated mediation, serial mediation, and accordingly test three hypotheses:

Hypothesis 3a: *meta-identity* mediates the link between safety culture and intention for safety citizenship behaviour, controlling for organisational identity (H3a).

Hypothesis 3b: *meta-identity* mediates the link between safety culture and intention conditionally according to organisational identity (H3b).

Hypothesis 3c: safety culture perceptions will indirectly influence self-reported SCBs through linked multiple mediators of *meta-identity* and organisational identity (H3c).

## 5. Materials and methods

### 5.1. Participants and data extraction

The data presented in this manuscript are part of an ongoing research program in collaboration with EUROCONTROL that measures safety culture in European air traffic management (ATM; Noort, Reader, Shorrock, & Kirwan, 2016; Reader, Noort, Shorrock, & Kirwan, 2015; Tear, Reader, Shorrock, & Kirwan, 2020). The database contains responses of over 20,000 participants from 30 different European nations from 2006 onwards. To date, the research program has delivered a bespoke safety culture survey for European air traffic management (Mearns, Kirwan, Reader, & Jackson, 2013) and is the is a key element of the EUROCONTROL safety culture assessment process, which also

involves qualitative workshops to unpack the results.

The database has been used to: (1) demonstrate that the safety culture model can be used reliably across international contexts (Reader, Noort, Shorrock, & Kirwan, 2015); (2) introduce methods to account for national culture in safety culture benchmarking (Noort, Reader, Shorrock, & Kirwan, 2016); and (3) conceptualize the role of power dynamics and national culture in Air Navigation Service Provider (ANSP) safety culture (Tear, Reader, Shorrock, & Kirwan, 2020). See Appendix A for a breakdown of the overlapping data from this database.

In this manuscript we report on participant data from five ANSPs that we surveyed in 2017 and 2018. In 2016, we updated the safety culture survey to include a measure of citizenship. It was only in 2017, however, that we further updated the survey to include measures of meta- and social-identity. Participants were extracted further on the basis of having complete data for each of the key variables (safety culture, safety citizenship, *meta-identity*, and organisational identity). The resulting dataset contained responses from 1,427 participants.

Due to the sensitive nature of safety culture surveys, we collect little demographic data so that participants' data cannot be identified on the basis of their demographics (e.g. age, gender). The demographic data that we do collect (i.e. participant role, primary work location, business unit) is adjacent to the present research questions and so not reported.

In order to maintain the anonymity of the ANSP and the continued working relationship, we elect to withhold data about the characteristics of each ANSP as well (e.g. nationality). Instead we present descriptive data for each ANSP on our measures of interest in the Results section.

### 5.2. Measures

**Safety citizenship.** A five-item scale was developed in consultation with ATM practitioners and validated with safety culture specialists. Items from other scales (e.g. Geller, Roberts, & Gilmore, 1996; Simard & Marchand, 1995) were checked for face validity in the European ATM context with ATM practitioners (n = 4) and safety culture specialists (n = 2). Items were adapted if deemed not relevant/applicable to the context. This resulted in five statements (see Appendix B), with participants indicating their level of agreement to the statements on a Likert scale (1: strongly disagree; 5: strongly agree). These items adopt elements of both change- and affiliative-oriented citizenship behaviours, and are as follows: (1) if someone new joined the team, I would actively speak with them about safety risks and good practices; (2) if I think a procedure is negatively influencing safety, I will actively try to get it changed; (3) I actively involve myself in changes related to procedures; (4) I often discuss safety issues with people in other departments within this organisation, and; (5) I keep up to date with developments in other industries.

**Safety culture.** We assessed safety culture with a bespoke safety culture survey for the European air traffic context as part of an approach comprising a literature review, interviews with subject matter experts, focus groups, and incident analyses. Preliminary data collected with early versions of the survey were used to test the factor structure with exploratory and confirmatory factor analyses (Mearns, Kirwan, Reader, & Jackson, 2013). The survey has thus been demonstrated as having sound psychometric properties (Reader, Noort, Shorrock, & Kirwan, 2015).

The safety culture survey tool assesses a number of safety culture themes established in the wider safety culture literature, while also covering a large range ATM-specific safety culture issues. The six major underlying dimensions include management commitment to safety, collaboration for safety, incident reporting, safety communication, colleague commitment to safety, and safety support (see Table 1). The current version of the safety culture questionnaire tool comprises 19 Likert items (1: strongly disagree; 5: strongly agree). A safety culture score is calculated by averaging participants' scores on each of the six safety culture dimensions, where higher scores represent more positive perceptions of safety culture within the organisation.

**Table 1**

Safety culture dimensions for European Air Traffic Management (ATM). Reproduced from Reader, Noort, Shorrock, & Kirwan, 2015. Cronbach's alpha values represent internal consistency within present dataset.

Dimension	Definition	Relevance for Safety Management	Example Questionnaire Items
Management commitment to safety ( $\alpha = 0.89$ )	Extent to which management prioritize safety	Indicates organisational prioritization of safety within an ANSP	<ul style="list-style-type: none"> <li>My manager is committed to safety My manager takes action on the safety issues we raise My manager would always support me if I had a concern about safety</li> </ul>
Collaborating for safety ( $\alpha = 0.60$ )	Group attitudes and activities for safety management	Indicates normative behaviours and attitudes among ANSP staff toward safety	<ul style="list-style-type: none"> <li>Other people in this organisation understand how my job contributes to safety People who raise safety issues are seen as troublemakers There are people who I do not want to work with because of their negative attitude to safety My involvement in safety activities is sufficient</li> </ul>
Incident reporting ( $\alpha = 0.80$ )	Extent to which respondents believe it is safe to report safety incidents	Essential for identifying system weaknesses and learning	<ul style="list-style-type: none"> <li>People who report safety related occurrences are treated in a just and fair manner Voicing concerns about safety is encouraged We get timely feedback on the safety issues we raise</li> </ul>
Communication ( $\alpha = 0.81$ )	Extent to which staff are informed about safety-related issues in the ATM system	Important for ensuring staff are aware of system changes that might shape safety-related activities	<ul style="list-style-type: none"> <li>Information about safety related changes within this organisation is clearly communicated to staff We learn lessons from safety related incident or occurrence investigations I have good access to information regarding safety incidents or occurrences within the organisation There is good communication up and down the organisation about safety</li> </ul>
Colleague commitment to safety ( $\alpha = 0.70$ )	Beliefs about the reliability of colleagues' safety-related behaviour	Highlights reliability of ANSP staff for engaging in safety activities	<ul style="list-style-type: none"> <li>Every-one I work with in this organisation feels that safety is their personal responsibility I have confidence in the people that I interact with in my normal working situation My colleagues are committed to safety</li> </ul>
Safety support ( $\alpha = 0.71$ )	Availability of resources and information for safety management	Indicates active support within the institution for maintaining safety	<ul style="list-style-type: none"> <li>We have sufficient staff to do our work safely People in this organisation share safety related information</li> </ul>

We conducted an exploratory factor analysis to check whether safety culture was distinct from safety citizenship. Specifying a principle components extraction, varimax rotation, and forcing two extracted factors, we saw that 95 % of the safety culture items loaded onto one factor (loadings > 0.40), while 80 % of the safety citizenship items loaded onto a second factor (loadings > 0.40). There were no cross-loading items. Given the general pattern of loadings, we decided to keep all items moving forward.

**Organisational identity.** We used a single-item measure of organisational identity: "I feel committed to this organisation". This item is adapted from the Four Item measure of Social Identity (FISI; Postmes, Haslam, & Jans, 2013) and taps into the solidarity dimension from Leach and colleagues' 10-item (group-level) self-investment measure (see Appendix C for a breakdown of identity items). Participants indicated agreement with the item using a five-point Likert scale (1: strongly disagree; 5 strongly agree).

While we sought a single-item measure of identity, we chose not to use the Single Item measure of Social Identity (also Postmes, Haslam, & Jans, 2013) and opted for the commitment item from the FISI. While we note the distinction between organisational identification and organisational commitment, the distinction was difficult to convey in translation. Our survey was conducted in several different European languages (specific languages withheld to maintain anonymity of organisations involved), and the interpretation of identity varied widely during our survey setup periods. For example, some interpreted their identity as simply whatever was on their employee identification card. Others conflated 'identifying with an organisation' (e.g. agreeing with or understanding the organisation's values) with 'holding an organisational identity' (e.g. deriving self-worth from being a member of the organisation).

There was, however, less difficulty in translating organisational commitment. Since short form identity scales (e.g. FISI; Postmes, Haslam, & Jans, 2013) include both identity (e.g. "I identify with [In-group]") and commitment (e.g. "I feel committed to [In-group]") items, and these scales have high internal reliability, we opted to use the commitment item in place of a more pure identity measure. Many scholars have questioned the distinction between identity and commitment (Miller, Allen, Casey, & Johnson, 2000; Postmes, Tanis, & de Wit, 2001), and others have noted the strong overlap between identification and commitment ( $r = 0.70$ ; Fontenot & Scott, 2000), resulting in some concluding that the terms can be used interchangeably (Postmes, Tanis, & de Wit, 2001). Thus, we felt justified in using the above item to measure organisational identity.

**Meta-identity.** We adapted the organisational identity item to reflect meta-identity – individuals' perception of how strongly others identify with the in-group. To do this, we changed the target of the item from the individual (i.e. "I feel committed to this organisation") to their colleagues (i.e. "I believe that my colleagues feel committed to this organisation"). The response scale remained a five-point Likert scale (1: strongly disagree; 5: strongly agree).

