

1 **What does safety commitment mean to leaders? A multi-method investigation**

2 **Abstract**

3 Perceived management safety commitment as an aspect of safety climate or culture is a key
4 influence on safety outcomes in organisations. What is unclear is how perceptions of management
5 commitment are created by leaders. To address this gap in the literature, we position safety
6 commitment as a leadership construct viewed from the perspectives of the leaders who experience
7 and demonstrate it. In this paper, an established multidimensional commitment framework is
8 applied to leaders' safety commitment (consisting of affective, normative and calculative
9 commitment). Via an exploratory sequential mixed methods design combining interviews (n = 40)
10 and surveys (n = 89), we investigate the applicability of this theoretical conceptualisation to safety
11 commitment. The results indicate the multiple dimensions captured leaders' safety commitment
12 well, safety commitment can be demonstrated via a range of behaviours, and the dimensions'
13 association with behavioural demonstrations aligned with those of other types of commitment
14 reported in the literature. Only affective safety commitment was consistently associated with
15 demonstrations of safety commitment. The link between high levels of affective and normative
16 safety commitment and demonstrations was more pronounced when participants perceived their
17 company's safety climate more positively. Adopting a focus on leaders' experience of safety
18 commitment offers opportunities for new research into the way in which safety commitment
19 perceptions are shaped by leaders.

20 **Practical application**

21 The findings can support leaders' reflection about their personal mindset around safety and
22 support them in fostering strong safety climates and cultures. It further encourages organisations
23 in creating work environments that in particular foster affective and normative safety commitments
24 in leaders.

25

26

Keywords: safety commitment; leadership; management; exploratory sequential mixed methods

27

design; organisational safety

28 **Highlights**

29 - Leaders experience multiple dimensions of safety commitment and demonstrate it through
30 various behaviours

31 - Affective and normative, but not calculative safety commitment are linked with
32 demonstrations

33 - Leader perceptions of positive safety climate enhance the link of safety commitment
34 dimensions with demonstrations

35 - Reflection on their safety commitment can support leaders in developing stronger safety
36 commitment demonstrations

37

38

39 **What does safety commitment mean to leaders? A multi-method investigation**

40 Employees are often asked to describe the degree to which their management are
41 committed to safety as a key aspect of their perceptions of safety climate. A high level of
42 perceived management safety commitment is an established indicator that the organization has a
43 positive safety climate (Cigularov, Lancaster, Chen, et al., 2013; Flin, 2003; Flin, Mearns,
44 O'Connor et al, 2000; Guldenmund, 2000, 2007; Zohar, 2008; Frazier, Ludwig, Whitaker et al.,
45 2013). A positive safety climate produces better safety outcomes such as higher rule compliance
46 and fewer work injuries (e.g. Beus, Payne, Bergman, et al., 2010).

47 Employee perceptions of management commitment are clearly important. The concept is
48 typically defined as “the extent to which management is perceived to place a high priority on
49 safety and communicate and act on safety issues effectively” within the concept of safety climate
50 (p. 27, Neal & Griffin, 2004). Meta-analyses identify employee perceptions of managerial safety
51 commitment as one of the most common and influential components of safety climate (Beus et
52 al., 2010; Christian, Bradley, Wallace et al., 2009; Clarke 2010). However, little attention has
53 been paid to the source of these perceptions (Reiman and Rollenhagen, 2014). By source, we
54 mean the ways in which leaders view safety and the various things that they do that lead
55 employees to perceive their leaders as committed to safety. Surprisingly, little research has
56 directly assessed what is meant by management safety commitment from the perspective of
57 leaders. This lack of direct focus on this important concept is likely to have contributed to it
58 being described as abstract and nebulous (O’Dea and Flin, 2001), with definitions that are broad
59 and inconsistent across studies (Hamid, Abdullah, Asmoni et al., 2015). This is an important gap
60 because it limits the information available to organisations and leaders about how to improve
61 perceptions of management commitment.

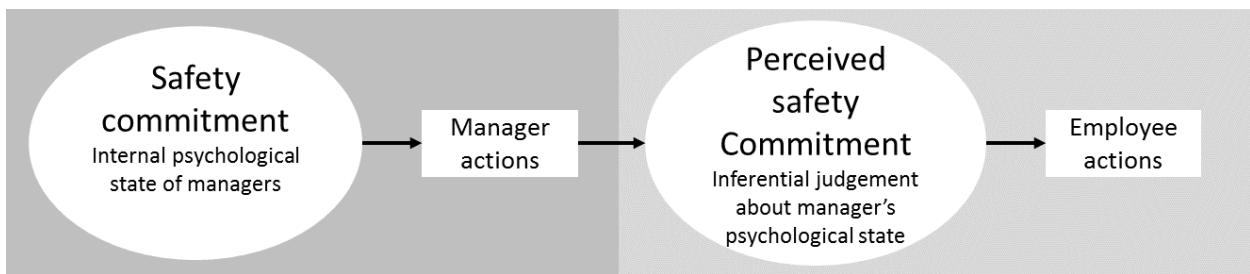
62 We address this gap in two ways. First, we ask what does it mean for leaders to be
63 committed to safety? We draw on organizational commitment theory to propose that leaders can
64 experience different forms of safety commitment and this experience is an internal psychological
65 state that shapes how they enact their commitment. For example, leaders who feel a personal
66 responsibility for the safety of all employees are likely to experience an emotional commitment
67 to safety that guides their subsequent actions. The safety literature's focus on safety commitment
68 via others' perceptions is somewhat detached from established conceptualisations of
69 commitment in other domains, which predominantly focus on the individual's experience of
70 commitment (Meyer & Allen, 1991), and shows that different dimensions of commitment
71 influence behaviors and outcomes in different ways (e.g. Meyer & Herscovitch, 2001). The
72 safety literature generally assumes that more safety commitment is better, without differentiating
73 different dimensions of safety commitment. Thereby, the specific nature of safety commitment
74 experiences is overlooked.

75 Second, we ask what are the behaviours that leaders engage in to convey their commitment
76 to safety to employees? We propose, based on social information processing theory (Salancik &
77 Pfeffer, 1978) that perceived management commitment is an inferential judgment made by
78 employees about leaders' internal psychological states based on the perceived actions of the
79 leaders. This inferential process, rooted in individual leaders' attributes and actions, has been
80 recognised in the safety climate literature as key sources of employee perceptions of
81 management commitment (Zohar, 2000, 2010; Zohar & Luria, 2005), yet it has not been studied
82 directly.

83 We expect that employees base their perceptions of management commitment on
84 observable actions that managers undertake in their role. For example, managers who speak

85 positively about the importance of safety, or make decisions that allocate resources to improving
 86 safety, are likely to be perceived by employees as being committed to safety.

87 Figure 1 summarizes the main constructs we use to address these two questions, the
 88 process we stipulate, and highlights how this process is linked with key aspects of the frequently
 89 used concept “perceived management commitment”. The Figure also shows that perceived
 90 management commitment leads to employee behaviours such as safety compliance. We do not
 91 elaborate this connection further because it is already well-established in the safety literature.



92

93 **Figure 1**

93

94 Managerial safety commitment as a psychological state in managers

94

95 1.1 Developing a theory of leader safety commitment

95

96 The limited direct focus on leaders in relation to safety commitment means that there is
 97 no theoretical framework for understanding how leaders themselves experience safety
 98 commitment. There are several benefits in building a theory of safety commitment from the
 99 individual leaders’ perspectives. The prevailing approach to leader safety commitment does not
 100 clearly articulate the leadership implications of safety commitment. Investigating commitment
 101 with a specific focus on safety, addresses recent calls for context specific considerations of safety
 102 leadership (e.g. Willis, Clarke, & O’Connor, 2017). While the evidence around these effects of
 103 safety leadership behaviors is accumulating fast, what is less understood are the differential
 104 driving forces behind behaviors and actions of individual leaders. A model of leader safety

105 commitment addresses this gap. In doing so, it contributes to the safety literature through a
106 critical refinement of one of its key concepts.