We constructed mediation models to determine the extent to which safety culture perceptions predict SCBs as a function of social identity processes. For these models, we entered organisational identity (H1) and meta-identity (H2) as mediators of the link between safety culture perceptions and safety citizenship behaviour. We then constructed a series of exploratory mediation models: (1) a parallel mediation model to test relative strength of the organisational identity mediators (H3a); (2) a moderated mediation model to test whether mediating property of meta-identity relies on existing organisational identity (H3b); and (3) a serial mediation model to test a potential causal explanation (H3c).

## 6. Results

### 6.1. Analysis plan

First, we analysed the descriptive data for the ANSPs. Next, hypotheses 1 and 2 were tested via a simple mediation model, whereas hypothesis 3 was tested via an exploratory series of moderated and serial mediations. Given the exploratory nature of our research questions, we took a simple holdout cross-validation approach to validate hypothesised models (Koul, Becchio, & Cavallo, 2018). The total dataset ( $n = 1,427$ ) was randomly split into a training set ( $n = 1,070$ ; 75 % of total sample) where models were constructed, and a quarantined test set ( $n = 357$ ; 25 % of total sample) where we conducted confirmatory tests of the training set models. All hypotheses, tests, and results are summarised with the main results in Table 4 below, with a detailed account of all results following.

### 6.2. Descriptives

Table 2 reports the descriptive statistics for each ANSP. Table 3 reports the correlations between the measures of interest. There were differences on the measures of interest across the ANSPs with the following general patterns: (a) ANSP 3 demonstrated significantly greater safety culture than ANSPs 1, 2, and 5; (b) ANSPs 3, 4, and 5 had

greater safety citizenship than ANSP 1; (c) ANSPs 2 and 5 had greater organisational identity than 1, and; (d) all ANSPs had greater meta-identity than ANSP 1. While the first ANSP scored significantly lower than other ANSPs on the measures of interest, nearly 70 % of the total sample comes from that ANSP, so we elect to report the full sample.

#### 6.2.1. Training dataset

For brevity, detailed analysis, results, figures, and tables related to the training dataset are presented in Appendix D. A summary of the results related to the training set is included in Table 4 below.

#### 6.2.2. Test dataset

We used a quarantined subset of the data (referred to as the test dataset) to confirm the findings obtained with the training dataset. Hypothesis 1 was supported, indicating that individuals' organisational identity mediates the relationship between safety culture and self-reported safety citizenship behaviour. The bootstrapped unstandardised indirect effect was significant ( $B = 0.126$ , boot SE = 0.0305, 95% CI = 0.066-0.378). Hypothesis 2 was also supported, demonstrating that individuals' perceptions of others' organisational identities similarly mediates the linked between safety culture and safety citizenship behaviour.

The bootstrapped unstandardised indirect effect of safety culture on safety citizenship via meta-identity was significant ( $B = 0.136$ , boot SE = 0.037, 95% CI = 0.176-0.378).

**Table 2**

Descriptive statistics (means and standard deviations) for each Air Navigation Service Provider (ANSP). Measures were Likert scales (1: strongly disagree; 5: strongly agree).

ANSP	Sample Size	Safety culture	Safety citizenship	Organisational identity	Meta-identity
1	984	3.52 (0.63)	3.34 (0.64)	3.82 (1.04)	3.22 (1.02)
2	157	3.39 (0.62)	3.45 (0.66)	4.24 (0.62)	3.69 (0.80)
3	45	3.97 (0.75)	3.74 (0.69)	4.20 (1.04)	3.89 (0.96)
4	66	3.75 (0.87)	3.76 (0.64)	4.05 (0.87)	3.94 (0.86)
5	175	3.43 (0.70)	3.63 (0.67)	4.29 (0.77)	3.91 (0.91)
Total	1427	3.52 (0.67)	3.42 (0.66)	3.95 (0.99)	3.41 (1.02)

**Table 3**

Correlations between measures.

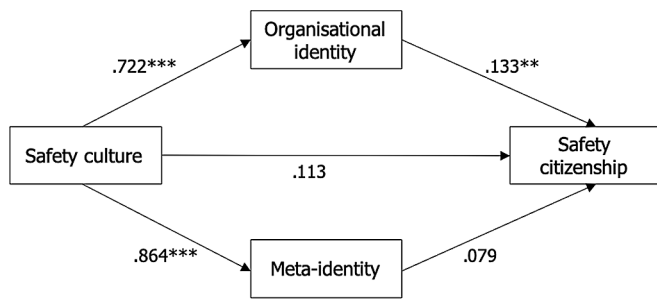
	Safety culture	Safety citizenship	Organisational identity	Meta-identity
Safety culture		0.295	0.429	0.487
Safety citizenship	0.295		0.356	0.257
Organisational identity	0.429	0.356		0.638
Meta-identity	0.487	0.257	0.638	

All correlations significant to  $p < .001$ .

**Table 4**

Summary table of hypotheses and results.

Hypothesis	Test of hypothesis	Result (training dataset)	Result (test dataset)	Interpretation
<b>Hypothesis 1:</b> organisational identity mediates the link between safety culture and safety citizenship behaviour (H1).	Significant <i>ab</i> path of simple mediation model (X: safety culture, Y: safety citizenship, M: organisational identity)	$B = 0.125$ , boot SE = 0.015, 95 % CI = 0.096-0.155	$B = 0.126$ , boot SE = 0.0305, 95 % CI = 0.066-0.378	Hypothesis supported in both datasets
<b>Hypothesis 2:</b> meta-identity mediates the link between safety culture and intention for safety citizenship behaviour (H2).	Significant <i>ab</i> path of simple mediation model (X: safety culture, Y: safety citizenship, M: meta- identity)	$B = 0.084$ , boot SE = 0.016, 95 % CI = 0.053-0.114	$B = 0.141$ , boot SE = 0.062, 95 % CI = 0.020-0.263	Hypothesis supported in both datasets (though less robust in test set)
<b>Hypothesis 3a:</b> meta-identity mediates the link between safety culture and intention for safety citizenship behaviour, controlling for organisational identity (H3a).	Significant <i>a1b1</i> path of parallel mediation model (X: safety culture, Y: safety citizenship, M1: meta- identity, M2: organisational identity)	$B = 0.009$ , boot SE = 0.018, 95 % CI = -0.025-0.045	$B = 0.068$ , boot SE = 0.047, 95 % CI = -0.018-0.160	Hypothesis not supported in both datasets
<b>Hypothesis 3b:</b> meta-identity mediates the link between safety culture and intention conditionally according to organisational identity (H3b).	Significant interaction term in moderated mediation model (X: safety culture, Y: safety citizenship, M: meta- identity, W: organisational identity)	$B = 0.091$ , SE = 0.033, $p = .006$	$B = 0.138$ , SE = 0.037, $p < .001$	Hypothesis supported in both datasets
<b>Hypothesis 3c:</b> safety culture perceptions will indirectly influence self-reported SCBs through linked multiple mediators of meta-identity and organisational identity (H3c).	Significant <i>a1d21b2</i> path in serial mediation model (X: safety culture, Y: safety citizenship, M1: meta- identity, M2: organisational identity)	$B = 0.074$ , boot SE = 0.012, 95 % CI = 0.052-0.100	$B = 0.068$ , boot SE = 0.027, 95 % CI = 0.021-0.127	Hypothesis supported in both datasets



Indirect effect<sub>org identity</sub>: B = .096, boot SE = .036, 95% CI = .030-.178

Indirect effect<sub>meta-identity</sub>: B = .068, boot SE = .047, 95% CI = -.018-.160

Fig. 1. Parallel mediation analysis of safety culture on safety citizenship via organisational identity and meta-identity (unstandardised coefficients) with test dataset.

Hypothesis 3a-3c sought to understand the multivariate effects of both organisational identity and meta-identity on the safety culture → SCB relationship. As such, we tested a number of different multivariate models. First, we constructed a parallel mediation model with no constraints on the two indirect effects (H3a). Testing this model with the confirmatory subset of data revealed that the same pattern of results found in the training set – a significant indirect pathway via organisational identity ( $B = 0.096$ , boot SE = 0.036, 95% CI = 0.030-0.178), but not meta-identity ( $B = 0.068$ , boot SE = 0.047, 95% CI = -0.018-0.160). Allowing the model to take into account that organisational identity and meta-identity are related concepts meant that the pathway via meta-identity was not significant. If each mediator is a distinct expression of culture in the simple single mediator models, then the parallel model suggests most of that relationship is accounted for by organisational identity. The comparison of the constrained and unconstrained versions of the model, however, did not show a significant difference ( $X^2(1, N = 357) = 0.170, p = .680$ ), meaning that the smaller confirmatory dataset was not able to demonstrate that the indirect effects were sufficiently different from one another. Interestingly, compared to the training set, safety culture was no longer related safety citizenship with the two mediators present in the model, demonstrating full mediation. See Fig. 1 for graphical representation of this parallel mediation model.

The test dataset confirmed the results of the training dataset regarding the moderated mediation model (H3b) – that organisational identity moderates the mediation path (path a) of safety culture on safety citizenship via meta-identity. The interaction term was again significant ( $B = 0.138, SE = 0.037, p < .001$ ). Coefficient values presented in Table 5.

As with the training set, the strength of indirect effect of safety culture on safety citizenship via meta-identity increased with increasing levels of organisational identity. The indirect effect was significant at both low (-1SD;  $B = 0.028, 95\% CI = 0.013-0.044$ ), mean (OSD;  $B = 0.044, 95\% CI = 0.026-0.064$ ), and high (+1SD;  $B = 0.060, 95\% CI = 0.035-0.087$ ) values of organisational identity. The indirect effects are summarised in Table 6.

Finally, we sought to test a theoretically derived mediation sequence. While none of our data is longitudinal – a necessary precondition for inferring a causal sequence of events – we can make correlational claims

Table 5  
Coefficient values for moderated mediation with test dataset.

Variable	Predictor	Path	B	SE	z	p	$\beta$
Meta-identity	Safety culture (centred)	a1	0.371	0.045	8.281	<0.001	0.249
Meta-identity	Organisational identity (centred)	a2	0.586	0.030	19.701	<0.001	0.582
Meta-identity	Interaction term	a3	0.138	0.037	3.721	<0.001	0.107
Citizenship	Safety culture (centred)	c1	0.176	0.036	4.888	<0.001	0.180
Citizenship	Meta-identity	b	0.118	0.022	5.394	<0.001	0.180

Table 6

Coefficient values for the indirect effect of safety culture on safety citizenship via meta-identity at levels of organisational identity with test dataset.

Organisational identity (W)	Indirect effect (a1 + a3 + W)*(b)		Direct effect c1	
	Estimate	95 % Bootstrap CI	Estimate	95 % Bootstrap CI
-0.979 (-1SD)	0.028	(0.013 to 0.044)	0.176	(0.106 to 0.247)
0.000 (mean)	0.044	(0.026 to 0.064)	0.176	(0.106 to 0.247)
0.979 (+1SD)	0.060	(0.035 to 0.087)	0.176	(0.106 to 0.247)

from our data. Thus, because safety culture perceptions are an individual’s perception of social safety signals from colleagues, then a strong and positive safety culture will be positively related with the extent to which individuals believe their colleagues value the group (organisational) membership – safety culture is positively related to meta-identity. Next, if individuals think others value the group membership, then they will perceive this as a signal that group membership is meaningful and be more likely to identify with the group themselves – meta-identity is positively related to organisational identity. Finally, those who identify more strongly with the group will be more likely to engage in citizenship behaviours for the group – organisational identity is positively related to safety citizenship.

The indirect effect of safety culture on safety citizenship, through meta-identity and organisational identity was significant (H3c;  $B = 0.068$ , boot SE = 0.027, 95% CI = 0.021-0.127), confirming the result found with the training subset. This test subset of the data also demonstrates evidence for full mediation, with the c’ pathway demonstrating non-significance in the presence of the two mediators. Coefficients presented in Table 7 below and model summarised in Fig. 2 below.

## 7. General discussion

### 7.1. Theoretical summary

This study considers whether social identity is a mechanism through which safety culture is associated with safety behaviour. We examined how a typical safety culture formulation changes when social identity is the main lens for conceptualising the flow between organisation-level psychology (culture) and individual-level psychology (identity). Through an investigation of safety culture in the Air Traffic Management (ATM) industry, we argue that social identity relates to safety culture and engagement in SCBs. Specifically, we demonstrate that beliefs around self and co-worker organisational identity (in terms of personal commitment to the organisation) shape how employees internalize an organisation’s safety culture, and, thus, their likelihood of engaging in SCBs.

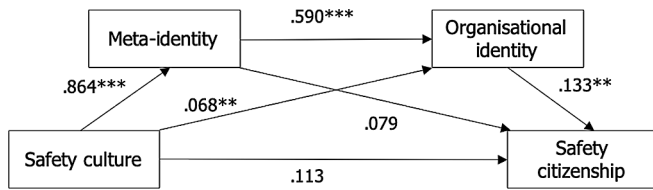
### 7.2. Theoretical implications

This is the first study to consider the role of social identity theory in the safety culture literature. While long-standing models of culture



**Table 7**  
Coefficient values for serial mediation with test dataset.

Variable	Predictor	Path	B	SE	z	p	$\beta$
Meta-identity	Safety culture	a1	0.864	0.069	12.591	<0.001	0.574
Organisational identity	Safety culture	a2	0.212	0.068	3.136	0.002	0.142
Organisational identity	Meta-identity	d21	0.590	0.054	11.015	<0.001	0.597
Citizenship	Safety culture	cp	0.113	0.060	1.886	0.059	0.112
Citizenship	Meta-identity	b1	0.079	0.055	1.437	0.151	0.117
Citizenship	Organisational identity	b2	0.133	0.042	2.013	<0.01	0.134



Indirect effect<sub>test</sub>: B = .068, boot SE = .027, 95% CI = .021-.127

**Fig. 2.** Serial mediation analysis of safety culture on safety citizenship via *meta-identity* and *organisational identity* (unstandardised coefficients) with test dataset.

emphasise shared understanding (e.g. Schein, 1985) and social representations (Moscovici, 1984), social identity theory – which suggests identity is a lens through which these phenomena are viewed – has been strangely absent in the safety culture literature. This study shows that in understanding the relationship between safety culture and SCBs, the role of social identity may be important, and moves the literature on from the cultural approaches that have typically dominated. Indeed, models that explain culture in terms of value orientations (Hofstede, 1980; Triandis, 1990), which have traditionally dominated organisational behaviour research, increasingly appear incomplete. These models portray culture as carried by traits—stable, general preferences—that reproduce themselves with the socialization of each new generation. But cultural influences on individual judgment and behaviour are dynamic and situational rather than stable and general, especially as people increasingly span multiple cultures (Haas & vanDellán, 2020). Our data support pivoting towards social identity theory to account for dynamic cultural influences of many different group memberships. For example, understanding the relative influence of various organisational identities (e.g. organisation, department, business unit, team) will provide a better opportunity for cultural or behavioural interventions to create change. Our data confirm this by demonstrating two identity pathways by which safety culture can influence safety citizenship: (1) via individuals’ personal organisational identities (H1); and (2) via the extent to which individuals perceive organisational identities in their colleagues (H2).

Furthermore, culture is multi-faceted and the individual has relatively poor access to the overall culture of the organisation (e.g. values and assumptions are relatively invisible to the individual; Schein, 2000). While culture is typically measured by asking individuals to reflect on the culture, it is difficult for individuals to provide meaningful answers when they do not already think in cultural terms (Homburg & Pflesser, 2000). Reflecting on identity processes, however, is much more tangible, both for the individual and the researcher. Indeed, there are countless studies demonstrating that individuals can easily handle the concept of identity with regards to the organisation (see Drury, 2018; Hornsey, 2008; and Zacher et al., 2018 for reviews of social identity theory in practice). Thus, using social identity as a basis for understanding culture might have stronger validity than traditional culture surveys.

While our approach thus far has been argued as applying a social identity lens to culture, there are also cultural ways of framing social identity. Our data also suggest that culture is as much about the individual’s outward perceptions of the norms as it is about the

individuals’ perceptions of *others’* outward perceptions of the norms, which is very much a cultural approach to identity. Specifically, there are contexts where a *meta-identity* perspective is important for unpacking cultural effects on behaviour (though there are cases where an organisational perspective is more important). Our data is among the first to position identity in such cultural terms.

Finally, our data suggest that current theorisation on safety citizenship could be aided by inclusion of social identity theory. Noting the recent advances that highlight change- vs affiliative-oriented citizenship behaviours, social identity theory could account for additional drivers of these behaviours beyond the existing motivational accounts. For example, our initial findings demonstrate that *meta-identity* is positively related to SCBs, suggesting that SCBs occur in individuals when they think that others are committed to the organisation. It may be the case that this relationship exists specifically for affiliative-oriented SCBs, whereas *meta-identity* is less important for change-oriented SCBs.

### 7.3. Practical implications

The results of the present work highlight the need to emphasize an exploration of organisational identities in the safety culture assessment process. In some ways, safety culture assessments already implicitly consider organisational identities in their feedback methods – feedback is often conveyed to groups of similar worker types to unpack reasoning behind specific responses (Mearns, Kirwan, Reader, & Jackson, 2013). Indeed, individuals may identify with the organisation to some degree, but there are often other competing work identities (e.g. organisation, site, department, work-unit, team). Based on our results, we speculate competing identities may impact the extent to which workers’ safety culture perceptions are linked to their SCBs – if the organisational identity is diluted or less salient to the individual, then that reduces its ability to increase safety citizenship behaviour.

What our research suggests, however, is that identity processes are important for SCBs, so developing a workplace identity around *safety*, not the organisation or work groups per se, is paramount. While ‘safety’ is not a social category that one may belong, work on opinion-based groups suggests that people can form common cause with others by forming groups based on shared opinions (Bliuc, McGarty, Reynolds, & Muntele, 2007; McGarty, Bliuc, Thomas, & Bongiorno, 2009). Evidence suggests that membership to opinion-based groups strongly predicts collective action (Bliuc et al., 2007; O’Brien & McGarty, 2009). Thus, if the goal is to increase safety behaviour, then it is in the organisation’s interest to interrogate ways of aligning workers’ attitudes and opinions regarding safety, and in facilitating those attitudes and opinions in becoming part of a shared social identity. Social identity interventions have been used in a variety of settings (Haslam, Cruwys, Haslam, Dingle, & Chang, 2016; Webber & Fendt-Newlin, 2017), but perhaps most relevant to organisations in the area of leadership development (Haslam, Steffens, Peters, Boyce, Mallett, & Fransen, 2017). We see furthering the spread of identity conceptualisations and interventions to safety, in conjunction with supportive organisational practices and supportive management behaviour (Baer & Frese, 2003), as the next step in organisational safety culture.

Additionally, our data provide evidence to enhance existing change methodologies. Specifically, behaviour change approaches stand to



benefit from an understanding of *meta*-identity. For example, visible norms are a key driver of individuals' behaviour (Ajzen, 1991; Cane, O'Connor, & Michie, 2012). What our data suggest is that behavioural interventions targeting norms may be more or less effective in organisations where *meta*-identity is strong.