107 **1.1.1 Conceptualising safety commitment via multiple dimensions**

108 The workplace/organisational commitment literature has frequently investigated
109 commitment concepts as personal drives or mindsets in individuals and has developed more
110 complete theoretical frameworks for understanding the psychological bases of commitments (e.g.
111 Meyer, Becker & Vandenberghe, 2004; Meyer, Stanley, & Herscovitch et al, 2002). This
112 literature provides a basis for conceptualising the psychological attributes associated with safety
113 commitment. Recent calls in the commitment literature promote a move towards action
114 commitments directed towards a specific goal or target instead of commitment to an entity (i.e.
115 organisations or professions; Meyer & Anderson, 2016; Neubert & Wu, 2009), a suggestion
116 highly applicable to safety commitment. Meyer and Anderson (2016) define action commitment
117 as a “psychological state that reflects an attitude, bond, or mindset and characterizes “an
118 individual’s orientation towards a course of action that contributes to persistence in that course of
119 action” (p. 179). Following this definition we define a leader’s safety commitment as an action
120 commitment that reflects their mindset and drive to support organisational safety (see also
121 Reason, 1997). In fields outside of safety research, a range of studies have taken a refined
122 approach towards leader commitment and show that leaders’ commitment influences a range of
123 outcomes. Studies have for example investigated the concept of leader commitment to their
124 subordinates (Atwater, Waldman, Atwater et al, 2000; Landry & Vandenberghe, 2012; Landry,
125 Vandenberghe & Ayed; 2014). Others investigate leader commitment to specific outcomes such
126 as sales automation technologies (Cascio, Mariadoss, & Mouri, 2010), or health care innovation

127 (Birken, Lee, Weiner, et al, 2013). These papers conceptualise leader commitment as a mindset
128 that affects leaders' actions specific to a commitment target.

129 The dominant model of workplace commitment (Meyer & Allen, 1991) identifies three
130 dimensions of commitment, namely affective, normative and continuance commitment.

131 Affective commitment describes employees' emotional attachment to an organisation, normative
132 commitment represents a sense of obligation, and continuance commitment is rooted in the
133 awareness of the costs associated with leaving the organization. The distinction between these
134 three dimensions of commitment has been applied and supported by the majority of studies on
135 various types of work related commitments (e.g. Birken et al 2013 ; Landry & Vandenberghe,
136 2012; Lee, Carswell & Allen, 2000; Meyer, Becker & Vandenberghe, 2004; Meyer, Stanley, &
137 Herscovitch et al, 2002; Solinger, Van Olffen, & Roe, 2008). Meta-analyses report affective
138 commitment to be the strongest predictor of positive work behaviour, such as performance,
139 attendance, and extra-role behaviour, followed by normative commitment. Continuance
140 commitment is usually found to be unrelated or negatively related with such outcomes (e.g.
141 Meyer et al, 2002; Rhoades, Eisenberger & Armeli, 2001).

142 Safety commitment as a leader mindset has not been considered in such detail in the
143 safety literature. A small number of papers conceptualise safety commitment by referring to
144 related constructs such as safety attitudes, core values, priorities and interests, without going into
145 detail about its specific nature (e.g. Christian et al., 2009; Cigularov et al., 2013; Huang, Verma,
146 Chang et al., 2012; Törner, 2011; Vinodkumar & Bhasi, 2011; Wei, Chen, & Li, 2015). Most
147 studies approach the psychological aspects of safety commitment as uni-dimensional.
148 Nevertheless, across these studies indirect references to the three commitment dimensions
149 established by Meyer and Allen (1991) emerge, suggesting that these may be applicable to the

150 concept. For example, Griffith, Livesey and Clayton (2010) allude to an underlying drive as a
151 personal responsibility for safety, resonating with normative safety commitment. Huang et al.
152 (2012) describe safety commitment as managers' concern for employees well-being, while
153 Michael, Guo, Wiedenbeck et al. (2005) reflect on it as a form of caring, referring to features
154 akin to affective safety commitment dimensions. Further studies associate safety commitment
155 with genuineness and sincerity (e.g. Barling, Loughlin & Kelloway 2002; Michael et al, 2006),
156 implying the absence of a safety specific form of continuance commitment as positive for safety
157 commitment.

158 Based on the theoretical distinction between different dimensions of commitment, we
159 propose an adaptation of Meyer and Allen's (1991) commitment model to leaders' safety
160 commitment, with the adaptation of labelling continuance commitment as calculative
161 commitment. In the original model continuance commitment reflects the tendency to stay with an
162 organization due to lack of alternatives and perceived costs of leaving. We propose that such a
163 form of attachment does not directly apply to safety and that being calculative around safety
164 issues, as defined below more accurately captures this aspect of safety commitment. The
165 following structure is proposed:

- 166 • ***Affective commitment to safety***: reflects an emotional and sometimes passionate sense of
167 personal care for keeping individuals in and outside of the organisation safe.
- 168 • ***Normative commitment to safety***: reflects a moral obligation for safety as a core human
169 and social value and as the right thing to strive for
- 170 • ***Calculative commitment to safety***: reflects a transactional or rational requirement to
171 prioritise safety as an obligation to business survival as well as other external pressures
172 (e.g. regulations, job security, KPIs).

173

174 A similar structure has recently been applied to safety commitment in employees more
175 generally by Delegach et al (in press). Apart from our specific focus on leader safety
176 commitment, rather than general employee safety commitment, our conceptualization further
177 differs from theirs in two ways. First, Delegach et al (in press) only focus on affective and
178 calculative safety commitment, as they argue the effects of normative commitment are not
179 sufficiently distinct from affective commitment. We include normative commitment because
180 commitment to safety can be based on a moral imperative or responsibility in leaders. Ethical or
181 moral behaviour has been associated with leadership, in general (Brown, & Treviño, 2006) and
182 has been argued to be particularly important for safety leadership (Barling et al, 2002). Further,
183 our inclusion of all three dimensions of safety commitment is consistent with more recent
184 developments in the commitment literature, which identifies the profile of commitment
185 dimensions as a predictor of important work outcomes (Gellatly, Meyer, & Luchak, 2006). This
186 research shows that normative commitment plays an important role when considered in
187 combination with affective and calculative commitment. In line with this research, we do not
188 conceptualise the underlying dimensions of leader safety commitment to be mutually exclusive.

189 Second, Delegach et al (in press) conceptualise calculative, or continuance safety commitment
190 solely via a focus on prevention of losses. In our conceptualisation we also include strategic
191 gains that leaders might strive for, such as promotions. Incorporating positive outcomes as part
192 of calculative safety helps to distinguish the construct from avoidance motivation, which is
193 characterised by the drive to avoid negative outcomes (Elliot & Trash, 2010). We propose:

194 **H1:** Leader safety commitment can be captured via the three dimensions of affective,
195 normative and calculative safety commitment.

196

197 **1.1.2. Safety commitment demonstrations**

198 The safety climate literature describes that employees derive their perceptions of
199 management commitment to safety from the priority that management assigns to safety (Neal &
200 Griffin, 2004). Following a social information processing perspective (Salancik & Pfeffer, 1978),
201 which suggests that individuals make sense of their work environments by processing social
202 information, perceptions of management safety commitment are most likely to be rooted in
203 observable actions of leaders.

204 The behaviours by which an individual expresses commitment are generally considered
205 to be specific to the target of the commitment concerned (Meyer & Herscovitch, 2001).