7.4. Limitations and future directions

The nature of applied work is steeped in compromise. We could not collect the level of data we would have liked due to a number of factors related to applied research. We have, thus, faced restrictions in the number of questions we could ask and how to ask them. As a consequence, the design of the study is not optimal for construct development. While this manuscript details some interesting preliminary insights into *meta*-identity in the organisation, future research should carefully map out a pathway for construct development and validity testing of *meta*-identity as a measure for understanding organisational life.

Related, our study suffers two other measurement issues: (1) it does not include a measure of safety compliance, and; (2) it does not include a modern conceptualisation of safety citizenship (i.e. change- vs affiliative-oriented citizenship). On the first issue, safety compliance was not included for a number of reasons (e.g. survey space, operational priorities for ANSPs), but had it been, it would have allowed for further development of our argument (i.e. demonstrating identity mediation for citizenship behaviours but not compliance behaviours). On the second issue, our citizenship measure did not reflect the most recent theoretical innovations. The measure needed to be highly tailored to the ANSP context and reflect the operational and contextual concerns of work in ANSPs, though we took efforts for it to resonate with the spirit of established citizenship scales. Future research should include more theoretically-informed measures of safety citizenship behaviour in order to better understand their motivational, social, or indeed cultural drivers.

Cross-sectional mediation has been shown to be problematic, and results in biased estimates (Kline, 2015; Maxwell and Cole, 2007; Spencer, Zanna, & Fong, 2005). Any time variables are correlated with each other, a mediation model can be estimated, but that model says nothing about the direction of the effects, nor the presence of other unmeasured variables that drive the relationships. Thus, all relationships in our mediation models must be understood as being related, but not necessarily *causally* related.

Our outcome measure is safety citizenship behaviour specifically. Our data do not speak to safety behaviour more broadly, as there is evidence that different safety behaviours have different behavioural drivers. For example, safety *citizenship* can be driven by individuals'

intrinsic motivations, whereas safety *compliance* is often driven by a lack of safety knowledge (Christian, Bradley, Wallace, & Burke, 2009; Griffin & Neal, 2000; Neal & Griffin, 2004). We have specifically investigated the role of social identity in understanding how safety culture relates to safety citizenship – and found it to be important – but we expect social identity to interact in different ways with different behavioural drivers.

We did not collect safety outcome data (e.g., accidents, incidents), as this was not possible to collect at the individual level (due to confidentiality reasons), and we lacked a sufficiently large sample to undertake a multi-level analysis to distinguish organisations in terms of their safety records.

7.5. Conclusions

Social identity theory has long been used to understand group dynamics across many various contexts, including within organisations. We extend on this work to provide insights on how identity is important for organisational culture – culture as an expression of identity – and individual safety behaviour within the organisation. Indeed, identity conceptualisations of culture provide a more dynamic and individual understanding of organisational culture compared to more static and all-encompassing approaches.

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Data available at <https://osf.io/7vsq4/>.

CRediT authorship contribution statement

**Morgan J. Tear:** Writing – review & editing, Writing – original draft, Visualization, Methodology, Investigation, Formal analysis, Conceptualization. **Tom W. Reader:** Writing – review & editing, Methodology, Funding acquisition.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request.

Appendix A. Data transparency table

Reader, Noort, Shorrock, & Kirwan, 2015	Noort, Reader, Shorrock, & Kirwan, 2016	Tear, Reader, Shorrock, & Kirwan, 2020	Current manuscript
17 European countries 10,717 respondents	21 European countries 13,616 respondents (additional 2,899)	21 European countries 13,616 respondents	5 ANSPs 1,427 respondents (subset that saw key items)
Primarily reported at regional level	Reported at the de-identified ANSP (country) level	Reported at occupation level (managers, controllers, engineers, admin), at de-identified ANSP (country) level, and at the interaction level	Reported at the aggregate individual level
Distinguishes between managers and controllers	Reports data collated across all workers	Distinguishes between managers, controllers, engineers, admin	Reports data collated across all workers
Uses 6-factor safety culture model	Uses 6-factor safety culture model	Uses 6-factor safety culture model	Uses 6-factor safety culture model
Uses Hofstede 5-factor model to link national culture with safety culture, and to test for regional differences in safety culture.	Uses single Hofstede factor (uncertainty avoidance) to test benchmarking technique.	Uses single Hofstede factor (power distance) to understand the role of power in safety culture research.	Uses no Hofstede factors.

**Appendix B. Safety citizenship behaviours**

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If someone new joined the team, I would actively speak with them about safety risks and good practices. (1: strongly disagree; 5: strongly agree)
If I think a procedure is negatively influencing safety, I will actively try to get it changed. (1: strongly disagree; 5: strongly agree)
I actively involve myself in changes related to procedures. (1: strongly disagree; 5: strongly agree)
I often discuss safety issues with people in other departments within this organisation. (1: strongly disagree; 5: strongly agree)
I keep up to date with developments in other industries. (1: strongly disagree; 5: strongly agree)

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**Appendix C. Short-form identity scales**

See [Table C1](#).

**Appendix D. Detailed training set results**

This section reports on the models constructed and evaluated using the training subset of data ( $N = 1,070$ ; 75 % of total sample). Following the results reported here, the models were then confirmed with the test subset, which is reported in the main body of the manuscript.

**Hypothesis 1** was supported – an individual’s internalised organisational identity mediated the relationship between their perceptions of safety culture in the organisation and their self-reported propensity to engage in SCBs. The bootstrapped unstandardised indirect effect was significant ( $B = 0.125$ , boot SE = 0.015, 95 % CI = 0.096-0.155). The second hypothesis was also supported through a mediation model. An individual’s perceptions regarding how much their colleagues internalised the organisational group membership mediated the relationship between that individual’s perceptions of safety culture and their self-reported SCBs. The bootstrapped unstandardised indirect effect of safety culture on safety citizenship via *meta*-identity was significant ( $B = 0.084$ , boot SE = 0.016, 95 % CI = 0.053-0.114).

Hypothesis 3a-3c sought to understand the multivariate effects of both organisational identity and *meta*-identity on the safety culture → SCB relationship. As such, we tested a number of different multivariate models. First, we constructed a parallel mediation model with no constraints on the two indirect effects (H3a). Organisational identity was found to mediate the relationship between safety culture and safety citizenship behaviour ( $B = 0.121$ , boot SE = 0.018, 95 % CI = 0.087-0.158), such that higher perceptions of safety culture were related to high internalised organisational identity, and higher internalised organisational identity was related to greater propensity for SCBs. In this model, which allowed *meta*-identity and organisational identity to covary, *meta*-identity no longer mediated the relationship between safety culture and safety citizenship behaviour ( $B = 0.009$ , boot SE = 0.018, 95 % CI = -0.025-0.045). Thus, when you allow the model to take into account that organisational identity and *meta*-identity are related, the indirect pathway through *meta*-identity is no longer significant. This suggests that while each mediator is a distinct expression of culture – there are significant effects of both organisational identity and *meta*-identity in their own models – the parallel model suggests most of the variance is accounted for by organisational identity. See [Fig. D1](#) for graphical representation of this parallel mediation model..

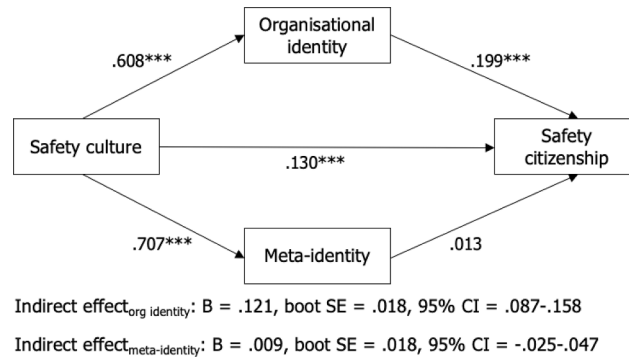
The indirect effect of safety culture on safety citizenship through *meta*-identity was also found to be conditional upon the value of the organisational identity variable. The indirect effect was significant at both low (-1SD;  $B = 0.035$ , 95 % CI = 0.020-0.055), mean (OSD;  $B = 0.047$ , 95 % CI = 0.028-0.067), and high (+1SD;  $B = 0.058$ , 95 % CI = 0.035-0.083) values of organisational identity. The strength of indirect effect also appears to get stronger with increasing values of organisational identity. The indirect effects are summarised in [Table D2](#).

**Table C1**  
Short-form identity scales.

Leach et al., 2008 - (Group-Level) Self-Investment	Postmes et al., 2013 - Four Item measure of Social Identity (FISI)	Postmes et al., 2013 - Single Item measure of Social Identity (SISI)	Current manuscript - Organisational identity	Current manuscript - meta-identity
I feel a bond with [in-group] (solidarity)	I identify with [in-group]	I identify with [in-group]		
I feel solidarity with [in-group] (solidarity)				
I feel committed to [in-group] (solidarity)	I feel committed to [in-group]		I feel committed to this ANSP	
I am glad to be [in-group] (satisfaction)	I am glad to be [in-group]			
I think that [in-group] have a lot be proud of (satisfaction)				
It is pleasant to be [in-group] (satisfaction)				
Being [in-group] gives me a good feeling (satisfaction)				
I often think about the fact that I am [in-group] (centrality)				
The fact that I am [in-group] is an important part of my identity (centrality)				
Being [in-group] is an important part of how I see myself (centrality)	Being [in-group] is an important part of how I see myself			
				I believe my colleagues feel committed to this ANSP

This serial mediation model (H3c) is summarised in Figure 4 below.

We find that the indirect effect of safety culture on safety citizenship, through *meta*-identity and organisational identity is significant ( $B = 0.074$ , boot SE = 0.012, 95 % CI = 0.052-0.100). Coefficients presented in Table D3 below and model summarised in Fig. D2 below.



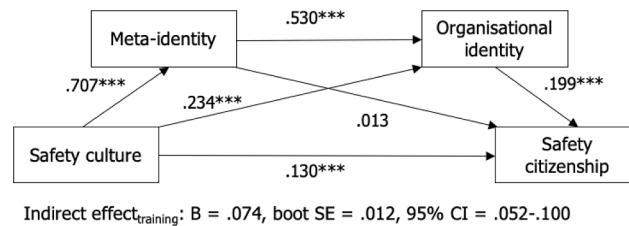
**Fig. D1.** Parallel mediation analysis of safety culture on safety citizenship via organisational identity and *meta*-identity (unstandardised coefficients) with training dataset. Testing the idea that organisational identity modulates the indirect effect of safety culture via *meta*-identity, we then tested a new model for moderation of the *a* path in a mediation model (moderated mediation; H3b). Organisational identity was found to moderate the relationship between safety culture and *meta*-identity (path *a*) – there was a significant interaction term for the mean-centred safety culture and organisational identity variables ( $B = 0.091$ , SE = 0.033,  $p = .006$ ). Coefficient values presented in Table D1.

**Table D1**  
Coefficient values for moderated mediation with training dataset.

Variable	Predictor	Path	B	SE	z	p	$\beta$
Meta-identity	Safety culture (centred)	a1	0.361	0.042	8.500	<0.001	0.251
Meta-identity	Organisational identity (centred)	a2	0.582	0.028	20.965	<0.001	0.604
Meta-identity	Interaction term	a3	0.091	0.033	2.750	0.006	0.074
Citizenship	Safety culture (centred)	c1	0.140	0.034	4.064	<0.001	0.142
Citizenship	Meta-identity	b	0.129	0.023	5.626	<0.001	0.188

**Table D2**  
Coefficient values for the indirect effect of safety culture on safety citizenship via *meta*-identity at levels of organisational identity with training dataset.

Organisational identity (W)	Indirect effect (a1 + a3 + W)*(b)		Direct effect c1	
	Estimate	95 % Bootstrap CI	Estimate	95 % Bootstrap CI
-0.984 (-1SD)	0.035	(0.020 to 0.055)	0.140	(0.073 to 0.209)
0.000 (mean)	0.047	(0.028 to 0.067)	0.140	(0.073 to 0.209)
0.984 (+1SD)	0.058	(0.035 to 0.083)	0.140	(0.073 to 0.209)



**Fig. D2.** Serial mediation analysis of safety culture on safety citizenship via organisational identity and *meta*-identity (unstandardised coefficients) with training dataset.

**Table D3**  
Coefficient values for serial mediation with training dataset.

Variable	Predictor	Path	B	SE	z	p	$\beta$
Meta-identity	Safety culture	a1	0.707	0.045	15.652	<0.001	0.457
Organisational identity	Safety culture	a2	0.234	0.047	4.930	<0.001	0.158
Organisational identity	Meta-identity	d21	0.530	0.033	16.111	<0.001	0.553
Citizenship	Safety culture	cp	0.130	0.035	3.720	<0.001	0.131
Citizenship	Meta-identity	b1	0.013	0.025	0.521	0.602	0.021
Citizenship	Organisational identity	b2	0.199	0.029	6.921	<0.001	0.298