206 Similarly, we expect that safety commitment will be demonstrated by specific actions that, at
207 least in part, contribute to employees' perceptions of management safety commitment (Zohar,
208 2000, 2010; Zohar & Luria, 2005). The actions through which leaders demonstrate safety
209 commitment have not been defined systematically in the research literature. However, studies of
210 safety climate that focus on employee perceptions of management safety commitment provide
211 insights into the actions through which individual managers demonstrate their commitment to
212 safety.

213 Therefore, in a preliminary step, we conducted a systematic review of the literature and
214 we identified six categories of behavioural safety commitment demonstrations that are applicable
215 to individual manager's actions (see Appendix for details on literature search and Table 1 for
216 behaviour categories). Table 1 shows that four of the categories involved interactions with
217 employees, including the way leaders communicated about safety issues, participation and

218 visibility at the worksite and in safety activities, providing support and guidance, and involving
 219 workers in safety matters by encouraging suggestions and considering employee input.

220 **Table 1**

221 *Demonstrations of safety commitment in the literature*

Demonstration	Descriptors	References
Communication	<ul style="list-style-type: none"> • Communication about safety issues • Talking to employees about working safely • Communication about safety policies • Expressing concerns about safety • Expressing safety values • Listening to safety concerns • Open communication 	Abudayyeh et al (2006); Cheyne et al (2002); Christian et al (2009); Cox & Cheyne (2000); Feng et al (2011); Fruhen et al (2013, 2014); Gilkey et al (2003); Kao et al (2009); O’Dea & Flin (2001); Raj-Reicher (2013); Rundmo & Hale (2003); Zohar (1980, 2008); Zohar & Luria (2005)
Managerial participation	<ul style="list-style-type: none"> • Visibility at the work site • Participation in safety activities and safety related work tasks • Involvement in safety promotion, inspections, safety analyses of critical tasks, working methods, accident investigations, safety trainings, accident prevention and safety goal setting • Participation in safety meetings and committees • Vigilance to rule violations during site visits • Conducting site visits, face-to-face meetings with employees, scheduled tours and briefings 	Gilkey et al (2003); Mearns et al (2003); O’Dea & Flin (2001); O’Toole (2002); Rundmo & Hale (2003); Simard & Marchand (1997); Vecchio-Sudus & Griffiths (2004); Wu et al. (2008); Yeung & Chan (2012); Zohar (1980); Zohar & Luria (2005)
Support and guidance	<ul style="list-style-type: none"> • Being a positive example • Support and appreciation of employees • Corrective actions in response to unsafe acts • Rewarding safe behaviour 	Arboleda et al (2003); Cheyne et al (1998, 1999, 2002); Cui et al., (2013); Fruhen et al (2014); Guldenmund (2007); Heese (2012); O’Dea & Flin (2001); O’Toole (2002); Rundmo & Hale (2003); Vecchio-Sudus & Griffiths (2004); Yeung & Chan, (2012); Zohar & Luria (2005)
Allocating resources	<ul style="list-style-type: none"> • Investment and financial support of safety activities • Provision of equipment • Designing jobs • Spending time on safety • Investment in safety training, education and safety programs 	Abudayyeh et al (2006); Cheyne et al (2002); Feng et al (2011); Flin (2003); Fruhen et al (2013, 2014); Gilkey et al (2003); Luria & Rafaeli (2008); Simard & Marchand (1997); Vecchio-Sudus & Griffiths (2004); Wu et al (2008); Zohar (1980, 2008); Zohar & Luria (2005)
Policies and decision making	<ul style="list-style-type: none"> • Making policies and decisions • Devising written safety policies • Implementation of safety policies and procedures • Defined safety objectives • Acting quickly and decisively on safety issues 	Cheyne et al (2002); Cui et al (2013); Feng et al (2011); Gilkey et al (2003); Hadjimanolis & Boustras (2013); Kao et al (2009); Simard & Marchand (1997); Zohar (2008)
Involving workers	<ul style="list-style-type: none"> • Welcoming and encouraging suggestions • Open door policy • Involving employees in planning and decision-making, including safety goal setting 	Cheyne et al (1999); Cox et al (1998); Hadjimanolis & Boustras (2013); O’Dea & Flin (2001)

223 Two of the categories involved actions that do not necessarily require direct contact with
224 employees, but nonetheless are likely to be perceived either directly or indirectly by employees
225 as ways in which individual leaders show their commitment to safety (akin to the safety systems
226 leadership conceptualisation by Griffin & Talati, 2014). These categories were resource
227 allocation in terms of finances, equipment and time by leaders, and policy development, decision
228 making, and implementation.

229 Our review of leader safety commitment demonstrations provides a framework for
230 differentiating the actions through which individual managers might convey their commitment to
231 safety. To date, these demonstrations of commitment have not been investigated systematically,
232 and the prevalence of the different demonstrations is not known. Therefore, we propose an
233 exploratory hypothesis in which the six categories are applicable to the ways in which leaders
234 demonstrate safety commitment.

235 **H2:** Leader safety commitment demonstrations can be captured via six categories of behaviours.

236

237 **1.3 Linking safety commitment with demonstrations**

238 The three dimensions of safety commitment (affective, normative, and calculative) might
239 be linked to demonstrations of safety commitment in individual leaders as follows. Affective and
240 normative safety commitment are likely to be associated with higher levels of engagement in
241 safety commitment demonstrations, as they reflect an appreciation of safety as an inherent value,
242 thereby promoting a strong and sincere focus on safety issues. In contrast calculative safety
243 commitment is likely to either have no effect or even a detrimental impact on demonstrations of
244 safety commitment, as it reflects a utilitarian approach towards safety as a means to other ends.
245 The proposed relationships are in line with findings on other types of commitment, which show

246 affective commitment, in particular, is a predictor of positive work behaviour. Normative
247 commitment is also associated with such behaviours, but to a lesser extent. Calculative
248 commitment is usually found to be unrelated or negatively related with such outcomes (Meyer et
249 al, 2002; Rhoades, Eisenberger & Armeli, 2001). We hypothesise:

250

251 **H3:** Affective, and normative safety commitment, but not calculative safety commitment,
252 are positively associated with demonstrations of safety commitment in leaders.

253

254 Finally, we expect the work context to influence the extent to which safety commitment
255 affects leaders' behaviour. In particular the overall safety climate is expected to facilitate the
256 demonstration of safety commitment. Safety climate captures perceptions of norms and actions
257 that help to prevent unsafe actions (Zohar, 2000). Generally, a positive overall safety climate is
258 indicated by the perceived emphasis on and priority for safety in an organisation or a team.
259 Norms have generally been paraphrased as 'standards', 'frames of references' or 'common
260 sense' (Sherif, 1936). Armitage and Conner (2001) define a subjective norm as an "individual's
261 perceptions of general social pressure to perform (or not to perform) the behavior" (p. 474). In
262 line with these general descriptions of norms, perceptions of safety climate have been shown to
263 critically influence safety behaviours and other outcomes (e.g. Flin, Mearns O'Connor &
264 Bryden, 2000; Neal & Griffin, 2002; Zohar, 2000; Zohar & Luria, 2005). When the environment
265 supports the expression of safety commitment, leaders with stronger affective and normative
266 commitments to safety will be able to express their safety commitment. They are likely to
267 perceive safety climate as 'standards', or a 'frame of reference' (Sherif, 1936), and their high
268 safety commitment will be highly consistent with those standards. Thus perceptions of positive

269 safety climates are likely to encourage leaders, who also have strong normative or affective
270 commitment to safety to act consistently with their own personal safety commitment as well as
271 the high priority of safety that is assigned by the context in which they operate. When the
272 environment does not support expressions of safety commitment, the demonstration of
273 commitment will be constrained regardless of the leader's affective or normative commitment.
274 Accordingly, we hypothesise:

275
276 **H4:** The association of affective and normative safety commitment with safety
277 commitment demonstrations will be moderated by perceived safety climate in a way that more
278 positive perceptions enhance the association of these safety commitments with demonstrations in
279 leaders.

280

281 **1.3 Study overview**

282 We approach the concept of safety commitment in individual leaders via an exploratory sequential
283 mixed methods design (Cameron, 2009). Following this type of study design, a combination of qualitative
284 and quantitative studies allows us to explore the concept's content and to test to what extent our
285 conceptualisation captures it in its entirety with some degree of triangulation. Both study types
286 complement each other and in doing so overall strengthen the robustness of the evidence presented
287 (Creswell & Plano Clark, 2011; Onwuegbuzie, Bustamante, & Nelson, 2010). In keeping with the
288 unexplored nature of safety commitment in leaders, Study 1 (interview study) tests the applicability of the
289 proposed conceptualisation of safety commitment to leaders' experiences (Hypotheses 1), and their
290 demonstrations of safety commitment (Hypothesis 2), including the specific content of these different
291 dimensions and demonstrations. It also explores the link of the safety commitment dimensions with
292 behavioural demonstrations (Hypothesis 3). The first study's findings are then employed to inform
293 measurement development in Study 2 (following a "building" strategy for integration (Creswell & Plano

294 Clark, 2011). Using this measure, Study 2 provides a quantitative test of the content of leader safety
295 commitment, by examining the factorial structure of a leader safety commitment measure (Hypothesis 1).
296 Further, it tests the associations of the different dimensions of leader safety commitment with the leaders'
297 overall level of safety commitment demonstrations (Hypothesis 3) and the extent to which this association
298 is moderated by perceptions of safety climate (Hypothesis 4). The second study tests how specific safety
299 commitment dimensions are related to the overall level of safety commitment demonstrations rather than
300 the specific behaviours identified in Study 1. This approach provides insight into the dimensions' of
301 commitment and their relationship with an independently developed measure of demonstrations of safety
302 commitment. This study also reports the safety commitment dimensions' association with the level of
303 safety commitment demonstrations, and to what extent this link is shaped by the individual leaders'
304 perception of their company's safety climate (addressing Hypotheses 3 and 4).

305 **2. Study 1 – Interview study**

306 **2.1 Method Study 1**

307 *2.1.1 Sample and recruitment*

308 We interviewed 40 participants (middle managers (superintendents and site managers; n = 21)
309 and frontline managers (team supervisors; n = 19) from 13 organisations operating in Australia.
310 The participants worked in construction in mining (n = 22) and the oil and gas sector (n = 18; all
311 sample sizes fulfil saturation criteria identified by Francis, Johnston, Robertson, et al 2010).
312 These industries play significant roles in the Australian economy and are safety critical
313 (NOPSEMA, 2011; Safe Work Australia, 2014). Participants had a median experience of 8 years
314 in their role ($Md_{\text{frontline managers}} = 10$ years, $Md_{\text{middle managers}} = 6.5$ years). They were all in
315 leadership functions and their median number of direct reports was 12 ($Md_{\text{frontline managers}} = 14.5$
316 and $Md_{\text{middle managers}} = 12$).

317 *2.1.2 Interview procedures*

318 Individual interviews were conducted in person. Participation was voluntary and participants
319 received detailed information about the purpose of the study, the topics and questions involved.
320 With the consent of the participants all interviews were recorded and subsequently transcribed.
321 One well experienced interviewer conducted all the interviews (>100 research interviews
322 conducted). The average interview duration was 19 minutes.

323 The interviews started with questions concerning the participants' role to familiarise the
324 interviewer with each participant's work and to establish their position within the organisation
325 (i.e. middle manager or frontline manager). It was then focussed on participants' safety
326 commitment via open questions and critical incident technique (Flanagan, 1954); see Appendix
327 A for complete interview schedule).

328 *2.1.3 Coding and analysis of interviews*

329 The interviews were deductively coded via the pre-defined dimensions of safety commitment
330 (following guidelines by Mayring, 2000; using the analysis software Atlas.Ti). This coding
331 procedure allowed pre-defined categories to be applied and for additional categories to emerge
332 when interview content did not fit within the existing coding categories. Coders were instructed
333 to identify segments in the text that represent standalone meaning units (as defined by
334 Graneheim & Lundman, 2004) and to allocate each meaning unit into only one categories,
335 treating them as mutually exclusive (Krippendorff, 2013).

336 Initial coding was conducted by two coders on a subset of interviews (n = 8). The two
337 coders first coded four interviews and then discussed their coding results. This discussion
338 indicated that an "other" category needed to be carried forward as a small number of meaning
339 units described safety commitment dimensions more broadly, so that these responses could not
340 be allocated clearly into the three dimensions. Following these refinements of the coding

341 scheme, the coders independently reviewed their so far coded interviews and co-coded the
 342 remaining four interviews. Sufficient inter-rater agreement of $\alpha = 0.79$ (95% CI_{LL} 0.72 to CI_{UL}
 343 0.86) was achieved (computed with a syntax by Hayes & Krippendorff, 2007). Consequently, the
 344 remaining interviews were coded by one coder using the refined coding scheme.

345 The coding results were analysed via the construct frequency, an indicator of relevance
 346 (Namey, Guest, Thairu et al, 2007). Second, illustrative quotes for the content of each coding
 347 category are provided. Third, to explore the link between safety commitment dimensions and
 348 demonstrations, the frequency of the dimensions and demonstrations was identified for each
 349 participant. To control for interview length a ratio of each concept's frequency and interview
 350 length was computed, resulting in ordinal values for each participant (based on Fruhen et al,
 351 2014). Only the calculative safety commitment and decision and policy-making frequency were
 352 indicated as normally distributed across the participants ($D_{\text{calculative safety commitment}}(40) = .09, p > .$
 353 $20; D_{\text{decision and policy making}}(40) = .12, p > .20$). Thus correlations were analysed using Kendall's
 354 Tau.

355 **2.2. Results and Discussion Study 1**

356 **2.2.1 Safety commitment - content analysis results**

357 A total of 182 meaning units were identified as representing dimensions of safety
 358 commitment, the majority of which ($f = 171$) reflected the three dimensions defined in the
 359 introduction (see Table 2). Only 11 meaning units could not be classified into the three
 360 dimensions. These units did not represent a coherent theme and thus were not classified further.

361 **Table 2**

362 *Frequencies of the safety commitment dimensions by position and industry*

Frequency

	Overall	Frontline managers	Middle managers	Oil and gas industry	Construction industry
Safety commitment					
Calculative	71	29	42	33	38
Affective	60	29	31	29	31
Normative	40	13	27	17	23
Other	11	6	5	8	3

363

364 Table 3 shows example meaning units reflecting each of the three dimensions. Meaning
365 units identified as calculative commitment often referred to safety commitment as driven by the
366 consideration of consequences for production if safety was not maintained, implications for the
367 participants' and their companies' reputation, as well as the value of safety for future contracts
368 and employability.

369 **Table 3**

370 *Example quotes for safety commitment dimensions*

Calculative Safety Commitment

"If we get safety and process safety right we're doing our job because everything else will happen, not just making a lot of barrels" (Middle manager, oil and gas)

"There is loss of personal reputation and loss of reputation to the company." (Frontline manager, oil and gas)

"They [employees who get injured] are not available for work. So that in turn, if they don't come back for the next swing, it puts more pressure on the other guys and it just compounds itself having an injury to one of your key guys. It's just bad business." (Middle manager, oil and gas)

"If you go out incident free you're pretty well assured of getting another job." (Frontline manager construction)

Affective Safety Commitment

"It's a caring thing, I don't want to see people get hurt." (Middle manager, construction)

"With the personnel in the field, I could not imagine having to go and tell someone, that their husband, or their wife is not going to come home. That would affect me pretty badly" (Frontline manager, construction).