## References

- Ajzen, I., 1991. The theory of planned behaviour. *Organ. Behav. Human Decis. Process.* 50 (2), 179–211. [https://doi.org/10.1016/0749-5978\(91\)90020-T](https://doi.org/10.1016/0749-5978(91)90020-T).
- Baer, M., Frese, M., 2003. Innovation is not enough: Climates for initiative and psychological safety, process innovations, and firm performance. *J. Organ. Behav.* 24 (1), 45–68. <https://doi.org/10.1002/job.179>.
- Barnard, C.T., 1938. *The functions of the executive*. Harvard University Press, Cambridge, MA.
- Belschak, F.D., Hartog, D.N.D., 2010. Pro-self, prosocial, and pro-organizational foci of proactive behaviour: Differential antecedents and consequences. *J. Occup. Organ. Psychol.* 83 (2), 475–498. <https://doi.org/10.1348/096317909x439208>.
- Beus, J.M., McCord, M.A., Zohar, D., 2016. Workplace safety: A review and research synthesis. *Organ. Psychol. Rev.* 6 (4), 352–381. <https://doi.org/10.1177/2041386615626243>.
- Bicchieri, C., 2006. *The Grammar of Society*. Cambridge University Press, Cambridge.
- Bisbey, T.M., Kilcullen, M.P., Thomas, E.J., Ottosen, M.J., Tsao, K., Salas, E., 2021. Safety culture: An integration of existing models and a framework for understanding its development. *Hum. Factors* 63 (1), 88–110. <https://doi.org/10.1177/0018720819868878>.
- Bliuc, A., McGarty, C., Reynolds, K., Muntele, D., 2007. Opinion-based group membership as a predictor of commitment to political action. *Eur. J. Soc. Psychol.* 37 (1), 19–32. <https://doi.org/10.1002/ejsp.334>.
- Brondino, M., Silva, S.A., Pasini, M., 2012. Multilevel approach to organisational and group safety climate and safety performance: Co-workers as the missing link. *Saf. Sci.* 50 (9), 1847–1856. <https://doi.org/10.1016/j.ssci.2012.04.010>.
- Burke, M.J., Signal, S.M., 2010. Workplace safety: A multilevel, interdisciplinary perspective. *Research in Personnel and Human Resources Management* 29, 1–47. [https://doi.org/10.1108/s0742-7301\(2010\)0000029003](https://doi.org/10.1108/s0742-7301(2010)0000029003).
- Cane, J., O'Connor, D., Michie, S., 2012. Validation of the theoretical domains framework for use in behaviour change and implementation research. *Implementation Science* 7, 37. <https://doi.org/10.1186/1748-5908-7-37>.
- Chen, Q., Jin, R., 2013. Multilevel safety culture and climate survey for assessing new safety program. *Journal of Construction Engineering Management* 139 (7), 805–817. [https://doi.org/10.1061/\(ASCE\)CO.1943-7862.0000659](https://doi.org/10.1061/(ASCE)CO.1943-7862.0000659).
- Choi, B., Lee, S., 2016. How social norms influence construction workers? Safety behavior: A social identity perspective. In: *Proceedings of Construction Research Congress 2016*, ASCE, Reston, VA.
- Choi, B., Ahn, S., Lee, S., 2015. Understanding social influence on construction worker's safety behavior. In: *Proceedings of the 12th International Organisation of Technology, Management in Construction Conference*, University of Zagreb, Primosten, Croatia.
- Choudhry, R.M., Fang, D., Mohamed, S., 2007. The nature of safety culture: A survey of the state-of-the-art. *Saf. Sci.* 45 (10), 993–1012. <https://doi.org/10.1016/j.ssci.2006.09.003>.
- Choudhry, R.M., Fang, D., 2008. Why operatives engage in unsafe work behavior: Investigating factors on construction sites. *Saf. Sci.* 46 (4), 566–584. <https://doi.org/10.1016/j.ssci.2007.06.027>.
- Christ, O., van Dick, R., Wagner, U., Stellmacher, J., 2003. When teachers go the extra mile: Foci of organisational identification as determinants of different forms of organisational citizenship behaviour among school-teachers. *Br. J. Educ. Psychol.* 73 (3), 329–341. <https://doi.org/10.1348/000709903322275867>.
- Christian, M.S., Bradley, J.C., Wallace, J.C., Burke, M.J., 2009. Workplace safety: A meta-analysis of the roles of person and situation factors. *J. Appl. Psychol.* 94 (5), 1103–1127. <https://doi.org/10.1037/a0016172>.
- Clarke, S., 1999. Perceptions of organizational safety: Implications for the development of safety culture. *Journal of Organizational Behavior* 20 (2), 185–198.
- Clarke, S., 2000. Safety culture: Under-specified and overrated? *International Journal of Management Reviews* 2 (1), 65–90. <https://doi.org/10.1111/1468-2370.00031>.
- Clarke, S., 2006. The relationship between safety climate and safety performance: a meta-analytic review. *J. Occup. Health Psychol.* 11 (4), 315–327. <https://doi.org/10.1037/1076-8998.11.4.315>.
- Clarke, S., Ward, K., 2006. The role of leader influence tactics and safety climate in engaging employees' safety participation. *Risk Anal.* 26 (5), 1175–1185. <https://doi.org/10.1111/j.1539-6924.2006.00824.x>.
- Conchie, S.M., 2013. Transformational leadership, intrinsic motivation, and trust: A moderated-mediated model of workplace safety. *J. Occup. Health Psychol.* 18 (2), 190–210. <https://doi.org/10.1037/a0031805>.
- Conchie, S.M., Donald, I.J., 2009. The moderating role of safety-specific trust on the relation between safety-specific leadership and safety citizenship behaviors. *J. Occup. Health Psychol.* 14 (2), 137–147. <https://doi.org/10.1037/a0014247>.
- Cooper, M.D., 2000. Towards a model of safety culture. *Soc. Sci. Med.* 36 (2), 111–136. [https://doi.org/10.1016/S0925-7535\(00\)00035-7](https://doi.org/10.1016/S0925-7535(00)00035-7).
- Curcuruto, M., Conchie, S.M., Mariani, M.G., Violante, F.S., 2015. The role of prosocial and proactive safety behaviours in predicting safety performance. *Saf. Sci.* 80, 317–323. <https://doi.org/10.1016/j.ssci.2015.07.032>.
- Curcuruto, M., Conchie, S.M., Griffin, M.A., 2019. Safety citizenship behaviour (SCB) in the workplace: A stable construct? Analysis of psychometric invariance across four European countries. *Accid. Anal. Prev.* 129, 190–201. <https://doi.org/10.1016/j.aap.2019.05.023>.
- Curcuruto, M., Griffin, M.A., 2018. Prosocial and proactive “safety citizenship behaviour” (SCB): The mediating role of affective commitment and psychological ownership. *Saf. Sci.* 104, 29–38. <https://doi.org/10.1016/j.ssci.2017.12.010>.
- Curcuruto, M., Mearns, K.J., Mariani, M.G., 2016. Proactive role-orientation toward workplace safety: Psychological dimensions, nomological network and external validity. *Saf. Sci.* 87, 144–155. <https://doi.org/10.1016/j.ssci.2016.03.007>.
- DeJoy, D.M., 2005. Behavior change versus culture change: Divergent approaches to managing workplace safety. *Saf. Sci.* 43 (2), 105–129. <https://doi.org/10.1016/j.ssci.2005.02.001>.
- DeJoy, D.M., Della, L.J., Vandenberg, R.J., Wilson, M.G., 2010. Making work safer: Testing a model of social exchange and safety management. *J. Saf. Res.* 41 (2), 163–171. <https://doi.org/10.1016/j.jsr.2010.02.001>.
- Didla, S., Mearns, K., Flin, R., 2009. Safety citizenship behaviour: A proactive approach to risk management. *J. Risk Res.* 12 (3–4), 475–483. <https://doi.org/10.1080/13669870903041433>.
- Drury, J., 2018. The role of social identity processes in mass emergency behaviour: An integrative review. *European Review of Social Psychology* 29 (1), 38–81. <https://doi.org/10.1080/10463283.2018.1471948>.
- Ellemers, N., de Gilder, D., van den Heuvel, H., 1998. Career-oriented versus team-oriented commitment and behavior at work. *J. Appl. Psychol.* 83 (5), 717–730. <https://doi.org/10.1037/0021-9010.83.5.717>.
- Ellemers, N., Russell, S., Doosje, B., 2002. Self and social identity. *Annu. Rev. Psychol.* 53, 161–186. <https://doi.org/10.1146/annurev.psych.53.100901.135228>.
- Ellemers, N., de Gilder, D., Haslam, S.A., 2004. Motivating individuals and groups at work: A social identity perspective on leadership and group performance. *The Academy of Management Review* 29 (3), 459–478. <https://doi.org/10.5465/amr.2004.13670967>.
- Fang, D., Wu, C., Wu, H., 2015. Impact of the supervisor on worker safety behavior in construction projects. *J. Manage. Eng.* 31 (6), 1–12. [https://doi.org/10.1061/\(ASCE\)ME.1943-5479.0000355](https://doi.org/10.1061/(ASCE)ME.1943-5479.0000355).
- Fontenot, J.C., Scott, C.R., 2000. Correlates of organizational identification moderated by measurement scale, organizational type, and publication date: A meta-analysis. In: *Paper presented at the 50th Annual Convention of the ICA, Acapulco, Mexico, June*.
- Fransen, K., Haslam, S.A., Steffens, N.K., Vanbeselaere, N., De Cuyper, B., Boen, F., 2015. Believing in “us”: Exploring leaders' capacity to enhance team confidence and performance by building a sense of shared social identity. *Journal of Experimental Psychology: Applied*, 21(1), 89–100. <https://doi.org/10.1037/xap0000033>.
- Fransen, K., Vanbeselaere, N., De Cuyper, B., Vande Broek, G., Boen, F., 2014. The myth of the team captain as principal leader: *Extending the athlete leadership classification within sport teams*. *Journal of Sport Sciences* 32 (14), 1389–1397. <https://doi.org/10.1080/02640414.2014.891291>.
- Frese, M., Fay, D., 2001. Personal initiative: An active performance concept for work in the 21st century. *Research in Organisational Behavior* 23, 133–187. [https://doi.org/10.1016/S0191-3085\(01\)23005-6](https://doi.org/10.1016/S0191-3085(01)23005-6).
- Fugas, C.S., Melia, J.L., Silva, S.A., 2011. The “Is” and the “Ought”: How do perceived social norms influence safety behaviours at work? *J. Occup. Health Psychol.* 16, 67–79. <https://doi.org/10.1037/a0021731>.
- Gagné, M., Deci, E.L., 2005. Self-determination theory and work motivation. *Journal of Organizational Behavior* 26 (4), 331–362. <https://doi.org/10.1002/job.322>.
- Geller, E., Roberts, D., Gilmore, M., 1996. Predicting propensity to actively care for occupational safety. *J. Saf. Res.* 27 (1), 1–8. [https://doi.org/10.1016/0022-4375\(95\)00024-0](https://doi.org/10.1016/0022-4375(95)00024-0).
- Glendon, A.I., Litherland, D.K., 2001. Safety climate factors, group differences and safety behaviour in road construction. *Saf. Sci.* 31 (3), 157–188. [https://doi.org/10.1016/S0925-7535\(01\)00006-6](https://doi.org/10.1016/S0925-7535(01)00006-6).
- Goh, Y., Binte Sa'adon, N., 2015. Cognitive factors influencing safety behavior at height: A multimethod exploratory study. *Journal of Construction Engineering and Management*, 141(6), 1–8. [https://doi.org/10.1061/\(ASCE\)CO.1943-7862.0000972](https://doi.org/10.1061/(ASCE)CO.1943-7862.0000972).
- Goldstein, N.J., Cialdini, R.B., Griskevicius, V., 2008. A room with a viewpoint: Using social norms to motivate environmental conservation in hotels. *Journal of Consumer Research* 35 (3), 472–482. <https://doi.org/10.1086/586910>.
- Griffin, M.A., Neal, A., 2000. Perceptions of safety at work: A framework for linking safety climate to safety performance, knowledge, and motivation. *J. Occup. Health Psychol.* 3, 347–358. <https://doi.org/10.1037/1076-8998.5.3.347>.
- Guldenmund, F.W., 2000. The nature of safety culture: A review of theory and research. *Saf. Sci.* 34 (1–3), 215–257. [https://doi.org/10.1016/S0925-7535\(00\)00014-X](https://doi.org/10.1016/S0925-7535(00)00014-X).
- Guldenmund, F.W., 2007. The use of questionnaires in safety culture research—An evaluation. *Saf. Sci.* 45 (6), 723–743. <https://doi.org/10.1016/j.ssci.2007.04.006>.
- Gyekye, S.A., Salminen, S., 2005. Are “good soldiers” safety conscious? An examination of the relationship between organisational citizenship behaviours and perception of workplace safety. *Social Behaviour and Personality* 33, 805–820. <https://doi.org/10.2224/sbp.2005.33.8.805>.
- Haas, B.W., vanDellen, M.R., 2020. Culture is associate with the experience of long-term self-concept changes. *Social Psychological and Personality Science*. <https://doi.org/10.1177/1948550619893966>.
- Hale, A.R., 2000. Editorial: Culture's confusions. *Saf. Sci.* 34 (1–3), 1–14. [https://doi.org/10.1016/S0925-7535\(00\)00003-5](https://doi.org/10.1016/S0925-7535(00)00003-5).
- Haslam, A.S., 2004. *Psychology in Organisations*. SAGE Publications, London.
- Haslam, C., Cruwys, T., Haslam, S.A., Dingle, G., Chang, M.-X.-L., 2016. Groups 4 Health: Evidence that a social-identity intervention that builds and strengthens social group membership improves mental health. *J. Affect. Disord.* 194, 188–195. <https://doi.org/10.1016/j.jad.2016.01.010>.
- Haslam, C., Jetten, J., Cruwys, T., Dingle, G.A., Haslam, S.A., 2018. *The new psychology of health: Unlocking the social cure*. Routledge, London.
- Haslam, S.A., Steffens, N.K., Peters, K., Boyce, R.A., Mallett, C.J., Fransen, K., 2017. A Social Identity Approach to Leadership Research. *Journal of Personnel Psychology* 16 (3), 113–124. <https://doi.org/10.1027/1866-5888/a000176>.
- Health and Safety Commission, 1993. *Third Report: Organising For Safety*. (HMSO, Ed.). ACSNI Study Group on Human Factors, London.
- Heinrich, H.W., Petersen, D., Roos, N.R., Brown, J., Hazlett, S., 1980. *Industrial accident prevention: A safety management approach*. McGraw-Hill, New York.