"I couldn't think of anything worse than seeing a mate that I work with get hurt" (Frontline manager, oil and gas)

"I mean I get to the point where I'm reading out notices in the morning and someone has been killed in a work accident. I tend to take it a bit deeper and there are times when I've done that and I've got emotional" (Frontline manager, construction)

Normative safety commitment

"Well you are the responsible person, the buck stops with you, you are not just legally accountable you are morally responsible." (Middle manager, oil and gas)

"My workers ought to be able to go home safely." (Frontline manager, construction)

"Everyone has a right to come to work and go home in the same way they came to work and it is possible in this day and age, you know what I mean?" (Middle manager, construction)

"For me that's the personal thing, it's the right thing to make sure that everybody's safe and not put anybody at risk." (Middle manager, oil and gas)

Other

“I just want it to be safe for everyone. I don’t want to have issues or another leak or another problem in the future. I would rather deal with it now to make it safer for later.” (Middle manager, oil and gas)

“If there is anything you can avoid, I think you should try and avoid it if there is a potential for a safety issue there.” (Middle manager, construction)

371

372 Meaning units identified as representing affective commitment often reflected the

373 sentiment of care for employees and the emotional load associated with having to deal with

374 accidents and injuries. To a lesser extent themes in the affective commitment meaning units

375 reflected on the consequences of a potential safety occurrence from the perspective of the

376 employees' families and the desire to not wanting to harm or hurt employees. Most of the of the

377 meaning units identified as representing normative commitment dimensions referred to a

378 personal, and moral responsibility to look after the workers’ safety. Participants also reflected on

379 the wider impact of their actions on others and indicated that safety should be a norm, as it is the

380 right thing to do in relation to normative safety commitment.

381 Table 4 shows that a total of 456 meaning units represented demonstrations of safety

382 commitment. Notably, all the demonstrations mentioned by the participants were captured by

383 those identified in our safety literature review and no additional themes emerged. Further, the

384 demonstrations’ relevance was mostly consistent across the different job roles and industry

385 contexts. Overall demonstrations that require direct interaction with employees, in particular

386 communication and offering guidance and support were identified most frequently, followed by

387 decision-making, policy making and planning.

388 **Table 4**

389 *Frequencies of the safety commitment demonstrations by position and industry*

	Frequency				
	Overall	Frontline managers	Middle managers	Oil and gas industry	Construction industry
Safety commitment demonstrations					
Communication	108	48	60	50	58
Guidance and support	99	49	50	30	69

Decision-making, policy making and planning	78	38	40	44	34
Allocating resources	61	25	36	32	29
Involving workers	59	25	34	31	28
Participation in safety activities	51	16	35	20	31

390

391 Table 5 illustrates the content of the behavioural demonstrations of safety commitment.

392 Meaning units identified as reflecting communication, the most frequently identified theme, were

393 often concerned with exchanging information and talking to others about safety more generally.

394 Other more specific themes within communication included openness in communication, using

395 different ways to communicate the importance of safety, talking about rules and procedures,

396 listening, as well as expressing concern.

397 **Table 5**

398 Safety commitment demonstrations by frontline and middle managers

Communication

“It’s the way to speak to people, the way you give instructions.” (Frontline manager, oil and gas)

“And you don’t belittle people no matter how silly you may think it is. You listen to everybody’s concerns and you address them. (Frontline manager, oil and gas)

Guidance and Support

“By stopping jobs and doing things like that, when I say “I don’t think that is right” then I’ll stop the job and so people can see that we don’t just talk about it, we actually do it and it’s important sometimes for people to see that” (Middle manager, oil and gas)

“I will submit that I think there’s a better way of doing the job and try and get them to look at the job from a different angle and then I might give them leading questions to prompt them the way I think that it should be done. (Frontline manager, construction)

Decision-Making, Policy-Making and Planning

“It’s part of the procedures. Let’s follow them. Let’s do it right. If something goes wrong here we need to be aware.” (Frontline manager, construction)

“It’s one thing saying we should be safe – we should be safe but I mean I have to demonstrate that on a day to day basis by making decisions based on the information I’m getting about what’s safe and what’s unsafe and acting upon those type of things.” (Middle manager, oil and gas)

Allocating Resources

“We also give them the time to produce the documentation. So never putting people under pressure to do something. You always give them ample time to do the safety side of things.” (Middle manager, construction)

“The engineers can say, “It will be okay with a patch on it” but for me it’s not and I would rather just spend that extra money and go through the job of actually shutting down the tray and replacing the spool.” (Middle manager, oil and gas)

Involving Workers

“And I think at the same time, I mean you must show people that you are caring and listening so that people, you know, know that if there is a situation or any unsafe thing they can come and talk to you rather than if you were to shut people down and close your ear to the peoples’ view or complaint then I think that it’s likely things will happen.” (Middle manager, construction)

2. Affective commitment	-.05									
3. Normative commitment	-.14	.16								
4. Calculative commitment	.16	-.25*	-.29*							
5. Overall drive	-.14	-.13	-.23 ⁺	.04						
6. Communication	-.05	-.10	.17	.07	-.08					
7. Guidance and support	-.12	.23*	.20 ⁺	.11	-.04	.13				
8. Policy-making, decision-making and planning	-.02	.19 ⁺	-.15	-.08	.14	-.02	-.08			
9. Resource allocation	-.03	.14	.09	-.08	-.08	.03	.21 ⁺	-.06		
10. Participating	.10	.18	.07	-.05	.02	-.15	.07	-.02	.01	
11. Involving workers	.06	-.17	-.16	.15	-.07	.04	-.05	-.07	.19	-.03

417 **Note:** * $p < .05$; ⁺ $p < .10$

418 Affective safety commitment was positively correlated with guidance and support ($r =$
419 $.23, p < .05$) and with policy-making, decision-making and planning at the $.10$ probability level (r
420 $= .19, p < .10$). Normative commitment also had a weak association with guidance and support (r
421 $= .20, p < .10$). These findings provide preliminary support for Hypothesis 3 and are in line with
422 research on other commitments that finds affective and normative commitment, but not
423 calculative commitment (i.e. continuance commitment to an organisation or profession), to be
424 associated with positive workplace outcomes (e.g. Meyer et al, 2002). It should also be noted
425 that both normative ($r = -.29, p < .05$) and affective ($r = -.25, p < .05$) safety commitment
426 dimensions were negatively correlated with calculative commitment, providing some further
427 insights into the internal structure of safety commitment.

428 Overall, the findings of Study 1 support the proposed structure of leader safety
429 commitment (in support of Hypothesis 1) and illustrate the applicability of the behavioural
430 categories identified from the literature (in support of Hypothesis 2). The meaning units
431 identified for each dimension further illustrate the content of the three dimensions of
432 commitment and in particular support the notion that distinct aspects of safety commitment
433 operate in leaders. Finally, in relation to Hypothesis 3, the study gives preliminary support for
434 the proposed links between safety commitment demonstrations and affective and normative
435 safety commitments, but not calculative safety commitment.

436 3. Study 2 Questionnaire Study

437 3.1. Method Study 2

438 3.2 Sample and Procedure

439 A survey was distributed to attendees at an aviation industry meeting (response rate 25%; n
440 = 50) and an online version of the survey was distributed via industry mailing lists of an
441 Australian national safety association and a newsletter by the Australian Department of Mines
442 and Petroleum (n = 58). Because of the particular research focus on leaders, only participants in
443 managerial positions with leadership responsibility were included in the main analysis (senior,
444 middle and operational management; n = 89).

445 The sample consisted of 68 males and 21 females. The majority of participants indicated to
446 have worked in their current position either between 1 and 5 years (n = 26) or between 6 and 15
447 years (n= 25). The majority of participants worked in the aviation industry (n =47), followed by
448 the mining sector (n = 17) and the oil and gas industry (n = 14).

449 3.3. Measures

450 All constructs were assessed via self-reports from the participants. All scales had sufficient
451 reliability at Cronbach's $\alpha = .77$ or higher (see Table 8 for details).

452 *Safety commitment dimensions* were assessed via self-developed items. The items were
453 developed based on measures of organizational commitment (e.g. Meyer, Allen, & Smith, 1993)
454 and the themes identified in Study 1. Table 7 reports the final nine item measure.

455 **Table 7**

456 *Factor analysis of safety commitment items*

Items	Communalities			
		Normative safety commitment	Calculative safety commitment	
I make safety a priority because...				
I am passionate about safety	.55	.10	-.03	.68
Safety has a great deal of personal meaning to me	.75	.06	.06	.83

I care about safety	.36	-.02	-.02	.61
It will help me get promoted	.46	-.17	.66	.11
I don't want to lose my reputation	.62	.09	.78	.02
I might lose my job if I don't	.62	.10	.77	-.16
My moral compass tells me to do so	.77	.88	-.01	-.01
I feel a sense of moral obligation to support safety	.73	.82	-.01	.06
Safety is my moral responsibility	.69	.78	.02	.08

457 **Note:** Extraction method Maximum Likelihood, rotation method: Oblimin with Kaiser Normalization; analysis based on all
 458 returned surveys independent of participant position; n = 104
 459

460 Items were evaluated through a two-stage validation process following Anderson and
 461 Gerbing (1991), starting with 15 items. Subject matter experts working in organizational
 462 psychology and safety management (n=8 during step 1 and n=11 during step 2) categorised items
 463 into the three safety commitment dimensions based on the extent to which they perceived the
 464 items to represent the three dimensions of safety commitment. Following the first step, items that
 465 were identified as not clearly representing one of the safety commitment dimensions were
 466 refined. After the second step, nine items were retained that all had a C_{SV} score of 0.82 or higher,
 467 indicating good content validity. Factor analysis of survey responses showed that the items load
 468 on three factors representing the three safety commitment dimensions as intended (see Table 7),
 469 thereby supporting hypothesis 1. Scores for each safety commitment form were computed via
 470 mean scores of the relevant items. Participants responded via a five point scale ranging from
 471 strongly disagree to strongly agree.

472 ***Demonstrations of safety commitment*** were measured via a nine-item scale by Rundmo
 473 and Hale (2003) to assess the extent to which participants show safety is important to them
 474 (example item: *I personally often talk to employees about working safely*). Items were rated on a
 475 five-point scale ranging from strongly disagree to strongly agree).

476 ***Perceptions of safety climate*** were measured using three-items by Neal and Griffin (2006;
 477 example item: *Safety is given a high priority by management*). Items were rated on a five-point
 478 scale ranging from strongly disagree to strongly agree.

479 *Time in position* was used as a control variable to account for participants' level of
480 experience.

481 **3.4 Analysis and Results Study 2**

482 The Kolmogorov–Smirnov test indicated that scales were not normally distributed (D (86)
483 ranging between 0.12 and 0.27; all $p < .005$). Accordingly, nonparametric tests were used,
484 namely Spearman's rank correlation and hierarchical regression (entering control variables in the
485 first step) with bootstrapping 5000 bootstrapped samples (Efron and Tibshirani, 1993).
486 Bootstrapped regression has been described by Field (2009) as a suitable alternative to standard
487 regression analysis in cases when data are non-parametric. It generates a number of samples by
488 re-sampling the initial sample with replacements, based on which it estimates the standard errors
489 of the standard deviations and calculates confidence intervals (Hayes, 2009). When the
490 confidence interval does not cross zero, the effect is identified as significant.

491 Correlations, shown in Table 8, indicate affective and normative commitment, but not
492 calculative commitment, were significantly related to demonstrations of safety commitment
493 ($r_{\text{affective}} = .67$; $p < .01$; $r_{\text{normative}} = .56$; $p < .01$; $r_{\text{calculative}} = -.08$; $p > .10$). Further, demonstrations of
494 safety commitment were associated with perceived safety climate ($r = .31$; $p < .01$). It should
495 also be noted that the mean score of calculative safety commitment ($M = 3.14$) was lower than
496 those of the other two commitment dimensions ($M_{\text{affective safety commitment}} = 4.55$; $M_{\text{normative safety}}$
497 $\text{commitment} = 4.40$), which is not consistent with the frequencies from Study 1, where calculative
498 commitment was identified most frequently.

499 **Table 8**

500 *Descriptive statistics and correlations Study 2*

Variable	M (SD)	1	2	3	4	5	6
1. Time in position	3.12 (1.57)						
2. Affective safety commitment	4.55 (0.52)	-.04	(.77)				

3. Normative safety commitment	4.40 (0.70)	-.19*	.50**	(.88)		
4. Calculative safety commitment	3.14 (0.94)	-.10	.02	.04	(.78)	
5. Perceived safety climate	4.15 (0.70)	-.09	.18*	.39**	-.06	(.92)
6. Demonstration of safety commitment	4.33 (0.55)	-.04	.57**	.45**	-.05	.31** (.89)

501 Note: n = 89* p<. 05; ** p<. 01; reliabilities shown on diagonal where applicable

502

503 The regression analysis (see Table 9) indicated that affective ($\beta = .60$; $p < .001$), but
 504 neither normative ($\beta = .14$; $p > .05$) nor calculative ($\beta = -.05$; $p > .05$) safety commitment
 505 dimensions were linked with demonstrations of safety commitment. Accordingly, Hypothesis 2
 506 was partially supported. Together, the three safety commitment dimensions explained 47% of the
 507 variance in demonstrations of safety commitment.

508 **Table 9**

509 *Regression analysis of safety commitment demonstrations on safety commitment and*
 510 *interaction effects*

	B(SE)	β	R²	LL 95% CI	UL 95% CI
Main Effects					
Step 1					
Time in position	-.01 (.04)	-.03	.00	-.07	.06
Step 2					
Time in position	-.01 (.03)	-.01		-.06	.05
Affective safety commitment	.63 (.10)	.60**		.41	.82
Normative safety commitment	.11 (.08)	.14		-.04	.28
Calculative safety commitment	-.03 (.05)	-.05	.47	-.18	.08
Interaction Effects					
Step 1					
Time in position	-.02 (.06)	-.03	.00	-.12	.09
Step 2					
Time in position	-.01 (.04)	-.01		-.08	.06
Affective safety commitment	.42 (.05)	.63**		.28	.58
Perceived safety climate	.08 (.05)	.14		.01	.16
Affective safety commitment X perceived safety climate	.17 (.07)	.20*	.50	.05	.31
Step 1					
Time in position	-.02 (.06)	-.03	.00	-.12	.08
Step 2					
Time in position	.05 (.05)	.09		-.05	.14
Normative safety commitment	.32 (.07)	.53**		.18	.47
Perceived safety climate	.08 (.06)	.13		-.04	.20