- Hofman, D.A., Morgeson, F.P., Gerrass, S.J., 2003. Climate as a moderator of the relationship between leader-member exchange and content specific citizenship: Safety climate as an exemplar. *J. Appl. Psychol.* 88 (1), 170–178. <https://doi.org/10.1037/0021-9010.88.1.170>.
- Hofstede, G., 1980. *Culture's Consequences: International Differences in Work-related Values*. Sage, London.
- Hogg, M.A., 2016. 'Social identity theory'. In: McKeown, Haji, Ferguson (Eds.), *Understanding Peace and Conflict Through Social Identity Theory: Contemporary Global Perspectives*. Springer International Publishing, pp. 3-17.
- Hollnagel, E., Paries, J., Woods, D., Wreathall, J., 2012. *Resilience Engineering in Practice: A Guidebook*. Ashgate, Farnham, UK.
- Homburg, C., Pflesser, C., 2000. A multiple-layer model of market-oriented organisational culture: Measurement issues and performance outcomes. *J. Mark. Res.* 37 (4), 449–462. <https://doi.org/10.1509/jmkr.37.4.449.18786>.
- Hornsey, M.J., 2008. Social identity theory and self-categorization theory: A historical review. *Soc. Pers. Psychol. Compass* 2 (1), 204–222. <https://doi.org/10.1111/j.1751-9004.2007.00066.x>.
- Howard-Grenville, J., Lahnehan, B., Pek, S., in press. *Organisational Culture as a Tool for Change*. Stanford Social Innovation Review.
- Iyer, A., Jetten, J., Tsvirikos, D., Postmes, T., Haslam, S.A., 2009. The more (and the more compatible) the merrier: Multiple group memberships and identity compatibility as predictors of adjustment after life transitions. *Br. J. Soc. Psychol.* 48 (4), 707–733. <https://doi.org/10.1348/014466608x397628>.
- Jetten, J., Haslam, C., Haslam, S.A. (Eds.), 2012. *The Social Cure: Identity, Health and Well-being*. Psychology Press, New York, NY.
- Jiang, Z., Fang, D., Zhang, M., 2014. Understanding the causation of construction workers' unsafe behaviors based on system dynamics modelling. *J. Manage. Eng.* 31 (6), 1–14. [https://doi.org/10.1061/\(ASCE\)ME.1943-5479.0000350](https://doi.org/10.1061/(ASCE)ME.1943-5479.0000350).
- Katz, D., Kahn, R.L., 1966. *The social psychology of organisations*. Wiley, NY.
- Kilmartin, C., Smith, T., Green, A., Heinzen, H., Kuchlar, M., Kolar, D., 2008. A real time social norms intervention to reduce male sexism. *Sex Roles* 59 (3–4), 264–273. <https://doi.org/10.1007/s11199-008-9446-y>.
- Kline, R.B., 2015. The mediation myth. *Basic Appl. Soc. Psychol.* 37 (4), 202–213. <https://doi.org/10.1080/01973533.2015.1049349>.
- Koul, A., Becchio, C., Cavallo, A., 2018. Cross-validation approaches for replicability in psychology. *Front. Psychol.* 9, 1117. <https://doi.org/10.3389/fpsyg.2018.01117>.
- Lazarus, R.S., 1991. *Emotion and Adaptation*. Oxford University Press, New York.
- Linkenbach, J., Perkins, H., 2005. MOST of us don't drink and drive campaign. A social norms strategy to reduce impaired driving among 21-34 year-olds. U.S. Department of Transportation, National Highway Traffic Safety Administration.
- Leach, C.W., van Zomeren, M., Zebel, S., Vliet, M.L.W., Pennekamp, S.F., Doosje, B., Ouwerkerk, J.W., Spears, R., 2008. Group-level self-definition and self-investment: A hierarchical (multicomponent) model of in-group identification. *J. Persona. Soc. Psychol.* 95 (1), 144–165. <https://doi.org/10.1037/0022-3514.95.1.144>.
- London, B., Rosenthal, L., Levy, S.R., Lobel, M., 2011. The influences of perceived identity compatibility and social support on women in non-traditional fields during the college transition. *Basic and Applied Psychology* 33 (4), 304–321. <https://doi.org/10.1080/01973533.2011.614166>.
- Martinez-Córcoles, M., Schöbel, M., Gracia, F.J., Tomás, T., Peiró, J.M., 2012. Linking empowerment leadership to safety participation in nuclear power plants: A structural equation model. *J. Saf. Res.* 43, 215–221. <https://doi.org/10.1016/j.jsr.2012.07.002>.
- Maxwell, S.E., Cole, D.A., 2007. Bias in cross-sectional analyses of longitudinal mediation. *Psychol. Methods* 12 (1), 23–44. <https://doi.org/10.1037/1082-989x.12.1.23>.
- McGarty, C., Bliuc, A.-M., Thomas, E.F., Bongiorno, R., 2009. Collective Action as the Material Expression of Opinion-Based Group Membership. *Journal of Social Issues* 65 (4), 839–857. <https://doi.org/10.1111/j.1540-4560.2009.01627.x>.
- Mearns, K., Kirwan, B., Reader, T.W., Jackson, J., 2013. Development of a methodology for understanding and enhancing safety culture in Air Traffic Management. *Safety Science*, 53, 123-133. <https://doi.org/10.1016/j.ssci.2012.09.001>.
- Miller, V.D., Allen, M., Casey, M.K., Johnson, J.R., 2000. Reconsidering the organizational identification questionnaire. *Management Communication Quarterly* 13, 626–658. <https://doi.org/10.1177/0893318900134003>.
- Mohamed, S., 2002. Safety climate in construction site environments. *Journal of Construction Engineering and Management* 128 (5), 375–384. [https://doi.org/10.1061/\(ASCE\)0733-9364\(2002\)128:5\(375\)](https://doi.org/10.1061/(ASCE)0733-9364(2002)128:5(375)).
- Moscovici, S., 1984. The phenomenon of social representation. In: Farr, R.M., Moscovici, S. (Eds.), *Social Representations*. Cambridge University Press, Cambridge.
- Nahrgang, J.D., Morgeson, F.P., Hofmann, D.A., 2011. Safety at work: A meta-analytic investigation of the link between job demands, job resources, burnout, engagement, and safety outcomes. *J. Appl. Psychol.* 96 (1), 71–94. <https://doi.org/10.1037/a0021484>.
- Neal, A., Griffin, M.A., 2004. Safety climate and safety at work. In: Barling, J., Frone, M. R. (Eds.), *The Psychology of Workplace Safety*. American Psychological Association, Washington, DC, pp. 15–34.
- Neal, A., Griffin, M.A., 2006. A study of the lagged relationships among safety climate, safety motivation, safety behaviour, and accidents at the individual and group levels. *J. Appl. Psychol.* 91 (4), 946–953. <https://doi.org/10.1037/0021-9010.91.4.946>.
- Neal, A., Griffin, M.A., Hart, P.M., 2000. The impact of organisational climate on safety climate and individual behavior. *Saf. Sci.* 34 (1–3), 99–109. [https://doi.org/10.1016/S0925-7535\(00\)00008-4](https://doi.org/10.1016/S0925-7535(00)00008-4).
- Newman, A., Miao, Q., Hofman, P.S., Zhu, C.J., 2016. The impact of socially responsible human resource management on employees' organisational citizenship behavior: The mediating role of organisational identification. *International Journal of Human Resource Management* 27 (4), 440–455. <https://doi.org/10.1080/09585192.2015.104289>.
- Noort, M.C., Reader, T.W., Shorrock, S., Kirwan, B., 2016. The relationship between national culture and safety culture: Implications for international safety culture assessments. *J. Occupat. Org. Psychol.* 89 (3), 515–538. <https://doi.org/10.1111/joop.12139>.
- O'Brien, L.V., McGarty, C., 2009. Political disagreement in intergroup terms: Contextual variation and the influence of power. *Br. J. Soc. Psychol.* 48, 77–98. <https://doi.org/10.1348/014466608X299717>.
- Organ, D.W., 2018. Organisational citizenship and behavior: Recent trends and developments. *Annual Review of Organisational Psychology and Organisational Behaviour* 5, 295–306. <https://doi.org/10.1146/annurev-orgpsych-032117-104536>.
- Parker, S.K., Bindl, U.K., Strauss, K., 2010. Making things happen: A model of proactive motivation. *Journal of Management* 36 (4), 827–856. <https://doi.org/10.1177/0149206310363732>.
- Pidgeon, N., 1998. Safety culture: Key theoretical issues. *European Journal of Work and Organisational Psychology* 12 (3), 202–216. <https://doi.org/10.1080/0267837980256862>.
- Pierce, J.L., Jussila, I., Cummings, A., 2009. Psychological ownership within the job design context: Revision of the job characteristics model. *Journal of Organisational Behavior* 30 (4), 477–496. <https://doi.org/10.1002/job.550>.
- Postmes, T., Branscombe, N., 2010. Sources of social identity. In: Postmes, T., Branscombe, N. (Eds.), *Rediscovering Social Identity: Core Sources*. Psychology Press.
- Postmes, T., Tanis, M., de Wit, B., 2001. Communication and commitment in organisations: A social identity approach. *Group Processes and Intergroup Relations* 4 (3), 227–246. <https://doi.org/10.1177/1368430201004003004>.
- Postmes, T., Haslam, S.A., Jans, L., 2013. A single-item measure of social identification: Reliability, validity, and utility. *Br. J. Soc. Psychol.* 52, 597–617. <https://doi.org/10.1111/bjso.12006>.
- Praharo, N.F., Tear, M.J., Cruwys, T., 2017. Stressful life transitions and wellbeing: A comparison of the stress buffering hypothesis and the social identity model of identity change. *Psychiatry Res.* 247, 265–275. <https://doi.org/10.1016/j.psychres.2016.11.039>.
- Qiang, M., Qiwei, W., Liu, S., Zhou, Q., Zhang, J., 2020. Effects of organizational safety on employees' proactivity safety behaviors and occupational health and safety management systems in Chinese high-risk small-scale enterprises. *International Journal of Occupational Safety and Ergonomics* 26 (1), 101–111. <https://doi.org/10.1080/10803548.2018.1470287>.
- Reader, T.W., Noort, M.C., Shorrock, S., Kirwan, B., 2015. Safety sans Frontières: An international safety culture model. *Risk Anal.* 35 (5), 770–789. <https://doi.org/10.1111/risa.12327>.
- Ribeiro, N., Duarte, A.P., Filipe, R., David, K., 2021. Does authentic leadership stimulate organisational citizenship behaviours? The importance of affective commitment as a mediator. *Sustainability Accounting, Management, and Policy Journal* 13 (2), 320–340. <https://doi.org/10.1108/SAMPJ-11-2019-0423>.
- Rickett, M., 2005. Organisational identification: A meta-analysis. *J. Vocat. Behav.* 66 (2), 358–384. <https://doi.org/10.1016/j.jvb.2004.05.005>.
- Roethlisberger, F.J., Dickson, W.J., 1939. *Management and the worker*. Harvard University Press, Cambridge, MA.
- Rosenthal, L., London, B., Levy, S.R., Lobel, M., 2011. The roles of perceived identity compatibility and social support for women in a single-sex STEM program at a co-educational university. *Sex Roles* 65 (9–10), 725–736. <https://doi.org/10.1007/s11199-011-9945-0>.
- Sammer, C.E., Lykens, K., Singh, K.P., Mains, D.A., Lackan, N.A., 2010. What is patient safety culture? A review of the literature. *J. Nurs. Scholarsh.* 42 (2), 156–165. <https://doi.org/10.1111/j.1547-5069.2009.01330.x>.
- Schein, E.H., 1985. *Organisational culture and leadership*. Jossey-Bass, San Francisco.
- Schein, E.H., 2000. Sense and nonsense about culture and climate. In: Ashkanasy, N.M., Wilderom, C.P.M., Peterson, M.F. (Eds.), *Handbook of organisational culture & climate* (pp. xxiii–xxx). Sage, Thousand Oaks, CA.
- Schneider, B., González-Romá, V., Ostroff, C., West, M.A., 2017. Organizational climate and culture: Reflections on the history of the constructs in the *Journal of Applied Psychology*. *J. Appl. Psychol.* 102 (3), 468–482. <https://doi.org/10.1037/apl000090>.
- Schwarz, M., Kallus, K.W., 2015. Safety culture and safety-relevant behavior in air traffic management. *Aviation Psychology and Applied Human Factors* 5 (1), 3–17. <https://doi.org/10.1027/2192-0923/a000068>.
- Seo, D.-C., 2005. An explicative model of unsafe work behavior. *Saf. Sci.* 43 (3), 187–211. <https://doi.org/10.1016/j.ssci.2005.05.001>.
- Simard, M., Marchand, A., 1995. A multilevel analysis of organisational factors related to the taking of safety initiatives by work groups. *Saf. Sci.* 21 (2), 113–129. [https://doi.org/10.1016/0925-7535\(95\)00050-x](https://doi.org/10.1016/0925-7535(95)00050-x).
- Singer, S., Lin, S., Falwell, A., Gaba, D., Baker, L., 2009. Relationship of safety climate and safety performance in hospitals. *Health Serv. Res.* 44 (2p1), 399–421. <https://doi.org/10.1111/j.1475-6773.2008.00918.x>.
- Spencer, S.J., Zanna, M.P., Fong, G.T., 2005. Establishing a causal chain: Why experiments are often more effective than mediational analyses in examining psychological processes. *J. Pers. Soc. Psychol.* 89 (6), 845–851. <https://doi.org/10.1037/0022-3514.89.6.845>.
- Steffens, N.K., Haslam, S.A., Reicher, S.D., 2014. Up close and personal: Evidence that shared social identity is a basis for the 'special' relationship that binds followers to leaders. *The Leadership Quarterly* 25 (2), 296–313. <https://doi.org/10.1016/j.leaqua.2013.08.008>.
- Suraji, A., Duff, A.R., Peckitt, S.J., 2001. Development of causal model of construction accident causation. *Journal of Construction Engineering and Management* 127 (4), 337–344. [https://doi.org/10.1061/\(ASCE\)0733-9364\(2001\)127:4\(337\)](https://doi.org/10.1061/(ASCE)0733-9364(2001)127:4(337)).