Normative safety commitment X perceived safety climate	.13 (.06)	.21*	.32	.03	.23
Step 1					
Time in position	-.02 (.06)	-.03	.00	-.12	.08
Step 2					
Time in position	.00 (.06)	-.01		-.10	.10
Calculative safety commitment	-.02 (.06)	-.03		-.11	.10
Perceived safety climate	.21 (.06)	.36**		.12	.32
Calculative safety commitment X perceived safety climate	.03 (.05)	.07	.13	-.06	.01

Note: n = 89 ** $p \leq .01$; * $p < .05$

511

512 Analysis of the hypothesized moderation effects indicated that normative ($\beta = .21$; $p < .05$)

513 and affective safety commitment ($\beta = .20$; $p < .05$; see Table 9) interacted with perceptions of

514 safety climate in their link with safety commitment demonstrations. Interaction effects (Figure 1)

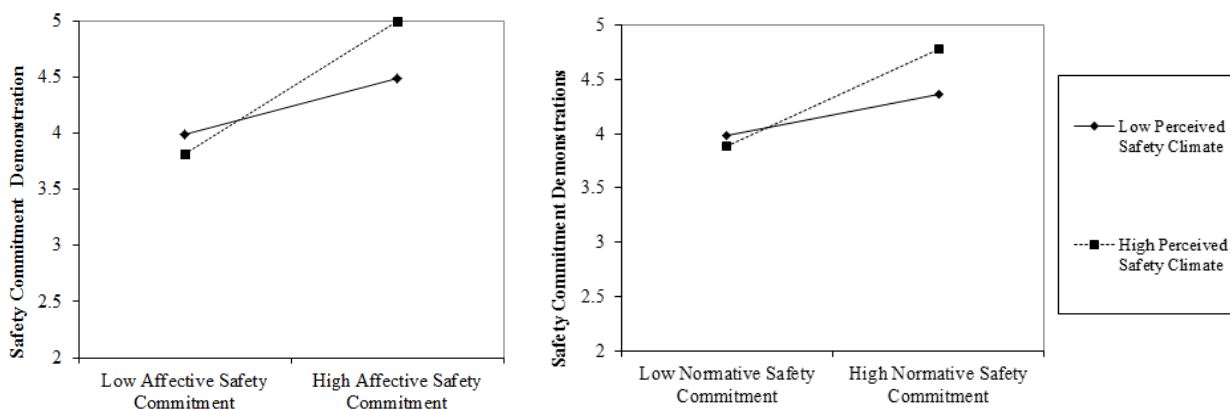
515 show that both safety commitments' associations with demonstrations were more pronounced

516 when safety climate was perceived more positively only in leaders with high levels of normative

517 and affective safety commitment. The tendency of those scoring low on these safety

518 commitments to engage in safety commitment demonstrations was not affected by their

519 perceptions of safety climate to such an extent. Accordingly, Hypothesis 4 was supported.



520 **Figure 1**

521 Interaction of affective and normative safety commitment with perceived safety climate

522

523 4. Overall Discussion

524 This paper approaches management safety commitment from the views of individual
525 leaders' themselves and approaches the concept via an exploratory sequential mixed methods
526 design involving two studies (Creswell & Plano Clark, 2011). Building on an established theory
527 of workplace commitment, we show that affective, normative and calculative dimensions of
528 commitment apply to the way safety commitment is experienced by leaders, supporting
529 Hypothesis 1. Both studies indicate this structure to be applicable, thereby confirming fit of
530 integration (Onwuegbuzie et al, 2010). Rooted in propositions of social information processing
531 theory (Salancik & Pfeffer, 1978), we further explored how managers demonstrate safety
532 commitment via behavioural expressions. Findings from both studies concerning the
533 demonstrations of safety commitment complement each other, and provide an expansion view of
534 the concept as follows (Onwuegbuzie et al, 2010). Interviews supported a distinction between
535 different demonstrations of safety commitment and enabled us to explore their content,
536 supporting Hypothesis 2. In partial support of Hypothesis 3, only affective but not normative
537 safety commitment were found to be consistently associated with demonstrations of safety
538 commitment across the two studies. Moreover, calculative safety commitment was not associated
539 with demonstrations in both studies. Although calculative commitment was not linked to
540 behavioural demonstrations in our studies, it might be associated with other outcomes. For
541 example, safety commitment can for example also be expressed relative to the priority given to
542 other organisational goals, such as productivity or cost (Mearns et al, 2003). The relative focus
543 on safety may for example be negatively associated with calculative safety commitment as this
544 type of dimension may be more prominent in individuals who simultaneously favour
545 organisational goals other than safety to a larger extent. It is further possible that a pronounced
546 focus on safety due to transactional requirements, rather than moral or affective reasons, may be

547 associated with leader authenticity (Borgersen, Hystad, Larsson, & Eid, 2014) with regards to
548 their value for safety, as well as employee cynicism (Stanley, Meyer & Topolnytsky, 2005).
549 Finally, the effects of affective and normative safety commitment on demonstrations were found
550 to be stronger when leaders perceived a more positive safety climate in their work environment,
551 thereby supporting Hypothesis 4.

552 The present approach towards leaders' safety commitment complements and extends the
553 existing safety literature in two ways. First, our research contributes to the safety literature
554 through a refinement of one of its key concepts. Our research shifts the focus on safety
555 commitment away from employee perceptions onto its roots in individual leaders' experiences
556 and demonstrations of safety commitment. It explores the specific dimensions of safety
557 commitment and how these may manifest themselves in behavioral demonstrations. In doing so,
558 it integrates safety commitment with concepts of leadership. Our results show that viewing safety
559 commitment in leaders as proposed in this study can help explain how they experience safety
560 commitment and how this might translate into leadership actions that support safety. Notably, the
561 safety leadership research has mostly focused on the role of leadership styles and behaviours
562 (e.g. Clarke, 2013), and not considered the sources of these observable leader actions. Our results
563 provide insights into leaders' mindsets that underpin the behaviours through which they support
564 safety.

565 Second, our multi-dimensional conceptualisation of safety commitment integrates the
566 established theory of work-related forms of commitment by Meyer and Allen (1991) into the
567 safety commitment literature. The focus on safety as a commitment target answers recent calls
568 for an extension of commitment theory via action commitments (Meyer & Anderson, 2016). Our
569 findings align with those observed for other forms of workplace commitments (e.g. Meyer et al,

570 2002; Meyer & Herscovitch, 2001) and show that the different dimensions of commitment are
571 also applicable to leaders' safety commitment and that this view provides refined and extended
572 understanding.

573 **4.1 Limitations**

574 This study combines qualitative and quantitative research methods via an exploratory
575 sequential mixed method design. The combination of qualitative and quantitative research
576 methods complement each other and are well suited to the stage of the research process and the
577 conceptual and measurement development that is carried out (Creswell & Plano Clark, 2011).
578 While the mixed method approach supports the robustness of our findings across two studies,
579 each studies' limitations should be considered when interpreting the findings. First, both studies
580 involved leaders themselves reflecting about their own work, and their safety commitment. We
581 adopted a view from the leaders' own perspective to gain insights into their introspections related
582 to safety commitment, which aligns with the theoretical propositions explored. We evaluate this
583 approach as suitable for the stage of the research process as it can support an initial exploration
584 of the internal structure of safety commitment and its functionality. However, because we asked
585 participants about their own behaviour and views, they might have presented themselves in a
586 desirable way to make a good impression in the interviews and surveys, so responses might not
587 reflect their actual actions and motives (Gardner & Martinko, 1988). Podsakoff and Organ
588 (1986) describe such a tendency to present oneself in a better light as not necessarily detrimental
589 to research findings as it should only lead to an upward shift in the distribution of the responses.
590 Further, Christian et al. (2009) evaluate data based on self-reports an unlikely area of concern for
591 safety related research. However, it needs to be considered that the responses to each of the
592 dimension of safety commitment may have been affected to varying extent. In particular a bias

593 may have obscured the importance of calculative safety commitment as reported via the items
594 and questions that were used. Leaders may not want to be perceived, or think of themselves, as
595 being interested in safety for calculative reasons, and this may have affected their responses and
596 may have contributed to underreporting on this dimension in Study 2.

597 Second, the sample size of the interview study amply fulfilled saturation criteria for
598 qualitative content analysis (Francis et al, 2009), representing a strength of the study. However,
599 the sample in the survey study is indicated by power analysis as being sufficient for detecting
600 only large effect sizes ($f^2=.35$; requiring a sample of $n = 48$ in regressions as conducted in the
601 study), and falling short of the required sample size for medium effect sizes ($f^2=.15$; requiring a
602 sample of $n = 107$; power analysis conducted using G*Power; Faul, Erdfelder, Buchner, & Lang,
603 2009). While the combination of interview and survey methods in this study is a strength that
604 provides a basis for the conceptual development conducted in this study and adequately
605 supported the conceptual refinement achieve, in the future, a wider test involving a larger sample
606 can help further establish the nature of the concept.

607 **4.3 Future research**

608 The repositioning of safety commitment with a focus on individual leaders developed in
609 this paper opens up several opportunities for future research. First, to complement the focus on
610 the leaders' own perspective adopted in this paper, going forward it will be important to consider
611 the subordinates' perspective on their leaders' experience and demonstrations of safety
612 commitment. Research concerning other forms of commitment shows that leaders' own
613 perceptions of their commitment are not necessarily aligned with their followers' perceptions
614 (Landry, Vandenberghe, & Ayed, 2014), suggesting that it will be of interest to study to what
615 extend leader and subordinate perceptions of the leader's safety commitment relate to each other.

616 Connected to this issue, it will be relevant to identify what factors contribute to a leader's
617 effectiveness in conveying their personal commitment to safety and may drive more or less
618 alignment of leader and followers' views on the leaders' safety commitment. Such factors can be
619 inherent in the leaders, followers, or the environments in which both operate. Further, research
620 can examine to what extent safety commitment in leaders in turn shapes their employees' safety
621 commitment and how the dimensions of safety commitment relate to safety outcomes as well as
622 the subordinates' safety behaviours.

623 Second, to overcome some of the concerns raised above related to self-reporting of the
624 dimensions of safety commitment and in particular calculative safety commitment,
625 measurements via other types of assessments could be considered. For example, the use of
626 implicit association tests to assess the different safety commitment dimensions may overcome
627 this issue and provide a measure of leaders' underlying automatic evaluations of safety
628 commitment drivers via response times (Greenwald, McGhee, & Schwartz, 1998).

629 Third, to build on this study's findings, future research can explore to what extent the
630 different safety commitment dimensions shape leadership style. For example, it can be proposed
631 that normative safety commitment can support leaders in developing stronger visions for safety
632 (as an aspect of transformational leadership; Rafferty & Griffin, 2004), rooted in their sense of
633 moral value in safety. It is further possible that affective safety commitment may be linked to
634 more engagement in leader support directed towards individual employees, which can be
635 reflected in consideration of employee needs and care for employees (Rafferty & Griffin, 2004).
636 This consideration and care can be rooted in the concern for employee wellbeing and care
637 inherent in affective safety commitment. Further, calculative safety commitment may contribute
638 to leaders' to engage in management by exception leadership, with a focus on establishing

639 performance standards and managing inadequate performance (i.e. management by exception –
640 passive; Judge & Piccolo, 2004), driven by a focus on safety via externally determined standards
641 and as a means of obtaining other role related goals (e.g. promotion).

642 Finally, going forward, more research is needed to investigate the antecedents of the safety
643 commitment dimensions, both in terms of the personal attributes of leaders and their work
644 contexts. For example, the reward and promotion structure attached to safety might influence the
645 level of calculative safety commitment if it orientates individuals toward other rewards that
646 might be gained by encouraging safety. Further, because the concept is not necessarily a stable
647 disposition, a longitudinal investigation of its development and effects over time can provide
648 further insights into leaders' safety commitment.

649 **4.4 Practical implications**

650 This paper introduces a new perspective on safety commitment in leaders. The
651 repositioning of the concept via a focus on leaders and a multidimensional structure provides
652 understanding of safety commitment beyond employee perceptions. By examining how leaders
653 experience and demonstrate their commitment to safety the roots of subsequent employee
654 perceptions of safety commitment can be uncovered. Currently most leaders will have been made
655 aware of the importance of their safety commitment, but receive little guidance on what it means
656 to be committed to safety and how to best demonstrate it. Leaders can use the insights presented
657 in this study to reflect about their safety commitment and how it affects the ways in which they
658 personally convey importance of safety. In particular a more detailed reflection about their safety
659 commitment may support them in developing stronger visions for safety that are rooted in their
660 own personal mindset for making safety a priority. Further, based on our findings, organisations
661 may look to shape their leaders' safety commitment to increase affective and normative safety

662 commitment. This can also be considered in the design of KPIs and reward structures as well as
 663 the formulation of organisational safety values. Our results also show that the ways in which
 664 organisations communicate the value of safety for their operations can be critical in shaping the
 665 extent to which leaders' safety commitment translates into behavioral demonstrations.

666

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671

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869

870 **Appendix**

871 **Literature review**

872 We applied the Boolean search term “safety commitment” in the available databases of
873 academic journals. The search engines were Scopus, PubMed, Web of Knowledge, Psycinfo,
874 PsycArticles and Science direct. No date limitations were set for articles, books or chapters.
875 Subsequently, it was inspected whether the papers referred to managerial or leader safety
876 commitment in the text (Stage 3) and references used in these papers in relation to managerial
877 safety commitment were identified and subsequently inspected (Stage 4). An inductive coding
878 procedure of the output of the literature search was carried out to structure the identified
879 descriptions (using N-Vivo). This procedure is described as suitable for theory building and has
880 previously been used in literature reviews (e.g. Henrickson Parker, Yule, Flin et al., 2011).
881 Conceptualisations of behaviours that demonstrate safety commitment were identified in 36
882 papers. A psychologist inductively grouped the descriptions into themes using a bottom-up
883 technique, matching similar descriptions to each other (resulting in six unnamed themes for
884 behavioural demonstrations of safety commitment). Each description was assigned to only one
885 theme. Finally, two organisational psychologists were given the sets of safety commitment
886 themes and asked individually to identify a common topic or meaning in each set of descriptions.
887 This exercise suggested the themes in the descriptions of safety commitment as highly robust, as
888 both psychologists identified almost identical topics to be reflected by each theme and found all
889 descriptions to match their theme.

890

891 **Interview questions**892 *Role related questions*

- 893 • What is your official role title and can you give a brief outline of your usual activities?
- 894 • How big is the team that you manage? (i.e. direct reports)
- 895 • How long have you been in that role?

896

897 *Safety commitment questions*

- 898 • In your view, what are the behaviours through which you personally demonstrate your commitment to safety? (to your team, others)
- 899
- 900 • What are your personal/ inherent motivations or drivers that make you focus on safety? Why is it
- 901 important to you?

902

903 *Critical incident questions*

- 904 • Can you tell me about a time or situation (a project, meeting or similar) that you remember well
- 905 where you demonstrated a strong commitment to safety?
- 906 • How would you describe the sense of safety commitment in that situation? What was your personal
- 907 driver that led you to maintain your focus on safety in that situation?
- 908 • How was your safety commitment reflected in the way you approached the situation? How
- 909 was it reflected in your own thinking? Your actions? How did you communicate it to your team?
- 910 • In that situation, were there any issues that made it difficult to make safety a priority?

911