- Tajfel, H., Turner, J.C., 1979. An integrative theory of intergroup conflict. In: Austin, W. G., Worchel, S. (Eds.), *The Social Psychology of Intergroup Relations*. Monterey, CA, Brooks/Cole, pp. 33–47.
- Tajfel, H., Turner, J.C., 1986. The social identity theory of intergroup behaviour. In: Worchel, S., Austin, W.G. (Eds.), *Psychology of Intergroup Relations*, 2nd ed., Nelson-Hall, Chicago, pp. 7–24.
- Tear, M.J., Reader, T.W., Shorrock, S., Kirwan, B., 2020. Safety culture and power: Interactions between perceptions of safety culture, organisational hierarchy, and national culture. *Saf. Sci.* 121 (2020), 550–561. <https://doi.org/10.1016/j.ssci.2018.10.014>.
- Triandis, H.C., 1990. Cross-cultural studies of individualism and collectivism. In: Berman, J. (Ed.), *Nebraska Symposium on Motivation 1989*. University of Nebraska Press, Lincoln, pp. 41–133.
- Turner, J.C., 1985. Social categorization and the self-concept: A social cognitive theory of group behaviour. In: Lawler, E.J. (Ed.), *Advances in Group Processes*, Vol. 2. JAI Press, Greenwich, CT, pp. 77–122.
- Turner, J.C., 1999. Some current issues in research on social identity and self-categorization theories. In: Ellemers, N., Spears, R., Doosje, B. (Eds.), *Social Identity: Context, Commitment, Content*. Blackwell, Oxford, pp. 6–34.
- Turner, J.C., Reynolds, K.J., 2001. 'The social identity perspective in intergroup relations: theories, themes and controversies'. In: Brown, R.J., Gaertner, S. (Eds.), *Blackwell Handbook of Social Psychology*. Vol. 4: Intergroup Processes. Blackwell, Oxford.
- Turner, J.C., Hogg, M.A., Oakes, P.J., Reicher, S.D., Wetherell, M.S., 1987. *Rediscovering the Social Group: A Self-categorization Theory*. Blackwell, Oxford.
- Turner, J.C., Oakes, P.J., 1997. The socially structured mind. In: McGarty, C., Haslam, S. A. (Eds.), *The Message of Social Psychology: Perspectives on Mind in Society*. Blackwell, Oxford, pp. 355–373.
- van Dick, R., Grojean, M.W., Christ, O., Wieseke, J., 2006. Identity and the extra mile: Relationships between organisational identification and organisational citizenship behaviour. *Br. J. Manag.* 17 (4), 283–301. <https://doi.org/10.1111/j.1467-8551.2006.00520.x>.
- van Knippenberg, D., 2000. Work motivation and performance: A social identity perspective. *Applied Psychology: An International Review* 49 (3), 357–371. <https://doi.org/10.1111/1464-0597.00020>.
- Veenstra, K., Haslam, A., 2000. Willingness to participate in industrial protest: Exploring social identification in context. *Br. J. Soc. Psychol.* 39 (2), 153–172. <https://doi.org/10.1348/014466600164390>.
- Webber, M., Fendt-Newlin, M., 2017. A review of social participation interventions for people with mental health problems. *Soc. Psychiatry Psychiatr. Epidemiol.* 52 (4), 369–380. <https://doi.org/10.1007/s00127-017-1372-2>.
- Weick, K.E., Sutcliffe, K.M., 2007. *Managing the Unexpected. Resilient Performance in the Age of Uncertainty*. Jossey-Bass, San Francisco, CA US.
- Xu, J., Cheung, C., Manu, P., Ejobwomu, O., 2021. Safety leading indicators in construction: A systematic review. *Saf. Sci.* 139, 105250 <https://doi.org/10.1016/j.ssci.2021.105250>.
- Xuesheng, D., Xintao, Z., 2011. An empirical investigation of the influence of safety climate on safety citizenship behavior in coal mine. *Procedia Eng.* 26, 2173–2180. <https://doi.org/10.1016/j.proeng.2011.11.2422>.
- Zacher, H., Esser, L., Bohlmann, C., Rudolph, C.W., 2018. Age, social identity and identification, and work outcomes: A conceptual model, literature review, and future research directions. *Work, Aging and Retirement* 5 (1), 24–43. <https://doi.org/10.1093/workar/way005>.
- Zhang, M., Fang, D., 2013. A cognitive analysis of why Chinese scaffolders do not use safety harnesses in construction. *Construction Management and Economics* 31 (3), 207–222. <https://doi.org/10.1080/01446193.2013.764000>.
- Zhang, L., Liu, Q., Wu, X., Skibniewski, M., 2016. Perceiving interactions on construction safety behaviors: Workers' perspective. *J. Manage. Eng.* 32 (5), 1–12. [https://doi.org/10.1061/\(ASCE\)ME.1943-5479.0000454](https://doi.org/10.1061/(ASCE)ME.1943-5479.0000454).
- Zohar, D., 1980. Safety climate in industrial organisations: Theoretical and applied implications. *J. Appl. Psychol.* 65 (1), 96–102. <https://doi.org/10.1037/0021-9010.65.1.96>.
- Zohar, D., 2003. Safety climate: conceptual and measurement issues. In: Quick, J.C., Tetrick, L.E. (Eds.), *Handbook of Occupational Health Psychology*. American Psychological Association, Washington, DC, pp. 123–142.
- Zohar, D., 2010. Thirty years of safety climate research: Reflections and future directions. *Accid. Anal. Prev.* 42, 1517–1522. <https://doi.org/10.1016/j.aap.2009.12.019>.
- Zohar, D., 2011. Safety climate: Conceptual and measurement issues. In: Quick, J.C., Tetrick, L.E. (Eds.), *Handbook of occupational health psychology*, 2nd ed. American Psychological Association, Washington, DC, pp. 141–164.